



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.A.

**Revised Syllabus of F.Y.B.A. English (Optional)
Choice Based Credit System (60:40)
w.e.f. Academic Year 2022-23**

Details of the Course

Sr. No.	Heading	Particulars
1	Title of Course	Introduction to Literature Paper I (Semester I and II)
2	Eligibility for Admission	12 th Arts, Commerce and Science of all recognised Boards
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-23

Preamble of the Syllabus:

English plays an important role in the life of every learner because it is an international language. Knowledge of English is considered as one of the most significant facets of one's personality. There is passionate desire in the mind of students to learn English in order to achieve global identity in today's competitive and digital world.

There is an indispensable relationship between literature and society. Every writer is endowed with keen observation, perception, creative and imaginative skills in the process of creation of literary masterpieces. The study of literature has two powerful and resourceful functions of providing delight and inculcation of moral and social values. It also reforms and transforms to the learners through one of the most inspirational and mesmerizing stories and poems. Therefore, the realm of English literature is not only appealing but also stirring especially to the students.

The learners have tremendous sense of curiosity to delve, understand, visualize and appreciate various genres of English literature and accomplish aesthetic pleasures. The learners experience sense of astonishment, suspense, venture, adventure, bravery, pity and fear towards the protagonist reflected in the poems, stories, plays and novels. The hero or heroine in the English literature is an embodiment of virtues which are imitated by the students. As a result, everybody is Hamlet.

It is through the study of English literature, the learners are gifted with universal truths, human values, insights and develop healthy relationship with regards to people and nature. The syllabus aims at empowering to the students with literary beauty of world classics and enhance their linguistic confidence and create renaissance in academic and professional life.

Bachelor of Arts (B.A.) in English is a under graduate course of department of English, Changu Kana Thakur Arts, Commerce & Science

college, New Panvel (Autonomous) The Choice Based Credit and Grading System to be implemented through this curriculum would enable the students to explore new horizons and its applications in English. The learners pursuing this course of English literature can accomplish knowledge and skills necessary for better employability and professionalism in 21st century.

Objectives of the Course:

- To acquaint students with the salient characteristics of various literary genres.
- To develop analytical skills and critical thinking through close reading of literary texts.
- To cultivate appreciation of language as an artistic medium and to help them understand the importance of forms, elements and style that shape literary works.
- To enable students to understand that literature is an expression of human values within a historical and social context.
- To familiarize the students with the world famous literary works.

Course Outcome: By the end of the course, a student should develop the Ability:

- To Describe prominent elements of stories and types of novels
- To Identify thematic concerns reflected in the domains of English literature
- To Examine salient features of novella as a genre in English Literature
- To Explain moral, social and human values through the literary works
- To Interpret poetic and dramatic forms with suitable illustrations
- To Perceive the relationship between society and literature

• **Title of the Paper: Introduction to Literature**
F. Y. B. A. English

For the subject of English there shall be two papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester-I

1. Paper-I (Introduction to Literature) Unit-I will be on Terms
2. Paper-I Unit-II will be on Short Stories
3. Paper- I Unit-III will be on Novel

Semester-II

1. Paper-I (Introduction to Literature) Unit-I will be on Terms
2. Paper-I Unit-II will be on Poetry
3. Paper-I Unit-III will be on Play

Scheme of Examination for Each Semester:

Internal Evaluation: 40%

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

I	Theory:
	Each theory paper shall be of two and half hour duration.
	All questions are compulsory and will have internal options. All questions carry equal marks
Q-1	From Unit – I Short Notes (With Internal Options) 12 Marks

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	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

Choice Based Credit System (CBCS)
F. Y. B. A. English Syllabus
To be implemented from the Academic year 2022-2023
SEMESTER I

Course Code	Unit	Topics	Credits	Lectures
UARIENG1	I Terms	Section A: Elements of Novel and Short Story: Plot, Character, setting, Section B: Types of Novel: Picaresque, Epistolary, Stream of Consciousness, Realistic, Gothic	03	15
	II Short Stories	<ul style="list-style-type: none">• O’ Henry: “The Last Leaf”• Waman Hoval: “The Storeyed House”• Oscar Wilde: “The Nightingale and the Rose”• Edgar Allan Poe: “The Tell-tale Heart”• Katherine Mansfield: “The Doll’s House”• Kate Chopin: “The Story of an Hour		15

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	III Novel	<ul style="list-style-type: none"> • Earnest Hemingway: <i>The Old Man and The Sea</i> <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • Robert Louis Stevenson: <i>Dr. Jekyll and Mr. Hyde</i> 		15
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**Choice Based Credit System (CBCS)
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SEMESTER II**

Course Code	Unit	Topics	Credits	Lectures
UAR2ENG1	I Terms	<p>Section A: Types of Verse: Lyric, Sonnet, Ballad, Satire and Ode</p> <p>Section B: Types of Drama: Tragedy, Comedy and Melodrama</p>	3	15
	II Poetry	<ul style="list-style-type: none"> • Sonnet: William Shakespeare: 116: "Let Me Not to the Marriage of True Minds" • Satire: Oliver Goldsmith: "Elegy on the Death of Mad Dog" • Ode: John Keats: "Ode to Autumn" • Ballad: Thomas Campbell: "Lord Ullin's Daughter" • Lyric: Robert Frost: "Stopping by Woods on a Snowy Evening" 		15
	III Play	<ul style="list-style-type: none"> • Vijay Tendulkar: "Silence the Court is in Session" <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • John Millington Synge: "Riders to the Sea" 		15

Reference Books:

1. Abrams, M.H. *Glossary of Literary Terms*. India, Macmillan Publishers, 2000. Albert, E. *History of English Literature*, India, Oxford University Press, 2009. Athenian Society. *Drama, Its History*, England, Nabu Press, 2012.
2. Auger, Peter. *The Anthem Glossary of Literary Terms and Theory*, India, Anthem Press, , 2011. Brooks, Cleanth and Warren, Robert Penn. *Understanding Fiction*, Prentice Hall.
3. Bennett, Andrew and Nicholas Royle. *Introduction to Literature Criticism and Theory*. Great Britain: Pearson Education Limited, 2004.
4. Cavanagh, Dermot Alan Gillis, Michelle Keown, James Loxley and Randall Stevenson (Ed). *The Edinburgh Introduction to Studying Literature*. Edinburgh: Edinburgh University Press, 2010.
5. Chakrabarti, Piyas. *Anthem Dictionary of Literary Terms and Theory*. Delhi: Anthem Press, 2006. Edmond Gore and Alexander Holmes. *What is Poetry?* England, Nabu Press, 2010. Ford, Boris. *The Pelican Guide to English Literature*, Volume I to X
6. Forster, E M. *Aspects of the Novel*, (1954) London: Rosetta Books, 2002.
7. Fowler, Roger. (Ed.). *A Dictionary of Modern Critical Terms*. (Rev.Ed.) London: Routledge & Kegan Paul, 1987.
8. Gibson Arthur. *What is Literature*, Peter Lang Pub Inc, 2007.
9. Hudson, W.H., 2011, *An Outline History of English Literature*, India, G K Publishers Pvt. Ltd McKeon, Michael. *Theory of the Novel: A Historical Approach*. Baltimore: John Hopkins University Press, 2000.
10. Prasad, B. . *Background of the Study of English Literature*, Chennai, Macmillan, 1999.
11. Rees, R.J. *English Literature: An Introduction to Foreign Readers*, New Delhi: Macmillan, 1982. Turco , Lewis. *The Book of Literary Terms*, UK, University Press of New England, 1999.
12. Widdowson, Peter. *The Palgrave Guide to English Literature and its Contexts 1500-2000*, Hampshire: Palgrave, Macmillan, 2004



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Program: B.A.

Revised Syllabus of F.Y.B.A. Communication Skills in English

**Choice Based Credit System (60:40)
w.e.f. Academic Year 2022-23**

F.Y.B.A. Communication Skills in English Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	Communication Skills in English I (Semester I and II)
2	Eligibility for Admission	12 th Arts, Commerce and Science of all recognised Board
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-23

Preamble of the Syllabus:

Communication Skills of English involves systematic and continuous process of speaking, learning and understanding. Students at undergraduate level have physical and mental abilities to talk, but they lack the various skills of communication in English. Communication in English is considered as a passport to better education and employment opportunities. It also plays a crucial role to weave the world into a single thread because English is received a status of a professional language. To acquire the skills of language students need to be well acquainted with various functions of English language.

Communication Skills of English transforms the student's point of view towards language; moreover it gives an opportunity to be an effective communicator in today's digital world. It has become a global link as it has been used effectively in science, literature, information technology and competitive examinations at national and international levels. The aim of this syllabus is to empower the learners with basic language skills, vocabulary enrichment, clear understanding of passages, and interpretation of technical data and the skill of summarization. It also trains the students in effective drafting of formal correspondence and inculcates creative and imaginative writing. The syllabus of Communication Skills of English will enhance the basic language skills of the students. In addition to that it will also develop the creative and imaginative panorama of the students and has multi-dimensional approach that will improve the proficiency of students at wider level.

Objectives of the Course:

- To acquaint students with the various skills of English language
- To enhance language proficiency by providing adequate exposure to the Listening, Speaking, Reading, Writing skills
- To orient learners towards the functional aspects of English language
- To promote the students to learn information technology based communication Skills of English
- To increase the range of lexical resources through a variety of exercises
- To develop the creativity amongst the students

Course Outcome: By the end of the course, a student should develop the Ability:

- To Develop quick and efficient reading techniques in order to achieve academic performance
- To classify the different use of formal correspondence in the rapid era of information technology.
- To Find out multiple ways of vocabulary enrichment to improve communicative competence
- To Appraise E-mail writing techniques for quick and precise for better communication
- To Improve the artistic and imaginative skills of different types of writing

- **F. Y. B. A. Communication Skills in English**

For the subject of Communication Skills in English there shall be two papers for 45 lectures each comprising of five units of 09 lectures each.

Semester-I

1. Paper-I Unit-I will be on Basic Language Skills: Grammar
2. Paper-I Unit-II will be on Listening Skills
3. Paper- I Unit-III will be on Reading Skills: Comprehension (unseen passage)
4. Paper- I Unit-IV will be on Writing Skills (Formal Correspondence): Letters
5. Paper- I Unit-V will be on Writing Skills: Essay

F.Y.B.A. Communication Skills in English Syllabus

Semester-II

1. Paper- Unit-I will be on Basic Language Skills: Vocabulary building
2. Paper-II Unit-II will be on Speaking Skills:
3. Paper-II Unit-III will be on Writing Skills: e mails
4. Paper- II Unit-IV will be on Report Writing
5. Paper- II Unit-V will be on Creative Writing

Scheme of Examination for Each Semester:

Internal Evaluation: 40 %

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory: Semester-I			
I	Each theory paper shall be of two hours duration.		
	All questions are compulsory and will have internal options. All questions carry equal marks		
	Q-1	A) Basic grammar	12 Marks
	Q-2	A) Short notes with internal choice Unit II	12 Marks
	Q-3	Comprehension of an unseen passage (Unit-III)	12 Marks
	Q-4	Letters with internal options Unit IV	12 Marks
	Q-5	Essay (1 out of 2) (Unit- V)	12 Marks

F.Y.B.A. Communication Skills in English Syllabus

II	Theory: Semester-II	
	Each theory paper shall be of two hours duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	Objective questions (Unit-I) 12 Marks
	Q-2	A)Short notes with internal options (Unit-II) 12 Marks
	Q-3	A)E-Mail with internal options (Unit-III) 12 Marks
Q-4	Report Writing internal options (Unit-IV) 12 Marks	
Q-5	Creative Writing internal options (Unit-V) 12 Marks	

Choice Based Credit System (CBCS)
F. Y. B. A. Communication Skills in English Syllabus
To be implemented from the Academic year 2022-23
SEMESTER I

Course Code	Unit	Topics	Credits	Lectures
UAR1CS1	I Basic Language Skills: Grammar	a. Parts of Speech b. Tenses c. Types of Verbs	03	09
	II Listening Skills	a. Concept of listening b. Types of listeners c. Effective ways of listening		09
	III Reading Skills: Comprehension (unseen passage)	The following skills to be acquired: • Reading with fluency and speed • Skimming and scanning • Identifying relevant information • Isolating fact from opinion • Understanding concepts and arguments		09

F.Y.B.A. Communication Skills in English Syllabus

		• Identifying distinctive features of language		
	IV Writing Skills (Formal Correspondence): Letters	a. Job Application Letter (with Resume) b. Statement of Purpose c. Request for information under Right to Information Act (RTI)		09
	V. Writing Skills: Essay	a. Expository b. Persuasive c. Reflective/Descriptive		09

Choice Based Credit System (CBCS)
F. Y. B. A. Communication Skills in English Syllabus
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SEMESTER II

Course Code	Unit	Topics	Credits	Lectures
UAR2CS1	I Basic Language Skills: Vocabulary building	a. Antonyms, Synonyms b. Suffixes, Prefixes, Root words c. Homophones, homonyms Collocation	3	09
	II Speaking Skills	a. Group Skills b. Interview c. Public Speaking		09
	III Writing Skills: E-mails	a. Inquiry b. Invitation c. Congratulation		09
	IV Report Writing	a. Eye-witness Report b. Activity Report c. Newspaper Report		09

F.Y.B.A. Communication Skills in English Syllabus

	V Creative Writing	This unit attempts to cover those aspects of writing that go beyond the boundaries of technical or professional forms of writing and encourage the learner to explore the artistic and imaginative elements of writing. a. Story writing b. Dialogue writing c. Blog Writing		09
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Reference Books:

1. Bellare, Nirmala. *Reading Strategies*. Vols. 1 and 2. New Delhi. Oxford University Press, 1998.
2. Bhasker, W. W. S & Prabhu, N. S.: *English through Reading*, Vols. 1 and 2. Macmillan, 1975.
3. Blass, Laurie, Kathy Block and Hannah Friesan. *Creating Meaning*. Oxford: OUP, 2007.
4. Brown, Ralph: *Making Business Writing Happen: A Simple and Effective Guide to Writing Well*. Sydney: Allen and Unwin, 2004.
5. Buscemi, Santi and Charlotte Smith, *75 Readings Plus*. Second Edition New York: McGraw-Hill, 1994.
6. Doff, Adrian and Christopher Jones *.Language in Use (Intermediate and Upper Intermediate)*. Cambridge: CUP, 2004.
7. Doughty, P. P., Thornton, J. G, *Language in Use*. London: Edward Arrol, 1973.
8. Freeman, Sarah: *Written Communication*. New Delhi: Orient Longman, 1977.
9. Glendinning, Eric H. and Beverley Holmstrom. Second edition. *Study Reading: A Course in Reading Skills for Academic Purposes*. Cambridge: CUP, 2004
10. Grellet, F. *Developing Reading Skills*, Cambridge: Cambridge University Press, 1981.
11. Hamp-Lyons, Liz and Ben Heasley. Second edition. *Study Writing: A Course in Writing Skills for Academic Purposes*. Cambridge: CUP, 2006
12. Jakeman, Vanessa and Clare McDowell. *Cambridge Practice Test for IELTS 1*. Cambridge: CUP, 1996.
13. Maley, Alan and Alan Duff. Second Edition. *Drama Techniques in Language Learning*.

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Cambridge: CUP, 1983.

14. Mohan Krishna & Banerji, Meera: *Developing Communication Skills*. New Delhi: Macmillan India, 1990.
15. Mohan Krishna & Singh, N. P. *Speaking English Effectively*. New Delhi: Macmillan India, 1995.
16. Narayanaswami, V. R. *Organised Writing*, Book 2. New Delhi: Orient Longman.
17. *Reading & Thinking in English*, Four volumes, (vol. 1 for the lowest level, vol. 4 for the highest level). The British Council Oxford University Press, 1979-1981.
18. Sasikumar, V., Kiranmai Dutt and Geetha Rajeevan. *A Course in Listening and Speaking I& II*. New Delhi: Foundation Books, Cambridge House, 2006.
19. Savage, Alice, et al. *Effective Academic Writing*. Oxford: OUP, 2005.
20. Widdowson, H. G.: *English in Focus. English for Social Sciences*.



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Program: B. Com.

**Revised Syllabus of F.Y.B. Com. Business Communication
Choice Based Credit System (60:40)
w.e.f. Academic Year 2022-23**

The Details of Course

Sr. No.	Heading	Particulars
1	Title of Course	Business Communication paper I and II(Semester I and II)
2	Eligibility for Admission	12 th Commerce and Science of all recognised Boards
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-23

Preamble of the Syllabus:

Business communication plays crucial role in commercial world. It is regarded as the life blood of the internal and external activities performed in the business organizations. The growth of an organization directly or indirectly depends upon the effective methods of communication employed by all the stakeholders. Success and image building in the business arena is determined by different dimensions of communication. Therefore, all the corporate professionals should have command over oral and written communication.

Business communication is successful and effective only when all the elements of the communication process are actively involved in it. The desire to communicate is very natural and fundamental amongst all the human beings. Hence, corporate communication is intentional as well as unintentional. Action oriented communication is an amalgamation of verbal as well as non- verbal means of communication.

Business communication as a phenomenon has experienced tremendous transformation on account of advent of information technology and its application in all the spheres of business world. The information technology revolution which the world has experienced in the last decade has reformed business communication consistently and made it techno-savvy. As a result, business communication reaches across the world within seconds and all the business activities are performed digitally.

It is through the study of business communication, the learners are empowered with the process of successful communication, effective use body language, presentation and interview skills in the realm of commerce. It also makes them understand nuances of group discussion, meetings and conferences to be implemented in professional life. The students are meticulously trained in the process of drafting various business correspondences along with report writing needed in the commercial organizations.

The systematic learning of business communication is capable of creating successful managers, accountants, entrepreneurs and businessmen with sound knowledge and skills needed in today's vibrant, competitive and digital business realm.

Objectives of the Course:

- To familiarize the students with process of communication and its applications
- To acquaint the students with different types of communication
- To demonstrate effective use of technology in communication
- To inform the students about barriers to effective communication
- To introduce the students with business correspondence
- To develop effective listening skills amongst the students
- To cultivate effective oral skills those can enable students to speak confidently, interpersonally as well as in business organization

Course Outcome: After successful completion of the course the learner should be able:

- To define the process successful communication and application of technology enabled communication
- To discuss prominent methods of communication in business organization and barriers to communication.
- To formulate various types of commercial correspondences
- To illustrate different types of interviews practiced in business organizations
- To explain types of meetings and committees and its application in corporate world
- To construct reports and formal business letters effectively

F. Y. B. Com Business Communication

For the subject of Business Communication there shall be two papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester-I

1. Paper-I Unit-I will be on Theory of Communication
2. Paper-I Unit-II will be on Business Correspondence
3. Paper- I Unit-III will be on Language and Writing Skills

Semester-II

1. Paper-II Unit-I will be on Group Communication
2. Paper-II Unit-II will be on Business Correspondence
3. Paper-II Unit-III will be on Language and Writing Skills

Scheme of Examination for Each Semester:

Internal Evaluation: 40

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

I	Theory: Semester I	
	Each theory paper shall be of two hours duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit –I Short Notes (With Internal Options) 12 Marks
	Q-2	From Unit –II (Essay having Internal Options) 12 Marks
	Q-3	From Unit –III (Essay having Internal Options) 12 Marks
	Q-4	From Unit –II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit –III (Short Notes any Two out of Four) 12 Marks
II	Theory: Semester II	
	Each theory paper shall be of two hours duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit –I Short Notes (With Internal Options) 12 Marks
	Q-2	

		From Unit –II (Essay having Internal Options)	12 Marks
	Q-3	From Unit –III (Essay having Internal Options)	12 Marks
	Q-4	From Unit –II (Short Notes any Two out of Four)	12 Marks
	Q-5	From Unit –III (Short Notes any Two out of Four)	12 Marks

Choice Based Credit System (CBCS)
F. Y. B. Com Business Communication Syllabus
To be implemented from the Academic year 2022-23
SEMESTER I

Course Code	Unit	Topics	Credits	Lectures
UCM1BC	I Theory of Communications and its Types	1. Concept of Communication <ul style="list-style-type: none"> • Meaning and Definition of Communication • Process of Communication • Need of Communication 2. Technology Enabled Communication and Types of Communication Types: Internet, Blogs, E-mail, Moodle, Social Media - Facebook, Twitter and What's App - Advantages & Disadvantages 3. Communication at the Workplace <ul style="list-style-type: none"> • Channels of Communication - Formal and Informal, Vertical, Horizontal, Grapevine • Methods of Communication Verbal and Non-verbal • Business Etiquettes 	03	15
	II Communication Barriers and Listening Skills	1. Problems/ Barriers to Communication <ul style="list-style-type: none"> • Physical, Semantic/Language, Socio-Cultural and Psychological Barriers 2. Listening		15

		<ul style="list-style-type: none"> • Importance of Listening Skills • Barriers to Listening <p>Cultivating Good Listening Skills</p>		
	III Business Corresp ondence	<p>1.Theory of Business Letter Writing</p> <ul style="list-style-type: none"> • Parts of a Business Letter • Full Block Layout of a Business Letter • Principles of Effective E-mail Writing <p>2. Personnel Correspondence 10 Lectures</p> <ul style="list-style-type: none"> • Statement of Purpose • Job Application Letter and Résumé • Letter of Resignation <p>3. Tutorials Activities-</p> <ul style="list-style-type: none"> • Speaking Skills • Writing Skills • Remedial Grammar • Soft Skills- EQ, Time Management • Role Play • Advertising • Computer Ethics • Corporate Social Responsibility 		15

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SEMESTER II

Course Code	Unit	Topics	Credits	Lectures
UCM2BC	I Group Communications	1. Group Discussions & Interviews <ul style="list-style-type: none"> • Group Discussion • Preparing for an Interview • Types of Interviews Selection, Grievance, Online 2. Meetings <ul style="list-style-type: none"> • Need and Importance of Meetings • Types of Meetings • Conduct of a Meeting • Drafting of Notice, Agenda and Resolutions 3. Committees <p style="text-align: center;">Conferences</p> <ul style="list-style-type: none"> • Importance & Types of Committees • Meaning & Importance of Conference • Modern Methods of Conducting Conferences- Skype & Webinar 4. Public Relations <ul style="list-style-type: none"> • Meaning of Public Relations (PR) • Functions of the PR Department of an Organization • External and Internal Measures of Promoting PR 	03	15
	II Business Correspondence	1. Trade Letters <ul style="list-style-type: none"> • Letters of Inquiry • Letters of Complaints, • Sales Letters 		15

		<ul style="list-style-type: none"> • Letters under Right to Information (RTI) Act 	
	III Business Report Writing	<ul style="list-style-type: none"> • Reports and Business Proposals • Parts of a Business Report • Types of Business Reports • Feasibility Reports • Investigative Reports • Drafting of Business Proposals • Tutorial Activities • Group Discussion • Book Reviews • Mock Interviews • Presentations • Press Release • Mock meeting 	15

Reference Books:

1. Agarwal, Anju D. (1989) A Practical Handbook for Consumers, India Book House, Mumbai.
2. Ashley, A. (1992) A Handbook Of Commercial Correspondence, Oxford University Press, New Delhi.
3. Aswalthapa, K. (1991) Organisational Behaviour, Himalayan Publications, Mumbai.
4. Atreya, N. and Guha (1994) Effective Credit Management, MMC School of Management, Mumbai.
5. Bahl , J. C. and Nagamia S. M. (1974) Modern Business Correspondence and Minute Writing, N. M. Tripathi Pvt. Ltd .New Delhi.
6. Balan, K.R. and Rayudu, C. S. (1996) Effective Communication, Beacon Books, New Delhi.
7. Bangh, L.Sue, Fryar, Maridell and Thomas David A. (1998) How to Write First Class Business Correspondence, N.T.C. Publishing Group USA.

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8. Banerjee, Bani P. (2005) *Foundation of Ethics in Management*, Excel Books, New Delhi.
9. Barkar, Alan (1993) *Making Meetings Work*, Sterling Publications Pvt. Ltd., New Delhi.
10. Basu, C. R. (1998) *Business Organisation and Management*, Tata McGraw-Hill, New Delhi.
11. Benjamin, James (1993) *Business and Professional Communication Concepts and Practices*, Harper Collins College Publishers, New York.
12. Bhargava and Bhargava (1971) *Company Notices, Meetings and Regulations*, Taxman New Delhi.
13. Black, Sam (1972) *Practical Public Relations*, E.L.B.S. London.
14. Britt, Deborah. *Improving Business Communication Skills*, Kendall Hunt Publishing Co. (1992) 26
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CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.M.S.

**Revised Syllabus of F.Y.B.M.S. (Business Communication)
Choice Based Credit System (60:40)
w.e.f. Academic Year 2022-23**

F.Y.B.M.S. (Business Communication) Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	Business Communication paper I and II(Semester I and II)
2	Eligibility for Admission	12 th Commerce, Arts and Science of all recognised Boards
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-23

Preamble of the Syllabus:

Business communication plays crucial role in commercial world. It is regarded as the life blood of the internal and external activities performed in the business organizations. The growth of an organization directly or indirectly depends upon the effective methods of communication employed by all the stakeholders. Success and image building in the business arena is determined by different dimensions of communication. Therefore, all the corporate professionals should have command over oral and written communication.

Business communication is successful and effective only when all the elements of the communication process are actively involved in it. The desire to communicate is very natural and fundamental amongst all the human beings. Hence, corporate communication is intentional as well as unintentional. Action oriented communication is an amalgamation of verbal as well as non- verbal means of communication.

Business communication as a phenomenon has experienced tremendous transformation on account of advent of information technology and its application in all the spheres of business world. The information technology revolution which the world has experienced in the last decade has reformed business communication consistently and made it techno-savvy. As a result, business communication reaches across the world within seconds and all the business activities are performed digitally.

It is through the study of business communication, the learners are empowered with the process of successful communication, effective use body language, presentation and interview skills in the realm of commerce. It also makes them understand nuances of group discussion, meetings and conferences to be implemented in professional life. The students are meticulously trained in the process of drafting various business correspondences along with report writing needed in the commercial organizations.

The systematic learning of business communication is capable of creating successful managers, accountants, entrepreneurs and businessmen with sound knowledge and skills needed in today's vibrant, competitive and digital business realm.

Objectives of the Course:

- To familiarize the students with process of communication and its applications
- To acquaint the students with different types of communication
- To demonstrate effective use of technology in communication
- To inform the students about barriers to effective communication
- To introduce the students with business correspondence
- To develop effective listening skills amongst the students
- To cultivate effective oral skills those can enable students to speak confidently, interpersonally as well as in business organization

Course Outcome: After successful completion of the course the learner should be able:

- To Demonstrate the outline of theory of Business Communication
- To Analyse formal and informal communication present in business organizations
- To Examine methods of communication and identify different barriers to successful communication
- To Formulate various types of commercial letters effectively
- To Identify different types of interviews organized in commercial world
- To Analyse mechanism of meetings, conferences and its applications in business world

F. Y. B.M.S. (Business Communication)

For the subject of Business Communication there shall be two papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester-I

1. Paper-I Unit-I will be on Theory of Communication
2. Paper-I Unit-II will be on Obstacles to Communication in Business World
3. Paper- I Unit-III will be on Business Correspondence
4. Paper- I Unit- IV will be on Language and Writing Skills

Semester-II

1. Paper-I Unit-I will be on Group Communication
2. Paper-II Unit-II will be on Presentation Skills
3. Paper-II Unit-III will be on Business Correspondence
4. Paper-II Unit- IV will be on Language and Writing Skills

Scheme of Examination for Each Semester:

Internal Evaluation: 40 Marks.

Internal Assessment: 40 %

40 Marks

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I Short Notes (With Internal Options) 12 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

Choice Based Credit System (CBCS)
F.Y. B.M.S. (Business Communication) Syllabus
To be implemented from the Academic year 2022-23
SEMESTER I

Course Code	Unit	Topics	Credits	Lectures
UCM1BC	I Theory of Communication	<p>1. Concept of Communication Meaning, Definition, Process, Need, Feedback Importance of Communication in Corporate world</p> <p>2. Channels and Objectives of Communication: Channels- Formal and Informal- Vertical, Horizontal and Grapevine.</p> <p>3. Objectives of Communication Information, Order, Persuasion, Motivation, Warning, and Boosting the Morale of Employees</p> <p>4. Methods and Modes of Communication Methods: Verbal and Non-verbal, Characteristics of Verbal and Non-verbal Communication, Business Etiquette Technology Enabled Communication: Email, Fax, Video and Satellite Conferencing</p>	03	15
	II Obstacles to Communication in Business World	<p>1. Problems in Communication / Barriers to Communication Physical/ Semantic/Language / Socio-Culture/ Psychological / Barriers, Ways to Overcome these Barriers.</p> <p>2. Listening</p> <ul style="list-style-type: none"> • Importance of Listening Skills, • Types of Listeners, Cultivating good Listening Skills – 4 <p>3. Introduction to Business Ethics</p> <ul style="list-style-type: none"> • Concept and Interpretation, Importance of Business Ethics, Personal Integrity at the workplace, Business Ethics and 		15

F.Y.B.M.S. (Business Communication) Syllabus

		<p>media, Corporate Social Responsibility.</p> <ul style="list-style-type: none"> • Teachers can adopt a case study approach and address issues such as the following so as to orient and sensitize the student community to actual business practices: • Surrogate Advertising, Patents and Intellectual Property Rights, Dumping of Medical/E-waste, • Human Rights Violations and Discrimination on the basis of gender, race, caste, religion, appearance and sexual orientation at the workplace • Piracy, Insurance, Child Labour. 		
	<p>III Business Correspondence</p>	<p>1. Theory of Business Letter Writing</p> <ul style="list-style-type: none"> • Parts, Structure, Layouts—Full Block, Modified Block, Semi - Block Principles of Effective Letter Writing, <p>2. Personnel Correspondence</p> <ul style="list-style-type: none"> • Statement of Purpose, Job Application Letter and Resume, Letter of Acceptance of Job Offer, Letter of Resignation, Letter of Appointment, Promotion and Termination, Letter of Recommendation. 		<p>15</p>
	<p>IV Language and Writing Skills</p>	<p>1. Commercial Terms used in Business Communication</p> <ul style="list-style-type: none"> • Paragraph Writing: • Blog Writing: • Advertising: <ul style="list-style-type: none"> • Activities • Listening Comprehension • Remedial Teaching • Speaking Skills: Presenting a News Item, Dialogue and Speeches • Paragraph Writing: Preparation of the first draft, Revision and Self – Editing, Rules of spelling. 		<p>15</p>

F.Y.B.M.S. (Business Communication) Syllabus

		<ul style="list-style-type: none"> • Reading Comprehension: Analysis of texts from the fields of Commerce and Management. <p>Particles:</p> <ul style="list-style-type: none"> • English language laboratory. 		
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**Choice Based Credit System (CBCS)
F. Y. B.M.S (Business Communication) Syllabus
To be implemented from the Academic year 2022-23
SEMESTER II**

Course Code	Unit	Topics	Credits	Lectures
UCM2BC	I Group Communication	<p>Interviews:</p> <ul style="list-style-type: none"> • Group Discussion <p>Preparing for an Interview, Types of Interviews – Selection, Appraisal, Grievance, Exit</p> <p>Meetings: Need and Importance of Meetings, Conduct of Meeting and Group Dynamics Role of the Chairperson, Role of the Participants, Drafting of Notice, Agenda and Resolutions</p> <p>Conference: Meaning and Importance of Conference Organizing a Conference Advantages and Disadvantages of Conference in Business World</p> <p>Public Relations: Meaning, Functions of PR Department, External and Internal Measures of PR</p>	03	15

F.Y.B.M.S. (Business Communication) Syllabus

	II Presentation Skills	Presentations <ul style="list-style-type: none"> • Principles of Effective Presentation • How to make a Power-Point Presentation • Public Speaking and its importance in corporate world 		15
	III Business Correspondence	Trade Letters: Letters of Inquiry, Letters of Order, Letters of Complaints, Letters of Adjustments Letters of Sales Letters, Letter of RTI, Promotional leaflets and fliers Consumer Grievance Letters		15
	IV Language and Writing Skills	Reports: Parts, Types, Feasibility Reports, Investigative Reports. Basics of Grammar: Parts of speech and Tense. Particles: English language laboratory: Presentations, Mock Interview, Group Discussion	03	15

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23. Frailley, L.E. (1982) *Handbook of Business Letters*, Revised Edn. Prentice Hall Inc., New Jersey.
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Program: B.A.F. Subject Code- UAF1ECS
Revised Syllabus of F.Y.B.A.F. *Effective Communication Skills.*

Choice Based Credit System (60:40)
w.e.f. Academic Year 2022-23

F.Y.B.A.F. Effective Communication Skills.

Sr. No.	Heading	Particulars
1	Title of Course	<i>Effective Communication Skills</i>
2	Eligibility for Admission	12 th Arts, Commerce and Science of all recognised Boards
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	One
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-23

Details of the Course

Preamble of the Course Syllabus

Communication is considered as an indispensable element of all the activities performed by the human beings. The success and failure of any activity is associated with application of communication. Effective communication Skills in English has become necessity in today's competitive and digital realm. The knowledge of English has become an inevitable facet of versatile personality development of the student. It is essential to enhance soft skills for accomplishment of personal as well as professional progress. Industry is also demanding an excellent balance of knowledge and skills in English pertaining to employees. Paradoxically, there is gap between demand of corporate world and skills developed by the curriculum. Therefore, it is crucial to upgrade communication skills of the learners. It is an initiative to contribute in the process of Skill India Campaign.

Effective communication skills in English is a pathway to achieve global identity in scientific and technology driven world. Hence, it is necessary to develop presentation, interview and leadership qualities in the personality of the students.

F.Y.B.A.F. Effective Communication Skills.

This innovative and creative two credit course aims at empowerment of effective communication skills in order to rise and shine in all the spheres of science and technology in 21st century.

Title: - *Effective Communication Skills.*

Course Objectives:

- ❖ To define essentials of basic grammar for effective communication.
- ❖ To explain significance of employment communication and its application
- ❖ To examine communication theory and develop effective presentation and interview skills.

Course Outcomes:

After completion of the course the student will be able to

- ❖ CO1: To develop effective communication skills amongst the students for better employment opportunities.
- ❖ CO2: To distinguish between verbal and non- verbal methods of communication.
- ❖ CO3: To adapt soft skills for inculcation of effective communication amongst students.

Title of the Paper: - *Effective Communication Skills.*

For the subject of *Effective Communication Skills* there shall be two papers for 30 lectures each comprising of two units of 15 Lectures each.

Semester-I

1. Paper-I (Academic Skills) Unit-I will be on Academic Skills
2. Paper-I Unit-II will be on Soft Skills

Scheme of Examination for Each Semester:

Internal Evaluation: 40%

Sr.No.	Particular	Marks
01	Any four tools out of these (10 Marks each) 1. Mock interview and resume (10 M) 2. Power Point Presentation and write up on the selected topics of the subjects (10 M) 3. Case studies and its write up (10 M) 4. Role Play and its write up (10 M) 5. Public Speech and its write up (10 M)	40 Marks

F.Y.B.A.F. Effective Communication Skills.

Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I Short Notes (With Internal Options) 15 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 15 Marks
	Q-3	From Unit – I (Essay having Internal Options.) 15 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 15 Marks

Choice Based Credit System (CBCS)

F. Y. B. A.F. Effective Communication Skills Syllabus

To be implemented from the Academic year 2022-2023

SEMESTER I

Course Code	Unit	Topics	Credits	Lectures
	Academic Skills	1.1.Essentials of Grammar: Parts of speech, Articles, Model Auxiliaries, Types of Sentences, Punctuation marks. 1.2.Employment Communication: Introduction, Resume, Curriculum Vitae, Developing an Impressive Resume, Formats of Resume, Job Application Letter, Email Writing. 1.3. Professional Presentation: Nature of Oral Presentation, planning a Presentation, Guidelines for Power Point Presentation, Preparing the	02	15

		<p>Presentation, Delivering the Presentation</p> <p>1.4.Job Interviews: Introduction, Definition of Interview, Types of Interviews, preparations made by the interviewer and interviewee, Guidelines for Job Interviews, Frequently Asked Questions during Interviews.</p> <p>1.5.Group Discussion: Introduction, Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion.</p> <p>1.6. Barriers to Communication: Nature and Definition, Types-Physical, Psychological, Semantic Barriers.</p>		
	2. Soft Skills	<p>2.1. Introduction to Soft Skills and Hard Skills: Nature, Definition and Importance of Soft Skills and Hard Skills</p> <p>2.2. Personality Development: Knowing Your-self, Positive Thinking, Integrity, Honesty, Leadership, Decision Making, Critical Thinking and Physical Fitness.</p>	02	15

F.Y.B.A.F. Effective Communication Skills.

		<p>2.3. Etiquette and Mannerism: Introduction, Professional and Technology Etiquette</p> <p>2.4. Communication Theory: Nature and Definition, Process of Communication, Types of Communication, Verbal and Non- Verbal Communication.</p> <p>2.5. Ethical Values: Ethics and Society, Theories of Ethics, Correlation, between Values and behaviour, Nurturing Ethics, Importance of Work Ethics.</p> <p>2.6. Leadership and Team Building: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams.</p>		
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2. Bhasker, W. W. S & Prabhu, N. S.: *English through Reading*, Vols. 1 and 2. Macmillan, 1975.
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5. Buscemi, Santi and Charlotte Smith, *75 Readings Plus*. Second Edition New York: McGraw-Hill, 1994.
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Choice Based Credit System (CBCS)
F. Y. B. Com Accounting and Finance (Business Communication)
Syllabus
To be implemented from the Academic year 2022-23
SEMESTER II

Course Code	Unit	Topics	Credits	Lectures
UAF1BC1	I	<p>1. Concept of Communication</p> <p>Meaning, Definition, Process, Need, Feedback Importance of Communication in Corporate world</p> <p>2. Channels and Objectives of Communication: Channels-</p> <p>Formal and Informal- Vertical, Horizontal and Grapevine.</p> <p>3. Objectives of Communication</p> <p>Information, Order, Persuasion, Motivation, Warning, and Boosting the Morale of Employees</p> <p>4. Methods and Modes of Communication</p> <p>Methods: Verbal and Non-verbal, Characteristics of Verbal and Non-verbal Communication, Business Etiquette, Technology Enabled Communication: Email, Fax, Video and Satellite Conferencing</p>	03	15
	II	<p>1. Problems in Communication /Barriers to Communication</p> <p>Physical/ Semantic/Language / Socio-Culture/ Psychological /</p>		15

	<p>Obstacles to Communication in Business World</p>	<p>Barriers, Ways to Overcome these Barriers.</p> <p>2.Listening</p> <ul style="list-style-type: none"> • Importance of Listening Skills, • Types of Listeners, Cultivating good Listening Skills – 4 <p>3.Introduction to Business Ethics</p> <ul style="list-style-type: none"> • Concept and Interpretation, Importance of Business Ethics, Personal Integrity at the workplace, Business Ethics and media, Corporate Social Responsibility. • Teachers can adopt a case study approach and address issues such as the following so as to orient and sensitize the student community to actual business practices: • Surrogate Advertising, Patents and Intellectual Property Rights, Dumping of Medical/E-waste, • Human Rights Violations and Discrimination on the basis of gender, race, caste, religion, appearance and sexual orientation at the workplace • Piracy, Insurance, Child Labour. 		
	<p>III Business Correspondence</p>	<p>1. Theory of Business Letter Writing</p> <ul style="list-style-type: none"> • Parts, Structure, Layouts—Full Block, Modified Block, Semi - Block Principles of Effective Letter Writing, <p>2. Personnel Correspondence</p> <ul style="list-style-type: none"> • Statement of Purpose, Job Application Letter and Resume, Letter of Acceptance of Job Offer, Letter of Resignation, Letter of Appointment, Promotion and Termination, Letter of Recommendation. 		<p>15</p>

	<p style="text-align: center;">IV</p> <p>Language and Writing Skills</p>	<p>1. Commercial Terms used in Business Communication</p> <ul style="list-style-type: none"> • Paragraph Writing: • Blog Writing: • Advertising: <p>Activities</p> <ul style="list-style-type: none"> • Listening Comprehension • Remedial Teaching • Speaking Skills: Presenting a News Item, Dialogue and Speeches • Paragraph Writing: Preparation of the first draft, Revision and Self – Editing, Rules of spelling. • Reading Comprehension: Analysis of texts from the fields of Commerce and Management. <p>Practicals:</p> <ul style="list-style-type: none"> • English language laboratory. 		<p>15</p>
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Choice Based Credit System (CBCS)
S. Y. B.Com Accounting and Finance (Business Communication)
Syllabus
To be implemented from the Academic year 2022-23
SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
UAF2BC2	I Group Communication	Interviews: <ul style="list-style-type: none"> • Group Discussion • Preparing for an • Interview, Types of • Interviews – Selection, Appraisal, Grievance, and Exit Meetings: <ul style="list-style-type: none"> • Need and Importance of Meetings, • Conduct of Meeting • Group Dynamics • Role of the Chairperson, • Role of the Participants, • Drafting of Notice, Agenda and Resolutions Conference: <ul style="list-style-type: none"> • Meaning and Importance of Conference • Organizing a Conference • Advantages and Disadvantages of Conference in Business World Public Relations: <ul style="list-style-type: none"> • Meaning, Functions of PR Department • External and Internal Measures of PR 	03	15

	II Presentation Skills	Presentations <ul style="list-style-type: none"> • Principles of Effective Presentation • How to make a Power-Point Presentation • Public Speaking and its importance in corporate world 		15
	III Business Correspondence	Trade Letters: <ul style="list-style-type: none"> • Letters of Inquiry, • Letters of Order, • Letters of Complaints, • Letters of Adjustments • Letters of Sales Letters, • Letter of RTI, • Promotional leaflets and fliers • Consumer Grievance Letters 		15
	IV Language and Writing Skills	Reports: <ul style="list-style-type: none"> • Parts, Types, Feasibility Reports, • Investigative Reports. Basics of Grammar: <ul style="list-style-type: none"> • Parts of speech and Tense. Practical's: <ul style="list-style-type: none"> • English language laboratory: Presentations, Mock Interview, Group Discussion 	03	15



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
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NEW PANVEL (AUTONOMOUS)

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'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: B.A.

Revised Syllabus of S.Y.B.A. English II (Optional)
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2020-2021

Details of the Course

Sr. No.	Heading	Particulars
1	Title of Course	Indian Literature in English III (Semester III and IV)
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Syllabus:

The systematic and passionate study of English Literature plays an important role in the overall personality development of the learners. It becomes necessary to understand and appreciate various genres incorporated especially in the realm of American Literature. There is reflection of human life and its vicissitudes with the power of creative and imaginative faculty possessed by the writer. The salient personality traits of the people are communicated through the protagonist as well as an antagonist in literary masterpieces.

The learning of American Literature provides an insight into different perspectives of race, class, human values, materialism and spiritualism along with multiculturalism. It also empowers to the students to have an accurate perception about implications and applications of the so called “American Dream”. It also gives an opportunity to explore different facets of identity prevalent in an American environment.

The syllabus aims at inculcation of moral and social values, gender equality and annihilation racial discrimination in the mind of students and make them rise and shine and achieve success through the wings of American Literature in academic as well as professional arena in today’s digitization.

Bachelor of Arts (B.A.) in English is a under graduate course of department of English, Changu Kana Thakur Arts, Commerce & Science college, New Panvel (Autonomous) The Choice Based Credit and Grading System to be implemented through this curriculum would enable the students to examine various world classics belonging to American Literature and appreciate it for overall personality development in 21st century.

Objectives of the Course:

- To familiarize the learners with various genres of Indian Literature.
- To inform the students with prominent themes and styles of Indian Literature
- To study the prominent essays belonging to the realm of Indian Literature.
- To introduce the students with uniqueness of Indian Literature in English
- To enhance understanding of the students about socio- cultural milieu of India text and context.

Course Outcome: By the end of the course, a student should develop the Ability:

- To appreciate literary beauty depicted in the essays.
- To understand thematic concerns reflected in prominent Indian writers.
- To learn the pluralistic dimensions of Indian Literature in English
- To understand importance of Indian culture represented in English
- To enable the learners to delve into the speciality of Indian poetry.

Title of the Paper: Indian Literature in English

S. Y. B. A. English Paper: III

For the subject of English there shall be two papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester-III

1. Paper-III Unit-I will be on Essays
2. Paper-III Unit-II will be on Novel
3. Paper- III Unit-III will be on Short Stories

Semester- IV

1. Paper- III Unit-I will be on Essays
2. Paper- III Unit-II will be on Poetry
3. Paper- III Unit-III will be on Drama

Scheme of Examination for Each Semester:

Internal Evaluation: 40 %

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two- and half-hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I (Short Notes any Two out of Four) 12 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

Choice Based Credit Grading and Semester System (CBCGS)
S. Y. B. A. English – American Literature Paper III Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
UAR1ENG II	I Essays	i. Meenakshi Mukherjee: "The Anxiety of Indianness" ii. Urvashi Butalia: "Memory" from The Other Side of Silence: Voices from the Partition of India iii. K. Satchidanandan: "That Third Space: Interrogating the Diasporic Paradigm" iv. Jasbir Jain: "Prologue" from beyond postcolonialism: dreams and realities of a nation.	03	15
	II Novel	i. Anita Desai: Fasting, Feasting. OR ii. R. K. Narayan : Swami and Friends		15
	III Short Stories	i. Bhisham Sahani : "Pali" ii. Vilas Sarang : "A Revolt of the Gods" iii. Githa Hariharan : "The Remains of the Feast" iv. Shashi Deshpande : "The Awakening"		15

Choice Based Credit Grading and Semester System (CBCGS)
S. Y. B. A. English – American Literature Paper III Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER IV

Course Code	Unit	Topics	Credits	Lectures
UARENG II	I Essays	i. Makarand Paranjape: Introductory essay to Indian Poetry in English. ii. Arjun Dangle: “Dalit Literature: Past, Present and Future” from Poisoned Bread. iii. Vijay Tendulkar: “Characterization and Structure: Two Essentials for a Playwright” iv. Rajeswari Sunder Rajan: “English Literary Studies, Women’s Studies and Feminism in India”.	3	15
	II Poetry	i. Jayanta Mahapatra : ‘Hunger’ and ‘Freedom’ ii. Keki Daruwalla : ‘Map-Maker’ and ‘A Take-Off on a Passing Remark’ iii. Meena Kandasamy : ‘Ekalavyan’ and ‘The Flight of Birds’ iv. Dilip Chitre : ‘Father Returning Home’ and ‘Ode to Bombay’		15
	III Drama	Vijay Tendulkar : Kamala OR Mohan Rakesh : Halfway House		15

Reference Books:

1. Agrawal, Anju Bala. 2010. Post-Independence Indian Writing in English (Vols. I and II). Delhi: Authorspress.
2. Agarwal, Beena. 2012. Contemporary Indian English Drama: Canons and Commitments. Jaipur: Aadi Publications.
3. Agarwal, Smita,ed. 2014. Marginalized: Indian Poetry in English. New York: Rodopi6.
4. Ahmad, Aijaz. 1996. In Theory: Classes, Nations, Literatures. Delhi: Oxford University Press.
5. Basu, Tapan, ed. 2002. Translating Caste. New Delhi: Katha.
6. Bhattacharya, Gargi. “(De) Constructing an Aesthetics of Indian Writing in English”. Muse India, Issue 70 (Nov-Dec 2016)
7. Bose, Brinda, ed. 2002. Translating Desire: The Politics of Gender and Culture in India. New Delhi: Katha.
8. Daruwalla, Keki, ed. 1980. Two Decades of Indian Poetry 1960-1980. Delhi: Vikas Publishing.
9. Das, Bijay Kumar. “Remembering the Founding Fathers of Indian English Fiction”. Journal of Literature, Culture and Media Studies Winter Vol.-I. Number 2 (July-December 2009): 7-15.Web.
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11. Gandhi, Leela. 1998. Postcolonial Theory: A Critical Introduction. New Delhi : Oxford University Press.
12. Gopal, Priyamvada.2009. The Indian English Novel: Nation, History, and Narration. Oxford University Press.
13. Iyengar, Srinivasa. 1985. Indian Writing in English, 5th ed. New Delhi: Sterling Publishers.
14. Jain, Jasbir. 2002. Gender and Narrative. New Delhi: Rawat Publications.
15. Jain, Jasbir. 2004. Dislocations and Multiculturalism. Jaipur: Rawat Publications.
16. Jain, Jasbir and Singh, Veena. 2004. Contesting Postcolonialisms. 2nd edition. Jaipur: Rawat Publications.

S.Y.B.A. English Paper II

17. Jain, Jasbir. 2006. *beyond postcolonialism: dreams and realities of a nation*. Jaipur: Rawat Publications.
18. Jain, Jasbir. 2007. *Reading Partition/Living Partition*. Jaipur: Rawat Publications.
19. Joshi, Priya. 2003. *In Another Country: Colonialism, Culture and the English Novel in India*. New Delhi: Oxford University Press.
20. Kambar, Chandrasekhar. 2000. *Modern Indian Plays*. Vols. 1 & 2. New Delhi: National School of Drama.
21. Karnad, Girish. 1995. "Author's Introduction" in *Three Plays*. Delhi: OUP.
22. King, Bruce. 2001. *Modern Indian Poetry in English*. Revised Edition. Oxford University Press.
23. Kushwaha, M.S. 1984. *Dimensions of Indian English Literature*. New Delhi: Sterling Publishers Pvt. Ltd.
24. Mc Cutchion, David. 1973. *Indian Writing in English*. Calcutta: Writers Workshop.
25. Mehrotra, Arvind, ed. 2010. *A Concise History of Indian Literature in English*. New Delhi : Permanent Black.
26. Mittal, R.K. 2013. *Problems of Indian Creative Writing in English*. New Delhi: Kumud Publishers.
27. Mittapalli, Rajeshwar and Piciucco, Pier Paolo. 2000. *Studies in Indian Writing in English*, Vol. 1. New Delhi: Atlantic Publishers and Distributors.
28. Mishra, V. 2008. *Literature of the Indian Diaspora*. London: Routledge.
29. Mouli, T. Sai Chandra. 2011. *Multicultural Theatre and Drama*. New Delhi: Authorspress.
30. Mukherjee, Meenakshi. 2002. *The Perishable Empire: Essays on Indian Writing in English*. New Delhi: Oxford University Press.
31. Mukherjee, Meenakshi. 1994. *Realism and reality: The Novel and Society in India*. New Delhi: Oxford University Press.
32. Mukherjee, Meenakshi. 1971. *The Twice-Born Fiction: Themes and Techniques of the Indian Novel in English*. University of Michigan: Heineman Educational Books.
33. Naik, M.K. 1977. *Critical Essays on Indian Writing in English*. Madras: Macmillan.
34. Naik, M.K. 1979. *Aspects of Indian Writing in English*. Delhi: Macmillan.
35. Naik, M.K. 1982. *History of Indian English Literature*. New Delhi: Sahitya Akademi.
36. Naik, M.K. 1984. *Dimensions of Indian English Literature*. New Delhi: Sterling Publishers Pvt. Ltd.
37. Naik, M.K. 1987. *Studies in Indian English Literature*. New Delhi: Sterling Publishers

S.Y.B.A. English Paper II

Pvt. Ltd.

38. Nayar, Pramod. 2008. *Postcolonial Literature : An Introduction*. New Delhi: Pearson Education.
39. Panikker, K. Ayyappa. 1991. *Indian English Literature Since Independence: Golden Jubilee Vol.1940-1990*. New Delhi: The Indian Association for English Studies.
40. Paranjape, Makarand. 1993. *Indian Poetry in English*. Macmillan India Ltd.
41. Paranjape, Makarand. "Indian (English) Criticism: Some Notes." *Indian Literature*, Vol. 37, No. 2 (160) (March-April, 1994), pp. 70-78. Print.
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43. Rau, M. Chalapathi. 1982. *Indian Drama: Traditional Societies in Transition*. New Delhi: Allied Publishers Private Ltd.
44. Shaikh, F.A. 2009. *New Perspectives on Indian Writing in English*. New Delhi: Sarup and Sons.
45. Singh, Amardeep. "Friday, September 24 , 2004 "An Introduction to Edward Said, Orientalism, and Postcolonial Literary Studies." *F R I D A Y, S E P T E M B E R 24 , 2004* (2004): n. pag. Web. 15 Jan. 2017.
<<http://www.lehigh.edu/~amsp/2004/09/introduction-to-edward-said.html>>.
46. Sinha, Krishna Nandan. 1979. *Indian Writing in English*. Delhi: Heritage Publishers.
47. Stewart, Frank and Sukrita Paul Kumar, ed. 2008. *Crossing Over : Partition Literature from India, Pakistan and Bangladesh*. New Delhi: Doaba Publications.
48. Viswanathan, Gauri. 1989. *Masks of Conquest : Literary Study and British Rule in India*. New Delhi: Oxford University Press.
49. Walsh, William. 1990. *Indian Literature in English*. London: Longman.



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NEW PANVEL (AUTONOMOUS)**

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'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.A.

**Revised Syllabus of S.Y.B.A. English III (Optional)
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2020-2021**

Details of the Course

Sr. No.	Heading	Particulars
1	Title of Course	American Literature Paper III (Semester III and IV)
2	Eligibility for Admission	12 th Arts, Commerce and Science of all recognised Boards
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Syllabus: To Be Updated

English plays an important role in the life of every learner because it is an international language. Knowledge of English is considered as one of the most significant facets of one's personality. There is passionate desire in the mind of students to learn English in order to achieve global identity in today's competitive and digital world.

There is an indispensable relationship between literature and society. Every writer is endowed with keen observation, perception, creative and imaginative skills in the process of creation of literary masterpieces. The study of literature has two powerful and resourceful functions of providing delight and inculcation of moral and social values. It also reforms and transforms to the learners through one of the most inspirational and mesmerizing stories and poems. Therefore, the realm of English literature is not only appealing but also stirring especially to the students.

The learners have tremendous sense of curiosity to delve, understand, visualize and appreciate various genres of English literature and accomplish aesthetic pleasures. The learners experience sense of astonishment, suspense, venture, adventure, bravery, pity and fear towards the protagonist reflected in the poems, stories, plays and novels. The hero or heroine in the English literature is an embodiment of virtues which are imitated by the students. As a result, everybody is Hamlet.

It is through the study of English literature, the learners are gifted with universal truths, human values, insights and develop healthy relationship with regards to people and nature. The syllabus aims at empowering to the students with literary beauty of world classics and enhance their linguistic confidence and create renaissance in academic and professional life.

Bachelor of Arts (B.A.) in English is a under graduate course of department of English, Changu Kana Thakur Arts, Commerce & Science

S.Y.B.A. English III (Optional) Syllabus

college, New Panvel (Autonomous) The Choice Based Credit and Grading System to be implemented through this curriculum would enable the students to explore new horizons and its applications in English. The learners pursuing this course of English literature can accomplish knowledge and skills necessary for better employability and professionalism in 21st century.

Objectives of the Course:

- To acquaint the learners with various genres and literary terms of Twentieth Century American Literature.
- To sensitize the students with prominent themes and styles of American Literature
- To study eminent literary works of American writers
- To introduce the students with socio- cultural milieu of Twentieth Century America through world famous literary texts
- To enhance students understanding of American, African – American and multicultural sensibility through literary works.

Course Outcome: By the end of the course, a student should develop the Ability:

- To appreciate literary terms of Twentieth Century American Literature.
- To understand thematic concerns reflected in prominent American writers
- To develop gender equality in the personality of students
- To inculcate moral and social values in order to become better citizens
- To maintain equality and justice irrespective of race and class in the society.

Title of the Paper: American Literature

S. Y. B. A. English Paper: III

For the subject of English there shall be two papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester-III

1. Paper-III Unit-I will be on Terms
2. Paper-III Unit-II will be on Novel
3. Paper- III Unit-III will be on Short Stories

Semester- IV

1. Paper- III Unit-I will be on Terms
2. Paper- III Unit-II will be on Play
3. Paper- III Unit-III will be on Poetry

Scheme of Examination for Each Semester:

Internal Evaluation: 40 %

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

S.Y.B.A. English III (Optional) Syllabus

Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two- and half-hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I (Short Notes any Two out of Four) 12 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

Choice Based Credit Grading and Semester System (CBCGS)
S. Y. B. A. English – American Literature Paper III Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
UAR1ENG1II	I Terms	i. Naturalism in 20 th Century American Fiction ii. Lost Generation Writers iii. African American Fiction iv. Jewish American Fiction v. Literature of Chinese-American Diaspora vi. Literature of Indian Diaspora in America	03	15
	II Novel	• Toni Morrison: The Bluest Eye OR • Ernest Hemingway: Pearl		15
	III Short Stories	i. John Steinbeck: The Chrysanthemums ii. Alice Walker: Everyday Use iii. Amy Tan: Two Kinds iv. Bernard Malamud: The German Refugee v. Jhumpa Lahiri: Unaccustomed Earth		15

Choice Based Credit Grading and Semester System (CBCGS)
S. Y. B. A. English – American Literature Paper III Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER IV

Course Code	Unit	Topics	Credits	Lectures
UAR2ENG1	I Terms	i. American Dream, ii. Confessional Poetry iii. Expressionism in American Drama iv. African American Poetry of the 20 th century v. African American Drama of the 20 th Century vi. Broadway and Off Broadway Theatre	3	15
	II Play	<ul style="list-style-type: none"> • Arthur Miller: Death of a Salesman OR <ul style="list-style-type: none"> • James Baldwin: Blues for Mister Charlie 		15
	III Poetry	i) Langston Hughes: Mother to Son Democracy Dream Deferred I Too Sing American ii) Sylvia Plath: Mirror I am Vertical Tulips Age		15

Reference Books:

1. Abrams, M. H. *A Glossary of Literary Terms*. (8th Edition) New Delhi: Akash Press, 2007.
2. Baldick, Chris. *The Oxford Dictionary of Literary Terms*. Oxford: Oxford University Press, 2001.
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5. Cook, Bruce. *The Beat Generation*. New York: Scribners, 1971.
6. Gould, Jean. *Modern American Playwrights*. New York: Dodd, Mead, 1966.
7. Drabble, Margaret and Stringer, Jenny. *The Concise Oxford Companion to English Literature*. Oxford: Oxford University Press, 2007.
8. Fowler, Roger. Ed. *A Dictionary of Modern Critical Terms*. Rev. ed. London: Routledge & Kegan Paul, 1987.
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12. Henderson, Stephen, ed. *Understanding the New Black Poetry*. New York: William Morrow, 1973.
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S.Y.B.A. English III (Optional) Syllabus

19. Moore, Harry T., ed. *Contemporary American Novelists*. Carbondale: Southern Illinois University Press, 1964.
20. Pattee, Fred Lewis. *The Development of the American Short Story: An Historical Survey*. New York: Biblio and Tannen, 1975.
21. Rosenblatt, Roger. *Black Fiction*. Cambridge, Mass.: Harvard University Press, 1974.
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23. Stepanchev, Stephen. *American Poetry since 1945: A Critical Survey*. New York: Harper and Row, 1965.
24. Vendler, Helen. *Part of Nature, Part of Us: Modern American Poets*. Cambridge, Mass.: Harvard University Press, 1980.
25. Voss, Arthur. *The American Short Story: A Critical Survey*. Norman: Univ. of Oklahoma



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**Re-accredited 'A+' Grade by NAAC
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'Best College Award' by University of Mumbai**

Program: B. A.

**Revised Syllabus of T.Y.B.A. English Literature
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2021-2022**

Details of the Course

Sr. No.	Heading	Particulars
1	Title of Course	16 th to 18 th Century English Literature – Paper IV (Semester V and VI)
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Preamble of the Syllabus:

English Literature is a perennial source of honing of new horizons depicted in life as well as society. The strategic and passionate study of English Literature plays an important role in the overall personality development of the learners. Literature has been an epitome of human life with its fluctuations, uncertainties and unpredictability since time immemorial. Therefore, it is inevitable to understand and appreciate various genres incorporated especially in the realm of English Literature. There is a strong desire to learn English literature in the mind of students on account of its international significance in today's digital arena.

There is reformation and transformation in the identity and personality of the students through the systematic understanding of characters especially protagonist as well as an antagonist represented in literary masterpieces.

The passionate delving of English Literature provides an insight into different perspectives humanity, materialism and spiritualism along with multiculturalism. It also empowers to the students to have an accurate perception about implications and applications of the so called "To be or not to Be, Analysis and Evaluation of Literary Texts, Word Classes, Phrases and Clauses, Romanticism, Classicism, Victorian epoch and Modernism".

The syllabus aims at inculcation of moral, social, ethical values, close reading of literary text, gender, class and race inequality and eradication of racial discrimination in the mind of students and make them awake and arise to accomplish incredible and commendable success through the wings of English Literature in academic as well as professional world.

Bachelor of Arts (B.A.) in English Literature is a under graduate course of department of English, Changu Kana Thakur Arts, Commerce & Science college, New Panvel (Autonomous) The Choice Based Credit and Grading System to be implemented through this curriculum would enable the students to examine

various world classics belonging to English Literature and appreciate it for overall personality development in 21st century.

Objectives of the Course:

- To introduce the students to English Literature of the 16th, 17th and 18th centuries.
- To acquaint the students with prominent writers belonging to Elizabethan era.
- To understand development of various genres of poetry and drama.
- To familiarize the students with salient features of writing styles.
- To enhance students understanding about characterization and themes depicted in world famous literary work.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand the distinctive features of English literature of the 16th, 17th and 18th centuries.
- To comprehend the relationship between era and writers creative thinking.
- To recognize universal truths and human values represented in World Classics.
- To appreciate development of various genres of English literature.
- To understand the dramatic devices used during the Elizabethan era.

Title of the Paper: 16th to 18th Century English Literature

T. Y. B. A. English Paper: IV

For the subject of English, there shall be two papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester- V

1. Paper- IV Unit-I will be on Terms
2. Paper- IV Unit-II will be on Drama
3. Paper- IV Unit-III will be on Poetry

Semester- VI

1. Paper- IV Unit-I will be on Terms
2. Paper- IV Unit-II will be on Drama
3. Paper- IV Unit-III will be on Poetry

Scheme of Examination for Each Semester:

Internal Evaluation: 40 %

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two- and half-hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I (Short Notes any Two out of Four) 12 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

Choice Based Credit Grading and Semester System (CBCGS)
T. Y. B. A. English – 16th to 18th Century English Literature Paper IV
Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER V

Course Code	Unit	Topics	Credits	Lectures
UAR5ENG4	I Terms	<ul style="list-style-type: none"> • The Elizabethan Age (1550-1603) i. Renaissance ii. Elizabethan Poetry – Sonnets iii. Epic iv. Elizabethan Drama • The Jacobean Period (1603-1650) i. Characteristics of the Jacobean Period ii. Metaphysical Poetry iii. Jacobean Drama- Revenge Tragedy 	04	15
	II Drama	<ul style="list-style-type: none"> • William Shakespeare: Hamlet <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> • William Shakespeare: As you Like it 		15
	III Poetry	<ul style="list-style-type: none"> • Elizabethan Period Sir Philip Sidney i. Sonnet No. 1. Loving in Truth and Fain in Verse My Love to Show ii. Sonnet No. 9. Queen Virtue’s Court, which some call Stella’s Face 		15

T.Y.B.A. English Literature Syllabus

		<p>William Shakespeare</p> <p>i. Sonnet No. 18 Shall I Compare Thee to a Summer's Day</p> <p>ii. Sonnet No. 130 My Mistress Eyes are Nothing Like the Sun</p> <p>• Jacobean Period</p> <p>John Donne</p> <p>i. The Sunne Rising</p> <p>ii. Death Be Not Proud</p> <p>George Herbert</p> <p>i. Pulley</p> <p>ii. Love</p>		
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Choice Based Credit Grading and Semester System (CBCGS)
T. Y. B. A. English – 16th to 18th Century English Literature Paper IV
Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER VI

Course Code	Unit	Topics	Credits	Lectures
UAR6ENG4	I Terms	<ul style="list-style-type: none"> • The Restoration Period (1660-1700) i. Characteristics of Restoration Period ii. Restoration Poetry- Mock Epic iii. Restoration Drama- Comedy of Manners, iv. Heroic Tragedy • Neo-Classical Period (1700-1798) i) Neo- Classical/ Augustan Age ii) Age of Satire iii) Rise of the Periodical Essays 	3	15
	II Drama	<ul style="list-style-type: none"> • John Dryden: All for Love OR • Oliver Goldsmith: She Stoops to Conquer 		15
	III Poetry	<p>John Milton:</p> <ul style="list-style-type: none"> i) On His Blindness ii) How Soon Hath Time, the Subtle Thief of Youth <p>Alexander Pope:</p> <ul style="list-style-type: none"> i. The Rape of the Lock Canto II Lines 1-54 <p>John Dryden:</p> <ul style="list-style-type: none"> i) Alexander's Feast ii) Can Life be a Blessing 		15

Reference Books:

1. Alpers, Paul E. *Elizabethan Poetry: Modern Essays in Criticism* (OUP: 1967)
2. Daiches, David. *A Critical History of English Literature* (Secker and Warburg: London, 1960)
3. Ford, Boris Ed. *The New Pelican Guide to English Literature: The Age of Shakespeare* Vol. 2 (Penguin, 1993) From Donne to Marvell Vol. 3 (Penguin, 1990)
4. Keast, William B. *Seventeenth Century English Poetry: Modern Essays in Criticism* (OUP: 1971)
5. King, Bruce. *Seventeenth Century English Literature* (Macmillan: 1983).
6. Leggatt, Alexander. *English Drama: Shakespeare to The Restoration 1590- 1660* (Longman: Literature in English Series, 1988)
7. Perfit, George. *English Poetry of the Seventeenth Century* (Longman: Literature in English Series, 1992)
8. Parry, Graham. *The Seventeenth Century the Intellectual and Cultural Context of English Literature. 1603-1700* (Longman: Literature in English Series, 1989)
9. Pooley, Roger. *English Prose of the Seventeenth Century* (Longman: Literature in English Series, 1992)
10. Ricks, Christopher. *The Penguin History of English Literature* Vol.3. (Penguin, 1993)
11. Roston, Murray. *Sixteenth Century English Literature* (Macmillan, 1983)
12. Baugh, Albert C. *A Literary History of England, The Restoration and Eighteenth Century* (1660-1789), 2nd Edition, (London, Routledge and Kegan Paul, 1967)
13. Clifford, James L. Ed. *Eighteenth Century English Literature: Modern Essays in Criticism* (OUP, 1959)
14. Craig, Hardin. Ed. *A History of English Literature Series. Literature of the Restoration and the Eighteenth Century 1660-1798.* Vol III (London, Macmillan, 1969)
15. Ford, Boris. Ed. *The Pelican Guide To English Literature: From Dryden to Johnson,* Vol.4, (Penguin, 1982) & From Blake to Byron, Vol.5, (Penguin, 1982)
16. Jack, Ian. *Augustan Satire: Intention and Idiom in English Poetry 1660-1750* (OUP,1978)
17. Roger. *The Penguin History of English Literature: Dryden to Johnson.* Vol.4, (Penguin, 1993)
18. Probyn, Clive T. *English Fiction of The Eighteenth Century 1700-1789* (Longman

T.Y.B.A. English Literature Syllabus

Literature in English Series, 1987)

19. Novak, Maximillian E. *Eighteenth Century English Literature*, (Macmillan, 1983)
20. Sambrook, James. *The Eighteenth Century: The Intellectual and Cultural Context of English Literature 1700-1789*. (Longman Literature in English Series, 1986)
21. Sutherland, James. *A Preface to Eighteenth Century Poetry*, (OUP, 1975).

Details of the Course:

Sr. No.	Heading	Particulars
1	Title of Course	Literary Criticism – Paper V (Semester V and VI)
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Objectives of the Course:

- To introduce the learners to important critical terms.
- To make them aware of the nature and function of literature and criticism.
- To impart the technique of close reading of literary texts.
- To enable students to understand various literary theories and critical approaches.
- To familiarize the learners with the mechanism of application of theory to literary texts.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand use of important critical terms.
- Become aware the nature and function of literature and criticism.
- Impart the technique of close reading of literary texts.
- Understanding of various literary theories and critical approaches.
- To develop the skills of scansion and practical criticism.

Title of the Paper: Literary Criticism

T. Y. B. A. English Paper: V

For the subject of English, there shall be two papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester- V

1. Paper- V Unit-I will be on Critical Terms
2. Paper- V Unit-II will be on Nature of Literature
3. Paper- V Unit-III will be on Functions of Literary Criticism
4. Paper- V Unit- IV will be on Scansion

Semester- VI

1. Paper- V Unit-I will be on Literary Terms
2. Paper- V Unit-II will be on Critical Approaches
3. Paper- V Unit-III will be on Critical Approaches
4. Paper- V Unit- IV will be on Practical Criticism

Scheme of Examination for Each Semester:

Internal Evaluation: 40 %

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two- and half-hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I (Short Notes any Two out of Four) 12 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

Choice Based Credit Grading and Semester System (CBCGS)

T. Y. B. A. English –Literary Criticism Paper V Syllabus

To be implemented from the Academic year 2021-2022

SEMESTER V

Course Code	Unit	Topics	Credits	Lectures
UAR5ENG5	I Terms	<ul style="list-style-type: none">• Critical Terms:i. Simileii. Imageryiii. Symboliv. Paradoxv. Myth		15

<p>II Nature of Literature</p>	<ul style="list-style-type: none"> • Nature and Function of Literature <p>i. Literature as Imitation (Plato-Aristotle debate)</p> <p>ii. Literature and Imagination (the Romantic Idea of the Imagination)</p> <p>iii. Literature as an expression of the writer's personality</p>	<p>04</p>	<p>15</p>
<p>III Nature and Functions of Literary Criticism</p>	<ul style="list-style-type: none"> • Nature and function of Literary Criticism <p>i. Nature of Literary Criticism</p> <p>ii. Functions of Literary Criticism (Explication, Analysis, Interpretation, Evaluation, Theorizing)</p> <p>iii. Qualification / Role of a Critic</p>		

	IV Scansion	<ul style="list-style-type: none">• Practical Criticism: Scansion <p>Two short passages of poetry (6 to 10 lines each) will be set for scansion. Students should scan the poem, identify the base metre (iamb, trochee), variations (pyrrhic, spondee, anapaest, dactyl, cretic, etc.), rhyme scheme, stanza forms if any, and the metrical peculiarities such as end-stopped lines, run-on lines, caesura and other basic concepts of versification. (5 marks for scanning and identifying the base metre, 4 marks for identifying modulations and other metrical peculiarities and 1 mark for rhyme scheme)</p>		15
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Choice Based Credit Grading and Semester System (CBCGS)
T. Y. B. A. English –Literary Criticism Paper V Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER VI

Course Code	Unit	Topics	Credits	Lectures
UAR6ENG5	I Terms	<ul style="list-style-type: none"> • Literary Movements: i. Classicism ii. Romanticism iii. Realism iv. Naturalism v. Aestheticism 	04	15
	II Critical Approaches	<ul style="list-style-type: none"> • Critical Approaches: i. New Criticism ii. Structuralism iii. Psychoanalytic Criticism 		15
	III Critical Approaches	<ul style="list-style-type: none"> • Critical Approaches i. Feminist Criticism ii. Marxist Criticism iii. Eco Criticism 		15
	IV Practical Criticism	<ul style="list-style-type: none"> • Practical Criticism: <p>Critical Appreciation of an unseen poem: A short poem of about 20 lines will be set for appreciation. The title of the poem will be given. The unit will test the students' responsiveness to the poem and their linguistic ability in analysing the poem. Students are expected to mobilize the techniques of close reading and their understanding of</p>	15	

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		literary devices like imagery, metaphor and other poetic devices while learning this unit.)		
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References:

1. Abrams, M. H. *A Glossary of Literary Terms*. (8th Edition) New Delhi: Akash Press, 2007.
2. Abrams, M. H. *The Mirror and the Lamp: Romantic Theory and Critical Tradition*. Oxford: OUP, 1971 Ashcroft, Bill et al. (ed.) *The Post-Colonial Studies Reader*. London: Routledge, 1995.
3. Baldick, Chris. *The Oxford Dictionary of Literary Terms*. Oxford: OUP, 2001. Blackstone, Bernard. *Practical English Prosody*. Mumbai: Orient Longman, 1984.
4. Bodkin, Maud. *Archetypal Patterns in Poetry*. London: Oxford University Press, 1934.
5. Buell, Lawrence. *The Environmental Imagination: Thoreau, Nature Writing, and the Formation of American Culture*. MA: Harvard University Press, 1995.
6. Daiches, David. *Critical Approaches to Literature*. London: Longman, 1984.
7. Drew, Elizabeth. *Understanding Poetry*. New York: Norton, 1959.
8. Dutton, Richard. *Introduction to Literary Criticism*. London: Longman, 1984.
9. Eagleton, Terry. *Literary Theory*. London: Basil Blackwell, 1983.
10. Enid, Hamer. *The Metres of English Poetry*. Books way, 2014
11. Garrard, Greg. *Ecocriticism*. New York: Routledge, 2012.
12. Garrard, Greg, ed. *The Oxford Handbook of Ecocriticism*. New York: OUP, 2014.
13. Guerin, Wilfred et al. *A Handbook of Critical Approaches to Literature*. Oxford: OUP, 1999.
14. Enright, D.J. and Chickera, E. *English Critical Texts*. Delhi: Oxford University Press, 1962.
15. Fowler, Roger (ed.) (rev.) *A Dictionary of Modern Critical Terms*. London: Routledge & Kegan Paul, 1987.
16. Frye, Northrop. "The Archetypes of Literature." *The Norton Anthology: Theory and Criticism*. Ed. Vincent B. Leitch. New York: Norton, 2001.
17. Habib, M.A.R. *A History of Literary Criticism: From Plato to the Present*. London: Blackwell, 2005.
18. Hudson, William Henry. *An Introduction to the Study of Literature*. New Delhi: Atlantic, 2007.
19. Jump, John (ed.) *Critical Idiom Series*. Methuen. Lentriccia, Frank. *After the New Criticism*. Chicago: Chicago UP, 1980.
20. Lodge, David (Ed.) *Twentieth Century Literary Criticism*. London: Longman, 1972.

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21. Lodge, David, with Nigel Wood. *Modern Criticism and Theory: A Reader*. 2nd Ed. London: Longman, 1988.
22. Nagarajan M. S. *English Literary Criticism and Theory: An Introductory History*. Hyderabad, Orient Black Swan, 2006.
23. Ramamurthi, Lalitha. *An Introduction to Literary Theory*. Chennai: University of Madras, 2006.
24. Richards, I. A. *Practical Criticism*. London: Kegan Paul, 1930.
25. Said, Edward. *Orientalism*. New York: Pantheon, 1978.
26. Schreiber, S. M. *Introduction to Literary Criticism*. Oxford: Pergamon Press, 1965.
27. Selden, Raman and Widdowson, Peter. *A Reader's Guide to Contemporary Literary Theory*. 3rd ed. Lexington: University of Kentucky Press, 1993.
28. Selden, Raman. *A Reader's Guide to Contemporary Literary Theory*. London: Harvester Press, 1985.
29. Scott, Wilbur. *Five Approaches to Literary Criticism*. London: Longman, 1984.
30. Wellek, Rene and Austin, Warren. *Theory of Literature*. London: Jonathan Cape, 1955.
31. Wolfreys, Julian. (ed.) *Introducing Literary Theories: A Guide and Glossary*. Edinburgh: Edinburgh University Press, 2003.

Details of the Course:

Sr. No.	Heading	Particulars
1	Title of Course	Grammar and Art of Writing VI (Semester V and VI)
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Objectives of the Course:

- To develop an insight into the process of word formation and transformation amongst learners
- To develop amongst students an understanding into the sounds, stress patterns and intonations in the English language to improve their speaking skills.
- To develop among learners an insight into the structure of the English language and to provide knowledge of the rules of grammar.
- To help students to learn grammatical analysis, description and the skills of sentence transformation.
- To introduce the mechanics of writing for effective writing for various domains.

Course Outcome: By the end of the course, a student should develop the Ability:

- To gain a basic understanding of phonetics, morphology and word transformation.
- To learn the difference between various units of grammar.
- To improve speaking skills
- To develop adequate knowledge of the rules of grammar, grammatical analysis and sentence transformation.
- To write effectively in various domains.

Title of the Paper: Grammar and Art of Writing

T. Y. B. A. English Paper: VI

For the subject of English, there shall six papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester-V

1. Paper-VI Unit-I will be on Phonetics and Morphology
2. Paper-VI Unit-II will be on Words and Phrases
3. Paper- VI Unit-III will be on Art of Writing

Semester- VI

1. Paper- VI Unit-I will be on Grammar
2. Paper- VI Unit-II will be on Art of Writing
3. Paper- VI Unit-III will be on Types/ Domains of Writing

Scheme of Examination for Each Semester:

Internal Evaluation: 40 %

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

T.Y.B.A. English Literature Syllabus

Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two- and half-hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I (Short Notes any Two out of Four) 12 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

Choice Based Credit Grading and Semester System (CBCGS)
T. Y. B. A. English – Grammar and Art of Writing Paper VI Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER V

Course Code	Unit	Topics	Credits	Lectures
UAR5ENG6	I Phonetics and Morphology	A. Phonetics i. English Vowels and Consonants (Difference between BRP and Indian English) ii. Diphthongs B. Morphology i. Free and Bound Morphemes ii. Root and stem iii. Inflection and Derivation iv. Morphological Analysis	3.5	15
	II Grammar: Words and Phrases	i. Open word classes: nouns, adjectives, verbs, adverbs ii. Closed word classes: pronouns, determiners, operator verbs, prepositions, conjunctions, enumerators, interjections. iii. Noun Phrase, Genitive Phrase, Prepositional Phrase, Adjective Phrase and Adverb Phrase iv. Verb Phrase		15

	III Art of Writing	<ul style="list-style-type: none">• Discourse Analysis<ul style="list-style-type: none">i. Tenorii. Modeiii. Domain• Mechanics of Writing<ul style="list-style-type: none">i. Understanding paragraph divisions and topic sentences of paragraphs• Writing for Print Media<ul style="list-style-type: none">i. Print – News Report		15
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Choice Based Credit Grading and Semester System (CBCGS)
T. Y. B. A. English – Grammar and Art of Writing Paper VI Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER VI

Course Code	Unit	Topics	Credits	Lectures
UAR6ENG6	I Grammar	<ul style="list-style-type: none"> • Clauses: <ol style="list-style-type: none"> i. Clause elements and subject – verb concord ii. Basic clause patterns iii. Types of clauses: finite – non-finite (tensed – tenseless), independent – dependent (Main – Subordinated) iv. Kinds of subordinate clause: Noun clause, Prepositional Clause, Relative clause, Adverb Clause, Comparative Clause v. Co-ordinated Clauses • Sentences: <ol style="list-style-type: none"> i. Basic and Derived structures Following rules to be studied – Fronting, Inversion, Substitution of PP for Indirect Object, Tag Questions, Postponement of the post modifier, Cleft Sentence, Existential Sentence 	3.5	15
	II Art of Writing	<ul style="list-style-type: none"> • Mechanics of Writing <ol style="list-style-type: none"> i. Characteristics of typical writing and typical speech ii. Cohesion and Coherence iii. Correct use of Articles, Prepositions, Adverbs, Adjectives 		15

		<p>iv. Common Errors – Grammatical, Syntactical, Lexical, Punctuation, Logical</p> <p>v. Writing a Thesis Statement</p> <ul style="list-style-type: none"> • Rhetorical Structures <p>i. Classification, Comparison – Contrast, Cause – Effect, Chronological and Spatial Ordering, Order of Importance, Statement and Elaboration, Restatement, Exemplification, Listing</p> <p>ii. Understanding connotations, using bias-free language, Avoiding jargon and archaic/ outdated language, Eliminating repetition and redundancy, Content Analysis and Rhetorical Devices</p>		
	<p>III Types/ Domains of Writing</p>	<p>i. Argumentative/ reflective writing</p> <p>ii. Analytical writing</p> <p>iii. Creative / Figurative writing</p> <p>iv. Advertisement /Body Copy writing</p>		<p>15</p>

Reference Books:

1. Payne, Lucile Vaughan. *The Lively Art of Writing*. New York: Mentor, 1969
2. Kleiser, Grenville. *The Art of Writing*. New Delhi: A P H, 2011
3. Trimble, John R. *Writing with Style, Conversations on the Art of Writing*. New Jersey: Prentice Hall, 1975
4. Bailey, Stephen. *Academic Writing: A Handbook for International Students*. New York: Routledge, 2011
5. Huddleson, Rodney and Pullum, Geoffrey. *A Student's Introduction to English Grammar*. New Delhi: Cambridge University Press, 2005
6. Leech, Geoffrey and Svartvik, Jan. *A Communicative Grammar of English*. New York: Routledge, 1975
7. Singh Sukhdev and Singh Balbir. *Grammar of the Modern English Language: A Resource Book*. New Delhi: Cambridge University Press India Pvt. Ltd., 2012
8. Turton, Nigel D. *A B C of Common Grammatical Errors*. New Delhi: Macmillan India Ltd., 1996
9. Sethi, J. and Dhamija, P.V. *A Course in Phonetics and Spoken English*. New Delhi: Prentice-Hall of India Private Ltd., 2006
10. Jones, Daniel. *Everyman's English Pronunciation Dictionary the English Language Books Society, ELBS*
11. Gimson, A. C. *An Introduction to the Pronunciation of English*. ELBS
12. Rahman, Tariq. *A General Introduction to Linguistics*. Orient Black swan
13. Crystal, David. *The Cambridge Encyclopaedia of Language*. Cambridge University Press
14. Crystal, David. *A Little Book of Language*. Orient Black swan.
15. Sreedharan, V. *How to Write Correct English*. New Delhi: Goodwill Publishing House
16. Lowe, Michelle and Graham, Ben. *Language and Power: A Resource Book for Students*. Orient Longman, 1998
17. Simpson, Paul and Mayr, Andrea. *Language and Power: A Resource Book for Students*. Routledge, Taylor & Francis Group, 2010
18. Mohan, Krishna and Raman, Meenakshi. *Advanced Communicative English: A Comprehensive Course for Undergraduate Learners*. New Delhi: Tata McGraw Hill Education Private Limited, 2010
19. Gurman, Pamela J. *Strategies for Successful Writing: Written Communication in the Modern World*. Pearson Custom Publishing.
20. *Grammar Handbook* (Capella University) available in pdf format at

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<http://www.capella.edu/interactivemedia/onlinewritingcenter/downloads/grammar.pdf>

21. Brighton, Laurel J. *The Structure of Modern English: A Linguistic Introduction* available in pdf format at <http://npu.edu.ua/~e-8>

[book/book/djvu/A/iif_kgpm_The%20Structure%20of%20Modern%20English.pdf](http://npu.edu.ua/~e-8/book/book/djvu/A/iif_kgpm_The%20Structure%20of%20Modern%20English.pdf)

22. *A Course in English Phonetics for English EFL Students* available in pdf format at [file:///C:/ADMIN/Desktop/A_Course_in_English_Phonetics%20\(1\).pdf](file:///C:/ADMIN/Desktop/A_Course_in_English_Phonetics%20(1).pdf)

Details of the Course:

Sr. No.	Heading	Particulars
1	Title of Course	19 th Century English Literature (Semester V and VI)
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Objectives of the Course:

- To introduce to students the major trends and ideas in the literature and culture of the Romantic and Victorian Eras.
- To help students understand the texts in the context of prevailing sociocultural conditions & their historical, political location.
- To familiarize and highlight major representative texts, genres, thematic concerns and select key concepts/terms pertaining to the respective periods.
- To help students apply a variety of critical, historical, and theoretical approaches to prescribed literary texts.
- To sensitize students to diverse sensibilities and humanitarian concerns through literature of the nineteenth century.

Course Outcome: By the end of the course, a student should develop the Ability:

- To view literary works in their dynamic interface with the background.
- To understand the literature of the 19th century as a complex outcome of artistic, intellectual and socio-political cross-currents.
- To appreciate poetry as mirroring private personality, protest and subsequently, public concerns.
- To view the development of the Victorian Novel as informed by Victorian morality as well as by larger democratic processes.
- To contextualize the impulses behind the significant emergence of women writing in the 19th century.

Title of the Paper: 19th Century English Literature
T. Y. B. A. English Paper: VII

For the subject of English, there shall be six papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester- V

1. Paper- VII Unit-I will be on Terms
2. Paper- VII Unit-II will be on Poetry
3. Paper- VII Unit-III will be on Novel

Semester- VI

1. Paper- VII Unit-I will be on Terms
2. Paper- VII Unit-II will be on Poetry
3. Paper- VII Unit-III will be on Novel

Scheme of Examination for Each Semester:

Internal Evaluation: 40 %

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

T.Y.B.A. English Literature Syllabus

Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two- and half-hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I (Short Notes any Two out of Four) 12 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

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SEMESTER V

Course Code	Unit	Topics	Credits	Lectures
UAR5ENG7	I Terms	<ul style="list-style-type: none"> • Background i. Romanticism as a reaction to Neo-classicism ii. Influence of Rousseau and French Revolution iii. Survey of Literature: Novel, Poetry and Prose (Types, Trends and Characteristics) iv. Rise of women writers in the period • Concepts: i. Romanticism: Features ii. Romantic Imagination iii. German Transcendentalism iv. The Gothic Revival v. Medievalism vi. Pantheism 	04	15
	II Poetry	<ul style="list-style-type: none"> • William Blake: i. 'The Divine Image' from Songs of Innocence ii. 'The Tiger from Songs of Experience • William Wordsworth: i. The Solitary Reaper ii. I Wandered Lonely as Cloud 		15

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		<ul style="list-style-type: none">• P.B. Shelley:<ol style="list-style-type: none">i. Ozymandiasii. Ode to the West Wind• John Keats:<ol style="list-style-type: none">i. On First Looking into Chapman's Homer'ii. Ode to Autumn		
	III Novel	Jane Austen: Pride and Prejudice OR Ann Radcliffe: Mysteries of Udolpho's: A Romance		15

Choice Based Credit Grading and Semester System (CBCGS)
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SEMESTER VI

Course Code	Unit	Topics	Credits	Lectures
UAR6ENG7	I Terms	<ul style="list-style-type: none"> • Background i. Effects of Industrial Revolution ii. Middle class complacency and the rise of the working class iii. Age of Science, Age of Faith and Doubt (the Victorian Dilemma) iv. Survey of Literature of the period: Types, features and development (Novel, Poetry and Prose) <ul style="list-style-type: none"> • Concepts i. Utilitarianism ii. Darwinism iii. Victorian Concept of Morality iv. Aestheticism v. Pre-Raphaelitism vi. The Oxford Movement vii. Bildungsroman and the Victorian Novel 	04	15
	II Poetry	<ul style="list-style-type: none"> • Alfred Tennyson: From In Memoriam i. Lyric 7: Dark house by which once more I stand. ii. Lyric 54: Oh, yet we trust that somehow good 		15

		<ul style="list-style-type: none"> • Robert Browning: <ol style="list-style-type: none"> i. Porphyria’s Lover ii. My Last Duchess • Elizabeth Barrett Browning Sonnets from the Portuguese: <ol style="list-style-type: none"> i. ‘Sonnet 21’: ‘Say over again, and yet once over again’ • Matthew Arnold: <ol style="list-style-type: none"> i. Dover Beach • Thomas Hardy: <ol style="list-style-type: none"> i. Channel Firing ii. In Times of the Breaking of the Nations 		
	III Novel	<p>Charles Dickens: Oliver Twist</p> <p style="text-align: center;">OR</p> <p>Charlotte Bronte: Jane Eyre</p>		15

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The Details of the Course:

Sr. No.	Heading	Particulars
1	Title of Course	20 th Century British Literature – Paper VIII (Semester V and VI)
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Objectives of the Course:

- To expose students to literary genres, trends, and literary movements of Britain in the 20th Century.
- To help learners to understand the texts in the context of social, cultural, historical and political conditions of the Turn of the century
- To show the diverse range of subjects of modern British literature after the catastrophe of the World War I
- To enable students to create linkages between social and historical contexts and literary texts.
- To train students to develop skills for a critical and analytical understanding of the text.

Course Outcome: By the end of the course, a student should develop the Ability:

- Students will be equipped with comprehensive understanding of literary genres, trends and movements in 20th Century British Literature
- To enable them to understand the valuable co –relation between the sociocultural, economical and historical contexts; behind the literary production.
- To understand the complex nature different genres of the 20th century British Literature
- Students will acquire the discipline to become reflective and imaginative thinkers through a close, critical and analytical reading of the prescribed texts.
- To appreciate various genres of British Literature.

Title of the Paper: 20th Century British Literature

T. Y. B. A. English Paper: VIII

For the subject of English, there shall be six papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester- V

1. Paper- VIII Unit-I will be on Terms
2. Paper- VIII Unit-II will be on Drama
3. Paper- VIII Unit-III will be on Poetry

Semester- VI

1. Paper- VIII Unit-I will be on Terms
2. Paper- VIII Unit-II will be on Novel
3. Paper- VIII Unit-III will be on Short Stories

Scheme of Examination for Each Semester:

Internal Evaluation: 40 %

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

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Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two- and half-hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I (Short Notes any Two out of Four) 12 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

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SEMESTER V

Course Code	Unit	Topics	Credits	Lectures
UAR5ENG8	I Back ground Topics	i. Modernism ii. Imagism iii. Symbolism iv. War Poetry v. Movement Poets vi. Poetic Drama vii. Social Realism and its impact on English Drama viii. The Theatre of the Absurd	04	15
	II Drama	Harold Pinter: The Homecoming (1964) OR Bernard Shaw: Saint Joan (1923)		15
	III Poetry	<ul style="list-style-type: none"> • T.S. Eliot: <ol style="list-style-type: none"> i) 'The Hippopotamus ii) 'Portrait of a Lady' • W. B. Yeats: <ol style="list-style-type: none"> i) Leda and Swan ii) 'A Prayer for My Daughter' • W.H. Auden: <ol style="list-style-type: none"> i) The Unknown Citizen ii) 'In Memory of W.B. Yeats' • Wilfred Owen: <ol style="list-style-type: none"> i) Insensibility ii) Strange Meeting 		15

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SEMESTER VI

Course Code	Unit	Topics	Credits	Lectures
UAR6ENG8	I Back ground Topics	i. Feminism in Modern Literature ii. Psychological Novel iii The rise of Science Fiction iv. Post World War II Novel v. Political Satire/Allegory as rising literary trends vi. Imperialism and Post colonialism in Modern British Fiction vii. Existentialism and Modern British Literature	04	15
	II Novel	George Orwell: 1984 OR Iris Murdoch: The Black Prince (1973)		15
	III Short Stories	<ul style="list-style-type: none"> • James Joyce: i. Eveline • Roald Dahl: ii. Lamb to the Slaughter • Graham Greene: i. The End of the Party • Angela Carter: i. The Courtship of Mr. Lyon 		15

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- <https://www.litcharts.com/lit/lamb-to-the-slaughter/summary-and-analysis>
- <https://www.cliffsnotes.com/literature/d/dubliners/summary-andanalysis/eveline>.
- <https://interestingliterature.com/2017/07/18/a-summary-and-analysis-ofjames-joyces-eveline/>

Details of the Course:

Sr. No.	Heading	Particulars
1	Title of Course	Literature of Protest Paper IX (Semester V and VI)
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Objectives of the Course:

- To explore voices of discord, rhetoric and cultural contexts.
- To compare and contrast the artistic manoeuvres.
- To examine the protest spectrum in literature.
- To bring in panoramic understanding of global protest literature and ideologies.
- To learn the historical links between forms of protest and meanings of literature

Course Outcome: By the end of the course, a student should develop the Ability:

- To read and interpret cross cultural texts.
- To understand protest literature.
- To get sensitized towards global issues.
- To learn to look into past, correlate it to present and future.
- To understand the historicity of protest literature.

Title of the Paper: Literature of Protest

T. Y. B. A. English Paper: IX

For the subject of English, there shall be six papers for 45 lectures each comprising of three units of 15 Lectures each.

Semester- V

1. Paper- IX Unit-I will be on Terms
2. Paper- IX Unit-II will be on Autobiography
3. Paper- IX Unit-III will be on Short Stories

Semester- VI

1. Paper- IX Unit-I will be on Terms
2. Paper- IX Unit-II will be on Novel
3. Paper- IX Unit-III will be on Poetry

Scheme of Examination for Each Semester:

Internal Evaluation: 40 %

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two- and half-hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I (Short Notes any Two out of Four) 12 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 12 Marks
	Q-3	From Unit – III (Essay having Internal Options.) 12 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 12 Marks
	Q-5	From Unit – III Short Notes any Two out of Four) 12 Marks

Choice Based Credit Grading and Semester System (CBCGS)
T. Y. B. A. English – Literature of Protest Paper IX Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER V

Course Code	Unit	Topics	Credits	Lectures
UAR5ENG9	I Back ground Topics	i..Literature and Protest ii. Politics and Language of Protest iii. Translation and Literature of Protest iv. Concept of Caste, Varna Theory and Division of Labour v. Concept of Race and Discrimination vi. Protest in African American, Dalit and Tribal Literature	3.5	15
	II Autobio graphy	Urmila Pawar: The Weave of My Life: (Translated by Maya Pandit) OR Barack Obama: Dreams from My Father		15
	III Short Stories	i. Death of a Rich Man ii. When the Sun God Refused to Set iii. Loneliness of An Ex-soldier iv. Confessions of a Graveyard Keeper (The stories are from Desperate Men and Women: Ten Dalits Short Stories from India, edited by Rangrao, B., Kalpaz Publications, 2013)		15

Choice Based Credit Grading and Semester System (CBCGS)
T. Y. B. A. English – Literature of Protest Paper IX Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER VI

Course Code	Unit	Topics	Credits	Lectures
UAR6ENG9	I Back ground Topics	i. Marathi Literature ii. Tamil Literature iii. Gujrati Literature iv. Kannada Literature v. Hindi Literature vi. Bengali Literature	3.5	15
	II Novel	Harriet Beecher Stowe: Uncle Tom's Cabin- OR Y.B.Satyanarayana: My Father Baliah		15
	III Poetry	<ul style="list-style-type: none"> • Kamala Das: <ul style="list-style-type: none"> i. The Looking Glass ii. An Introduction • Meena Kandasamy: <ul style="list-style-type: none"> i. Advaita: The Ultimate Question, ii. The Gods Wake Up • Jyoti Lanjewar: <ul style="list-style-type: none"> i. The Nameless Ones (anamikas), ii. Caves, 		15

References:

1. Ambedkar B. R., 1978, *Dr. Babasaheb Ambedkar's Writings and Speeches*, vol 1, Education Department, Government of Maharashtra, Bombay
2. Lohia, Rammanohar, 1964, *The Caste System*, Rammanohar Lohia Samta Vidyalaya Nyas, Hyderabad.
3. Dangle, Arjun. *Poisoned Bread: Translations from Modern Marathi Dalit Literature*. Orient Longman, 1992 –
4. Faye, Harrison. *The Persistent Power of "Race" in the Cultural and Political Economy of Racism*. Annual Review of Anthropology 24:47-74.
5. Nath, J.P., 2002, *Socialist Leadership in India*, Kanishka Publishers, New Delhi
6. Sharan Kumar Limbale and Jaydeep Sarangi, 2018. *Dalit Voice: Literature and Revolt*. Authors Press, New Delhi Zoe,
7. Trodd. *American Protest Literature*.2008. Belknap Press of Harvard University Press.
8. Drake, Kimberly. *Literature of Protest*. 2013.Salem Press.
9. Patricia D. Netzley 1999, *Social Protest Literature: An Encyclopaedia of Works, Characters, Authors, and Themes*. ABC-CLIO Literary Companion
10. Faye, Harrison.2008. *Outsider Within: Reworking Anthropology in the Global Age*. Urbana: University of Illinois Press.
11. Guru, Gopal, 2008. *Humiliation: Claims and Context*. Oxford University Press Delhi.
12. Hilliard, Nunn, 1998. Representing African Women in Movies in J. D. Hamlet (Ed.), *Afrocentric Visions: Studies in Culture and Communication*. Sage Publications. USA.
13. Bhowmik, Davinder & Steve Rabson. 2016. *Islands of Protest: Japanese Literature from Okinawa* University of Hawai Press.
14. Reed, T.V. "Introduction" and "Reflections on the Cultural Study of Social Movements." in *The Art of Protest: Culture and Activism from the Civil Rights Movement to the Streets of Seattle*. Minneapolis: University of Minnesota Press, 2005.



॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

**ARTS, COMMERCE AND SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Program: M. A.

Revised Syllabus of M.A. English Literature

Semester I and II

Under Choice Based Credit System (60:40)

w.e.f. Academic Year 2022-2023

Preamble of the Syllabus:

English plays paramount role the life of every student because it is an international language. Sound knowledge of English literature is regarded as one of the most significant facets of one's personality. There is passionate desire in the mind of students to learn different disciplines of English literature in order to accomplish global identity in today's competitive and digital world.

Literature is a reflection of universal truths and there is an inevitable relationship between literature and society. Poets, dramatists and novelists are blessed with keen observations, perceptions, creative and imaginative skills in the process of creation of literary masterpieces. The study of English literature has two commendable functions of providing delight and inculcation of moral and social values amongst the learners. It also reforms and transforms the critical understanding and appreciation of the world classics belonging to Greek, Roman, British, American and Indian literature by the stakeholders. Therefore, the realm of English literature is intensively appealing as well as extensively stirring to the budding students.

The learners have tremendous sense of curiosity to delve, understand, visualize and appreciate various eras of English literature and attain aesthetic delights. The learners experience sense of astonishment, suspense, venture, adventure, bravery, catharsis, towards the protagonist and antagonist reflected in the poems, stories, plays and novels. The protagonist depicted in English literature is an epitome of virtuousness and unrighteousness with an indelible impact on the readers. Imitation is fundamental principle in all the literary works. Therefore, everybody experiences the phenomenon of procrastination leading into the realm of Hamlet in one's life.

It is through the study of English literature, the learners are endowed with universal truths, human values, insights and develop healthy relationship with regards to people and nature. The syllabus aims at empowering the students with in depth understanding of critical theories, stylistic and linguistic analysis of the texts and appreciation of world classics. The learning of English literature unfolds new horizons and creates renaissance in academic and professional world.

Master of Arts (M.A.) in English is a post graduate course of department of English, Changu Kana Thakur Arts, Commerce & Science College, New Panvel (Autonomous) The Choice Based Credit and Grading System to be implemented through this curriculum would

enable the students to explore new insights, dimensions and its applications in English literature. The learners pursuing this course of English literature can achieve knowledge and skills necessary for better employability and professionalism in 21st century.

Sr. No.	Heading	Particulars
1	Title of Course	Literary Theory and Criticism
2	Eligibility for Admission	B.A./B.Com./B.Sc. Degree from recognised University
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-2023

Objectives of the Course:

- To introduce the learners to a wide range of critical methods and literary theories.
- To enable them to use the various critical approaches and advanced literary theories.
- To enhance their analytical skills.
- To enable them to mobilize various theoretical parameters in the analysis of literary and cultural texts.
- To familiarize the learners with the trends and cross-disciplinary nature of literary theories.
- To develop insights in the process of application of critical theories.

Course Outcome: By the end of the course, a student should develop the Ability:

- To interpret classical critical theories and its reflection in literature
- To apply Romantic critical theories and its relevance in literary texts.
- To examine nature and features of Indian classical drama

- To recognise the relationship between literature and literary theories
- To evaluate the formation of ecocriticism and its essence in literature as well as in real life

M. A. English Literature Semester I and II

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-I</u>	<u>Semester-II</u>
1. Paper-I Unit-I will be on Classical Theories	1. Paper-I Unit-I will be on Structuralism
2. Paper-I Unit-II will be on Romantic Theories	2. Paper-I Unit-II will be on Marxism and Feminism
3. Paper- I Unit-III will be on Indian Theories	3. Paper-I Unit-III will be on Reader Response
4. Paper- I Unit-IV will be on Formalism	4. Paper- I Unit-IV will be on Formalism

**M.A. English Literature Syllabus
Under Choice Based Credit System (CBCS)
To be implemented from the Academic year 2022-23
SEMESTER I**

Course Code	Unit	Topics	Credits	Lectures
PARIENG1	I	Classical/Neoclassical Theories: <ul style="list-style-type: none"> • Aristotle – <i>Theory of Mimesis and Catharsis</i> • Samuel Johnson – “Preface to Shakespeare” (from <i>English Critical Texts</i>) 	06	15
	II	Romantic Theories: <ul style="list-style-type: none"> • William Wordsworth’s Preface to Lyrical Ballads Themes and Diction • Matthew Arnold– “The Study of Poetry” 		15
	III	Indian Aesthetics/Literary <ul style="list-style-type: none"> • S. N. Dasgupta – “The Theory of Rasa” • G. N. Devy – “Anandvardhana: Dhvani Structure of Poetic Meaning” (From Ganesh Devi’s Indian Literary Criticism, New Delhi Orient Black Swan) 		15
	IV	Formalism and New Criticism <ul style="list-style-type: none"> • T. S. Eliot – “Tradition and Individual Talent” • Victor Shklosky “Art as a Technique” 		15

**M.A. English Literature Syllabus
Under Choice Based Credit System (CBCS)
To be implemented from the Academic year 2022-23
SEMESTER II**

Course Code	Unit	Topics	Credits	Lectures
PAR2ENG2	I	Structuralism, Poststructuralism and Deconstruction: <ul style="list-style-type: none"> • Roland Barthes – “The Death of the Author” • Jacques Derrida – “Structure, Sign and Play” 	06	15
	II	Feminism and Psychology <ul style="list-style-type: none"> • Carl Jung – “Psychology and Literature” • Juliet Mitchell – “Femininity , Narrative and Psychoanalysis” 		15
	III	Reader Response and New Historicism <ul style="list-style-type: none"> • Wolfgang Iser – “Reading Process: A Phenomenological Approach” (From <i>Modern Criticism and Theory: A Reader</i>) • Stephen Greenblatt – “Resonance and Wonder” (From <i>Learning to Curse</i>) 		15
	IV	Postcolonialism, Diaspora and Ecocriticism <ul style="list-style-type: none"> • Kerstin W. Shands – Neither East nor West: From Orientalism to Postcoloniality (From <i>Theorizing Diaspora</i>) • Cheryll Glotfelty – “Literary Studies in an age of Environmental Crisis” (From <i>The Ecocriticism Reader</i>) 	06	15

Sources of the prescribed texts

1. Braziel, Jana Evans and Anita Mannur (Ed.) *Theorizing Diaspora*. London: Blackwell, 2003.
2. Enright, D.J. and Chickera, Ernst de. (Ed.) *English Critical Texts*. Delhi: Oxford University Press, 1962.
3. Glotfelty, Cheryll and Harold Fromm (Ed.) *The Ecocriticism Reader: Landmarks in Literary Ecology*. Athens: The University of Georgia Press, 1996.
4. Lodge, David and Nigel Wood (Ed.) *Modern Criticism and Theory: A Reader*
5. Raghavan V. and Nagendra (Ed.) *An Introduction to Indian Poetics*. Madras: MacMillan, 1970.

Reference Books:

1. Adams, Hazard. *Critical Theory Since Plato*. New York, Harcourt Brace Jovanovich, 1971. Abrams, M. H. *A Glossary of Literary Terms*. (8th Edition) New Delhi: Akash Press, 2007. Baldick, Chris. *The Oxford Dictionary of Literary Terms*. Oxford: Oxford University Press, 2001.
2. Barry, Peter. *Beginning Theory: An Introduction to Literary and Cultural Theory*. New Delhi: Viva Books, 2008.
3. Drabble, Margaret and Stringer, Jenny. *The Concise Oxford Companion to English Literature*. Oxford: Oxford University Press, 2007.
4. Fowler, Roger. Ed. *A Dictionary of Modern Critical Terms*. Rev. ed. London: Routledge & Kegan Paul, 1987.
5. Habib, M. A. R. *A History of Literary Criticism: From Plato to the Present*. London: Blackwell, 2005.
6. Harmon, William; Holman, C. Hugh. *A Handbook to Literature*. 7th ed. Upper Saddle River, N.J. : Prentice-Hall, 1996.
7. Hall, Donald E. *Literary and Cultural Theory: From Basic Principles to Advanced Application*. Boston: Houghton, 2001.

9. Hudson, William Henry. *An Introduction to the Study of Literature*. New Delhi: Atlantic, 2007. Jefferson, Anne. and D. Robey, eds. *Modern Literary Theory: A Comparative Introduction*. London: Batsford, 1986.
10. Keeseey, Donald. *Contexts for Criticism*. 4th Ed. Boston: McGraw Hill, 2003. Latimer, Dan. *Contemporary Critical Theory*. San Diego: Harcourt, 1989.
11. Lentriccia, Frank. *After the New Criticism*. Chicago: Chicago UP, 1980.
12. Lodge, David (Ed.) *Twentieth Century Literary Criticism*. London: Longman, 1972.
13. Murfin, Ross and Ray, Supryia M. *The Bedford Glossary of Critical and Literary Terms*. Boston: Bedford/St.Martin's, 2003.
14. Nagarajan M. S. *English Literary Criticism and Theory: An Introductory History*. Hyderabad: Orient Black Swan, 2006.
15. Natoli, Joseph, ed. *Tracing Literary Theory*. Chicago: U of Illinois P, 1987.
16. Ramamurthi, Lalitha. *An Introduction to Literary Theory*. Chennai: University of Madras, 2006.
17. Selden, Raman and Peter Widdowson. *A Reader's Guide to Contemporary Literary Theory*. 3rd Ed. Lexington: U of Kentucky P, 1993.
18. Tyson, Lois. *Critical Theory Today: A User-Friendly Guide*. New York: Garland Publishing, 1999.
19. Wolfreys, Julian. ed. *Introducing Literary Theories: A Guide and Glossary*. Edinburgh: Edinburgh University Press, 2003.

Scheme of Examination for Each Semester:

Internal Evaluation: 40

❖ Scheme of Examination

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the

Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below-

A) Internal Assessment: 40 %

40 Marks

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Essay on the theories 1 out of 2	15 Marks
Q-2	From Unit II - Essay on the theories 1 out of 2	15 Marks
Q-3	From Unit III - Essay on the theories 1 out of 2	15 Marks
Q-4	From Unit IV - Essay on the theories 1 out of 2	15 Marks

Sr. No.	Heading	Particulars
1	Title of Course	Linguistics and Stylistic Analysis of Text
2	Eligibility for Admission	B.A./B.Com./B.Sc. Degree from recognised University
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-23

Objectives of the Course:

- To understand the concept of style in literature.
- To understand the linguistic basis of literary criticism (stylistics as an input to literary criticism).
- To communicate the concept of discourse and the principles of discourse analysis.
- To inform the use of stylistic approach in teaching literature.
- To understand the impact of stylistic analysis on academic writing.
- To familiarize with the concepts in narratology to the students.

Course Outcome: By the end of the course, a student should develop the Ability

- To Classify figurative devices and linguistic patterns demonstrated in language
- To Analyse the usage of cohesion and coherence in English language
- To Elaborate stylistic and linguistic approach to the study of literature
- To Illustrate the sound system of English language
- To Inspect salient traits in narratology and its application

M. A. English Literature Semester I and II

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-I</u>	<u>Semester-II</u>
1. Paper-I Unit-I will be on Concept of style in literature 2. Paper-I Unit-II will be on Lexis and Syntax 3. Paper- I Unit-III will be on Discourse Analysis 4. Paper- I Unit-IV will be on application of the stylistic and linguistic approach to the study of literature	1. Paper-I Unit-I will be on Phonology 2. Paper-I Unit-II will be on Narratology 3. Paper-I Unit-III will be on application of the principles of discourse analysis to academic writings on literary topics

**M.A. English Literature Syllabus
Under Choice Based Credit System (CBCS)
To be implemented from the Academic year 2022-2023
SEMESTER I**

Course Code	Unit	Topics	Credits	Lectures
PARIENG1	I	<p>Concept of style in literature Foregrounding : variation from the norm , through :</p> <p>a) Linguistic patterning : phonological , grammatical and lexical patterns (e.g. structural repetition like parallelism , the rhetorical effect of antithesis , climax)</p> <p>b) Deviation from the code (e.g. neologisms , archaisms , deviant collocations)</p> <p>c) Figurative language (e.g. metaphor, symbolism, imagery, irony, paradox, tautology)</p>	06	15
	II	<p>Lexis and syntax</p> <ul style="list-style-type: none"> • Lexis : types of words (e.g. stative & dynamic verbs); type of vocabulary (e.g. simple/ complex , formal colloquial) • Syntax: Syntagmatic and paradigmatic relations; sentence types; sentence complexity; types of clauses ; types of phrases 		15
	III	<p>Discourse analysis</p> <ul style="list-style-type: none"> • A)Cohesion: a. Logical and other links between sentences (Subordinating and coordinating conjunctions and linking adverbilas b. Cross- referencing by pronouns c. Ellipsis d. Lexical cohesion: reiteration and collocation e. Literary cohesion through reported speech, authorial comments in fiction 		15

		<p>B) Coherence: sequence, segmentation , salience</p> <p>a. The structure of written discourse</p> <p>b. The structure of conversation, including speech acts. Given and new information. Presupposition. The cooperative principle.</p>		
PAR1ENG1	IV	<ul style="list-style-type: none"> • Application of the stylistic and linguistic approach to the study of (teaching) of literature 	06	15

**M.A. English Literature Syllabus
Under Choice Based Credit System (CBCS)
To be implemented from the Academic year 2022-2023
SEMESTER II**

Course Code	Unit	Topics	Credits	Lectures
PAR2ENG2	I	<p>Phonology</p> <ul style="list-style-type: none"> • The sound system of English vowels and consonants, transcription, description according to their place, type and manner of articulation • Phonological patterns of rhyme metre, alliteration, assonance, clustering of vowel and consonant sounds • Varieties of English 	06	15

	II	Narratology <ul style="list-style-type: none"> • Narrators and narration: addresser – addressee relationships. Use of authorial comment, dialogue, free indirect discourse, stream of consciousness, soliloquy • Histoire, discourse / story, discourse / story , text, narration • Text and time • Character • Setting • Point of view. Authorial commentary on the events : implicit ; overt 		15
	III	Application of the principles of discourse analysis to academic writing on literary topics	06	15

Sample topics : for Projects

1. Poetry recitation and transcription
2. Comparative study of styles (2 poems by the same poet/ 2 poets of the same school , etc.)
3. Comparative study of styles (2 novels by the same author.)
4. Creative writing (fiction) by using different types of narrators / treating the time in different ways/ different modes of characterisation

Recommended Reading

1. Bhelande , Anjali. *Lord of the Flies: A Stylistic Analysis*. Calcutta: Writers Workshop.1996 (for basic introduction to stylistic theory)
2. Bradford ,Richard. *Stylistics* . London and New York : Routledge, 1997
3. Burton D. *Dialogue and Discourse : A Sociolinguistic Approach to Modern Drama Dialogue and Naturally Occurring Conversation* . London : Routledge and Kegan Paul

.1982

4. Carter , Ronald (ed) . *Language and Literature* . London: Allen and Unwin, 1982 (useful analysis of literary works.
5. Cummings, M. , Simons, R.. *The Language of Literature : A stylistic introduction to the study of literature*. London : Pergamon,1983
6. Fowler ,Roger. *Style and Structure in Literature* . Oxford : Blackwell, 1975
7. Gimson,A.D. *Introduction to the Pronunciation of English*, U.K. : Edward Arnold, 1964 (2nd ed) , London : ELBS, 1974
8. Leech .G.N., Deuchar, M. and Hoogenraad, R. *English Grammar for Today: A new introduction*. London : Macmillan, 1973 (This grammatical framework will be followed)
9. Leech G.N. *A Linguistic Guide to English Poetry* . London: Longman, 1969
10. Leech G.N. and Short ,M.H. *Style in Fiction* . London: Longman, 1981
11. Lodge ,David. *Language of Fiction: Essays in Criticism and Verbal Analysis of the English Novel*. London: Routledge, 1966
12. Narayan , Meenakshi (ed) . *Functional Stylistics : An analysis of Three Canadian Novels*. Bombay: SNTD, 1994
13. O'Connor, J. D. *Better English Pronunciation*. Cambridge: Cambridge University Press, 1967.
14. Page Norman . *Speech in the English Novel*. London: Longman, 1973
15. Quirk, R. and Greenbaum, S. *A University Grammar of English* . London: Longman, 1973.
16. Short , M.H. and Culpeper , J. *Exploring the Language of Drama : From Text to Context*, London : Routledge ,1998
17. Thorat , Ashok . *A Discourse Analysis of Five Indian Novels* . New Delhi: Macmillan India Ltd.2002
18. Trudgill, Peter. *Sociolinguistics*, U.K. Penguin , 1972
19. Verdonk , Peter. *Stylistics* .Oxford : Oxford University Press, 2002
20. Widdowson H.G. *Stylistics and the Teaching of Literature*. London: Longman , 1973
21. Yule, George and Brown , Gillan. *Discourse Analysis*. Cambridge: Cambridge University Press, 1983

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

40 Marks

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Essay on the theories 1 out of 2	15 Marks
Q-2	From Unit II - Essay on the theories 1 out of 2	15 Marks
Q-3	From Unit III - Essay on the theories 1 out of 2	15 Marks
Q-4	From Unit IV - Essay on the theories 1 out of 2	15 Marks

Sr. No.	Heading	Particulars
1	Title of Course	Fiction
2	Eligibility for Admission	B.A./B.Com./B.Sc. Degree from recognised University
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-2023

Objectives of the Course:

- To familiarize learners with different genres in fiction.
- To familiarize them with different types of fictional narratives.
- To provide the learners with an idea of the growth of fiction over the period of the last three centuries.
- To make the learners aware of the social, cultural and psychological implications of fiction

Course Outcome: By the end of the course, a student should develop the Ability:

- To Interpret significant types of novels with suitable examples
- To Identify satirical elements reflected in the novel and its correlation with socio-political condition
- To Analyse distinctiveness of Victorian novelist and their depiction of multiple themes
- To Perceive the causes of tragedy in literature as well as in real life
- Adapt social, ethical values percolated in the literary texts

M. A. English Literature Semester I and II

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-I</u>	<u>Semester-II</u>
1. Paper-I Unit-I will be on Terms	1. Paper-I Unit-I will be on Terms
2. Paper-I Unit-II will be on Novel	2. Paper-I Unit-II will be on Novel
3. Paper- I Unit-III will be on Fiction	3. Paper-I Unit-III will be on Fiction
4. Paper- I Unit-IV will be on Novel	4. Paper- I Unit-IV will be on Novel

**M.A. English Literature Syllabus
Under Choice Based Credit System (CBCS)
To be implemented from the Academic year 2022-2023
SEMESTER I**

Course Code	Unit	Topics	Credits	Lectures
PARIENG1	I	Terms for study <ol style="list-style-type: none"> 1. Picaresque 2. Epistolary Novel 3. Sentimental Novel 4. Bildungsroman / Künstlerroman 5. Historical Novel 6. Gothic Novel 7. Romantic Novel 8. Sociological Novel 9. Realistic Novel 10. Satirical Novel 	06	15
	II	<ul style="list-style-type: none"> • Henry Fielding: Robinson Crusoe • Jonathan Swift: Gulliver's Travels 		15
	III	<ul style="list-style-type: none"> • Mary Shelley: Frankenstein • George Eliot: The Mill on the Floss 		15
	IV	<ul style="list-style-type: none"> • Thomas Hardy: The Mayor of Casterbridge • Annabhau Sathe: Fakira 		15

M.A. English Literature Syllabus
Under Choice Based Credit System (CBCS)
To be implemented from the Academic year 2022-2023
SEMESTER II

Course Code	Unit	Topics	Credits	Lectures
PAR2ENG2	I	1. Modern Novel 2. Stream of Consciousness Novel 3. Magic Realism Novel 4. Psychological Novel 5. Postmodern Novel 6. Science Fiction 7. Postcolonial Novel 8. Spy Fiction 9. Campus Novel 10. Protest Novel	06	15
	II	<ul style="list-style-type: none"> • D. H. Lawrence: Sons and Lovers • William Golding: Lord of the Flies 		15
	III	<ul style="list-style-type: none"> • Chinua Achebe: Things Fall Apart • J. M. Coetzee: The Life and Times of Michael K 		15
	IV	<ul style="list-style-type: none"> • Toni Morrison: "The Bluest Eye" • Baby Kamble: "Prison we Broke" 		15

Secondary Reading

1. Virginia Woolf: *To the Lighthouse*
2. E. M. Forster: *Passage to India*
3. D. H. Lawrence: *The Rainbow*
4. Joseph Conrad: *Victory*
5. Julian Barnes: *Flaubert's Parrot*
6. David Lloyd Jones: *Mr Pip*
7. Salman Rushdie: *Midnight's Children*
8. Ray Bradbury: *Fahrenheit 451*

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21. Carr, David (1991) *Time, Narrative and History*.
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27. Rzepka, C. J (2005) *Detective Fiction*
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34. Chase, R. (1949) *Quest for Myth*
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41. Knight, Charles A (2004) *Literature of Satire*
42. Hodgart, Matthew (2010) *Satire: Origins and Principles*

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

40 Marks

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 6. Group/individual Survey Project 7. Presentation and write up on the selected topics of the subjects 8. Case studies/Test based on tutorials 9. Book Review/Poetry Appreciation/ Open Book Test 10. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Essay on the theories 1 out of 2	15 Marks
Q-2	From Unit II - Essay on the theories 1 out of 2	15 Marks
Q-3	From Unit III - Essay on the theories 1 out of 2	15 Marks
Q-4	From Unit IV - Essay on the theories 1 out of 2	15 Marks

Sr. No.	Heading	Particulars
1	Title of Course	Drama
2	Eligibility for Admission	B.A./B.Com./B.Sc. Degree from recognised University
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-2023

Objectives of the Course:

- To introduce the learners to a wide range of theatrical practices around the world.

- To introduce the learners to various theories of drama
- To enable them to understand the elements of drama and theatre
- To introduce them to the conventions of research papers

Course Outcome: By the end of the course, a student should develop the Ability:

- To Demonstrate origin and development of drama and its theatrical features
- To Identify tenets of Natyashastra and its reflection in Sanskrit drama
- To Examine the need for emancipation of women and revolt against patriarchy
- To Classify different types of drama and its distinctiveness in modern and postmodern era
- To Estimate various paradigms of relationship and problems of working class depicted in the plays

M. A. English Literature Semester I and II

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-I</u>	<u>Semester-II</u>
1. Paper-I Unit-I will be on Terms	1. Paper-I Unit-I will be on Terms
2. Paper-I Unit-II will be on Drama	2. Paper-I Unit-II will be on Drama
3. Paper- I Unit-III will be on Drama	3. Paper-I Unit-III will be on Drama
4. Paper- I Unit-IV will be on Drama	4. Paper- I Unit-IV will be on Drama

**M.A. English Literature Syllabus
Under Choice Based Credit System (CBCS)
To be implemented from the Academic year 2022-2023
SEMESTER I**

Course Code	Unit	Topics	Credits	Lectures
PAR1ENG1	I	Terms for study Ancient Drama: <ul style="list-style-type: none"> • Elements of Theatre • Greek Theatre • Indian Classical Theatre • Folk element • Indian Theatre, • Black theatre, • Realistic theatre • Comedy of Manners • 20th century poetic drama, • One-act play 	06	15
	II	<ul style="list-style-type: none"> • Sophocles: Oedipus Rex • Kalidas: Shakuntala 		15
	III	<ul style="list-style-type: none"> • Henrik Ibsen: A Doll's House • Christopher Marlow: Dr. Faustus 		15
	IV	<ul style="list-style-type: none"> • William Congreve: The Way of the World • Amiri Baraka: Home on the Range 		15

**M.A. English Literature Syllabus
Under Choice Based Credit System (CBCS)
To be implemented from the Academic year 2022-2023
SEMESTER II**

Course Code	Unit	Topics	Credits	Lectures
PAR2ENG2	I	<ul style="list-style-type: none"> • Theatre of Absurd, • Epic theatre • Method theatre • Theatre of Cruelty • Poor Theatre • Off Broadway theatre • Kitchen-sink drama • Meta theatre • Expressionism • Irish theatre • Protest Theatre 	06	15
	II	<ul style="list-style-type: none"> • Pirandello: Six Characters in Search of the Author • J.M. Singe: Riders to the Sea 		15
	III	<ul style="list-style-type: none"> • Samuel Becket: Waiting for Godot • John Osborne : Look Back in Anger 		15
	IV	<ul style="list-style-type: none"> • Datta Bhagat: Routes and Escape Routes • Eugene Ionesco: Amedee or How to get Rid of it 		06

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

40 Marks

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 11.Group/individual Survey Project 12.Presentation and write up on the selected topics of the subjects 13.Case studies/Test based on tutorials 14.Book Review/Poetry Appreciation/ Open Book Test 15.Quiz	20 Marks

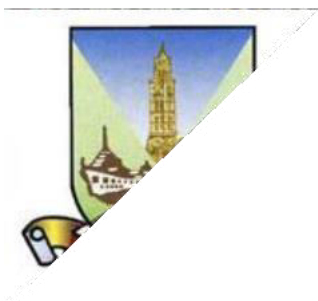
Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Essay on the theories 1 out of 2	15 Marks
Q-2	From Unit II - Essay on the theories 1 out of 2	15 Marks
Q-3	From Unit III - Essay on the theories 1 out of 2	15 Marks
Q-4	From Unit IV - Essay on the theories 1 out of 2	15 Marks

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॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

**ARTS, COMMERCE AND SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Program: M. A.

Revised Syllabus of M.A. English Literature Part II

Semester III

Under Choice Based Credit and Grading System (60:40)

w.e.f. Academic Year 2020-2021

Sr. No.	Heading	Particulars
1	Title of Course	Poetry From Chaucer to Present
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Syllabus:

This paper entitled “Poetry from Chaucer to the Present” seeks to familiarize the students with the development of poetry over a vast period especially from Chaucer to the present. Therefore, it aims at studying certain poetic genres in relation to the chief tendencies and movements of the age. This is an attempt to acquaint the students with poetic forms, development of poetry and representative poets through the ages in the wider context of socio-cultural background of the time. The selected texts are to be studied for the poetic form as well as the poet's contribution to the age and their place/relation to the age/movement they represent. It also aims at developing sensitivity of the learners towards life and all that surrounds it. It seeks to foster qualities such as understanding and appreciation of other cultures and ways of life. This poetry paper believes in understanding different schools of poetry, its characteristics and important contributors in the development of poetry as a genre of English Literature.

Objectives of the Course:

- To acquaint with learners with various Schools of Poetry in English Literature
- To study different genres of poetry and its salient traits.
- To empower the students with the skill of appreciation of poetic beauty
- To familiarize the learners with socio and cultural background of the age
- To enable the students to distinguish between prominent trends in English poetry.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand importance of poetry as a genre in English Literature
- To recognize the relationship between nature and poetry
- To develop the skill of appreciation of different poetic forms amongst the students.
- To examine the contribution of representative poets of the age or movement.
- To empower the students to identify moral and social values reflected in English poetry.

M. A. English Literature Semester III

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-III

1. Paper-I Unit- I will be on Chaucer to the Metaphysical Poetry
2. Paper-I Unit- II will be on Milton to the Age of Transition
3. Paper- I Unit- III will be on Romantic Revival to Pre- Raphaelite Poets
4. Paper- I Unit- IV will be on Modernism and after

M.A. English Literature Part II Syllabus
Under Choice Based Credit Grading and Semester System (CBCGS)
To be implemented from the Academic year 2020-2021
SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
PARENG301	I	Chaucer to the Metaphysical Poetry: <ul style="list-style-type: none"> • Geoffrey Chaucer: The Wife of Bath's Tale From The Canterbury Tales • Edmund Spenser: Prothalamion • John Donne: The Canonization Flea • Andrew Marvell: To His Coy Mistress A Dialogue between the Resolved Soul and Created Pleasure 	06	15
	II	Milton to the Age of Transition: <ul style="list-style-type: none"> • John Milton: Paradise Lost Book II • Alexander Pope: Essay on Man (Epistle I) • Thomas Gray: Elegy Written in Country Churchyard 		15
	III	Romantic Revival to Pre- Raphaelite Poets: <ul style="list-style-type: none"> • William Wordsworth: Resolution and Independence • P. B. Shelley: Ode to the West Wind • Alfred Tennyson: The Lady of Shalott • Robert Browning: Andrea Del Sarto • D. G. Rossetti: The Blessed Damozel 		15

	IV	Modernism and After <ul style="list-style-type: none"> • T. S. Eliot: The Love Song of J. Alfred Prufrock • W. B. Yeats: Amongst School Children • Siegfried Sasoon: The Child at the Window • W. H. Auden: The Unknown Citizen • Dylan Thomas: Fern Hill • Philip Larkin: The Whitsun Weddings 		15
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Scheme of Examination for Each Semester:

Internal Evaluation: 40

❖ **Scheme of Examination**

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below-

A) Internal Assessment: 40 %

40 Marks

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) <ol style="list-style-type: none"> 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz 	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Essay on the Poetry 1 out of 2	15 Marks
Q-2	From Unit II - Essay on the Poetry 1 out of 2	15 Marks
Q-3	From Unit III - Essay on the Poetry 1 out of 2	15 Marks
Q-4	From Unit IV - Essay on the Poetry 1 out of 2	15 Marks

References:

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Sr. No.	Heading	Particulars
1	Title of Course	Gender Perspectives on Literature
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Syllabus:

It is extremely important to create an awareness about different dimensions of gender perspectives in the mind of students. It is apparent that the issues of gender, race, class and nation are closely interconnected with each other. Therefore, gender roles are inscribed in social forces rather than in natural or innate differences. This course entitled “Gendered Perspectives on Literature” primarily articulates contemporary concerns both academic and sociocultural systematically. It also exposes literary texts as a microcosm of beliefs and values that engineer gender ideologies and generate stereotypes. Similarly, it also explores the contesting or subversion of such ideologies and stereotypes by examining contemporary debates in the study of gender and sexuality as reflected in literature. The course further addresses the patterned gender representations and the politics of departure from these locations. In the light of intense debates the world over, on the above issues, the need for such a course at the post-graduate level is self-evident. The syllabus of this course aims at development of gender quality in the mind of students in order to become better citizens in the society.

Objectives of the Course:

- To open up new avenues in gender studies to the students
- To acquaint the student with the complexity and diversity involved in the process of construction of gender and sexuality.
- To encourage the students to interrogate the rigid frameworks of gender construction.
- To evaluate literary text in the light of gender perspectives
- To examine the projection of women characters in literary text
- To familiarize the learners with critical theories related to gender.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand importance gender equality in the real life.
- To recognize the relationship society and gender formation
- To appreciate prominent literary text on the basis of gender perspectives.
- To examine the status and identity of women in literature as well as society.
- To practice gender parity in society.

M. A. English Literature Semester III

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-III</u>
1. Paper-I Unit-I will be on Critical Theories Related to Gender
2. Paper-I Unit-II will be on Poetry
3. Paper- I Unit-III will be on Fiction
4. Paper- I Unit-IV will be on Drama

M.A. English Literature Syllabus
Under Choice Based Credit Grading and Semester System (CBCGS)
To be implemented from the Academic year 2020-2021
SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
PARENG 302	I	Critical Theories <ul style="list-style-type: none"> • Critical Theory related to Gender, (Feminist Thought, Masculinity Studies, Queer/LGBT Theory) • Critical Approaches (Re-reading, Re-visioning, Gynocriticism, Trans-Criticism etc.) • Gender in theories of popular culture 	06	15
	II	<ol style="list-style-type: none"> 1. Catherine Acholonu <ul style="list-style-type: none"> • “The Market Goddess” • “The Way from <i>The Spring’s Last Drop</i> (1985)” 2. Arundhati Subramaniam <ul style="list-style-type: none"> • “Meenakshi” • “5:46, Andheri Local” 3. Sylvia Plath <ul style="list-style-type: none"> • “Daddy” • “Lady Lazarus” 4. W.H.Auden <ul style="list-style-type: none"> • “The Common Life” • “Lullaby” 5. Countee Cullen <ul style="list-style-type: none"> • “Tableau” • “Heritage” 		15
	III	<ul style="list-style-type: none"> • Karukku by Bama 		15

		Or The Awakening by Kate Chopin		
	IV	<ul style="list-style-type: none"> • <i>Sakharam Binder</i> by Vijay Tendulkar <p style="text-align: center;">OR</p> <p style="text-align: center;"><i>A Streetcar named Desire</i> by Tennessee Williams</p>		15

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

40 Marks

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 6. Group/individual Survey Project 7. Presentation and write up on the selected topics of the subjects 8. Case studies/Test based on tutorials 9. Book Review/Poetry Appreciation/ Open Book Test 10. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Short notes on the terms 2 out of 4	15 Marks
Q-2	From Unit II - Essay on the poetry 1 out of 2	15 Marks
Q-3	From Unit III - Essay on the novels 1 out of 2	15 Marks
Q-4	From Unit IV - Essay on the drama 1 out of 2	15 Marks

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Sr. No.	Heading	Particulars
1	Title of Course	Twentieth Century American Literature
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course

It is considered as that the 20th century American Literature is a corpus of experimental and multicultural writings. It also reveals the impact of many movements such as Imagism, Modernism, Postmodernism and Feminism. It is necessary to identify various facets of racial discrimination and its impact on literature. There a need to explore sufferings of women characters especially in African American literature. A course on 20th Century American Literature is an opportunity for the students to familiarize with a variety of literary expressions. The interesting thematic concerns such as identity, immigrant experiences, multiculturalism, marginality, protest and hyphenated identities are reflected in this course.

Objectives of the Course:

- To acquaint the learners with various genres of twentieth century American Literature
- To familiarize the students with literary terms of twentieth century American Literature
- To introduce the students with socio- cultural milieu of twentieth century America
- To examine the complexity of identity crisis reflected in the texts.
- To understand the the nature and sufferings of minority people.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand various thematic concerns reflected in the realm of American Literature
- To recognize the importance of equality and freedom in the society.
- To appreciate the style of modern and post modern American writers.
- To understand the importance of multiculturalism depicted in the texts.
- To encourage the students to make presentations on prominent American writers.

M. A. English Literature Semester III

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-III

1. Paper- I Unit- I will be on Terms
2. Paper- I Unit- II will be on Poetry
3. Paper- I Unit- III will be on Novel
4. Paper- I Unit- IV will be on Drama

M.A. English Literature Part II Syllabus
Under Choice Based Credit Grading and Semester System (CBCGS)
To be implemented from the Academic year 2020-2021
SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
PARENG303	I	Terms and Concepts <ul style="list-style-type: none"> • The Lost Generation • Southern Renaissance • Beat Generation • The Harlem Renaissance • The Civil Rights Movement • Expressionism in American Drama • Impact of World Wars on American Literature • Confessional Poetry • Jewish American Literature • African American Women's Writing 	06	15
	II	Poetry Robert Frost: Out Out- A Roadside Stand Fire and Ice Wallace Stevens: Anecdote of the Jar		15

		<p>Another Weeping Woman</p> <p>Domination of Black</p> <p>A Rabbit as the King of the Ghosts</p> <p>Nikki Giovanni: A Journey</p> <p>Crutches</p> <p>Life Cycles</p> <p>I Wrote a Good Omelet</p>	
	III	<p>Novel</p> <ul style="list-style-type: none"> • Joseph Heller: Catch-22 • Gloria Naylor: Mama Day 	15
	IV	<p>Drama</p> <ul style="list-style-type: none"> • Eugene O'Neill: The Hairy Ape • Angust Wilson: Fences 	15

Scheme of Examination for Each Semester:

Evaluation: 40

❖ Scheme of Examination

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below-

A) Internal Assessment: 40 %**40 Marks**

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 11.Group/individual Survey Project 12.Presentation and write up on the selected topics of the subjects 13.Case studies/Test based on tutorials 14.Book Review/Poetry Appreciation/ Open Book Test 15.Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Short notes on the terms 2 out of 4	15 Marks
Q-2	From Unit II - Essay on the Poetry 1 out of 2	15 Marks
Q-3	From Unit III - Essay on the Novel 1 out of 2	15 Marks
Q-4	From Unit IV - Essay on the Drama 1 out of 2	15 Marks

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Sr. No.	Heading	Particulars
1	Title of Course	Shakespeare
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course:

English literature is inevitably associated with one the most influential and towering personality belonging to sixteenth century. The Bard of Avon has created his reputation as one the greatest actors, dramatists and sonneteers in the realm of English Literature. English and William Shakespeare is considered as two sides of the same coin. He has made his works admirable and appreciable to all the readers all over the universe. Therefore, according to his contemporary Ben Jonson “was not of an age but for all time.” Indeed, Shakespeare has become a literary icon for all places and spaces: more than four hundred years after his death, his works continue to be staged, adapted into films and studied in Universities around the world. This paper will examine the ways in which Shakespeare’s works may have been received against the philosophical and intellectual viewpoints of the Renaissance. The paper will also consider the literary scholarship which shaped the understanding of Shakespearean works. The paper will similarly help the learners consider Shakespeare’s enduring global appeal through investigation into the rich, cultural and political complexities of Shakespeare adaptations. It also investigates

prominent themes and dramatic techniques depicted in the remarkable tragedies, romantic comedies and historical plays of William Shakespeare.

Objectives of the Course:

- To acquaint the learners with timeless dimensions of masterpieces of Shakespeare.
- To familiarize the students with features of Shakespearean tragedies
- To explore various universal truths incorporated in the works of Shakespeare
- To examine salient traits of Romantic comedies of William Shakespeare
- To understand the relevance of William Shakespeare in 21st century.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand various thematic concerns reflected in the masterpieces of Shakespeare.
- To identify effective use of iambic pentameter in the works of Shakespeare.
- To appreciate the tragedies, comedies and historical plays of William Shakespeare.
- To understand the contribution of William Shakespeare as a Sonneteer.
- To examine the how everybody is playing the role of Hamlet in one's life.

M. A. English Literature Semester III

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-III</u>
1. Paper- IV Unit- I will be on Tragedies
2. Paper- IV Unit- II will be on Comedies
3. Paper- IV Unit- III will be on Historical Plays
4. Paper- IV Unit- IV will be on Sonnets

M.A. English Literature Syllabus
Under Choice Based Credit Grading and Semester System (CBCGS)
To be implemented from the Academic year 2020-2021
SEMESTER III

Course Code	Unit	Topics	Credits	Lectures
PARENG304	I	Tragedies <ul style="list-style-type: none"> • Hamlet • King Lear 	06	15
	II	Comedies <ul style="list-style-type: none"> • As You Like It • Measure for Measure 		15
	III	Historical Plays <ul style="list-style-type: none"> • Anthony and Cleopatra • Henry IV – Part I 		15
	IV	Poetry <ul style="list-style-type: none"> • Venus and Adonis • Sonnets <ul style="list-style-type: none"> i. “Shall I compare thee to a Summer’s day” – Sonnet 18 ii. “When in disgrace with fortune and men’s eyes” – Sonnet 29 iii. “Since brass, nor stone, nor earth, nor boundless sea” – Sonnet 65 iv. “That time of year thou may’st in me behold” – Sonnet 73 v. “Let me not to the marriage of true minds” – Sonnet 116 vi. “Th’ expense of spirit in a waste of shame” – Sonnet 129 vii. “My mistress’ eyes are nothing like the sun” – Sonnet 130 viii. “When my love swears that she is made of truth” – Sonnet 138 		15

Scheme of Examination for Each Semester:**A) Internal Assessment: 40 %****40 Marks**

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 16.Group/individual Survey Project 17.Presentation and write up on the selected topics of the subjects 18.Case studies/Test based on tutorials 19.Book Review/Poetry Appreciation/ Open Book Test 20.Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I – Essay on the Tragedy 1 out of 2	15 Marks
Q-2	From Unit II – Essay on the Comedy 1 out of 2	15 Marks
Q-3	From Unit III – Essay on the Historical 1 out of 2	15 Marks
Q-4	From Unit IV – Essay on the Sonnets 1 out of 2	15 Marks

Following methods can be used for the for projects

- Class presentation on prominent masterpieces of William Shakespeare
- Book review of poets

- Article review: selected from journals and books
- Seminar participation
- Writing research papers
- Interpretation of literary and cultural texts (films, drama and Television shows)

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References by Genre

The Comedies and Romances

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Tragedies

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2. Garner, Shirley Nelson and Madelon Sprengnether. *Shakespearean Tragedy and Gender*. (1996)
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The Histories

1. Holderness, Graham. *Shakespeare: The Histories* (2000)
2. Levine, Nina S. *Women's Matters: Politics, Gender and Nation in Shakespeare's Early History Plays* (1998)
3. Norwich, John Julius. *Shakespeare's Kings: The Great Plays and the History of England in the Middle Ages 1337-1485*(1999)
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॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

**ARTS, COMMERCE AND SCIENCE COLLEGE, NEW PANVEL
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Program: M. A.

Revised Syllabus of M.A. English Literature Part II

Semester IV

Under Choice Based Credit and Grading System (60:40)

w.e.f. Academic Year 2020-2021

Sr. No.	Heading	Particulars
1	Title of Course	Indian Writing in Translation
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course:

It is necessary to make the syllabus a more multidisciplinary and multilingual in order to cater the needs of contemporary society and nation in present day context. In the times of globalization and increasing competitions, many of our students aspire to seek jobs multilingual regions in India and abroad for which they are to be equipped with a capability of knowing the works in translation and an expertise in Indian Literature in English translation.

Keeping in mind this multilingual scenario, the present syllabus includes writers from various languages of India and available in the translated forms in English as students shall create possible interactions and develop the expertise in the said discipline.

It is apparent that no language is great or small and medium of English as link language to help regional literature of India reach out to the world in their accessible tongue. One has to know that regional languages in India have been affluent in literary tradition by rich historical

collections they had since two centuries; people have been engaged in bringing this literature of various languages into English via translation. It is considered that translation is an important skill to be possessed by the students. There is a need to maintain golden balance in learning skills in domains of literary works from different languages in India.

Objectives of the Course:

- To provide an exhaustive study of Indian Literature in the various Indian languages especially through translation.
- To familiarize the students with major movement in India through English translations.
- To understand importance of translation and its mechanism in literature.
- To acquaint the students with the history of translation in India.
- To explore prominent poets, novelists and dramatists in Indian languages.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand various thematic concerns reflected in Indian Writing in Translation.
- To enable the students to delve deep in Indian literature in translation.
- To examine the nature of Indian ethos reflected in the various Indian languages.
- To understand the contribution of prominent writers in the realm of Indian languages.
- To empower the students to overcome the challenges of literary translation.

M. A. English Literature Semester IV

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester- IV</u>
1. Paper-I Unit-I will be on Background Study
2. Paper-I Unit-II will be on Poetry
3. Paper-I Unit-III will be on Drama
4. Paper- I Unit-IV will be on Fiction

M.A. English Literature Syllabus
Under Choice Based Credit Grading and Semester System (CBCGS)
To be implemented from the Academic year 2020-2021

SEMESTER IV

Course Code	Unit	Topics	Credits	Lectures
PARENG401	I	<p>Background Study</p> <p>1) Historical Review of Indian Writing in translation – the spread of English language and democratic values in Post-Independence India, Partition literature, the emergence of regional and translated literatures in India, East-West Encounters, Impact of Western trends and movements on Indian literature and culture.</p> <p>2) Contemporary trends and movements in Indian writing in translation – beginning and growth of marginalized literature, translated works of native writers from different languages in India and decolonization, development of women’s writings and gender studies, subaltern voices, tribal studies and protest literature.</p>	06	15
	II	<p>Poetry</p> <p>1) Songs of Kabir by Rabindranath Tagore Song No. 01- mo ko kahân dhûnro bande 05- avadhû, mâyâ tajî na jây 12- hamsâ, kaho purâtan vât 21- ghar ghar dîpak barai 38- bhram kê tâlâ lagâ mahal re</p> <p>2) Arun Kolatkar: <i>Jejuri</i> 3) Selected poems from Poisoned Bread edited by Arjun Dangle</p> <ul style="list-style-type: none"> • Hunger 		15

		<ul style="list-style-type: none"> • An Ultimatum • I will Belong to it • In Our Colony • To Be or Not To be Born 		
	III	Drama <ul style="list-style-type: none"> • Mohan Rakesh: <i>One Day in the Season of Rain</i> • Vijay Tendulkar: <i>Ghashiram Kotwal</i> 		15
	IV	Fiction <ul style="list-style-type: none"> • Maya Pandit : Baby Kamble • U. R. Anantha Murthy: <i>Samskara</i> 		15

Scheme of Examination for Each Semester:

A) Internal Assessment: 40 %

40 Marks

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) <ol style="list-style-type: none"> 1. Group/individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies/Test based on tutorials 4. Book Review/Poetry Appreciation/ Open Book Test 5. Quiz 	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Short notes on the terms 2 out of 4	15 Marks
Q-2	From Unit II - Essay on the Poetry 1 out of 2	15 Marks
Q-3	From Unit III - Essay on the Drama 1 out of 2	15 Marks
Q-4	From Unit IV - Essay on the Fiction 1 out of 2	15 Marks

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11. Rahman, Anisur. *Indian Literature(s) in English Translation - The discourse of resistance and representation* in Journal Of Postcolonial Writing Vol. 43 , Iss. 2,2007.
12. Samel, Swapna H. *Dalit Movement in South India: 1857-1950*: New Delhi, Serials, 2004.
13. Sharma, Pradeep K. *Dalit Politics and Literature*: Delhi, Shipra, 2006.
14. Zelliott,Eleanor *From Untouchable to Dalit: Essays on the Ambedkar Movement*:Manohar,1998.
15. Trivedi, Harish *Colonial Transactions: English Literature and India*, Manchester University Press, 1993.
16. Spivak, Gayatri Chakravorty. “*The Politics of Translation*” “The Politics of Translation”, in Lawrence Venuti (ed.), *The Translation Studies Reader*. London. New York: Routledge, 2000.

Sr. No.	Heading	Particulars
1	Title of Course	Research Methodology
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course:

There is an innate desire for searching and researching in the mind of students as well as human beings since time immemorial. It is apparent that curiosity and the spirit of questioning also contributes significantly in the development of research amongst the students. Research is an integral facet of learning process. Learning and research are considered as inevitable elements to be inculcated for better understanding and dissemination of knowledge.

Basically research is creative, innovative and systematic work undertaken to increase the stock of knowledge. It is a serious investigation aimed at the discovery and interpretation of data as well as facts with suitable methodology. Systematic enquiry of the questions is possible only with an amalgamation of research aptitude, critical acumen and application of relevant methodology in English language. The process of research involves identification of the problem, objectives, hypothesis, collection of data, interpretation of the data, literature review and interpretative and creative skills on the part of researcher. This journey of research requires lot of patience and inquisitiveness on the part of researcher.

This research paper primarily aims at developing interest in the mind of the students about nature, process and mechanism of research in English and become successful researchers in today's digital world.

Objectives of the Course:

- To introduce the learners with the concept of research.
- To familiarize the students with important stages involved in the process of research
- To inform the students about the the process of data collection and analysis.
- To acquaint the students with different research tools and methods present in English.
- To create thirst for research in the mind of students.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand importance of research in the process of learning.
- To acquire the interpretative and analytical skills during the process of research.
- To understand the process of research systematically and successfully.
- To enable the students with various conventions of documentation.
- To undertake research in English and become successful researcher.

M. A. English Literature Semester IV

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-IV</u>
1. Paper-II Unit-I will be on Key Concepts
2. Paper-II Unit-II will be on Research Tools, Language and Plagiarism
3. Paper-II Unit-III will be on Research in Language and Literature
4. Paper- II Unit-IV will be on Process of Research

M.A. English Literature Syllabus
Under Choice Based Credit Grading and Semester System (CBCGS)
To be implemented from the Academic year 2020-2021
SEMESTER IV

Course Code	Unit	Topics	Credits	Lectures
PARENG402	I	Key Concepts <ul style="list-style-type: none"> • Investigation, exploration, examination, analysis • Hypothesis and Problem Statement • Methods and Modes of Research • Data Analysis (Collection and Classification) • Reference Lists and Footnotes • Quotations and Citation • Bibliography / Appendix / Appendices 	06	15
	II	Research: Tools, Language and Plagiarism <ul style="list-style-type: none"> • Primary and Secondary Data • Research Language (Clarity, Correctness, Coherence) • Research Ethics 		15
	III	Research in Language and Literature <ul style="list-style-type: none"> • Methods in Language Research • Trends and Approaches in Literary Research 		15
	IV	Process of Research <ul style="list-style-type: none"> • Selection of Research Topic • Chapterisation: Sections and Sub-sections of Chapters • Findings and Conclusion 		15

Scheme of Examination for Each Semester:**A) Internal Assessment: 40 %****40 Marks**

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 6. Group/individual Survey Project 7. Presentation and write up on the selected topics of the subjects 8. Case studies/Test based on tutorials 9. Book Review/Poetry Appreciation/ Open Book Test 10. Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows :-

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I - Short notes on the Concepts 2 out of 4	15 Marks
Q-2	From Unit II – Essay on Research tools 1 out of 2	15 Marks
Q-3	From Unit III – Essay on Research language 1 out of 2	15 Marks
Q-4	From Unit IV – Essay on Process of Research 1 out of 2	15 Marks

References:

1. Ahuja, Ram. (2005), *Research Methods*. Rawat Publications.
2. Altick, R.D. (1963), *The Art of Literary Research*, New York: Norton.
3. Bawarshi, Anis S. and Reiff, Mary Jo. (2010), *Genre: An Introduction to History*,

Theory, Research, and Pedagogy. Parlor Press.

4. Booth, Wayne C. (2003), *The Craft of Research*, University of Chicago Press.
5. Eliot, Simon. (1998), *A Handbook of Literary Research*. Psychology Press.
6. Ellis, Jeanne (2010), *Practical Research Planning and Design*, Ormond, Merrill.
7. Gibaldi, Joseph. (2003), *MLA Handbook for Writers of Research Papers*, New York: MLA Association.
8. Gorman, G. E. and Clayton, Peter. (2005), *Qualitative Research for the Information Professional* by London: Facet Publishing. 95
9. Harner, James L. (2002), *Literary Research Guide: An Annotated Listing of Reference Sources in English Literary Studies*, New York: MLA of America.
10. Kothari C.R. (2004), *Research Methodology: Methods and Techniques*, New Age International.
11. Lenburg, Jeff. (2007), *Guide to Research*. Viva Books.
12. Miller R.H. *Handbook of Literary Research*. Methuen.

13. McMillan, James H. (1996). *Educational Research: Fundamentals for the Consumer*.
14. Oakman, Robert L. (1984), *Computer Methods for literary Research*, Athens: University of Georgia Press.
15. Rajanan, B. (1968), *Fundamentals of Research*, ASRC Hyderabad.
16. Caivery, R. & Nayak V.K. (2005), *Research Methodology*, S.Chand.
17. Sameer,Kumar. (2005), *Research Methodology*. Springer: US.
18. Seliger (2001), *Second Language Research Methods*, OUP.
19. Rahim, Abdul F. (2005), *Thesis Writing: A Manual for Researchers*. New Delhi: NewAge International.
20. Tunnell, Michael O. and Jacobs,James S. *Using "Real" Books: Research Findings on LiteratureBased Reading Instruction*. *The Reading Teacher* Vol. 42, No. 7 (Mar.,1989)

Sr. No.	Heading	Particulars
1	Title of Course	Political Reading of Literature
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Course:

It has been regarded that the study of English literature is directly or indirectly associated with the politics involved in it. Historically speaking, literature has been perceived as a domain of truth and knowledge. Particularly, the canonical texts are read and revered for their ability to come to grips with as well as reflect the timeless essence of universal human experience.

A great writer is seen as a genius who has transcended history, thus showcasing his ability to grapple with and unravel the eternal riddles of human Life. However, our exposure to some of the new radical theories like Marxism, Feminism, Postcolonialism, Cultural Studies etc. has taught us that literature as an institution is transfixed in the matrix of politics. In other words, literature which includes even canonical texts, mediates the dominant ideologies of the times and therefore, the 'political unconscious' [a term made famous by Fredric Jameson] is the built-in feature of a literary text. At the same time, the writer's world view is also conditioned and structured by the dominant politico-ideological framework of his/her times.

There is plenty of conflict involved in between the protagonist and antagonist on account of the pivotal role of the so called politics. The writer also describes issues of class, race and gender politics present in the literary texts. The syllabus of this paper highlights on the manner in which different characters are involved in the process of politics in order to accomplish the desired ambitions and missions.

Objectives of the Course:

- To introduce the learners with nature of monarchic ideology.
- To familiarize the students with emergence of colonialism and imperialism
- To inform the students about issues of race, class and gender politics
- To acquaint the students with different texts as an embodiment of power politics.
- To explore various pros and cons of power politics present in the literary texts.

Course Outcome: By the end of the course, a student should develop the Ability:

- To understand various nuances of power politics present in the literary texts.
- To examine the dominant ideology reflected in the realm of literature.
- To understand the mechanism of power politics and its implementation.
- To empower the students with the skill of coping with the power politics.
- To identify the power politics present in the literary works as well as real life.

M. A. English Literature Semester IV

For the subject of English there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

<u>Semester-IV</u>
1. Paper-III Unit-I will be on Macbeth
2. Paper-III Unit-II will be on Mansfield Park
3. Paper-III Unit-III will be on Wuthering Heights
4. Paper- III Unit-IV will be on A Passage to India

M.A. English Literature Syllabus
Under Choice Based Credit Grading and Semester System (CBCGS)
To be implemented from the Academic year 2020-2021
SEMESTER IV

Course Code	Unit	Topics	Credits	Lectures
PARENG403	I	<p>Elizabethan Age</p> <ul style="list-style-type: none"> • The Rise and Consolidation of Monarchic Ideology • How Shakespeare's texts uphold and authenticate absolutist monarchic ideology • William Shakespeare: Macbeth 	06	15
	II	<ul style="list-style-type: none"> • Emergence and spread of Colonialism and Imperialism • How colonial ideology is embedded in and transmitted by the canonical texts • Gendering the Subject and Social Construction of Woman • Jane Austen: Mansfield Park 		15
	III	<ul style="list-style-type: none"> • Patriarchal ideology and power---- How it is operational in family relationships • Emile Bronte: Wuthering Heights • Ideology of Race & Otherness---How it facilitates the hegemony of the dominant groups/race • [Heathcliff in relation to other characters in the text] 		15
	IV	<ul style="list-style-type: none"> • Representing the Oriental Other and the legitimization of colonial ideology • E M Forster: A Passage to India 		15

Scheme of Examination for Each Semester:**A) Internal Assessment: 40 %****40 Marks**

Sr.No.	Particular	Marks
01	One periodical class test/online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 11.Group/individual Survey Project 12.Presentation and write up on the selected topics of the subjects 13.Case studies/Test based on tutorials 14.Book Review/Poetry Appreciation/ Open Book Test 15.Quiz	20 Marks

Semester End Examination: 60 Marks will be as follows -:

Theory		Marks
Each theory paper shall be of two hours duration.		
All questions are compulsory and will have internal options. All questions carry equal marks		
Q-1	From Unit I – Essay on the Play 1 out of 2	15 Marks
Q-2	From Unit II – Essay on the Novel 1 out of 2	15 Marks
Q-3	From Unit III – Essay on the Novel 1 out of 2	15 Marks
Q-4	From Unit IV – Essay on the Novel 1 out of 2	15 Marks

References:

1. Archibald, Diana C. Domesticity, Imperialism, and Emigration in the Victorian Novel.

University of Missouri Press, 2002.

2. Cornell, Susan Meyer *Imperialism at Home: Race and Victorian Women's Fiction*.
University Press, 1996.

3. Donaldson, Laura E. *Decolonizing Feminisms: Race, Gender & Empire Building*.
University of North Carolina Press, 1992.

4. Gikandi, Simon *Maps of Englishness: Writing Identity in the Culture of Colonialism*
Columbia University Press, 1996.

5. Hodgkins, Christopher *Reforming Empire: Protestant Colonialism and Conscience in
British Literature*. University of Missouri Press, 2002.

6. Low, Gail Ching-Liang. *White Skins/Black Masks: Representation and Colonialism*
Routledge, 1996.

7. Parry, Benita *Postcolonial Studies: A Materialist Critique*. Routledge, 2004.

8. Rajan, Gita *Postcolonial Discourse and Changing Cultural Contexts: Theory and
Criticism* Radhika Mohanram Greenwood Press, 1995.

Sr. No.	Heading	Particulars
1	Title of Course	Project
2	Eligibility for Admission	
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Sr. No.	PARENG404 Topics/ Areas of the Project Work	Paper IV
1	Comparative Literature	
2	Re-reading Canonical Texts	
3	Language and Literature	
4	Film Appreciation	
5	Art and Literature	
6	Study of Popular Culture	
7	Subaltern in Literature	

8	Literature and Environment	
9	Gendered Reading of Literature	
10	Literature of Diaspora	
11	Queer and LGBT Studies	
12	Folk Literature	
13	Mythology	
14	Spirituality and Literature	
15	Journalism and Literature	
16	Marginality and Protest Literature	
17	Feminism and Literature	

Project Based Courses:

The objective of the Project Based Course is to evaluate the critical competence, logical reasoning and scholarly composition of the students at the end of the M.A. Programme. At the end of the course students are expected to have sound theoretical knowledge so that they can apply it to a particular area of study selected from the Project Based Course. They should develop the skills of identifying an area of investigation, reviewing literature, analyzing concepts, comparing alternative theories and perspectives, understanding the difference between primary and secondary sources in the area of their research, collecting and organizing data and articulating their arguments coherently and clearly.

Final Dissertation must be written as per the current edition of the Modern Language

Association (MLA) Handbook.

Detailed Regulations for Project Based Courses:

3.1 Project based courses will be offered in the fourth semester. Every learner will have to choose one project based course, which will be for ten credits. The project based course will be in the form of a dissertation based on a live project or a research assignment related to the specific discipline of the parent department.

The student will submit a list of his/her three most preferred topics in the order of preference by the fifth week of the third semester to the Head of the parent department.

The post graduate teachers in the Department and visiting Ph. D. Teachers will be guides for the project component.

The student will make a final presentation in the 10th to the 12th week of semester four.

The presentation will be evaluated by the same committee that evaluated the preliminary presentation. The criteria for evaluation will be as follows:

- i) 10 marks for the quality of presentation
- ii) 15 marks for answers to questions

The marks given by the three members of the evaluation committee will be averaged in each head and the total marks decided by totalling the averages under the three heads.

The student will submit a bound hard copy of the dissertation to the Department by the end of the fourth semester, along with a soft copy on a CD/DVD.

The final dissertation will have a word limit of 10,000 -15,000 words and will be typed in one and a half spacing on one side of the paper.

The final dissertation will be evaluated out of 75 marks.

The project will be given a grade point as per the following scheme:

10 Point Grading System

Marks	Grade Points	Grade	Performance
Less than 40	0	F	Fail
40 – 44.99	4	D	Pass
45 – 49.99	5	C	Average
50 – 54.99	6	B	Above Average
55 – 59.99	7	B+	Good
60 – 69.99	8	A	Very Good
70 – 79.99	9	A+	Excellent
80 & Above	10	O	Outstanding

A student who gets a letter grade F in the course will be deemed to have failed in the course.

A student who feels aggrieved by the grading received will have the option of applying

to the project committee for re-evaluation of the project within a period of one week after the declaration of the result. . If the project committee feels that the claim is justified, it shall appoint a fresh examiner who will submit his/her evaluation in a weeks time. If the marks by the re-evaluating examiner exceed the marks of the original examiner by a margin of 10% or more, the latter set of marks will be considered final.

The student who has got a letter grade F in the project course will have the option of resubmitting a revised version within 2 months from the date of declaration of the result. If a student fails this time too, he/she will not get any more chances and will be ineligible to be awarded the MA degree.

If a student is unable to submit his/her dissertation in the stipulated time or fails to make the presentations at the appointed time, he/she will be deemed to have failed the course

The schedule for preliminary presentation, final presentation and dissertation Submission is displayed in the first week of the fourth semester.

Ethical Standards regarding Dealing with Human Participants:

Students should refrain from acts which he or she knows, or under the circumstances has reason to know, spoil the academic integrity of the academic program. Violations of academic integrity include, and not limited to: plagiarism; violation of the rights and welfare of human participants in research and practice; cheating, knowingly furnishing false information; misconduct as a member of department or college, and harm to self and others.



Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Program: B.A.

Revised Syllabus of F.Y.B.A. Economics

Choice Based Credit & Grading System (60:40)

w.e.f. Academic Year 2022-2023

Sr. No.	Heading	Particulars
1	Title of Course	Economics
2	Eligibility for Admission	12 th Arts of all recognised Board
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-2023

Revised Syllabus of Courses of F.Y.B.A. Programme at Semester I & II with Effect from the Academic Year 2022-2023

Preamble

This course is designed to introduce the students to elementary concepts in microeconomics. The student should be able to use these concepts to understand the relevance of microeconomics to the real world. The student should be able to build on these concepts in the future to develop deeper understanding of the Economy as well as the revised syllabus is framed to understand the economic theory and its relevance in decision making.

COURSE CODE	PAPER TITLE	CREDITS	MARKS
UAR1EC1	Micro Economics	03	100

COURSE CONTENT

SN	Modules	No. of Lectures
1	Module - I	12
2	Module - II	12
3	Module - III	12
4	Module - IV	12
Total		48



University of Mumbai

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**

Revised Scheme of Evaluation for

**Continuous Assessments and
Semester End Examinations**

for

Under-graduate Programmes

under

Faculty of Arts

Under Autonomous status with

Choice Based Credit System (CBCS)

(To be implemented from Academic Year 2022-2023)

Revised Scheme of Examination

Faculty of Arts

(Under-graduate Programmes)

Choice Based Credit System (CBCS)

❖ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies / Test based on tutorials 4. Book Review /Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

(For Courses with Practical)

Sr. No.	Particular	Marks
01	Practical Examination	20 Marks
	Journal	05 Marks
	Viva Voce	05 Marks
	Laboratory Work	10 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Survey Project 2. Presentation and write up on the selected topics of the subjects / Case studies. 3. Test on Practical Skills 4. Open Book Test 5. Quiz	20 Marks

Question Paper Pattern

(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
<ol style="list-style-type: none">1. There shall be five questions each of 12 marks (24 marks with internal options).2. All questions shall be compulsory with internal options.3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: 1) It is noted that the concerned regulation of the College is amended and implemented to all Semesters i.e. Semester I to Semester VI to all undergraduate programmes, under faculty of Arts, Commerce and Science with effect from the academic year 2022 - 2023.

2) This revised scheme of evaluation is discussed in detail, finalised and accepted.

Programme outcomes (POs) for B. A.

Sr. No.	Attributes	Programme Outcomes
PO1.	Disciplinary Knowledge	Demonstrate a blend of conventional discipline knowledge and its applications to the modern world. Execute strong theoretical and practical understanding generated from the chosen programme and equip the students with a strong academic perspective.
PO2.	Critical Thinking, Cognitive skills and Problem Solving	Exhibit the skill of critical thinking and use higher order cognitive skills to approach problems situated in their social environment, propose feasible solutions and help in its implementation. The students will be able to comprehend, learn, process and apply knowledge in day to day life.
PO3.	Analytical Skills and Effective Communication	Ability to analyse and evaluate different concepts of problems of society and make students able to develop oral and written communication skills in literature.
PO4.	Competencies for employment and Research	Equip with strong work attitudes and Employment skills that will enable them to work independently as well as collaboratively. Seeks opportunity for research and higher academic achievements in the chosen field and allied subjects.
PO5.	Individuality and Teamwork	Able to work collaboratively and effectively with diverse groups towards personal and common goals. Develop leadership qualities among the learners.
PO6.	Effective Citizenship and Ethics	Demonstrate empathetic social concern and equity centred national development; ability to act with an informed awareness of moral and ethical issues and commit to professional ethics as well as to accomplish their duties and responsibilities as citizens successfully.
PO7.	Social competence	Express oneself clearly and precisely to build good interpersonal relationships in personal and professional life.
PO8.	Environment sustainability	Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of, and need for environmental conservation and sustainability through action.
PO9.	Self-directed and Life-long learning	Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.
PO10.	Community engagement	Help students to share gifts, pursue justice and demonstrate through communicative solutions, concern for the poor and marginalised

Programme outcomes (PSOs) for B. A. Economics

Name of the Programme B.A.	Programme Coordinator Dr. B. S. Patil	Head of the Department Dr. B. S. Patil
After completing the programme in Economics, students will able to:		
PSO1	Demonstrate progressive knowledge of Economics, finance, taxation, business, Indian economy, Demography, Statistical methods.	
PSO2	Develop managerial career skills applying both quantitative and qualitative knowledge to their future careers business, industry and officers in different sectors of the economy	
PSO3	Develop proficiency with the ability to engage in competitive exams like MPSC, UPSC, IES, ISS, Research analyst's, Bank POs and other courses.	

Programme Code BA1001
Micro Economics – I, Sem – I
Course Outcomes

	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Understand basic theories of micro economics.	Understand
CO2	Define ten principle of economics	Remember
CO3	Calculate the market demand and market supply.	Evaluate
CO4	Analyse the consumer’s behaviour with the help of indifference curve.	Analyse

SYLLABUS

Module –I: Introduction to microeconomics

(lectures 12)

Micro economics: meaning, scope, nature, importance and limitations- **Basic economic problems** – distinguish between micro economics and macroeconomics – positive economics and normative economics – concepts of equation, functions, graph, diagrams, line-slope and intercepts.

Module –II: Ten Principles of Economics

(lectures 12)

Trade-offs faced by the individuals – **significance of opportunity cost in decision making** – thinking at the margin- responses to incentives-benefits from exchange- organization of economic activities through markets and its benefits – role of government in improving market outcomes – **dependence of standard of living on production**- growth in quantity of money and inflation- inflation and unemployment trade-off.

Module –III: Demand and Supply

(lectures 12)

Demand – Demand function – Law of Demand – Determination of Demand – Supply - Supply function - Law of Supply - Determination of Supply – Elasticity of Demand

Module –IV: Market Structure

(lectures 12)

Concept of Market – **Types of Market** – Feature of Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition, Imperfect Competition – Equilibrium Condition of various Market.

Reference Books

Micro Economics - Paper I

1. N.Gregory Mankiw, Principles of Microeconomics, 7th edition, Cengage Learning, 2015
2. Sen Anindya (2007), Microeconomics: Theory and Applications, Oxford University Press, New Delhi.
3. Salvatore D. (2003), Microeconomics: Theory and Applications, Oxford University Press, New Delhi.
4. M.L.Jhingan “Microeconomics theory” 5th edition (2006) Vrinda publication (P) Ltd.

Programme Code BA1002
Micro Economics – I, Sem – II
Course Outcomes

Cos	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Relate types of production and producers equilibrium.	Remember
CO2	Explain cost and revenue and interrelationship.	Understand
CO3	Develop theories of factor pricing.	Apply
CO4	Compare equilibrium in different market structures.	Analyse

SYLLABUS

Module I: Production Analysis

(12 Lectures)

Production Function: Concept, Linear-Non Linear, Short and Long Run Production function, **Concepts of Total, Average and Marginal Product**; Law of Variable Proportion and Returns to Scale, Iso –Cost, Isoquant and Producer’s Equilibrium

Module II: Cost & Revenue Analysis

(12 lectures)

Concepts of Costs: Money and Real Cost, Social Cost, Private Cost, Explicit and Implicit Cost, Sunk Cost, Variable Cost, Opportunity Cost; Relationship between Average, Marginal and Total Cost; Derivation of Short Run and Long Run Cost Curves; Concepts of Revenue: Types and Interrelationship

Module III: Factor pricing

(12 lectures)

Marginal Productivity Theory of Distribution; **Rent: Ricardian Theory of Rent**, Modern Theory of Rent, Quasi Rent; Wages: Modern Theory of Wages; Collective Bargaining; Supply Curve of Labour; Interest: Classical Theory of Interest, Loanable Funds Theory of Interest; Profit: Risk and Uncertainty Theory, Innovation Theory.

Module IV: Capital Budgeting

(12 Lectures)

Meaning and Importance – Need for Capital Budgeting – Difficulties - **Steps of Capital Budgeting** - **Investment Criteria** –Payback Period – Net Present Value Method – Internal Rate of Return Methods.

Reference Books

Micro Economics - Paper I

1. Reference 1. A. Koutsoyainnis, (2015), Modern Microeconomics, 2nd edition, Palgrave Macmillan.
2. Paul Samuelson and W. Nordhaus, (2009), Economics, 19th edition: Economics, McGrawHill Publications.
3. Mankiw M.G (2015), Principles of Micro economics 7 th edition - Cengage Learning.
4. Anindya Sen, (2006), Microeconomics, OUP India Publisher.
5. M.L.Jhingan, (2006), “Microeconomics Theory”, 5 th edition, Vrinda Publication (P) Ltd. 6. H.L.Ahuja, (2016), “Advance Economics Theory” S.Chand & Company Ltd.

F.Y.B.A. Effective Communication Skills in English for Personality Development.



Janardan Bhagat Shikshan Prasarak Sanstha's

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'Best College Award' by University of Mumbai

Program: B.A.

Course Code- UAR 1ECS

**Revised Syllabus of F.Y.B.A. *Effective Communication Skills
in English for Personality Development***

Choice Based Credit System (60:40)

w.e.f. Academic Year 2022-23

F.Y.B.A. Effective Communication Skills in English for Personality Development.

Sr. No.	Heading	Particulars
1	Title of Course	<i>Effective Communication in English Skills for Personality Development.</i>
2	Eligibility for Admission	12 th Arts, Commerce and Science of all recognised Boards
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	One
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-23

Details of the Course

Preamble of the Course Syllabus

Personality development becomes a buzz word in 21st Century and it demonstrates resonance in all spheres of life. It is an amalgamation of various skills to be performed in order to accomplish personal and professional growth. Personality is the uniqueness present in an individual that separates the individual from the masses. Grooming of one's personality is an essential parameter for securing employment opportunities in today's competitive world. The concept of personality is understood as the process of developing a set of individual traits for exhibition one's uniqueness. It is responsible for inculcation of positive mind set amongst the students. Effective communication skills in English have become prerequisite at workplace. Therefore, it is essential to enhance linguistic skills for dynamic personality development of the learners. English is an emblem of global identity and there is desire in the mind of the students to express one-self successfully.

F.Y.B.A. Effective Communication Skills in English for Personality Development.

This innovative and creative two credit course aims at enhancement of the soft skills for overall personality development of the students. It also empowers the students with critical thinking, decision making, presentation and interview skills, leadership qualities and effective application of English for achieving the dream of versatile personality in reality.

Title: *Effective Communication Skills in English for Personality Development* **Course Objectives:**

- To Define Fundamentals of English Grammar and its Application.
- To Explain Communication Theory and its importance in Personality Development.
- To Identify Significance of Presentation and Interview Skills.

Course Outcomes:

After Completion of this Course the Students will be able:

CO1: To Develop Effective English for Dynamic Personality.

CO2: To Distinguish between Verbal and Non- Verbal Communication.

CO3: To Create an Amalgamation of Knowledge and Skills for Employability.

Title of the Paper: - *Effective Communication Skills in English for Personality Development.*

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For the subject of *Effective Communication Skills in English for Personality Development* there shall be two papers for 45 lectures each comprising of two units of 15 Lectures each.

Semester-I

1. Paper-I (Academic Skills) Unit-I will be on Academic Skills
2. Paper-I Unit-II will be on Soft Skills

Scheme of Examination for Each Semester:

Internal Evaluation: 40%

Sr.No.	Particular	Marks
01	Any four tools out of these (10 Marks each) 1. Mock interview and resume (10 M) 2. Power Point Presentation and write up on the selected topics of the subjects (10 M)	40 Marks

F.Y.B.A. Effective Communication Skills in English for Personality Development.

	3. Case studies and its write up (10 M) 4. Role Play and its write up (10 M) 5. Public Speech and its write up (10 M)	
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Semester End Examination: 60 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options. All questions carry equal marks	
	Q-1	From Unit – I Short Notes (With Internal Options) 15 Marks
	Q-2	From Unit – II (Essay having Internal Options.) 15 Marks
	Q-3	From Unit – I (Essay having Internal Options.) 15 Marks
	Q-4	From Unit – II (Short Notes any Two out of Four) 15 Marks

Choice Based Credit System (CBCS)

F. Y. B. A. Effective Communication Skills in English for Personality Development Syllabus To be implemented from the Academic year 2022-2023

SEMESTER I

Course Code	Unit	Topics	Credits	Lectures
	1. Academic Skills	a. Fundamentals of English Grammar: Subject- Verb Concord, Tenses, Types of Sentences, Auxiliary Verbs, Direct- Indirect Speech, Question Tags, and Common Errors in English. b. Communication Theory: Nature and Definition, Importance of Communication, Elements of	02	15

F.Y.B.A. Effective Communication Skills in English for Personality Development.

		<p>Communication, Process of Communication, Verbal and Non-Verbal Communication facial expressions, gestures, postures, silence.</p> <p>c. Barriers to Communication: Psychological, Semantic Physical Barriers</p> <p>d. Employment Communication: Introduction, Resume, Formats of Resume, Job Application Letter and Bio-data.</p> <p>e. Group Discussion: Introduction, Seating Arrangement for Group Discussion, Difference Between Group Discussion and Debate, Traits, Types of Group Discussion Topic Based and Case Based Group Discussion.</p>		
	2. Soft Skills	<p>a. Introduction to Soft Skills and Hard Skills: Nature, Definition and importance of soft skills and hard skills</p> <p>b. Personality Development: Knowing Your-self, Positive Thinking, Integrity, Honesty, Leadership, Decision Making,</p>	02	15

F.Y.B.A. Effective Communication Skills in English for Personality Development.

		<p>Critical Thinking and Physical Fitness.</p> <p>c. Presentation Skills: Theory, Nature, Guidelines for preparing a Presentation, Selection of the Topic, Making Power Point Presentation.</p> <p>d. Job Interviews: Introduction, Definition of Interview, Types of Interviews, Guidelines for Job Interviews, Interview Tips, Frequently Asked Questions during Interviews,</p> <p>e. Public Speeches: Nature of Speeches, Planning a Speech, Preparing the Speech, Delivering the Speech, Qualities of Leader.</p>		
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Reference Books:

1. Bellare, Nirmala. *Reading Strategies*. Vols. 1 and 2. New Delhi. Oxford University Press, 1998.
2. Bhasker, W. W. S & Prabhu, N. S.: *English through Reading*, Vols. 1 and 2. Macmillan, 1975.
3. Blass, Laurie, Kathy Block and Hannah Friesan. *Creating Meaning*. Oxford: OUP, 2007.
4. Brown, Ralph: *Making Business Writing Happen: A Simple and Effective Guide to Writing Well*. Sydney: Allen and Unwin, 2004.
5. Buscemi, Santi and Charlotte Smith, *75 Readings Plus*. Second Edition New York: McGraw-Hill, 1994.
6. Doff, Adrian and Christopher Jones *.Language in Use (Intermediate and Upper Intermediate)*. Cambridge: CUP, 2004.
7. Doughty, P. P., Thornton, J. G, *Language in Use*. London: Edward Arrol, 1973.
8. Freeman, Sarah: *Written Communication*. New Delhi: Orient Longman, 1977.

F.Y.B.A. Effective Communication Skills in English for Personality Development.

9. Glendinning, Eric H. and Beverley Holmstrom. Second edition. *Study Reading: A Course in Reading Skills for Academic Purposes*. Cambridge: CUP, 2004
10. Grellet, F. *Developing Reading Skills*, Cambridge: Cambridge University Press, 1981.
11. Hamp-Lyons, Liz and Ben Heasley. Second edition. *Study Writing: A Course in Writing Skills for Academic Purposes*. Cambridge: CUP, 2006
12. Jakeman, Vanessa and Clare McDowell. *Cambridge Practice Test for IELTS 1*. Cambridge: CUP, 1996.
13. Maley, Alan and Alan Duff. Second Edition. *Drama Techniques in Language Learning*. Cambridge: CUP, 1983.
14. Mohan Krishna & Banerji, Meera: *Developing Communication Skills*. New Delhi: Macmillan India, 1990.
15. Mohan Krishna & Singh, N. P. *Speaking English Effectively*. New Delhi: Macmillan India, 1995.
16. Narayanaswami, V. R. *Organised Writing*, Book 2. New Delhi: Orient Longman.
17. *Reading & Thinking in English*, Four volumes, (vol. 1 for the lowest level, vol. 4 for the highest level). The British Council Oxford University Press, 1979-1981.
18. Sasikumar, V., Kiranmai Dutt and Geetha Rajeevan. *A Course in Listening and Speaking I & II*. New Delhi: Foundation Books, Cambridge House, 2006.
19. Savage, Alice, et al. *Effective Academic Writing*. Oxford: OUP, 2005.
20. Widdowson, H. G.: *English in Focus. English for Social Sciences*.



Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC

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Program: B.A.

Revised Syllabus of S.Y.B.A. Economics

Choice Based Credit & Grading System (60:40)

w.e.f. Academic Year 2020-21

Sr. No.	Heading	Particulars
1	Title of Course	Economics
2	Eligibility for Admission	F.Y.B.A
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

***Revised Syllabus of Courses of S.Y.B.A. Programme at Semester III & IV
with Effect from the Academic Year 2020-2021***

Preamble

This course is designed to introduce the students to elementary concepts in microeconomics. The student should be able to use these concepts to understand the relevance of microeconomics to the real world. The student should be able to build on these concepts in the future to develop deeper understanding of the Economy as well as the revised syllabus is framed to understand the economic theory and its relevance in decision making.

COURSE CONTENT

SN	Modules	No. of Lectures
1	Module - I	12
2	Module - II	11
3	Module - III	11
4	Module - IV	11
	Total	45

Revised Scheme of Examination
Faculty of Arts
(Under-graduate Programmes)

Choice Based Credit System (CBCS)

❖ **Revised Scheme of Examination**

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Select any one of the Following (15 Marks each) 1. Group/ Individual Survey Project 2. <i>Presentation and write up on the selected topics of the subjects</i> 3. <i>Case studies / Test based on tutorials</i> 4. <i>Book Review /Poetry Appreciation/ Open Book Test</i> 5. Quiz	15 Marks
03	Attendance and active participation	05

Question Paper Pattern

(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Duration: 30 Minutes

Particular	Marks
1. Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks
2. Essay type 3 questions (Solve any Two)	

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
1. There shall be five questions each of 12 marks (24 marks with internal options).
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: 1) It is noted that the concerned regulation of the College is amended and implemented to all Semesters i.e. Semester I to Semester VI to all undergraduate programmes, under faculty of Arts, Commerce and Science with effect from the academic year 2023 - 2024.

2) This revised scheme of evaluation is discussed in detail, finalized and accepted

Macro Economics - II
S.Y.B.A. Semester – III Paper II
(Academic Year: 2020 - 21)

Semester-III

Class:- SYBA	Title:- Macroeconomics -II	Paper:- II
Paper Code :- UAR3MAE2	Semester : – III	Credits:- 03

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B.S.Patil
Subject Economics	Course: Macro Economics Course Code :	Course Coordinator Prof. K. N. Dhawale
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Define the concepts of Macro Economics and National Income	Remember
CO2	Interpret the theories of consumption and investment	Understand
CO3	Distinguish between supply of money and demand for money	Analyse
CO4	Compare the banking structure in India.	Evaluate

Module – I: Introduction to Macro Economics and National Income (12 Lectures)

Introduction: Meaning and Scope of Macro Economics; **Concepts of National Income: GNP, NNP, NDP, Per Capita Income, Personal Income and Disposal Income; Methods and Difficulties in Measurement of National Income; Circular Flow of National Income: Closed Economy (Two and Three Sector) and Open Economy Models (Four Sector Model).**

Module – II: Consumption and Investment (11 Lectures)

Consumption and Investment; Says Law of Market; Theory of Effective Demand; Consumption Function; Subjective factors and Objective factors, Investment Function; Marginal Efficiency of Capital and Rate of Interest- Investment Multiplier , Accelerator.

Module – III: Supply of Money and Demand for Money (11 Lectures)

Supply of Money; Determinants of Money Supply; Velocity of Circulation of Money; RBI's Approach to Measurement of Money Supply; Demand for Money: Classical, Keynesian and Friedman's Approaches.

Module – IV: Banking (11 Lectures)

Banking: Commercial Bank, Functions of Commercial Banks, Multiple Credit Creation, Balance Sheet of Commercial Bank; Development in Commercial Banking Sector Since 1990-91; Central Bank: Functions of Central Bank - Traditional, Developmental, Promotional, Exim Bank, NABARD.

Reference

- 1) N. Gregory Mankiw, (2015), Principle of Macroeconomics, 7th edition, Cengage Learning.
- 2) Abel A. B. S. Beranake and D. Croushore (2011), Macroeconomics, Pearson, New Delhi.
- 3) Ahuja H. L., (2008), Macroeconomics theory and Policy, S. Chand and company Ltd. New Delhi.
- 4) Dwivedi D.N., (2007), Macroeconomics theory and Policy, TATA Mcgraw – Hill Publication company Ltd. Delhi.
- 5) Dornbusch Rudiger, Fischer, Stanley and Startz, (2017) (Indian Edition), Macroeconomics Delhi: Mcgraw Hill Publication.
- 6) Paul Samuelson and William Nordhaus, (2010), Economics, Mcgraw Hill Publication.

Macro Economics - II
S.Y.B.A. Semester – IV Paper II
(Academic Year: 2020 - 21)

Semester-IV

Class:- SYBA	Title:- Macroeconomics -II	Paper:- II
Paper Code :- UAR4MAE2	Semester : – IV	Credits:- 03
Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course : Macro Economics Course Code :	Course Coordinator Prof. K. N. Dhawale
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Find the inflation in Indian economy	Remember
CO2	Relate the monetary and fiscal policy in India	Understand
CO3	utilize post Keynesian Theories of Economics	Apply
CO4	Examine the relationship between domestic economy and External sectors	Analyse

Module - I: Inflation

(12 Lectures)

The Economics of Depression, Hyper Inflation; Inflation: Features and Causes, Demand Pull Inflation and Cost Push Inflation, Effects of Inflation; Measures to control inflation, Nature of Inflation in Developing Economy; Phillips Curve; Stagflation: Meaning, Causes and Consequences.

Module – II: Economic Policy

(11 Lectures)

Monetary Policy: Objectives, Instruments, Limitations, Role of Monetary Policy in Developing Economies; Fiscal Policy - Objectives, Instruments, Limitations and Role of Fiscal Policy in Developing Economies, Narsimhan committee report 1998, Mutual Fund

Module – III: Post Keynesian Economics

(11 Lectures)

The IS-LM Model of Integration of Commodity and Money Market; IS Curve: Derivation of IS Curve, Shift in IS Curve, Equilibrium in Goods Market; LM Curve: Derivation of LM Curve, Shift in LM Curve, Equilibrium in Money Market; Simultaneous Equilibrium in Goods and Money Market.

Module – IV: External Sector

(11 Lectures)

Balance of Payment: Structure, Disequilibrium in Balance of Payment, Types, Causes and Measures to Correct Balance of Payment Disequilibrium; Foreign Exchange Market: Determination of Exchange Rate: Fixed and Flexible Exchange Rate; Exchange Rate Policy, SEBI.

Reference -

- 1 Richard Froyan, (2012), Macroeconomics: Theories and policies, Pearson Education.
- 2 Eroll D’Souza, (2008), Macroeconomics, Pearson Education.
- 3 Suman Kalyan Chakravarty, (2010), Macroeconomics, Himalaya Publishing House.
- 4 N. Gregory Mnakiw, (2015), Principle of Macroeconomics Cengage Learning.
- 5 Francis Cherunilam, (1999), International Economics, Tata McGraw-Hill.
- 6 Bo Soderstein, (1994), International Economics, Palgrave Macmillan.

SYBA - SEMESTER III
Economics – Paper III
Public Finance

Class:- SYBA	Title:- Public Finance -III	Paper:- III
Paper Code :- UAR3MAE3	Semester : – III	Credits:- 03

Name of the Programme B.A.	Programme Coordinator Prof.Dr. B.S. Patil	Head of the Department Prof. Dr. B.S.Patil
Subject Economics	Course: Public Finance Course Code :	Course Coordinator Prof. Dr. B. S. Patil
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Find out the difference between public finance and Private financ	Remember
CO2	Compare Budget and Taxation	Understand
CO3	Distinguish between public Expenditure and debt	Analyse
CO4	Interpret the Indian Public Finance	Evaluate

Unit – I Introduction

(12 Lectures)

Meaning and Scope of Public Finance; Public Finance versus Private Finance; Market Failure: Public Goods and Private Goods, Externalities, Efficiency versus Equity; Principles of Sound Finance and Functional Finance; Allocation, Distribution, Stabilisation and Growth Functions of the Government.

Unit - II Fiscal Policy: Budget and Taxation

(11 Lectures)

Dalton's and Musgrave Versions of the Law of Maximum Social Advantage; Role of Government in a Modern Economy; Types of Public Budget; Structure of Public Budget; Role of Taxation; Merits and Demerits of Direct and Indirect Tax Policy; Features of Good Tax System; Concept of Impact, Incidence and Shifting of Taxation; Elasticity and Determination of Tax Burden

Unit III Fiscal Policy: Public Expenditure and Debt

(11 Lectures)

Canons of Public Expenditure; Classification of Public Expenditure; Wagner's Law of Public Expenditure; Public Expenditure as an Instrument of Fiscal Policy; Meaning and Types of Public Debt; Burden of Public Debt; Principles of Public Debt Management; Concepts of Deficits

Unit IV Indian Public Finance

(11 Lectures)

Budget of The Government of India (Previous Financial Year); Sources of Public Receipts (Tax And Non-Tax, Introduction To GST); Components of Public Expenditure; Sources of Public Borrowing and Debt Liabilities; Deficits; Appraisal of FRBM Act 2004; Fiscal Federalism: Fourteenth Finance Commission Recommendations

References:

1. J. Hindriks, G. Myles, (2006), Intermediate Public Economics, MIT Press.
2. Harvey Rosen, (2005), Public Finance, Seventh Edition, McGraw Hill Publications.
3. KaushikBasu and Maertens (ed), (2013), The New Oxford Companion to Economics in India, Oxford University Press.
4. Sury M.M., (1990), Government Budgeting in India, Commonwealth Publishers.
5. Bhatia H.L., (2012), Public Finance, Vikas Publications.
6. Report of the Fourteenth Finance Commission, Government of India.

Economics
S.Y.B.A. Semester IV
Paper -III
Indian Economy

Class:- SYBA	Title:- Public Finance -III	Paper:-III
Paper Code :- UAR4MAE3	Semester : – III	Credits:-03

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course : Indian Economy Course Code :	Course Coordinator Prof. Dr. B. S. Patil
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Define the various concepts of Indian economy	Remember
CO2	Explain the agriculture policies.	Understand
CO3	Identify the various programmes for Industrial Development	Apply
CO4	Examine the role and nature of service sector in India	Analyse

Module- I: Introduction

(12 Lectures)

Trends in India's National Income and PCI Since 1990; Structural Changes In Indian Economy; Brief Overview of the Employment Generation and Poverty Alleviation Programmes; Regional Inequalities; Measures to Reduce Regional Inequalities in India.

Module - II: Agricultural Sector

(11 Lectures)

Role of Agriculture in Economic Development; Causes of Low Productivity; Agricultural Inputs; Agricultural Price Policy: Recent Minimum Support Price Policy; Income Support for Farmers; Sources of Agricultural Finance; Micro Finance; NABARD: Role and Function; Agricultural Marketing: Structure and Problems; National Policy for Farmers, 2007; Organic Farming Policy; Food Security in India

Module -III: Industrial Sector

(11 Lectures)

Infrastructure for Industrial Development; Industrial Policies in India; Industrial Policy of 1991; Micro, Small and Medium Enterprises (MSMEs): Classification, Role and Policy Measures; Growth of Large Scale Industries and Economic Development; Recent Policies and Programs for Industrial Development: Startup India, Make in India, Skill India; Role and Trends of FDI in Industrial Sector Development

Module -IV: Service Sector

(11 Lectures)

Role of Service Sector in Indian Economy; Growth and Performance of Healthcare; Performance of Trade and Tourism, Information Technology and IT - Enabled Services; Research and Development Services With Reference to Education and Skill Development in Employment Generation in India; Performance of Service Sector during XIIth Five Year Plan

Reference

- 1) Ashwini Mahajan, Gaurav Datt, (2018) 'Indian Economy', S. Chand and Company, New Delhi.
- 2) Brahmananda, P.R. and V.R. Panchmukhi (Eds.), (2001), 'Development Experience in the Indian Economy: Inter-State Perspectives', Bookwell, New Delhi.
- 3) Datt, Ruddra and K.P.M, Sundaram, (2017), 'Indian Economy', S. Chand & Company Ltd., New Delhi.
- 4) Misra, S. K. and V. K. Puri, (2018) 'Indian Economy', Himalaya Publishing House, Mumbai.
- 5) Gaurav Datt and Ashwani Mahajan, (2016) 'Indian Economy', S Chand Publishing House, New Delhi.

Demography

S.Y.B.A. Semester III
Paper –Applied Economics

Class:- SYBA	Title:- Demography -I	Paper:-Applied Economics
Paper Code :- UAR3DEM1	Semester : – III	Credits:-03

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B.S.Patil
Subject Economics	Course: Demography Course Code :	Course Coordinator Prof. Dr. B.S. Patil Dr. S. M. Bhoir
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Show the nature of Indian Population	Remember
CO2	Relate the theories of population	Understand
CO3	Assess the sources of demographic data in India	Evaluate
CO4	Choose the appropriate methods of calculation	Create

1. Introduction :

- Demography – Its definition, nature and scope, its relation with other disciplines.
- Theories of Population - Malthusian Theory, Optimum theory of population and theory of demographic transition.
- Population growth in India- Causes and Measures.
- Features of Indian population.

2. Sources of demographic data in India :

- Census –Features, Population Census in India, Merits and Demerits of Census.
- Civil Registration System- Merits and Demerits.
- Demographic Survey – National Family Health survey -1, 2 and 3.
- Sample Registration System –Merits and demerits.

3. Techniques of Analysis :

- Crude birth rate and death rate, Age specific birth rate and death rate, standardized birth rate and death rate.
- Study of fertility – total fertility rate, gross reproduction rate and net reproduction rate.

REFERENCES:

1. Agarwal S.S. (1985) - 'India's Population Problem' – Tata McGraw Hill Publication, Bombay.
2. A.K. P.C. Swain (2008) – 'Population Studies' – Kalyani Publications, Ludhiana.
3. Bhende A.A. & Tara Kanitkar (1982) – 'Principles of Population Studies'– Himalaya Publishing House, Bombay.
4. Hans Raj (1984) – 'Fundamentals of Demography' – Surjeet Publication, Delhi.
5. Jhingan, Bhat & Desai – 'Demography' –
6. Dr. D.D.Kachole (2001) – 'Demography' – Kailasha Publication, Aurangabad.

Demography

S.Y.B.A. Semester IV
Paper –Applied Economics

Class:- SYBA	Title:- Demography -I	Paper:-Applied Economics
Paper Code :- UAR4DEM1	Semester : – IV	Credits:-03

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course : Demography Course Code :	Course Coordinator Prof. Dr. B.S. Patil Dr. S. M. Bhoir
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the concept of fertility, Nuptiality, Mortality and Life Table	Understand
CO2	Choose the theories of Migration	Apply
CO3	Examine urbanization and problems of urbanization in India	Analyze
CO4	Evaluate the population Policy	Evaluate

1. Fertility, Nuptiality and Mortality.

- Fertility – concept and factors affecting fertility.
- Mortality - concept and factors affecting mortality.
- Nuptiality – concept, age at marriage and factors affecting nuptiality.

2. Migration and Urbanization:

- Migration – concept and types, factors affecting migration, Theory of Migration (Harris and Todaro model), issues related to migration.
- Urbanization - Concept, trends and patterns of urbanization in India, problems of urbanization in India.
- Structure and Features of Population in India.

3. Population Policy :

- Salient features and evolution of India's population policy.
- Shift in policy focus from population control to family welfare to women empowerment.
- Family Planning – Meaning, importance and methods of family planning.
- Population Projection in India.

REFERENCES :

1. Agarwal S.S. (1985) - 'India's Population Problem' – Tata McGraw Hill Publication, Bombay.
2. A.K. P.C. Swain (2008) – 'Population Studies' – Kalyani Publications, Ludhiana.
3. Bhende A.A. & Tara Kanitkar (1982) – 'Principles of Population Studies'– Himalaya Publishing House, Bombay.
4. Hans Raj (1984) – 'Fundamentals of Demography – Surjeet Publication, Delhi.
5. Jhingan, Bhat & Desai – 'Demography'.
6. Dr. D.D.Kachole (2001) – 'Demography' – Kailasha Publication, Aurangabad.



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(AUTONOMOUS)

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'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: B.A.

Revised Syllabus of T.Y.B.A. Economics
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2021-22

Criteria for admission to TYBA

Sr. No	Heading	Particulars
1	Title of Course	Economics
2	Eligibility for Admission	S.Y.B.A
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60-40)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Revised Syllabus of Courses of S.Y.B.A. Programme at Semester III & IV with Effect from the Academic Year 2020-2021

Preamble

This course is designed to introduce the students to elementary concepts in microeconomics. The student should be able to use these concepts to understand the relevance of microeconomics to the real world. The student should be able to build on these concepts in the future to develop deeper understanding of the Economy as well as the revised syllabus is framed to understand the economic theory and its relevance in decision making.

COURSE CONTENT

SN	Modules	No. of Lectures
1	Module - I	12
2	Module - II	11
3	Module - III	11
4	Module - IV	11
Total		45

Revised Scheme of Examination
Faculty of Arts
(Under-graduate Programmes)

Choice Based Credit System (CBCS)

❖ **Revised Scheme of Examination**

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Select any one of the Following (15 Marks each) 1. Group/ Individual Survey Project 2. <i>Presentation and write up on the selected topics of the subjects</i> 3. <i>Case studies / Test based on tutorials</i> 4. <i>Book Review /Poetry Appreciation/ Open Book Test</i> 5. Quiz	15 Marks
03	Attendance and active participation	05

Question Paper Pattern

(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Duration: 30 Minutes

Particular	Marks
1. Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks
2. Essay type 3 questions (Solve any Two)	

B) Semester End Examination:60% 60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
1. There shall be five questions each of 12 marks (24 marks with internal options).
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: 1) It is noted that the concerned regulation of the College is amended and implemented to all Semesters i.e. Semester I to Semester VI to all undergraduate programmes, under faculty of Arts, Commerce and Science with effect from the academic year 2023 - 2024.

2) This revised scheme of evaluation is discussed in detail, finalized and accepted

Programme Code - BA1005
ADVANCED MICROECONOMICS: PAPER IV
SEMESTER –V

COURSE CODE	PAPER TITLE	CREDITS	MARKS
UAR5EC4	ADVANCED MICRO ECONOMICS	4	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B.S.Patil
Subject Economics	Course: Advanced Micro Economics Course Code : UAR5EC4	Course Coordinator Mr. K. N. Dhawale
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Define the concepts of general equilibrium and welfare economics.	Remember
CO2	Explain the futures of monopoly and monopolistic competition structure.	Understand
CO3	Identify the various models of imperfect competition	Apply
CO4	Importance of information Economics	Evaluate

Module 1: General Equilibrium and Welfare Economics

(12 Lectures)

Concept of General Equilibrium and Walrasian General Equilibrium Model - Pareto Optimality – The Pareto Optimality Condition of Social Welfare - Marginal Conditions for Pareto Optimal Resource Allocation - Perfect Competition and Pareto Optimality - Arrow's Impossibility Theorem.

Module 2: Market Structure: Monopoly and Monopolistic Competition

(11 Lectures)

Concept of Monopoly - Measurement of Monopoly Power - Price Discrimination: Types and Classification of Price Discrimination (Degrees of Price Discrimination First, Second and Third) - Equilibrium under discriminating Monopoly - Regulation of Monopoly Market Product Differentiation in Monopolistic Competition - Chamberlin's Alternative approach- Equilibrium under Monopolistic Competition - Excess Capacity

Module 3: Oligopoly

(11 Lectures)

The Cournot Model - Meaning and Characteristics of Oligopoly Market - Rigid Prices - The Sweezy Model of Kinked Demand Curve - Collusive Oligopoly - Cartel: Centralised and Market Sharing Cartel - Imperfect Collusion- Price Leadership Models, Game Theory - Prisoner's Dilemma, Nash Equilibrium and Dominant Strategy Equilibrium.

Module 4: Information Economics

(11 Lectures)

Economics of Search and Search Cost - The Theory of Asymmetric Information-The Market for Lemons and Adverse Selection - Risk Preference and Expected Utility - The Problem of Moral Hazard - Market Signaling - Principal-Agent Problem

References:

1. Jhingan MLL. (2012), Advanced Economic Theory, Vrinda Publications, Delhi.
2. Mankiw N. Gregory (2015), Principles of Microeconomics, Cengage Learning.
3. Mansfield, Edwin (1985), Micro-economics: Theory & Applications, 5th edition, W.W. Norton & Company, New York.
4. Patil K. A (Second edition, 2011, Marathi), Advanced Economic Theory-Micro Analysis, Shri Mangesh Prakashan, Nagpur.
5. Salvatore D. (2006), Microeconomics: Theory and Applications, Oxford University Press, New Delhi.
6. Varian Hal R. (8 Edition 2010) Intermediate Microeconomics A Modern Approach, East-West Press, New Delhi

Programme Code - BA1005

ECONOMICS OF GROWTH AND DEVELOPMENT (SEMESTER-V) PAPER NO - V

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR5EC5	ECONOMICS OF GROWTH AND DEVELOPMENT	4	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B.S.Patil
Subject Economics	Course: Economics of Growth and Development Course Code : UAR5EC5	Course Coordinator Prof. Dr. B. S. Patil
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Relate the meaning of growth and development	Remember
CO2	Explain the theories of economic development	Understand
CO3	Identify the structural issues in development process	Apply
CO4	Adapt appropriate technology for the economic development	Create

Module1: Meaning of Economic Growth and Development (12 Lectures)

Concepts of Economic Growth and Development- Distinction between Economic Growth and Development- Concept of Human Development- H.D.I, G.D.I, Green GDP- Sen's Capability approach- Millennium Development Goals (MDGs)- Initiative by Indian government towards MDGs.

Module 2: Theories of Economic Development (11 Lectures)

Rostow's stages of growth; Big Push Theory- Leibenstein's Critical Minimum Effort Thesis - Harrod - Domar Growth Model- Lewis Model of unlimited supply of labour - Ragner Nurkse's Theory of Disguised Unemployment- Schumpeter's Theory of Development

Module 3: Structural Issues in Development Process (11 Lectures)

Concept of Human Capital- Role of Education, Health and nutrition in Human Capital - Meaning and Measurement of Poverty and Inequality- Measures to eradicate poverty and Inequality - Meaning of Inclusive growth - SHG and Microfinance- Migration – Urbanization- Formal and Informal Sector- Urban Informal Sector Module

4: Planning, Technology and Economic Development (11 Lectures)

Concept and Role of infrastructure in Economic Development- Role of technology in Economic Development- Labour intensive versus Capital intensive technology- Schumacher's concepts of intermediate and appropriate technology- Green Technology- Meaning and Types of Economic Planning- Role of Planning in Economic Development

References:

1. Baldwin, Economic Development: Theory, History and Policy, Willy Publishers, 1957.
2. Mamoria, Joshi, Principles and practice of marketing in India, Kitab Mahal, 1979.
3. Meier, Gerald M. and James E. Rauch. Leading Issues in Economic Development, New Delhi:Oxford Univ.Press,2006.
4. Thirlwall, A.P. Growth and Development 8e. New York: Palgrave MacMillan, 2005.
5. Todaro, Michael P. and Stephen C. Smith. Economic Development, 8e. Delhi: Pearson Education, 2003.
6. V.K. Puri and S.K. Mishra, Indian Economy, Himalaya Publishing House, 2019

Programme Code - BA1005

ECONOMICS OF AGRICULTURE AND CO-OPERATION (SEMESTER-V) PAPER NO - VI

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR5EC6	ECONOMICS OF AGRICULTURE AND CO-OPERATION	3	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B.S.Patil
Subject Economics	Course: Economics of Agriculture and Cooperation Course Code : UAR5EC6	Course Coordinator Dr. S. M. Bhoir
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the Agricultural Productivity	Understand
CO2	Classify the Agricultural credit	Analyse
CO3	Justify the agricultural marketing	Evaluate
CO4	Discuss agriculture price and Policy	Create

Module 1: Agricultural Productivity (12 Lectures)

Role of agriculture in Economic Development - Cropping pattern in India, Recent trends, Factors affecting - cropping pattern - Physical, Technical and Economic - Agricultural Productivity, Causes of Low Productivity in Agriculture - Measures taken to improve the Agricultural Productivity in India - Irrigation and Water Management and agricultural development - Agricultural labour Problems and suggestions.

Module 2: Agricultural Credit (11 Lectures)

Institutional and Non-Institutional Sources of Credit Co-operative Credit and Agriculture Rural Indebtedness - Commercial Banks and Regional Rural Banks - Microfinance and NABARD - Role and Performance - Crop loan and Crop Insurance, Kisan Credit card Yojana.

Module 3: Agricultural Marketing (11 Lectures)

Types of Marketing - Corporate, Commodity and Global Problems and Measures of Agricultural Marketing - Regulated Market - WTO and Indian Agriculture - Problems of Agricultural Marketing and its measures - National Agricultural Market - FPO – Farmers Producer Organizations.

Module 4: Agricultural Price and Policy (11 Lectures)

Food Security in India - Price Policy of CACP Evaluation - Agricultural Crisis and Farmers Suicide - Agro-Tourism and its policy - Organic Farming - Mechanization of Agriculture.

References:

1. Bilgrami S.A.R. (2000), An Introduction of agricultural Economics, Himalaya Publishing House, Mumbai
2. Datta Ruddra and Mahajan Ashwini (2016), Indian Economy, Chand and Company Ltd., New Delhi.
3. Gupta P. K.,(2012), Agricultural Economics, Vrinda Publications (P) Ltd. Delhi.
4. Mamoria C.B. and B.B. Tripalhi (1991), Agricultural Problems in India, Kitab Mahal, Allahabad.
5. Sadhu and Singh (2008), Fundamental of Agricultural Economics, Himalaya Publishing House, Mumbai.
6. Tyagi B.P., (2016), Agricultural Economics and Rural Development, Jaiprakash Nath and Co. Meerut.

Programme Code - BA1005

INDUSTRIAL AND LABOUR ECONOMICS (SEMESTER-V) PAPER NO - VI

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR5EC6	INDUSTRIAL AND LABOUR ECONOMICS	3	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B.S.Patil
Subject Economics	Course: Industrial and Labour Economics Course Code :	Course Coordinator Prof. Dr. B. S. Patil
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Find the profile of different industrial sectors	Remember
CO2	Relate the Industrial location and problem of regional Imbalance	Understand
CO3	Relationships between industrial productivity and Industrial sickness	Analyse
CO4	Evaluate the various policies	Evaluate

Module 1: Introduction

(12 Lectures)

Meaning and Scope of Industrial Economics- Industrial Profile- Private sector- Performance and Problems - Cooperatives sector and its role, merits and demerits- Public Sector – Role - Performance and Problems -Role of agriculture in Industrial development, Industrial Combinations - Motives for Mergers and Acquisitions.

Module 2: Industrial Location and Problem of Regional Imbalance

(11 Lectures)

Determinants of Industrial Location, Theories of Industrial Location - Weber's and Sargent Florence's Theories, Dispersal and Decentralization of Industries, Problem of Regional Imbalance.

Module 3: Industrial Productivity and Industrial Sickness

(11 Lectures)

Concept and Measurement of Industrial Productivity- Factors Affecting Industrial Productivity-Industrial Sickness - Causes, Effects and Remedial Measures - Rationalisation - Concept, Aspects and Impact.

Module 4: Industrial Development in India

(11 Lectures)

New Industrial Policy, 1991; Disinvestment Policy; Small Scale Industries and Rural Industrialization; National Manufacturing Policy, 2011 - Recent Trends in India's Industrial Growth- Role of MNCs in the Indian Economy - Merits and Demerits, Industrial Finance in India.

References:

1. Barthwal R.R. (2007), Industrial Economics, New Age International Publishers, New Delhi.
2. D. Agrawal A.N. (2011), Indian Economy, New Age International Publishers, New Delhi.
3. Datt R. and Sundaram K.P.M. (2009), Indian Economy, S.Chand & Co., New Delhi.
4. Kuchhal S.C. (1980), Industrial Economy of India, Chaitanya Publishing House, Allahabad.
5. Mishra S.K. and Puri V.K.(2008), Indian Economy, Himalaya Publishing House, Mumbai.
6. Ranjana Seth, Industrial Economics (2010), Ane Books Pvt. Ltd., New Delhi.

Programme Code - BA1005

RESEARCH METHODOLOGY (SEMESTER-V) PAPER NO - VII

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR5EC7	RESEARCH METHODOLOGY	4	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B.S.Patil
Subject Economics	Course: Research Methodology Course Code : UAR5EC7	Course Coordinator Prof. Dr. B. S. Patil
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Choose research methods	Remember
CO2	Outline the research problems	Understand
CO3	Make use of types of data	Apply
CO4	Take part in representation and analysis of data	analyse

Module 1: Introduction to Research

(12 Lectures)

Meaning and scope of social science research- Basic assumptions of research- Features and importance of social science research- Objectives and types of research; Basic, Applied, Pure, Descriptive, Analytical, and Empirical research- Limitations of social science research- Difficulties in social science research

Module 2: Formulation of Problem in Social Science Research

(11 Lectures)

Research process: Identification, selection and formulation of research problem-Sources of research problem - Criteria of a good research problem- Review of literature-Formulation of hypothesis- Research design: Definition, Concepts, and types- Data Collection and analysis- Interpretation and report writing- Use of web search in research process.

Module 3: Types of Data: Primary and Secondary

(11 Lectures)

Types of Data: Primary data and its collection methods: Observation method- Interview Technique - Design of schedule and questionnaire - Survey method and Field visits - Secondary data : Meaning- advantages-sources- relevance and limitations of secondary data- Sampling Techniques : Census and sample survey- Essentials of a good sampling - Advantages and limitations of sampling- Types of sampling: Random sampling and Non-random sampling-Sampling and Non-Sampling errors.

Module 4: Representation and Analysis of Data

(11 Lectures)

Classification, Tabulation and Graphical presentation of socio-economic data- Need and importance of data analysis- Statistical analytical tools: Measures of Central Tendency - Measures of Variation : Absolute and relative measures - Quartile deviation, standard deviation, coefficient of variation- Skewness: Meaning and measurement (Karl Pearson's and Bowley's methods) - Preliminaries of computer applications in data organization and data processing.

References:

1. Bhandarkar P.L., (1994), Samajik Sanshodhan Padhati, Himalaya Publication, New Delhi.
2. Dawson, Catherine (2002), Practical research methods, UBS Publishers, New Delhi.
3. Ghosh, B.N. (1992), Scientific methods and social research, Sterling Publishers Pvt. Ltd, New Delhi.
4. Gupta S P, (1987), Statistical methods, Sultan Chand and Sons, New Delhi.
5. Kothari R.C. (2008), Research methodology, methods and techniques, New Age International Publishers, New Delhi.
6. Krishnaswamy O.R.(1993), Methodology of research in social sciences, Himalaya publishing House, Mumbai.

Programme Code - BA1005

ENVIRONMENTAL ECONOMICS (SEMESTER-V) PAPER NO - VIII

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR5EC8	ENVIRONMENTAL ECONOMICS	4	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B.S.Patil
Subject Economics	Course: Environmental economics Course Code : UAR5EC8	Course Coordinator Prof. K. N. Dhawale
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Define the meaning, nature, scope and significance of Environmental Economics	Remember
CO2	Outline the Environmental policies	Understand
CO3	identify the various methods of measuring benefits of environmental improvements	apply
CO4	Discuss the global environmental issues	Create

Module1: Introduction to Environmental Economics (12 Lectures)

Environmental Economics: Nature, Significance and Scope; Environment and the economy; Environmental Kuznets Curve; Common resources, externalities and property rights; Coase Theorem; Rio Declaration and Agenda 21 programme of action for sustainable development.

Module 2: The Design and Implementation of Environmental Policy (11 Lectures)

Criteria for evaluating environmental policies; Tools of Environmental Policy: Standards, Pigovian taxes/effluent fees, quotas/tradable permits; Choice between taxes and quotas; Environmental Policy: Regulation and Implementation.

Module 3: Measuring Benefits of Environmental Improvements (11 Lectures)

Economic value of Environment: Use and Non-use values; Measurement methods of environmental value: Market based and Non-market based methods; Contingent Valuation Method; Travel Cost Method; Hedonic Price Method.

Module 4: Global Environmental Issues (11 Lectures)

Trade and environment-Overview of trans-boundary environmental problems-Global Warming - Climate Change - Energy Crisis - Challenges of urbanization - International environmental agreements.

References:

1. Barry Field and Martha k Field: Environmental Economics, McGraw Hill International Edition, 2017.
2. Bennear, Lori Snyder, and Cary Coglianese (2004), Evaluating Environmental Policies, KSG Faculty Research Working Paper Series RWP04-049,USA
3. Charles Kolstad : Environmental Economics, Oxford University Press, New York, 2000.
4. Hanley Nick, Shogren Jason and White Ben: Introduction to Environmental Economics, Oxford University Press, 2001.
5. Mickwitz, Per. (2003). A Framework for Evaluating Environmental Policy Instruments Context and Key Concepts. Evaluation.
6. Smith Stephen: Environmental Economics: A very Short Introduction, 1st Edition, Oxford University Press, New York, 2011.

Programme Code - BA1005

HISTORY OF ECONOMIC THOUGHT (SEMESTER-V) PAPER NO - IX

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR5EC9	HISTORY OF ECONOMIC THOUGHT	3	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B.S.Patil
Subject Economics	Course: History of Economic Thought Course Code : UAR5EC9	Course Coordinator Prof. K.N. Dhawale
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Compare the classical theories.	Understand
CO2	Utilize Neo-classical theories of economics	Apply
CO3	Evaluate Keynesian Ideas for developing countries	Evaluate
CO4	Discuss the post Keynesian Theories	Create

Course Objectives-

The very purpose of this course is to provide information about the biography and contribution of the most influential economists who influenced the economic fraternity and to whom we are obliged to for shaping up the economic thought process.

Course Outcome-

- Students will get information about the genesis of Economics and its modern scenario.
- Establish the co-relation of Economics with other subjects.

Module 1: Classical Economics

(12 Lectures)

Mercantilism and Physiocracy: Introduction -Adam Smith: Liberalism -Division of Labour -Theory of Value - David Ricardo: Rent Theory- Wage Theory - Theory of Value- Karl Marx: Surplus Value Materialistic Interpretation of History -Scientific Socialism.

Module 2: Neo-Classical Economics

(12 Lectures)

Alfred Marshall : Thought on Value - Representative Firm - Consumer's Surplus - Internal and External Economies-Quasi Rent - Schumpeter: Economic Development And Innovation- Pigou :Welfare Economics.

Module 3: Keynesian Ideas

(12 Lectures)

Employment Theory- Money- Wage Rigidity Model- Multiplier and accelerator and their interaction - Trade Cycle - Inflation -Role of Fiscal Policy - Keynesian Economics and Developing Countries.

Module 4: Post-Keynesian Economics

(12 Lectures)

Supply Side Economics -Hayek's Theory of Trade Cycle- Life Cycle theory Consumption- Friedman: Theory of Demand for Money - Long-Run Philips Curve - Mankiw's New Keynesian Model - Stagflation.

References-

1. Dasgupta A. K, Epochs of Economic Theory Oxford University Press. New Delhi, 1985.
2. Ernesto Screpanti and Stefano Zamagni, An Outline Of The History Of Economic Thought, OxfordUniversity Press Inc., New York, 5005.
3. Ghosh and Ghosh: Concise History of Economic Thought, Himalaya Publishers.
4. Gide, O. and G. Rist, A History of Economics Doctrine. George Harrop Co. London. 1956.
5. Harry Landreth and David C. Colander, History of Economic Thought, Houghton Mifflin Company Boston Toronto, 2001.
6. Roll, E., A History of Economics Thought. Faber Landon, 1973.

Programme Code - BA1006

ADVANCED MACROECONOMICS (SEMESTER-VI) PAPER NO - IV

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR6EC4	ADVANCED MACROECONOMICS	4	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course : Advanced Macro Economics Course Code : UAR6EC4	Course Coordinator Mr. K. N. Dhawale
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Tell the post Keynesian theories of economics	Remember
CO2	Summarize the trade cycles.	Understand
CO3	Compare exchange rates and balance of payments	Analyse
CO4	Determine International Monetary System	Evaluate

Module 1: Post Keynesian Synthesis

(12 Lectures)

Derivation of Aggregate Demand Curve with IS-LM - Aggregate Supply Curve - Determination of Equilibrium National Income and Price Level under Aggregate Demand and Aggregate Supply Model - Extension of IS-LM Model with Labour Market and Flexible Prices - Natural Rate of Unemployment Long run Philips Curve - Friedman's Expectation Model - Tobin's Modified Philips Curve - Adaptive Expectations and Rational Expectations.

Module 2: Trade Cycles

(11 Lectures)

Meaning- Nature- Features and Types of Trade Cycles - Phases of Trade Cycles - Theories of Trade Cycles- Hawtrey's, Kaldor, Paul Samuelson and Hicks - Measures to Control Trade Cycles.

Module 3: Exchange Rate Regimes and Currency Crises

(11 Lectures)

Managed Exchange Rate- Advantage and Disadvantage - Policy of Managed Flexibility-Adjustable Peg System, Crawling Peg System, Managed Floating System, Clean and Dirty Float System - Balance of Payment and Exchange Rate - Is Balance of Payments Always in Balance? – Convertibility of Currency - Currency Crisis-Causes, Impact and Measures.

Module 4: International Monetary System

(11 Lectures)

Rise and Fall of International Gold Standard - Bretton Woods System- Breakdown of the Bretton Woods System - Monetary System after the Collapse of Bretton Woods System - Maastricht Treaty, Features, Effects and Importance of Euro- Currency Market - Causes and Consequences of Global Economic Crisis - Impact of Global Recession on the Indian Economy - Asia Infrastructure Investment Bank (AIIB) - New Development Bank (NDB): Asian Development Bank (ADB).

References:

1. Blanchard, Oliver (2008), Macroeconomics, Pearson education, New Delhi, India.
2. Dornbusch, Fisher and Startz (2018): Macroeconomics, McGraw Hill Education (India) Pvt. Ltd.
3. Mankiw N Gregory (2003), Macroeconomics, 6th edition, Worth Publishers, New York.
4. Patil J. F (2005, Marathi Edition), Macroeconomic Analysis, Phadke Prakashan, Kolhapur.
5. Rana K. C. & Verma K.N (2017), International Economics, Vishal Publishing CO. Jalandhar.
6. Salvatore D. (1997), International Economics, Printice Hall, New York.

Programme Code - BA1006

INTERNATIONAL ECONOMICS (SEMESTER-VI) PAPER NO - V

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR6EC5	INTERNATIONAL ECONOMICS	4	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course : International Economics Course Code : UAR6EC5	Course Coordinator Prof. Dr. B.S. Patil
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Classify the trade theories	Understand
CO2	Identify the difference between balance payments and balance of trade	Apply
CO3	Examine the foreign exchange market	Analyse
CO4	Judge international economic institutions and economic Integration	Evaluate

Module 1: Introduction to Trade Theories

(12 Lectures)

Meaning, scope and importance of International Trade- Difference between Internal and International Trade - Adam Smith's Theory of International Trade - Ricardian theory of comparative cost difference Heckscher- Ohlin Theory- Leontief's Paradox- Krugman's Model

Module 2: Balance of Trade and Balance of Payment

(11 Lectures)

Concepts of Terms of Trade(Net barter, Gross barter and Income terms of trade)-Meaning and difference between Balance of Trade (BOT) and Balance of Payment (BOP)-Purchasing Power Parity theory, Law of Reciprocal Demand- Marshall-Edgeworth Offer curves, Gains from trade-Case for and against Free Trade and Protection policy

Module 3: Foreign Exchange Market

(11 Lectures)

Meaning and Functions of Foreign Exchange Market-Exchange rate determination, Factors influencing foreign exchange rate-Managed Flexibility-SWAP Market, Components of foreign exchange reserves Foreign Aid Vs Foreign Trade, FDI and MNCs

Module 4: International Economic Institutions and Economic Integration

(11 Lectures)

IMF, World Bank - Role and functions-WTO-Objectives, Functions and Agreements with respect to TRIPS, TRIMS, GATS, AoA - Forms and objectives of Economic Integration-Cartels-Trade Blocs, ASEAN- European Union (EU)- NAFTA and SAARC.

References -

1. Appleyard Dennis and Alfred j Field, Jr, International Economics, 2001, 4th Edition, Tata McGraw-Hill Education Private Limited.
2. Cherunilam Francis, International Economics, 2009, 5th Edition, Tata McGraw-Hill Education Private Limited, New Delhi.
3. Krugman R Paul, Maurice Obstfeld, International Economics Theory and Policy, 2009, 8th Edition, Pearson.
4. Melitz M. and Trefler D., Gains from Trade When Firms Matter, Journal of Economic Perspectives, Spring 2012.
5. Salvatore, Dominick, International Economics, 2008, 8th Edition, Wiley India.
6. Sodersten, Bo and Geoffery Reed, International Economics, 2006, 3rd Edition.

Programme Code - BA1006

ECONOMICS OF AGRICULTURE AND CO-OPERATION (SEMESTER-VI) PAPER NO - VI

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR6EC6	ECONOMICS OF AGRICULTURE AND CO-OPERATION	3	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course: Economics of Agriculture and Cooperation Course Code : UAR6EC6	Course Coordinator Dr. S. M. Bhoir
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Find out the meaning, scope and nature of co-operation	Remember
CO2	Explain co-operative finance in India	Understand
CO3	Categorize agricultural Co-operatives	Analyse
CO4	Evaluate Co-operative organization in India	Create

Module 1: Co-operation

(12 Lectures)

Meaning and features of Co-operation- Principles of Co-operation (Manchester-1995) - Role of Co-operation in Economic development - Globalization and Co-operation-Importance and Benefits of Co-operation - Co-operative Movement in foreign Countries - Consumer Cooperative Movement in U.KAgricultural Cooperative Movement in Israel.

Module 2: Co-operative Finance in India

(11 Lectures)

Co-Operative Finance: Need, Structure. Progress and Problems - National Co-operative Development Corporation (NCDC) - Farmers service societies - Urban Co-operative banks.

Module 3: Agricultural Co-operatives

(11 Lectures)

Role and Types of Agro-Industries - Problems and Measures of Agro-Industries - Sugar and Dairy Co-operatives - Food and Fruits Processing Industry - Co-Operative Farming.

Module 4: Co-operative Organizations in India

(11 Lectures)

Consumer Co-operatives - Co-operative Marketing - NAFED - Housing Co-operative societies Labour Co-operative societies - Leadership in Cooperative development - Concept of Co-Operatives Audit.

References-

1. Bedi R. D. (2001), Theory, History and Practice of Co-Operation, International Publishing House, Meerut (U.P.).
2. Government of Maharashtra - Co-operative movement at a Glance (latest annual report).
3. Hajela T.N, (2000), principles, problem and practice of Co-operation, Agarwal Publication, New Delhi.
4. Mathur B. S, (2000), Co-Operation in India, Sahitya Bhavan, Agra.
5. Matthai John, (1996), Agricultural Co-Operation in India, Reliance Publishing House, New Delhi.
6. Swami Krishna, (1985), Fundamentals of Co-Operation, S. Chand and Company Ltd, New Delhi.

Programme Code - BA1006

INDUSTRIAL AND LABOUR ECONOMICS (SEMESTER-VI) PAPER NO - VI

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR6EC6	INDUSTRIAL AND LABOUR ECONOMICS	3	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course : Industrial and Labour Economics Course Code : UAR6EC6	Course Coordinator Prof. Dr. B.S. Patil
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Define Indian labour market	Remember
CO2	Summarise the role and problems of trade unions	Understand
CO3	Design the various methods of industrial relations	Create
CO4	Prioritize the various welfare schemes	Evaluate

Module 1: Introduction - Indian Labour Market (12 Lectures)

Characteristics of the Indian Labour Market, Child Labour and Women Labour -Problems and Measures, Labour Market Reforms - Exit Policy and Need for Safety Nets, Second National Commission on Labour, Globalization and its impact on Indian Labours.

Module 2: Trade Unionism (11 Lectures)

Definition and Functions of Trade Unions, Historical Evolution of Trade Unions in India and their Present Status- Problems of Trade Unions in India- Role of Outside Leadership- International Labour Organization.

Module 3: Industrial Relations (11 Lectures)

Causes of Industrial Disputes and Their Settlement Mechanism- Collective Bargaining - Concept, Features - Importance and Pre-requisites for Successful Collective Bargaining - Collective Bargaining in India - Workers' Participation in Management- Concept, Objectives and Forms of Workers' Participation in India - Working Conditions and life style of Indian workers.

Module 4: Labour Welfare and Social Security (11 Lectures)

Concept -Theories and Principles of Labour Welfare- Agencies for Labour Welfare, Role of the Labour Welfare Officer - Social Security-Concept; Social Assistance and Social Insurance – Social Security Measures in India - Indian Labour Legislations.

References-

1. Agrawal A.N. (2011), Indian Economy, New Age International Publishers, New Delhi.
2. CO Monappa A, (2006), Industrial Relations, Tata McGraw Hill Publishing Company Ltd, New Delhi.
3. Datt R. and Sundaram K.P.M. (2009), Indian Economy, S.Chand & Co., New Delhi.
4. Mamoria C.B. and Mamoria S. (2002), Dynamics of Industrial Relations, Himalaya Publishing House, Mumbai.
5. U. Mishra S.K. and Puri V.K.(2008), Indian Economy, Himalaya Publishing House, Mumbai.
6. U. Ratna Sen, Industrial Relations in India - Shifting Paradigms (2005), Macmillan, New Delhi.

Programme Code - BA1006

RESEARCH METHODOLOGY (SEMESTER-VI) PAPER NO - VII

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR6EC7	RESEARCH METHODOLOGY	4	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course: Research Methodology Course Code : UAR6EC7	Course Coordinator Prof. Dr. B. S. Patil
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Choose the statistical methods in research	Apply
CO2	Examine the various index numbers	Analyse
CO3	Decide the formulation of hypothesis and testing	Evaluate
CO4	Improve the skills of report writing	Create

Module 1: Application of Statistics in Research

(11 Lectures)

Methods of studying correlation- measurement of simple correlation: graphic method- Scatter diagram Coefficient of correlation- Karl Pearson and rank correlation- Interpretation of $r = +1$. Linear regression analysis: Meaning, regression lines, regression equation, regression equation relationship between correlation and regression- Analysis of time series- Components- Trend analysis- Moving averages (3, 4 and 5 Yearly)- Method of least square.

Module 2: Index Number:

(12 Lectures)

Meaning and classification of index number - Problems encountered while constructing index numbers Uses and limitation of index numbers - Methods of constructing index numbers: Simple index: i) Aggregate method ii) Simple average of Relative method - Weighted index: Laspeyer's, Paache's, Fisher's and Marshall- Edgeworth - Base shifting - Deflating and Cost of living index number: Weighted average of Relative method - Aggregate Expenditure method- Chain based index - Concepts of base shifting, splicing, and deflating - Consumer price index- Meaning, need and construction.

Module 3: Hypothesis Formulation and Testing

(11 Lectures)

Definition and functions of Hypothesis - Criteria of workable Hypothesis - Forms and sources of hypothesis- Concepts in testing of hypothesis: Universe / Population parameter and sample statistics Types of hypotheses: Null and Alternative Hypotheses-Levels of significance-Critical region -Type I and Type II Errors -Student t-test.

Module 4: Research Report Writing

(11 Lectures)

Types of research reports: Technical, Popular, Interim, Summary, Article- Format of a research report Principles of writing the research report: Organization and style - Contents- Styles of reporting- Steps in drafting reports- Editing the final draft-Evaluating the final draft -Organization of the research report: Preliminaries, Contents of report, Structuring the report: Chapter format- Pagination- Identification Using quotations, Presenting footnotes- Abbreviations- Presentation of tables and figures- Referencing documentation-Use and format of appendices- Indexing - Bibliography, Appendices.

References-

1. Allen, T. Harrell (1978), New methods in social science research, Praeges Publishes, New York
2. Bhandarkar P.L.,(1994), Samajik Sanshodhan Padhati, Himalaya Publication, New Delhi, (Marathi)
3. Ghosh, B.N, (1992). Scientific methods and social research, Sterling publishers Pvt. Ltd, New Delhi. 4. Gupta S. P, (1987), Statistical methods, Sultan Chand and Sons, New Delhi
5. Kothari R.C. (2008), Research methodology, methods and techniques, New Age International Publishers, 2nd revised edition, New Delhi.
6. Krishnaswamy O.R. (1993), Methodology of research in social sciences, Himalaya Publishing House, Mumbai

Programme Code - BA1006

ENVIRONMENTAL ECONOMICS (SEMESTER-VI) PAPER NO - VIII

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR6EC8	ENVIRONMENTAL ECONOMICS	4	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course: Environmental economics Course Code : UAR6EC8	Course Coordinator Prof. K. N. Dhawale
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Relate the environmental degradation and measures for it	Understand
CO2	Build Environmental accounting methods	Apply
CO3	Assess the sustainable development in India	Evaluate
CO4	Adapt Environmental policy in India	Create

Module1: Environmental Degradation

(12 Lectures)

Concept and types of Environmental Degradation; Renewable and Non-renewable natural resources: Land, Air, Water and Noise Pollution: Causes, effects and measures.

Module 2: Environmental Accounting

(11 Lectures)

Accounting for environmental and natural resources: Meaning and importance; System of Environmental-Economic Accounting (SEEA) and Environmental and Natural Resources Accounting (ENRA); Integration of Environmental Accounts with System of National Accounts: Green GDP; Concept of Green Growth and its Indicators; Concepts of Green Consumer and Green Business.

Module 3: Sustainable Development and India

(11 Lectures)

Concept of Sustainable Development; Characteristics and dimensions of Sustainable Development; Sustainable Development Goals and Measures with special reference to India; Smart Cities Mission in India; National Mission For Sustainable Agriculture (NMSA): Objectives, strategy and components.

Module 4: Environmental Policy in India

(11 Lectures)

Overview of laws to improve the environment in India; Central pollution Control Board; Industrial Pollution Control Measures in India; Pradhan Mantri Ujjwala Yojana (PMUY); National Green Tribunal.; Environmental Education in India.

References-

1. Barry Field and Martha k Field: Environmental Economics, McGraw Hill International Edition, 2017. 2. Bhattacharya R.N. (Ed) (2001), Environmental Economics: An Indian Perspective, Oxford University Press, New Delhi.
3. Charles Kolstad : Environmental Economics, Oxford University Press, New York, 2000.
4. Hanley Nick, Shogren Jason and White Ben: Introduction to Environmental Economics, Oxford University Press, 2001.
5. Kaltschmitt, Martin, Streicher, Wolfgang, Wiese, Andreas, Renewable Energy: Technology, Economics and Environment, Springer, Germany, 2007.
6. V.S. Ganesamurthy: Environmental Economics in India, New Century Publications, New Delhi, 2009.

Programme Code - BA1006

HISTORY OF ECONOMIC THOUGHT (SEMESTER-VI) PAPER NO - IX

COURSE CODE	PAPER TITLE	CREDIT	MARKS
UAR6EC9	HISTORY OF ECONOMIC THOUGHT	3	100

Name of the Programme B.A.	Programme Coordinator Dr. B.S. Patil	Head of the Department Dr. B. S. Patil
Subject Economics	Course: History of Economic Thought Course Code : UAR6EC9	Course Coordinator Prof. K.N. Dhawale
	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Compare Indian economic thoughts	Understand
CO2	Analyse the Economic thought of Mahatma Phule and Mahatma Gandhi	Analyse
CO3	Importance of Economic thought of Dr. B. R. Ambedkar, G. K. Gokhale and Dr. Manmohan Singh	Evaluate
CO4	Discuss the Nobel prize winners in Economics	Create

Module 1: Indian Economic Thought

(12 Lectures)

Kautilya on welfare state -Dadabhai Naoroji's Thoughts on Drain Theory- Ranade's Case on Protection - R. C. Dutt on Imperialism - Land Tax and Public Finance - Gopal Ganesh Agarkar.

Module 2: Economic Thought of Mahatma Phule and Gandhi

(11 Lectures)

Mahatma Phule's Views on Agriculture - Reasons of Farmer's Poverty - Gandhian Economic Thoughts on Self-Sufficient Village Economy - Dignity of Labour – Trusteeship - and Sarvodaya.

Module 3: Economic Thought of Dr. B.R.Ambedkar, G.K.Gokhale and Dr. Manmohan Singh

(11 Lectures)

Dr.Ambedkar's Case for State Socialism - Problem of Rupee - Public Finance – G.K.Gokhale on Development and Welfare - Dr. Manmohan Singh's ' Three Steps' to Stem India's Economic Crisis.

Module 4: Nodel Prize Winners in Economics

(11 Lectures)

Dr. Amartya Sen (1998) -Robert. A. Mundell (1999) -Joseph Stiglitz(2001) -Dr. Abhijeet Banarjee (2019)

References:

1. B.R.Nanda Gokhale (1977):- The indian moderates and the British raj, Delhi.
2. Ajit K.Dasgupta,A History of Indian Economic Thought, (1993)Routledge London and New York.
3. Bipin Chandra (ed) (1999) Rande's economic writings, Gyan Publication House, New Delhi.
4. Encyclopaedia of Nobel Laureate, Ed's, (2002) R. Kapila & A. Kapila, Academic Foundation.
5. Gandhi. M. K., (1959), India of my dreams, Navjivan publishing house Ahmadabad.
6. R. P. Mansi, Dadabhai Naoroji, (1960) publication Division, Government of India Delhi.



Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Program: M.A.

Revised Syllabus of M.A.-I Economics

Choice Based Credit & Grading System (60:40)

w.e.f. Academic Year 2022-23

Sr. No.	Heading	Particulars
1	Title of Course	Economics
2	Eligibility for Admission	T.Y.B.A. in Economics / Any Graduate
3	Passing marks	External -24 Internal -16
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Four
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-2023

Revised Syllabus of Courses of M.A.-I Programme at Semester I & II with Effect from the Academic Year 2022-23

Preamble

The Paper aims at introducing concepts, theories and policies regarding Economics. The student should be able to use these concepts to understand the relevance of economics to the real world. The student should be able to build on these concepts in the future to develop deeper understanding of the Economy as well as the revised syllabus is framed to understand the economic theory and its relevance in decision making.

COURSE CONTENT

SN	Modules	No. of Lectures
1	Module - I	15
2	Module - II	15
3	Module - III	15
4	Module - IV	15
Total		60

Revised Scheme of Examination

Faculty of Arts

(Post-Graduate Programmes)

Choice Based Credit System (CBCS)

❖ **Revised Scheme of Examination**

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below-

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies / Test based on tutorials 4. Book Review /Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Question Paper Pattern

(Periodical Class Test/ online examination for the Courses at Post Graduate Programmes)

Maximum Marks: 20

Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

B) Semester End Examination: 60 %**60 Marks**

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern**Theory question paper pattern**

1. There shall be four questions each of 15 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

❖ Passing Standard

The learners shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of grade D in each project wherever applicable to pass a particular semester.

❖ Guidelines and Evaluation pattern for project work (100 Marks)**Introduction**

Inclusion of project work in the course curriculum of the M.A. programme is one of the ambitious aspect in the programme structure. The main objective of inclusion of project work is to inculcate the element of research work challenging the potential of learner as regards to his/ her eager to enquire and ability to interpret particular aspect of the study in his/ her own words. It is expected that the guiding teacher should undertake the counseling sessions and make the awareness among the learners about the methodology of formulation, preparation and evaluation pattern of the project work.

- There are two modes of preparation of project work
 1. Project work based on research methodology in the study area
 2. Project work based on internship in the study area

Guidelines for preparation of Project Work

Work Load

Work load for Project Work is 01 (one) hour per batch of 15-20 learners per week for the teacher. The learner (of that batch) shall do field work and library work in the remaining 03 (three) hours per week.

1. General guidelines for preparation of project work based on research methodology

- The project topic may be undertaken in any area of Elective Courses.
- Each of the learner has to undertake a Project individually under the supervision of a teacher-guide.
- The learner shall decide the topic and title which should be specific, clear and with definite scope in consultation with the teacher-guide concerned.
- University/college shall allot a guiding teacher for guidance to the students based on her / his specialization.
- The project report shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.
 - The project report should be 80 to 100 pages

A) External Assessment

Question Paper Pattern

Maximum Marks: 60

Questions to be set: 04

Duration: 2 Hrs.

All Questions are Compulsory Carrying 15 Marks each.

Question No	Particular	Marks
Q-1	Attempt Any 2 out of 3 A. Full Length Question B. Full Length Question C. Full Length Question	15 Marks
Q-2	Attempt Any 2 out of 3 A. Full Length Question B. Full Length Question C. Full Length Question	15 Marks
Q-3	Attempt Any 2 out of 3 A. Full Length Question B. Full Length Question C. Full Length Question	15 Marks
Q-4	Attempt Any 2 out of 3 A. Full Length Question B. Full Length Question C. Full Length Question	15 Marks

Programme outcomes (POs) for

M. A.

Sr. No.	Attributes	Programme Outcomes
PO1.	Disciplinary Knowledge	Amalgamations of theoretical and practical understanding generated from the chosen programme and develop the students with academic perspective.
PO2.	Communication Skills	Demonstrate effective communication skills pertaining to different domains of the courses.
PO3.	Critical Thinking	Application of analytical thoughts, arguments, evidences and relevant assumptions for development of scientific approach.
PO4.	Problem Solving	Solving of different kinds of non-familiar problems and apply ones learning to real life situations.
PO5.	Analytical reasoning	Identification of relevance along with logical flaws in the arguments for synthesis of the data of variety of sources.
PO6.	Research-related skills	Development of sense of enquiry and research capabilities and acumen related problems of research.
PO7.	Reflective thinking	Critical sensibility about live experiences with self-awareness and its reflection in self and society.
PO8.	Moral and ethical awareness	Demonstration of moral and ethical values in one's life.
PO9.	Leadership qualities	Capability for building a team to achieve desired goals and objectives.
PO10.	Lifelong learning	Acquisition of knowledge and skills for participating in learning activities throughout the life.

Programme outcomes (PSOs) for

M. A. Economics

Name of the Programme B.A. Economics	Programme Coordinator Dr. B. S. Patil	Head of the Department Dr. B. S. Patil
After completing the programme in Economics, students will able to:		
PSO1	Demonstrate advanced knowledge of Research Methodology, Agricultural Economics, Public Finance, Environmental Policies, Industrial Relations, and Statistical and Mathematical methods.	
PSO2	Develop Research skills like- methods of data collection, sampling methods, interpretation, Report writing, by applying both quantitative and qualitative knowledge.	
PSO3	Develop proficiency of research analysts, industrial consultancy, environment policy applications, own business at the same time ability to engage in competitive exams like MPSC, UPSC, IES, ISS, Labour Officers, Research analyst's, Bank POs and other courses.	

M.A – I (ECONOMICS)

SEMESTER :- I and II

Academic Year :- 2022 – 23

SEMESTER :- I

Sr. No	PAPER NO	COURSE CODE	NAME OF THE SUBJECT	CREDITS	MARKS
1	I	PAR1MIE	MICRO ECONOMICS	6	100
2	II	PAR1MAE	MACROECONOMICS	6	100
3	III	PAR1EOD	ECONOMICS OF DEVELOPMENT	6	100
4	IV	PAR1MTE	MATHEMATICAL TECHNIQUES FOR ECONOMICS	6	100

SEMESTER :- II

5	I	PAR2MEC	MICRO ECONOMICS	6	100
6	II	PAR2MAE	MACRO ECONOMICS	6	100
7	III	PAR2PUE	PUBLIC ECONOMICS	6	100
8	IV	PAR2SEM	STATISTICAL AND ECONOMETRIC METHODS	6	100

Microeconomics – I, SEM - I

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR1MIE	MICRO ECONOMICS	06	100

Course Outcomes

Cos	After completing the course, student will able to:	Course Attributes
CO1	Relate the utility with consumer behavior.	Remember
CO2	Explain production, cost and supply function.	Understand
CO3	Make use of price and output determination under perfect competition.	Apply
CO4	Examine the monopoly and its aspects.	Analyse

SYLLABUS

Module –I: Consumer Behavior

(lectures 15)

Utility function, Cardinal Approach – Marshall, Ordinal Approach - Indifference Curve, Slutsky equation :- Uses of Slutsky equation, **Income, Price and Substitution effects**, Comprehended Demand Curve, **Revealed preference approach to consumer choice**, consumer's optimization problem, Giffen goods.

Module –II: Production, Cost

(lectures 15)

Production Function – CES Production function Properties and Importance, Returns to scale , Law of Variable proportions, production function (Cobb-Douglas), Cost Minimization, **Relationship between production function and cost function**, Production possibility curve,

Module –III: Price and Output determination under perfect competition

(lectures 15)

Features of perfect competitions, price and output determination in the long and short run, Equilibrium of the firm and the industry, **practical applications of perfect competitions**, General equilibrium :- Meaning, existence and stability of General equilibrium in a pure consumption economy, first and second fundamental theorems of welfare economics, market failures and theory of the second best, Profit Maximization in perfect competition.

Module –IV: Monopoly

(lectures 15)

Monopoly: Its features, measures market power, price and output determination in a monopoly, Price Discrimination:- First, Second and Third degree under monopoly, bilateral monopoly, regulation of monopolies. Profit Maximization under monopoly.

Reference Books

Micro Economics - Paper I

1. Gravelle H. and Ress R. (2004) : Microeconomics., 3rd Edition, Pearson edition Ltd, New Delhi.
2. Varian H. (2000) : Intermediate microeconomics : A Modern Approach, 8th Edition, W. W. Norton and company.

Microeconomics –I, Sem - II

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR2MEC	MICRO ECONOMICS	06	100

Course Outcomes

	After completing the course, student will able to:	Course Attributes
CO1	Outline the game theory in detail.	Understand
CO2	Create an understanding of strategic behaviour under oligopoly and monopoly market.	Create
CO3	Simplify the information economics for their practical life.	Analyse
CO4	Define various alternative theories of the firms.	Remember

SYLLABUS

Module –I: Introduction to Game Theory

(lectures 15)

Introduction to Game theory, **Types of Games :- Types of Strategies**, normal form games and extensive form games, dominant strategy equilibrium, Prisoner's dilemma, **Nash equilibrium in Pure and Mixed strategies**, sub game perfection, measures of Risk Aversion.

Module –II: Oligopoly Market

(lectures 15)

Oligopoly and its features, Cournot Model, Collusion Model, Bertrand Model, Stackelberg Model, Edgeworth Model, **Sales and Revenue maximization model of oligopoly**, limit pricing, Nudge Theory

Module –III: Asymmetric information based analysis

(lectures 15)

Moral hazard and adverse selection, market for lemons, principle – agent models, optimal contracts under symmetric information, contracts under asymmetric information, screening and signaling applications.

Module –IV: Alternative Theories of the firms

(lectures 15)

Alternative theories of the firm: Morris model of managerial enterprise, Williamson's model of managerial discretion, behavioral theories of the firm, Full cost pricing Principle, Baumol Model

Reference Books

Micro Economics - Paper I

1. Gravelle H. and Riss R. (2004) : Microeconomics., 3rd Edition, Pearson edition Ltd, New Delhi,
2. Varian H. (2000) : Intermediate microeconomics : A Modern Approach, 8th Edition, W. W. Norton and company.
3. Gibbons R. A. Primer in Game Theory, Harvester – Wheatsheaf, 1992

Macroeconomics –II, Semester – I

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR1MAE	MACROECONOMICS	06	100

Course Outcomes

Cos	After completing the course, student will able to:	Course Attributes
CO1	Relate economic mechanism with their regular life.	Remember
CO2	Illustrate the concept of national income.	Understand
CO3	Identify the mechanism of the open economy.	Apply
CO4	Assess the functions of the money and capital market.	Evaluation

SYLLABUS

Module –I: Introduction to Macroeconomics (lectures 15)

Macroeconomics- Meaning, Scope, Importance and Limitations, Stocks and Flows; Concepts of National Income- **GDP, GNP, NDP, Gross Value Added (GVA), Personal Income, Disposable Income, Per Capita Income, GDP Deflator; Methods and limitations of measuring National Income.**

Module –II: Micro foundations of Macroeconomics (lectures 15)

Consumption Function- Keynes's Theory of Consumption and Keynes's Psychological Law of Consumption, Types of Investment, irreversibility and investment, Autonomous and Induced Investment, **Accelerator Theory of Investment, Theory of Multiplier.**

Module –III: Determination of National Income and the Price Level (lectures 15)

The Demand for Money and Supply of Money, The Keynesian Model: IS-LM Analysis, Fiscal and Monetary Policy, The role of expectations: The AS-AD Model; Inflation and Unemployment.

Module –IV: The Open Economy (lectures 15)

Balance of Payments: - Meaning-Structure-Disequilibrium-Corrective Measures, Trade Barriers- Tariffs and Import Quotas- Effects of Tariff, Effects of Quotas, Floating/Flexible Exchange Rates and Managed Float/Managed Flexible exchange rate, **The IS-LM-BP model**

Reference Books

Macro Economics - Paper II

1. Carlin, Wendy and David Soskice, 2007, Macroeconomics, Oxford University Press.
2. D'Souza, Errol, Macroeconomics, 2012, Dorling Kindersley (India) Pvt Ltd.
3. Michl, Thomas, 2009, Macroeconomic Theory, PHI Learning.
4. H.L. Ahuja, 2020, Macroeconomics- Theories and Policies, S. Chand.

Macroeconomics –II, Semester – II

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR2MAE	MACRO ECONOMICS	06	100

Course Outcomes

	After completing the course, student will able to:	Course Attributes
CO1	Examine the price setting mechanism in an economy.	Analyse
CO2	Understand the importance of Neo-Classical economics.	Evaluation
CO3	Elaborate the Keynesian economics in detail.	Create
CO4	Summarise Macroeconomic policies.	Understand

SYLLABUS

Module –I: Money and Pricing

(lectures 15)

Money- Meaning, History and origin, Functions of Money, Importance of Money, Measures of money supply in India- M1, M2, M3, M4, Fisher's Equation of Money, Cambridge cash balance approach, Credit creation, Menu costs.

Module –II: Neo Classical Economics

(lectures 15)

New Classical Economics, Credit Control methods by RBI- Quantitative and Qualitative Methods, Wealth Effects and the Government Budget Constraint; money/bond finance, the government budget deficit; Ricardian Equivalence.

Module –III: Keynesian theory

(lectures 15)

New Keynesian Economics and disequilibrium, Theories of Consumption- Relative Income Theory of Consumption- Life Cycle Theory of Consumption - Permanent Income Theory of Consumption, The NK model of inflation.

Module –IV: Macroeconomic Policy

(lectures 15)

Government in Macroeconomic Policy- Types of Public Expenditure, Direct and Indirect Taxes, Inflation Targeting and Exchange Rate policies, Union Budget, Finance Commission and FRBM Act, 2003, Recent Macroeconomic policies.

Reference Books

Macro Economics - Paper II

1. Heijdra, Ben J. and Frederick Van Der Ploeg, 2002, Foundations of Modern Macroeconomics, Oxford University Press, Oxford.
2. Romer, David, 2012, Advanced Macroeconomics, McGraw-Hill, Fourth Edition
3. Wickens, Michael, 2011, macroeconomic Theory and the Dynamic General Equilibrium Approach, Princeton University Press.
4. H.L. Ahuja, 2020, Macroeconomics- Theories and Policies, S. Chand.

Economics of Development –III, Semester – I

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR1EOD	ECONOMICS OF DEVELOPMENT	06	100

Course Outcomes

Cos	After completing the course, student will able to:	Course Attributes
CO1	Demonstrate the role of social and economic indices of growth and development.	Understand
CO2	Judge various modern theories of growth and distribution.	Evaluate
CO3	Define various market concepts.	Remember
CO4	Examine the various aspects of Foreign trade.	Analyse

SYLLABUS

Module –I: Concepts and measures of Growth and Development (lectures 15)

Concept of Growth and Developments, Economic growth and structural change- capabilities, entitlements and deprivation- inequality and growth – Measurement of inequality and poverty- Vicious circle of poverty, Measurement of Development-HDI,GDI.

Module –II: Theories of Economic Growth and Development (lectures 15)

Harrod- Domar Model of growth - Solow model of growth, - Endogenous Growth models of Romer – Big push theory - Balanced growth (Nurkse), Unbalanced growth (Hirschman)

Module –III: Microeconomics of Development (lectures 15)

Rural Land market- Labour market- Capital market- Credit market-Microfinance- Market interlink-ages-Households sector –The household model of fertility decisions- institutions and development.

Module –IV: Interlinkages between environment and Development (lectures 15)

Environment and development- Population environment linkage - Natural resources-Environmental problems in Economic Development- Environment and sustainable Development- Environmental Acts - Trade and Development- Trade and foreign exchange- Role of International financial and trade institutions- Structural adjustment and stabilization.

Reference Books

Economics of Development - Paper III

1. Basu, Kaushik (1998), Analytical Development Economics, OUP, New Delhi.
2. Ray, Debraj (2004), Development Economics, OUP, New Delhi.

Public Economics –III, Semester – II

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR2PUE	PUBLIC ECONOMICS	06	100

Course Outcomes

Cos	After completing the course, student will able to:	Blooms Taxonomy
CO1	Define mechanism of taxation in India	Remember
CO2	Illustrate local, state and central government expenditure.	Understand
CO3	Evaluate tax regulation, distribution, implication and tax evasion.	Evaluation
CO4	Examine India's federal structure, Decentralization and Government reforms.	Analysing

SYLLABUS

Module –I: Introduction to Welfare economics (lectures 15)

Concept of Welfare economics, Pigou's approach view on welfare, **The Social welfare function**, Market failure and Externalities, Theorems of welfare economics: Pigou, Pareto Optimality, Compensation principle, Arrow Impossibility Theorem, The Principle of Maximum Social advantage

Module –II: Taxation (lectures 15)

Tax:- Classification, Direct vs. indirect Taxes, VAT, GST, Lump sum taxes, Cess, Corporate Tax, Cannon of Taxation - **Ability to pay, Benefit Principle of Taxation**, Impact and Incidence Tax, Shifting of Tax, Incidence and Burden Tax, Tax Evasion: basic Model, Auditing and punishment.

Module –III: Public Expenditure: Rationale and Evaluation (lectures 15)

Public Goods, Private Goods, Club Goods, Merit Goods, private provision of public Goods, Optimal Provision, Lindahl's Voluntary Exchange Approach, **Government Expenditure**, - Evaluation of Government Expenditure: Elements of Cost-Benefit analysis.

Module –IV: Fiscal Federalism (lectures 15)

Concept of Fiscal Federalism, India's Federal Structure, Working of Indian fiscal federation, Decentralization: Need Decentralization Theorem, expenditure responsibilities, Intergovernmental Transfers, Fourteenth and Fifteenth finance commission in India.

Reference Books

Public Economics - Paper III

1. Atkinson A.B. and J.E. Stieglitz: Lectures on public Economics, New York: McGraw-Hill,1980
2. Cullis J. and P. Jones: Public Finance and Public Choice, OUP,1998
3. Hindricks J. and Gareth D. Myles: Intermediate public Economics, MIT Press, 2006.
4. Myles G.: public Economics, Cambridge University Press,1995
5. Oates W.: Fiscal Federalism, Harcourt, Brace Jovanovich, 1972
6. Purohit M.: Value Added Tax, Gayatri Publications.
7. Tesch R.: Public Finance: A Normative Theory, Academic Press, 1995

Mathematical Techniques for Economics –IV, Semester – I

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR1MTE	MATHEMATICAL TECHNIQUES FOR ECONOMICS	06	100

Course Outcomes

Cos	After completing the course, student will able to:	Blooms Taxonomy
CO1	Construct the economic functions.	Construct
CO2	Apply derivatives in economics and Understand Unconstrained optimization techniques in economics	Apply
CO3	Understand constrained optimization techniques in economics	Understand
CO4	Apply matrix in economics.	Apply

SYLLABUS

Module –I The concept of Sets and types of Function: (lectures 15)

A set and its elements, Operations on sets, De Morgan's laws, slope and intercept of a straight line, higher order functions, logarithmic and exponential functions, rules of logarithms and exponentiation, Economic applications of Equation (Supply and Demand Analysis, Income determination)

Module –II Derivatives and its applications: (lectures 15)

limits, Derivative of a function, rules of differentiation, uses of derivatives in economics, Unconstrained optimization in economics, partial derivatives and their applications in Economics, introduction to integration and its applications in Economics.

Module –III Optimization techniques: (lectures 15)

Constrained optimization in Economics, Lagrange multipliers and equality constraints, constrained optimization with inequality constraints, applications in economics.

Module –IV Matrix algebra: (lectures 15)

Introduction to matrices, matrix operations (upto 3 X 3), matrix addition and multiplication, transpose and inverse of a matrix, Adjoin of a matrix, solving simultaneous equations with matrices, Determinant-minors and cofactors – cramer's Rule, Application in Economics

Reference Books

Mathematical Techniques for Economics - Paper IV

1. Chiang, A.C., Fundamental Methods of Mathematical Economics, McGraw-Hill, 2005
2. K. Sydsaeter and P. Hammond, Mathematics for Economic Analysis, Pearson Educational Asia: Delhi, 2002.
3. Dowling Edward T : Introduction to Mathematical Economics, Schaum Outline Series in Economics, Tata McGraw -Hill, New Delhi,2004

Statistical and Econometric Methods – IV, Semester – II

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR2SEM	Statistical and Econometric Methods	06	100

Course Outcomes

Cos	After completing the course, student will able to:	Blooms Taxonomy
CO1	Understand the basic statistics concepts.	Understand
CO2	Construct the hypothesis and select suitable test for data analysis.	Construct
CO3	Estimate and Interpret the regression coefficient.	Estimate and Interpret
CO4	Understand the problems of heteroscedasticity, autocorrelation and multicollinearity in regression model.	Understand

SYLLABUS

Module –I introduction of statistics and Probability

(lectures 15)

Measures of Central tendency and dispersion, Random variables mean and variance of a random variable, basic laws of probability, Discrete random variables (Geometric, Binomial and Poisson), Continuous distributions (The Normal Distribution), Covariance and Correlation (Pearson's and Spearman's coefficients), the law of large numbers (without proof),

Module –II Tests of Hypothesis :

(lectures 15)

Tests of Hypothesis: Tests of hypothesis, null and alternative hypothesis, one tailed and two tailed tests, the standard normal distribution and its applications, the Chi-square distribution and its applications, the T distribution and its application, the F distribution and its application the central Limit Theorem.

Module –III Fundamentals of Regression Analysis :

(lectures 15)

The linear regression model: Estimation and hypothesis testing, properties of least square estimators, the Coefficient of determination and adjusted R square, the F test in regression, interpreting regression coefficients, Multiple Regression Analysis.

Module –IV Relaxing the Assumptions of the Classical Model:

(lectures 15)

Problems in simple Linear Regression model: Heteroscedasticity and consequences of using OLS in the presence of Heteroscedasticity, Detection of Heteroscedasticity, autocorrelation and its consequences, Detection of Autocorrelation, multicollinearity and its consequences, Detection of Multicollinearity.

Reference Books

Statistical Methods in Economics - Paper IV

1. Hatakhar Neeraj R: Principles of Econometrics : an introduction Using R, SAGE publications, 2010
2. Kennedy P.: A Guide to Econometrics, Sixth Edition, Wiley Blackwell edition, 2008
3. Gujarati D. N. and Porter D.C., Basic Econometrics, McGraw Hill, 5th edition, International Edition, 1 July, 2017
4. Wooldridge, J., Introductory Econometrics: A Modern Approach, Cengage Learning, 2009
5. Stock J. H. and Watson M. W., Introduction to Econometrics, Third Edition, Pearson, 2018



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: M.A.

Revised Syllabus of M.A.-II Economics
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2020-21

Sr. No.	Heading	Particulars
1	Title of Course	Economics
2	Eligibility for Admission	M.A.-I in Economics
3	Passing marks	External -24 Internal -16
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-21

**Revised Syllabus of Courses of M.A.-II Programme at Semester III & IV
with Effect from the Academic Year 202-21**

Preamble

The Paper aims at introducing concepts, theories and policies regarding Economics. The student should be able to use these concepts to understand the relevance of economics to the real world. The student should be able to build on these concepts in the future to develop deeper understanding of the Economy as well as the revised syllabus is framed to understand the economic theory and its relevance in decision making.

COURSE CONTENT

Sr. No.	Modules	No. of Lectures
1	Module – I	15
2	Module - II	15
3	Module - III	15
4	Module - IV	15
Total Lectures		60

Semeter-III and IV

Semester III (Four Courses)

Semester IV (Four Courses)

2.3.1	Economics of Agricultural Production and Rural Markets	2.4.1	Economics of Human Development
2.3.2	Economics of Labour Markets	2.4.2	Industrial Economics
2.3.3	Trade Unions and Industrial Relations in India	2.4.3	Agricultural Development and Policy
2.3.4	Environmental Economics	2.4.4	Dissertation in Economics

Scheme of Evaluation

The performance of the learners will be evaluated in two Components. One component will be the Internal Assessment component carrying 40 marks and the second component will be the Semester-wise End Examination component carrying 60 marks. The allocation of marks for the Internal Assessment and Semester End Examinations will be as shown below:-

A) Internal Assessment: 40 marks

Question Paper Pattern

(Internal Assessment- Courses without Practical Courses)

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Mark s
02	One case study / project with presentation based on curriculum to be assessed by the teacher concerned/ Exam based on essay type questions.	15 Mark s
	Presentation	
	Written Document	05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Mark s

External Assessment

Question Paper Pattern

Maximum Marks: 60

Questions to be set: 04

Duration: 2 Hrs.

All Questions are Compulsory Carrying 15 Marks each.

Question No	Particular	Marks
Q-1	Attempt Any 2 out of 4 A. Full Length Question B. Full Length Question C. Full Length Question D. Full Length Question	12 Marks
Q-2	Attempt Any 2 out of 4 A. Full Length Question B. Full Length Question C. Full Length Question D. Full Length Question	12 Marks
Q-3	Attempt Any 2 out of 4 A. Full Length Question B. Full Length Question C. Full Length Question D. Full Length Question	12 Marks
Q-4	Attempt Any 2 out of 4 A. Full Length Question B. Full Length Question C. Full Length Question D. Full Length Question	12 Marks
Q-5	Attempt Any 2 out of 4 A. Full Length Question B. Full Length Question C. Full Length Question D. Full Length Question	12 Marks

Economics of Agricultural Production and Rural Markets

Semester – III

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR1EAP1	Economics of Agricultural Production and Rural Markets	04	100

COURSE OUTCOMES

COs	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	<u>Outline</u> Economics of agricultural production and productivity in India.	Understand
CO2	<u>Elaborate</u> the Rural credit markets in India.	Create
CO3	<u>Define</u> labour markets for economic development in India.	Remember
CO4	<u>Identify</u> Land and Lease market in detail.	Analyse

Module 1: Economics of Agricultural Production, Resource Use and Instability in Agriculture: (15 Lectures)

Agricultural inputs use – Economics of input and product substitution – Farming as a business or way of life – Sources of price variability and income instability – Rationale for Government Intervention for Price Support and Reduction in Instability – Types of Government intervention for Price Support and reduction in instability – Alternative concepts of cost of cultivation and determination of minimum support prices in India – Role and optimum size of buffer stocks

Module 2: Agricultural Credit Markets: (15 Lectures)

Characteristics of rural credit markets, credit fragmentation– Agricultural Credit – Need, Characteristics and Sources - Organized and unorganized sectors — Evolution of credit systems in India – Role and Performance of Commercial Banks, History of Co-operative movements in India – Structure of Co-operative Banking in India - Regional Rural Banks, NABARD and Micro-credit through SHGs in India, imperfections in rural credit markets in India

Module 3: Labour Markets: (15 Lectures)

Concepts of work, skill and productivity – Methods of measurement of employment and unemployment – Free and Unfree labour – Types of employer-employee relationships – Determinants of wage rates – Labour market segmentation – Gender-based discrimination – Biases in data sources – Wage Differentials – Contract Labourers in rural markets

Module 4: Land and Lease Markets: (15 Lectures)

Types of farming – Historical evolution – Characteristics and functioning - Land Reforms — Lease market – Formal and informal leases – Economics of share tenancy – Crop-sharing practices in India – Inequity in distribution of holdings – Agriculture Institutes – FCI, NAFED, ICAR – Advanced Farming (DNA)

Reference Books -

1. Heady Earl O., Economics of Agricultural Production and Resource Use, Prentice Hall, New York, 1961 (Module 1)
2. Kahlon A.S. and D.S. Tyagi, Agricultural Price Policy in India, Allied Publishers Pvt. Ltd., New Delhi 1983 (Module 1)
3. Basu Kaushik, Agrarian Structure and Economic Underdevelopment, Harwood, Switzerland, 1990 (Modules 2, 3, 4)
4. Dantwala M.L. (Ed), Indian Agricultural Development Since Independence, (Second Edition) Oxford and I.B.H. Pvt. Ltd., 1991 (Module 2)

Economics of Labour Markets

Semester – III

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR3ELM2	Economics of Labour Markets	04	100

COURSE OUTCOMES

COs	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Assess the nature of labour market.	Evaluation
CO2	Explain the demand and supply of labours.	Understand
CO3	Classify the various dimensions of wages in labour market.	Analyse
CO4	Identify social upliftment of labours in India.	Apply

Module 1: Nature of the Labour Market: (15 Lectures)

Concept of labour market, Characteristics, Types, **Growth of labour Market in India – Labour Force and Human Resource Development in India**, Investment in Human Capital, Costs and life-time benefits to education.

Module 2: Approaches in Labour Markets: (15 Lectures)

The theory of labour demand; time period and types of markets, Industry demand for labour, Determinants of labour demand, The theory of supply, Work-leisure choice in indifference curves, **Labour Supply: Favorable and An Favorable Factor for Economic Development**, Backward-bending labour supply curve and its applications, **Changing Scenario of Labour Market**

Module 3: Wage Issues in Labour Markets: (15 Lectures)

Definition and Types of Wages - Characteristics of Ideal Wage Payment - Theories of Wages – Subsistence Theory of Wages, Standard of Living Theory Wages, Marginal Productivity Theory of Wages - , Wage structure and components of wages, Share of wages, Time Wage and Piece Wage, Minimum Wage – Objectives, Principles and Methods – Need-Based Minimum Wage- Labour market rigidities and flexibilities,

Module 4: Labour Markets in India: (15 Lectures)

Labour Policy in India - Linkages in labour markets - Dualism and Segmentation, Employee Turnover, Migrant labour, Impact of Trade Unions on Productivity and Wages, Minimum Wages Act - 1948, Social Security, Occupational safety and security, Impact of Privatization, Liberalization and Globalization on Indian Labour Markets, LPG – Opportunities and Threats in Labour Markets in India.

Reference Books -

1. Bhattacharya BB and S Sakthivel, Economic Reforms and Jobless Growth in India in the 1990s, The Indian Journal of Labour Economics, Volume 48, No.2, 2005, pp. 243-258
2. Bhagoliwal T.N., Economics of Labour and Industrial Relations, SahityaBhawan, Agra,1985
3. Bloom Gordon F and Northrup Herbert R, Economics of Labour Relations, Richard D Irwin Inc, Homewood, 1973
4. Cahuc Pierre and Andre Zylberberg, Labor Economics, MIT Press, 2004
5. Government of India, Report of Second National Commission on Labour, 2002 Harris-White Barbara and SinhaAnushree, Trade Liberation and India's Informal Economy, Oxford University Press, New Delhi, 2007
6. Sapsford David and ZafirisTzannatos, The Economics of the Labour Market, Macmillan,London, 1993
7. Singh Jwitesh Kumar, Labour Economics, Deep and Deep Publishers, Delhi, 1998
8. UchikawaShuji (eds.), Labour Market and Institutions in India 1990s and Beyond, Manohar Publishers, New Delhi, 2003
9. UnniJeemol and Uma Rani, Employment and Income in the Informal Economy: A Micro Perspective, in RenanaJhabvala, Ratna M Sundaram and JeemolUnni (eds) Informal Economy Centre-stage: New Structures of Employment, Sage Publications, New Delhi, 2003. 26

Trade Unions and Industrial Relations in India

Semester – III

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR3TUIR3	Trade Unions and Industrial Relations in India	04	100

Course Outcomes

COs	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Outline origin and roles of Trade Unions.	Understand
CO2	Discuss various approaches for the development of Industrial sector.	Create
CO3	Evaluate responsibilities by workers in India.	Evaluate
CO4	Analyse the various laws related to industries and social development.	Analyse

Module 1: Trade Unions :

(15 Lectures)

Meaning, Concept, Evolution and Role of Trade Unions. Approaches to the Origin of Trade Unions. Bargaining Theory of Wages, Impact of unions on productivity and wages, Employment Security and Efficiency, Unorganized Sector, **Relive and Proposes of Trade Union.**

Module 2: Industrial Relations :-

(15 Lectures)

Industrial Relations: - Meaning, Scope and Nature, Approaches to Industrial Relations: Macro Approaches- System Approach and Class Conflict Approach, Micro Approaches -Taylorism, Fordism and Post- Fordism, Neo-Fordism, Pluralism, Human Relations School and Organizational Behavior Approach.

Module 3: Industrial Relations in India:

(15 Lectures)

Trade Unions and Workers: Industrial Sociology of workers in India, History, growth and structure of trade unions, Independent and white collar unions in India. Trade Unions and Contract Workers. Employer's Organizations: Role of managerial class in industrial relations. Industrial conflict: Forms of conflict, strikes, lockouts, absenteeism, employee turnover, causes and consequences of and trends in industrial disputes.

Module 4: Role of the State in Industrial Relations in India:

(15 Lectures)

Labour Policy in India: Pre and Post-Reform scenario, Impact of Globalization- Tripartism, Labour Legislation affecting industrial relations: Statutory and Non-Statutory measures to settle industrial disputes. Workers Participation in Management. Voluntary Retirement Schemes, Social Security Measures, Unemployment Insurance. Occupational Safety and Health Management Systems, India and the ILO.

Reference Books

1. Amin, Ash (Ed.), Post-Fordism-A Reader, Blackwell, Oxford, 1994 (Module 2)
2. Government of India, Ministry of Human Resource Development, Report of Second National Commission on Labour, 2002 (Module 3, 4)
3. Hicks J.R., The Theory of Wages, Clarendon Press, Oxford, 1932 (Module1)
4. Monappa, Arun, Industrial Relations, Tata McGraw Hill, New Delhi, 2005. (Module 4)
5. Pencavel, John, Labour Markets under Trade Unionism: Employment, Wages and Hours, Basil Blackwell, Cambridge, Massachusetts, 1991 (Module 1)
6. Ramaswamy, E.A. and Uma Ramaswamy, Industry and Labour, Oxford University Press, Bombay 1981 (Module 3)
7. Rees, Albert, The Economics of Trade Unions, University of Chicago Press, Chicago, 1973 (3rd Edition) (Module 1)
8. Roy. J. Adams (eds.), Comparative Industrial Relations, Harper Collins Academic, London, 1991. (Module 2, 4).

Environmental Economics

Semester – III

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR3EE4	Environmental Economics	04	100

Course Outcomes

COs	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Outline role of environment in economic growth.	Understand
CO2	Explain different aspects related to environmental development.	Evaluate
CO3	Identify the issues related to environmental field.	Apply
CO4	Elaborate various environmental policies, agreements and case studies.	Create

Module 1: Economic Growth and the Environment: (15 Lectures)

Economic Growth and environment, Limits to growth and Sustainable Development, Environmental Kuznets Curve- Environment as an economic and social good/asset, Natural Resources (Exhaustible, renewable, common property resources) - Accounting and Natural Resource Management- Green Accounting

Module 2: Micro foundations of Environmental Economics: (15 Lectures)

Types of goods and services - Public, private and common pool resources, externalities and market failure, Social Cost- Benefit- Analysis, Pollution as a Public Bad?, The equi-marginal principle- Economic efficiency versus equity, Damage functions Mitigation and abatement costs, Role of Institutions in environmental protection, Coase Theorem

Module 3: Supplementary Analytical Tools and Environmental Issues: (15 Lectures)

Valuation of Natural Resources: Direct and Indirect Methods Environmental impact assessment, Life Cycle Analysis, Pollution- Air, Water and Noise; Regional, National and Supranational dimensions of environmental degradation, Ozone Layer Depletion, Green House Gas Emissions, Global Warming, and Climate Change

Module 4: Environmental Policy and Practices: (15 Lectures)

Few approaches to environmental policy: Command and control - Environmental Standards, Technology Mandates; Market based instruments - Taxes, subsidies, liability instruments tradable permits; Rehabilitation and Resettlement Policy- Kyoto Protocol; Rio debate- Relevant Case Studies and Carbon Trading

Reference Books -

1. Dixon, J. A., and M. M. Hufschmidt, (ed.) Economic valuation techniques for the environment: A Case Study Workbook. Baltimore: Johns Hopkins University, 1986.
2. Field, B.C., Environmental Economics- An Introduction, McGraw-Hill International Edition, Singapore, 1997
3. Hodge, I. Environmental Economics, MacMillan Press Ltd., London-1995.
4. Jeroen C.J.M. van den Bergh, Handbook of Environmental and Resource Economics, Edward Elgar publishing, 2002.
5. Jinhua, Z. and T. Fisher, Notes on Irreversibility, Sustainability and the Limits to Growth, <http://econpapers.repec.org/paper/isugenres/default22.htm>.
6. Kolstad, C., Environmental Economics, Oxford University Press, USA, 2006.
7. Sankar, U., Policy Instruments For Achieving Low Carbon and High Economic Growth in India (Monograph), National Institute of Public Finance and Policy, New Delhi, 2009.
8. United Nations Statistical Division: System of Environmental-Economic Accounts (SEEA) <http://unstats.un.org/unsd/envaccounting/seearev>

Economics of Human Development

Semester – IV

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR4EHD1	Economics of Human Development	04	100

Course Outcomes

Cos	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Illustrate various concepts related to human development.	Understand
CO2	Define multiple dimensions of human development.	Remember
CO3	Measure various aspects related to human development indices.	Evaluation
CO4	Identify different aspects of human development.	Analyse

Module 1: Concepts of Human Development:

(15 Lectures)

Economic Development – Indicators, Obstacles – Features of Modern Economic Growth - Basic Needs Approach – Quality of Life Approach – Capability Approach – Human rights – Millennium Development Goals, Sustainable Development Goals

Module 2: Dimensions of Human Development:

(15 Lectures)

Human Development:- Concept and Factor – Human Resource Development :- Form / Factor and Problems - Inclusive Growth – Concept, Obstacles - Gender Empowerment Measure - Sustainability, Security, Productivity and Participation – Role of NGOs – Need for Peoples Movement – Impact of Globalization

Module 3: Aspects of Human Development:

(15 Lectures)

Livelihoods – Child labour – Aging population – Poverty alleviation - Food Security – Environment – Displacement – Indigenous groups – Migration - Education and Health – Workers and Informal Sector -- Social Security – Human security – Conflict 19

Module 4 : Human Development Indices:

(15 Lectures)

Need for indices - GDP – Physical Quality of Life Index (PQLI), Disability Adjusted Life Years (DALY), Social Capability index – Human Development Index – Human Poverty Index – Gender Related Development Index – Multi-dimensionality of Poverty Index – Inequality adjusted Human Development Index – Global Gender Gap Index - Happiness Index

Reference Books -

1. Chelliah Raja J and R. Sudarshan (ed), Income Poverty and Beyond: Human Development In India, UNDP, Social Science Press, New Delhi, 1999
2. Comim F, M. Qizilbash and S. Alkire (eds), The Capability Approach: Concepts, Measures and Applications, Cambridge University Press, Cambridge, 2007
3. Costanza R, B. Low, E. Ostrom and James Wilson (ed), Institutions, Ecosystems And Sustainability, Lewis Publishers, Boca Raton, 2001
4. Dev S. Mahendra, P. Antony, V. Gayathri, and R P Mamgain, Social and Economic Security in India, Institute for Human Development, New Delhi, 2001
5. Fukuda-Parr S. and Shiva Kumar A K (ed), Readings in Human Development: Concepts, Measures and Policies for a Development Paradigm, Oxford University Press, New Delhi, 2003
6. Grinspun, A. (ed), Choices for the Poor, Lessons from National Poverty Strategies, UNDP, NewYork, 2001.
7. International Labour Organization, A Fair Globalization: Creating Opportunities for All, World Commission on the Social Dimension of Globalization, Geneva, 2004.
8. International Labour Organization: World Employment Reports.
9. Meier G M and Stiglitz J E (eds), Frontiers of Development Economics, Oxford University Press, New York, 2001
10. Sen Amartya, Development as Freedom, Oxford University Press, New Delhi, 1999.

Industrial Economics

Semester – IV

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR4IE2	Industrial Economics	04	100

Course Outcomes

COs	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Define market structure with the reference to the firms.	Remember
CO2	Explain overall development of industrial development with the help of technical know-how.	Understand
CO3	Examine the financial tools in industrial development.	Analyse
CO4	Elaborate performance and growth of Indian Industrial sector.	Create

Module 1: Theory of the Firm

(15 Lectures)

Firm Competition and Performance: Effects of Monopoly Power- Determinants of Firm Structure- Mergers- Horizontal and Vertical- Conglomerate Integration. Market Structure: Patterns of Market Structure- Determinants of Market Structure- Economies of Scale- Product Differentiation- Capital Requirements. Pricing Strategy in Oligopoly: Theories of Interdependence- Tacit Collusion and Price Leadership- Limit Pricing.

Module 2 : Technical Change and Financial Analysis :

(15 Lectures)

Advertising and Market Structure - Cost of Advertising - Invention and Innovation: Process and Product - Innovation Effects of Innovation on Welfare and Employment - Adoption and Diffusion of Innovation - Financial Analysis : Funds Flow - Cash Flow Statements - Balance Sheet - Income Statement (Profit and Loss Account) Investment Appraisal : Nature of Investment Decisions - Net Present Value Method - Internal Rate of Return- Discounted Payback Period

Module 3 :- Industrial Finance

(15 Lectures)

Sources of Finance: - Internal and External, Role, Nature – Volume and Types of Institutional Finance: IFCI, IDBI, IRCI, SFC, SIDC, SIDBI, ICICI – Commercial Banks Secured and Unsecured Loans.

Module 4: Indian Industry

(15 Lectures)

Industrial Growth: Trends in Industrial Growth in India-Industrial Location (factors) and Location Policy in India. Small-Scale Industries: Definition-Role-Policy-Issues and Performance. Public Enterprises in India: Performance and Constraints. Competitiveness of Indian Industries: Competition Policy and Foreign Direct Investment. 43

Reference Books

1. Ahluwalia I.J., Industrial Growth in India- Stagnation since the mid-sixties, Oxford Uni. Press, Delhi,1985 (Module 4)
2. Hay J and Morris D. J, Industrial Economics- Theory and Evidence, Oxford Uni. Press, (Latest Edition) (Module 2)
3. Koutsoyiannis A., Modern Microeconomics, ELBS/Macmillan, Hong Kong, 1985(Module1)
4. Martin Stephen, Industrial Economics- Economic Analysis and Public Policy, Macmillan Publishing Company, New York, 1988/latest edition (Module 1)
5. Mohanty, Binode,(eds.), Economic Development Perspectives, Vol. 3, Public Enterprises and Performance, Common Wealth Publishers, New Delhi,1991 (Module 4)
6. Mookherjee Dilip (eds.), Indian Industry-Policies and Performance, Oxford University Press, Delhi,1998 (Module 4)
7. Pandey I M., Financial Management, Vikas Pub. House Pvt. Ltd., New Delhi, 2000(Module3)
8. Shepherd W. C., The Economics of Industrial Organization, Prentice Hall, Inc., London,1985, (Modules 1 and 2)

Agricultural Development and Policy

Semester –IV

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR4ADP3	Agricultural Development and Policy	04	100

Course Outcomes

COs	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain various theories of agricultural development.	Understand
CO2	Analyse various initiatives by public sector time to time for agricultural development.	Analyse
CO3	Create awareness on contemporary debates in the area of agricultural products and market.	Create
CO4	Explain trends about agricultural development and its implications.	Evaluate

Module 1: Theories of Agricultural Development:

(15 Lectures)

Role of agriculture in a developing economy – **Agriculture Development under Planning Period** - Theories of agricultural development (Lewis, Schultz, Mellor, **Boserup's, Ranis – Fie**)

Module 2: Sustainable Agricultural Development and Food Security:

(15 Lectures)

Green Revolution – **Characteristics**, Impacts, **Sustainable Agriculture - Factor; National Mission for Sustainable Agriculture** - Measurement and strategies for sustainable development; Food security: Concept, measurement, magnitude, and critical evaluation of government policies -

Module 3: Competitiveness of Agriculture Products and Marketing:

(15 Lectures)

Measurement of efficiency of agricultural products in international markets; Efficiency of agricultural markets in India; Form and impact of government intervention in the markets and its effects on efficiency; Commodity markets: operation and likely impacts; Strategies for surviving in a globalizing world, Agricultural Price Policy

Module 4: History and Policies for Agricultural Development in India:

(15 Lectures)

Trends in production since 1950; Agriculture Policy :- **Objectives and Needs, National Agriculture Policy :- 2000 - Five Year Plan and Agriculture, Expenditure of Sector in Five Year Plan**, Trends in India's agricultural exports and imports and implications – **Policies of RBI on Agriculture**

Reference Books -

1. BasuKaushik, Analytical Development Economics, Oxford University Press, 1998 (Module1).
2. Bhalla G S., Globalization and Indian Agriculture, Volume 19 of the State of the Indian Farmer Series. Academic Foundation, 2004 (Module 3)
3. Dreze Jean and Amartya Sen, Hunger and Public Action, Oxford University Press, 1989 (Module 2)
4. Lewis Arthur, Economic Development with Unlimited supply of labour, Manchester School of Economics and Social Studies 22: 139-91, 1954 (Module 1)
5. Mellor J and Mudahar M, in Agriculture in Economic Development: Theories, findings and Challenges in Asian context in A Survey of Agricultural Economics Literature, Edited by Lee Martin. University of Minnesota Press, 1992 (Module 1)
6. Norton George and Jeffery Alwang, Introduction to Economics of Agricultural Development, Mc Graw Hills, New York, 1993 (Module 1)
7. Sawant S D (2002), Indian Agriculture: Past developments and policies for the future, Dantwala Monograph Series, No. 4, 2002 (Module 4)

Dissertation in Economics

Semester –IV

COURSE CODE	PAPER TITLE	CREDITS	MARKS
PAR4DE4	<u>Dissertation in Economics</u>	04	100

Course Outcomes

COs	After completing the course, student will able to:	Bloom Taxonomy Level (BTL)
CO1	<u>Explain</u> the basics of Research Methodology.	Understand
CO2	<u>Compare</u> the methods of data collection, analysis of data and presentation.	Analyse
CO3	<u>Decide</u> the advance methods of analysis and Index	Evaluate
CO4	<u>Compile</u> the testing of hypothesis and report writing	Create

Note : Theory to be taught to learners before the completion of Dissertation.

- | | |
|---|---------------|
| 1. Research Methodology: An Introduction. | (07 Lectures) |
| 2. Defying the research problem. | (08 Lectures) |
| 3. Research Design. | (07 Lectures) |
| 4. Sampling Design. | (08 Lectures) |
| 5. Methods of Data collection. | (07 Lectures) |
| 6. Research Techniques / Hypothesis. | (08 Lectures) |
| 7. Index | (07 Lectures) |
| 8. Conclusion and Recommendations | (08 Lectures) |

References:

1. Bhandarkar P.L., (1994), Samajik Sanshodhan Padhati, Himalaya Publication, New Delhi.
2. Dawson, Catherine (2002), Practical research methods, UBS Publishers, New Delhi.
3. Ghosh, B.N. (1992), Scientific methods and social research, Sterling Publishers Pvt. Ltd, New Delhi.
4. Gupta S P, (1987), Statistical methods, Sultan Chand and Sons, New Delhi.
5. Kothari R.C. (2008), Research methodology, methods and techniques, New Age International Publishers, New Delhi.
6. Krishnaswamy O.R.(1993), Methodology of research in social sciences, Himalaya publishing House, Mumbai.

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Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**

Revised Scheme of Evaluation for

**Continuous Assessments and
Semester End Examinations**

for

Under-graduate Programmes

under

Faculty of Arts

Under Autonomous status with

Choice Based Credit System (CBCS)

University of Mumbai

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Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**



Department of Hindi

Bachelor of Arts (B.A.) *Revised Syllabus for*

F.Y.B.A.-Hindi- Compulsory Paper

Choice Based Credit System (CBCS)

(60:40)

(To be implemented from Academic Year 2022-2023)

University of Mumbai

॥ ivaVa ivanayaona SaaoBato ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**

Department of Hindi

Bachelor of Arts (B.A.) Revised Syllabus for

Academic Yeas-2022-2023

Board Studies in Hindi

Sr. No.	Name	Designation	Position
1	Prof. (Dr.) S.K. Patil	Principal	Member (Faculty)
2	Dr. U.T. Bhandare	Head, Department of Hindi	Chairman
3	Dr. (Mrs.) G.S. Tanwar	Assistant Professor	Member (Faculty)
4	Dr. Bisen Jogendrasingh Motisingh	Professor	Member (Faculty)
5	Dr. Hubnath Pandey	Professor	Member (Faculty)
6	Dr. Balkavi Suranje	Professor	Member (Faculty)
7	Dr. Sunita M. Sakhare	Associate Professor	Member (Faculty)
8	Dr. Gharat Arjun Janu	Associate Professor	Member (Faculty)
9	Mr. V. N. Ekambe	Rotary President,	Member (Faculty)
10	(Mrs.). Kavita Shaema	Ex-P.G. Students	Member (Faculty)



University of Mumbai

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Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

Arts, Commerce and Science College,
New Panvel
Autonomous



Affiliated to University of Mumbai

CONTENT

Bachelor of Arts (B.A.) Revised Syllabus for Academic Yeas-2022-2023

Sr.No.	Class	Course Name of the paper	Paper No.	Paper Code	Credits
1.	FYBA	Compulsory Hindi	Compulsory	UAR1HNC	04
2.	FYBA	Compulsory Hindi	Compulsory	UAR2HNC	04
3.	FYBA	Optional Hindi	I	UAR1HN1	04
4.	FYAB	Optional Hindi	I	UAR1HN2	04

Revised Scheme of Examination
Faculty of Arts

(Under-graduate Programmes)

Choice Based Credit System (CBCS)

❖ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies / Test based on tutorials 4. Book Review /Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

(For Courses with Practical)

Sr. No.	Particular	Marks
01	Practical Examination	20 Marks
	Journal	05 Marks
	Viva Voce	05 Marks
	Laboratory Work	10 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Survey Project 2. Presentation and write up on the selected topics of the subjects / Case studies. 3. Test on Practical Skills 4. Open Book Test 5. Quiz	20 Marks

Question Paper Pattern

(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

B) Semester End Examination: 60 % 60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
1. There shall be five questions each of 12 marks (24 marks with internal options). 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: 1) It is noted that the concerned regulation of the College is amended and implemented to all Semesters i.e. Semester I to Semester VI to all undergraduate programmes, under faculty of Arts, Commerce and Science with effect from the academic year 2022 - 2023.

2) This revised scheme of evaluation is discussed in detail, finalised and accepted.

Semester-I

F.Y.B.A. Compulsory Hindi (अनिवार्य हिंदी)

Name of the Programme	:	B.A.
Name of the Course	:	Compulsory Hindi (अनिवार्य हिंदी)
Course Code	:	UAR1HNC
Total Lectures	:	60
Total Credit	:	04

List of Test Books

1. काव्य-कथा माला-संपादक-प्रोफेसर (डॉ.) उद्धव तुकाराम भंडारे,
डॉ.गीतिका तंवर, विद्यापीठ प्रकाशन, मुंबई

पाठ्यक्रम के लिए निर्धारित रचनाएँ

ईकाई-1

व्याख्यान-१५

१. बीती विभावरी जागरी-जयशंकर प्रसाद

२. जागो फिर एक बार-सूर्यकांत त्रिपाठी निराला
३. मैं नहीं चाहता चिर सुख-सुमित्रानन्दन पंत
४. कलगी बाजरे की-अज्ञेय
पाठ्यक्रम के लिए निर्धारित रचनाएँ

ईकाई-II

व्याख्यान-१५

१. भूल गलती-गजानन माधव म्क्तिबोध
२. दस्ताने-सर्वेश्वरदयाल सक्सेना
३. सन्नाटा-भवानीप्रसाद मिश्र
४. मैं चाहती हूँ-निर्मल प्तल
पाठ्यक्रम के लिए निर्धारित रचनाएँ

ईकाई-III

व्याख्यान-१५

१. ममता-जयशंकर प्रसाद
२. नमक का दारोगा-मंशी प्रेमचन्द
३. शरणागत-वृंदावनलाल वर्मा
४. परदा-यशपाल

व्याकरण

ईकाई-IV

व्याख्यान-१५

१. भारतीय संविधान सामान्य परिचय
२. पत्र-लेखन
 १. आवेदन पत्र
 २. शिकायत पत्र
 ३. संपादक के नाम पत्र
३. लिंग परिवर्तन
४. वचन परिवर्तन
५. पर्यायवाची शब्द
६. विलोम शब्द
७. भाववाचक शब्दों की रचना

प्रश्नपत्र का प्रारूप

Semester-I

F.Y.B.A. Compulsory Hindi (अनिवार्य हिंदी)

कुल अंक ६०

प्रश्न १. सन्दर्भ सहित व्याख्या:-	१५
अ) (ईकाई एक में से विकल्प के साथ)	
आ) (ईकाई दो में से विकल्प के साथ)	
प्रश्न २. दीर्घोत्तरी प्रश्न	१५
अ) (ईकाई एक और दो में से विकल्प के साथ)	
प्रश्न ३. दीर्घोत्तरी प्रश्न	१५
अ) (ईकाई तीन में से विकल्प के साथ)	
प्रश्न ४. व्याकरण	१५
अ) पत्र-लेखन (दो में से एक) अथवा संविधान की भूमिका	०५
आ) कोष्ठक की सूचनानुसार निम्नलिखित प्रश्नों के उत्तर लिखिए :	
१.लिंग परिवर्तन (चार में से दो)	०२
२.वचन परिवर्तन (चार में से दो)	०२
३.पर्यायवाची शब्द (चार में से दो)	०२
४.विलोम शब्द (चार में से दो)	०२
५.भाववाचक शब्दों की रचना (चार में से दो)	०२

आंतरिक मूल्यांकन

	४०
१. कक्षा परीक्षा	२०
२. इनमें से किन्हीं दो विषयों की परियोजना (प्रत्येक 10 अंक)	२०
१.समूह/व्यक्तिगत सर्वेक्षण परियोजना	
२.चयनित विषयों पर प्रस्तुतिकरण और लेखन	
३.ट्यूटोरियल पर आधारित केस स्टडी / टेस्ट	

४. पुस्तक समीक्षा / कविता प्रशंसा / ओपन बुक टेस्ट

५. प्रश्नमंजूषा

Semester-II

F.Y.B.A. Compulsory Hindi (अनिवार्य हिंदी)

Name of the Programme	:	B.A.
Name of the Course	:	Compulsory Hindi (अनिवार्य हिंदी)
Course Code	:	UAR2HNC

Total Lectures	:	60
Total Credit	:	04

List of Test Books

1. काव्य-कथा माला-संपादक-प्रोफेसर (डॉ.) उद्धव तुकाराम भंडारे,
डॉ.गीतिका तंवर, विद्यापीठ प्रकाशन, मुंबई

पाठ्यक्रम के लिए निर्धारित रचनाएँ

ईकाई-I

व्याख्यान-१५

१. मलबे का मालिक-मोहन राकेश
२. पिता-ज्ञानरंजन
३. पगडंडियों का जमाना-(व्यंग्य) हरिशंकर परसाई
४. भाषा और पर्यावरण-(कहानी) अन्पम मिश्र
पाठ्यक्रम के लिए निर्धारित रचनाएँ

ईकाई-II

व्याख्यान-१५

१. बच्चे गवाह नहीं होते-(कहानी) पंकज बिष्ट
२. सत्यजित राय के पूर्वज-जयनारायण प्रसाद
३. सलाम- (कहानी) ओमप्रकाश वाल्मीकि
४. घीसा (रेखाचित्र) महादेवी वर्मा
पाठ्यक्रम के लिए निर्धारित रचनाएँ

ईकाई-III

व्याख्यान-१५

१. वो हिम्मत करके पहले-जहीर क़रैशी
२. हस्ती के दोहे-हस्तीमल हस्ती
३. सूर्य का स्वागत-दृष्यंत कुमार
४. कविताओं वाली नदी-वन्दना टेटे

ईकाई-IV

व्याकरण

व्याख्यान-१५

१. अन्वाद
२. सूचना का अधिकार
३. वाक्य के भेद (रचना एवं अर्थ के आधार पर)
४. अशुद्धि शोधन १. शब्दगत २. वाक्यगत
५. उपसर्ग
६. प्रत्यय
७. म्हावरों तथा कहावतों का अर्थ एवं प्रयोग

प्रश्नपत्र का प्रारूप

Semester- II

F.Y.B.A. Compulsory Hindi (अनिवार्य हिंदी)

कुल अंक ६०
समय : २ घंटे

- | | | |
|-----------|---|----|
| प्रश्न १. | सन्दर्भ सहित व्याख्या:- | १५ |
| | अ) (ईकाई एक में से विकल्प के साथ) | |
| | आ) (ईकाई दो में से विकल्प के साथ) | |
| प्रश्न २. | दीर्घोत्तरी प्रश्न | १५ |
| | अ) (ईकाई एक और दो में से विकल्प के साथ) | |
| प्रश्न ३. | दीर्घोत्तरी प्रश्न | १५ |
| | अ) (ईकाई तीन में से विकल्प के साथ) | |

प्रश्न ४. व्याकरण	१५
अ) अनुवाद (दो में से एक) अथवा सूचना का अधिकार	०५
आ) कोष्ठक की सूचनानुसार निम्नलिखित प्रश्नों के उत्तर लिखिए :	
१. वाक्य के भेद (रचना एवं अर्थ के आधार पर) (चार में से दो)	०२
२. अशुद्धि शोधन: शब्दगत तथा वाक्यगत (चार में से दो)	०२
३. उपसर्ग (चार में से दो)	०२
४. प्रत्यय (चार में से दो)	०२
५. मुहावरों तथा कहावतों का अर्थ एवं प्रयोग (चार में से दो)	०२

आंतरिक मूल्यांकन

	४०
१. कक्षा परीक्षा	२०
२. इनमें से किन्हीं दो विषयों की परियोजना (प्रत्येक 10 अंक)	२०
१. समूह/व्यक्तिगत सर्वेक्षण परियोजना	
२. विषयों के चयनित विषयों पर प्रस्तुतिकरण और लेखन	
३. ट्यूटोरियल पर आधारित केस स्टडी / टेस्ट	
४. पुस्तक समीक्षा / कविता प्रशंसा / ओपन बुक टेस्ट	
५. प्रश्नमंजूषा	

सन्दर्भ ग्रंथ सूची

अन् क्र	किताब का नाम	लेखक/संपादक का नाम	प्रकाशक का नाम
१.	हिंदी व्याकरण	कामता प्रसाद गुरु	संस्करण-१९८४-नागरी प्रचारणी सभा, वाराणसी
२	हिंदी व्याकरण मीमांसा	काशीराम शर्मा	चतुर्थ संस्करण-२०१६, राधाकृष्ण प्रकाशन प्रा.लि, ७/३१, दरियागंज, नई दिल्ली
३.	हिंदी व्याकरण के नवीन क्षितिज	डॉ.रविन्द्र कुमार पाठक	दूसरा संस्करण-२०१२-भारतीय ज्ञानपीठ, दिल्ली-११०००३
४.	अभिनव व्यावहारिक पत्र-लेखन	डॉ.अनिल सिंह	पहला संस्करण-१९९९, ज्योति प्रकाशन, उल्लास नगर-४
५.	अकादमिक हिंदी व्याकरण	डॉ.भंडारे उद्धव	अकादमिक बुक इंडिया, दिल्ली ११००९०
६.	प्रयोजनमूलक हिंदी तथा भाषा कम्प्यूटिंग	संपादक डॉ.जमादार ए.एच.तथा प्रा.जान अहेमद के.जे.	अभिजित पब्लिकेशन, लातूर-४१३५१२
७.	सामयिक हिंदी निबन्ध	राजेन्द्र भटनागर	संस्करण- २०१०-सामयिक प्रकाशन, ३३२०-२१, जतवाडी, नेताजी सुभाष मार्ग, दरियागंज, नई दिल्ली-११०००२
८.	अच्छी हिंदी कैसे लिखें	संत समीर	पहला संस्करण-२०१३, प्रभात प्रकाशन, नई दिल्ली-११०००२

९. निबंधमाला: हिंदी
निबन्ध

डॉ.भंडारे उद्धव

अकादमिक बुक इंडिया, दिल्ली
११००९०

University of Mumbai

॥ ivaVa ivanayaona Saaobato ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**

Revised Scheme of Evaluation for

**Continuous Assessments and
Semester End Examinations**

for

Under-graduate Programmes

under

Faculty of Arts

Under Autonomous status with

Choice Based Credit System (CBCS)

University of Mumbai

॥ ivaVa ivanayaona Saaobato ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**



Department of Hindi

Bachelor of Arts (B.A.) *Revised Syllabus for*

F.Y.B.A.-Hindi- Optional -I

Choice Based Credit System (CBCS)

(60:40)

(To be implemented from Academic Year 2022-2023)

University of Mumbai

॥ ivaVa ivanayaona SaaoBato ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
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Department of Hindi

Bachelor of Arts (B.A.) Revised Syllabus for

Academic Yeas-2022-2023

Board Studies in Hindi

Sr. No.	Name	Designation	Position
1	Prof. (Dr.) S.K. Patil	Principal	Member (Faculty)
2	Dr. U.T. Bhandare	Head, Department of Hindi	Chairman
3	Dr. (Mrs.) G.S. Tanwar	Assistant Professor	Member (Faculty)
4	Dr. Bisen Jogendrasingh Motisingh	Professor	Member (Faculty)
5	Dr. Hubnath Pandey	Professor	Member (Faculty)
6	Dr.Balkavi Suranje	Professor	Member (Faculty)
7	Dr. Sunita M. Sakhare	Associate Professor	Member (Faculty)
8	Dr. Gharat Arjun Janu	Associate Professor	Member (Faculty)
9	Mr. V. N. Ekambe	Rotary President,	Member (Faculty)
10	(Mrs.). Kavita Shaema	Ex-P.G.Students	Member (Faculty)

Revised Scheme of Examination

Faculty of Arts (Under-graduate Programmes)

Choice Based Credit System (CBCS)

❖ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
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(For Courses with Practical)

Sr. No.	Particular	Marks
01	Practical Examination	20 Marks
	Journal	05 Marks
	Viva Voce	05 Marks
	Laboratory Work	10 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Survey Project 2. Presentation and write up on the selected topics of the subjects / Case studies. 3. Test on Practical Skills 4. Open Book Test 5. Quiz	20 Marks

Question Paper Pattern

(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

B) Semester End Examination: 60 % 60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
<ol style="list-style-type: none">1. There shall be five questions each of 12 marks (24 marks with internal options).2. All questions shall be compulsory with internal options.3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

☐ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: 1) It is noted that the concerned regulation of the College is amended and implemented to all Semesters i.e. Semester I to Semester VI to all undergraduate programmes, under faculty of Arts, Commerce and Science with effect from the academic year 2022 - 2023.

2) This revised scheme of evaluation is discussed in detail, finalised and accepted.

Semester-I

F.Y.B.A. Optional Hindi-I (ऐच्छिक हिंदी)

Name of the Programme	:	B.A.
Name of the Course	:	Optional Hindi (ऐच्छिक हिंदी)
Course Code	:	UAR1HN1
Total Lectures	:	60
Total Credit	:	04

List of Test Books

१. श्रेष्ठ हिंदी कहानियाँ (कहानी संग्रह) १९९०-२००० सं. उमा शंकर चौधरी/ जोती चावला, पीपल्स पब्लिशिंग हाँउस प्रा. लिमिटेड
२. शेष यात्रा-उषा प्रियंवदा (उपन्यास) राजकमल प्रकाशन,

पाठ्यक्रम के लिए निर्धारित कहानियाँ

ईकाई-1

व्याख्यान-१२

	<ol style="list-style-type: none"> १. शवयात्रा-ओमप्रकाश वाल्मीकि २. बाजार में रामधन-कैलास बनवासी ३. बिल्लियाँ बतियाती हैं- एस.आर.हरनोट 	
ईकाई-II		व्याख्यान-१२
	<ol style="list-style-type: none"> १. टोपी-संजय सहाय २. सिफैलोटस-रघुनन्दन त्रिवेदी ३. नालन्दा पर गिधद-देवेन्द्र 	
	पाठ्यक्रम के लिए निर्धारित उपन्यास- शेष यात्रा-उषा प्रियंवदा	
ईकाई-III		व्याख्यान-१२
	<ol style="list-style-type: none"> १. उषा प्रियंवदा का जीवन परिचय २. शेष यात्रा उपन्यास की कथावस्तु ३. शेष यात्रा उपन्यास-पात्र परिचय ४. औपन्यासिक तत्वों के आधार पर चर्चा एवं अन्य प्रश्नोत्तर 	
ईकाई-IV		व्याख्यान-१२
	<ol style="list-style-type: none"> १. शेष यात्रा उपन्यास की समस्याएं २. शेष यात्रा उपन्यास में प्रवासी जीवन ३. शेष यात्रा उपन्यास में जीवन संघर्ष ४. शेष यात्रा उपन्यास में अस्तित्व की कशमकश 	
ईकाई-V	व्याकरण	व्याख्यान-१२
	<ol style="list-style-type: none"> १. संज्ञा २. सर्वनाम ३. विशेषण ४. क्रिया ५. क्रिया विशेषण ६. लिंग 	

प्रश्नपत्र का प्रारूप
Semester-I
F.Y.B.A. Optional Hindi-I (ऐच्छिक हिंदी)

कुल अंक ६०

समय : २ घंटे

प्रश्न १. सन्दर्भ सहित व्याख्या (ईकाई एक और दो में से विकल्प के साथ)	१२
प्रश्न २. सन्दर्भ सहित व्याख्या (ईकाई तीन और चार में से विकल्प के साथ)	१२
प्रश्न ३. दीर्घोत्तरी प्रश्न (ईकाई एक और दो में से विकल्प के साथ)	१२
प्रश्न ४. दीर्घोत्तरी प्रश्न (ईकाई तीन और चार में से विकल्प के साथ)	१२
प्रश्न ५. कोष्ठक की सूचनानुसार निम्नलिखित प्रश्नों के उत्तर लिखिए	१२
१. संज्ञा (चार में से दो)	२
२. सर्वनाम (चार में से दो)	२
३. विशेषण (चार में से दो)	२
४. क्रिया (चार में से दो)	२
५. क्रिया विशेषण (चार में से दो)	२
६. लिंग (चार में से दो)	२

आंतरिक मूल्यांकन ४०

१. कक्ष परीक्षा	२०
२. इनमें से किन्हीं दो विषयों की परियोजना (प्रत्येक २० अंक)	२०

१.समूह/व्यक्तिगत सर्वेक्षण परियोजना

२. चयनित विषयों पर प्रस्तुतिकरण और लेखन
३. ट्यूटोरियल पर आधारित केस स्टडी / टेस्ट
४. पुस्तक समीक्षा / कविता प्रशंसा / ओपन बुक टेस्ट
५. प्रश्नमंजूषा

Semester-II

F.Y.B.A. Optional Hindi-I (ऐच्छिक हिंदी)

Name of the Programme	:	B.A.
Name of the Course	:	Optional Hindi (ऐच्छिक हिंदी)

Course Code	:	UAR2HN1
Total Lectures	:	60
Total Credit	:	04

List of Test Books

१. गद्य विविधा
२. भगदड-डॉ.दामोदर खडसे (उपन्यास)
प्रथम संस्करण-१९९६, राधा कृष्ण प्रकाशन, दिल्ली

पाठ्यक्रम के लिए निर्धारित रचनाएँ

ईकाई-I

व्याख्यान-१२

१. रज़िया (रेखाचित्र) रामवृक्ष बेनीपुरी
२. ऋषिकेश मुखर्जी के साथ ढाई दिन (संस्मरण)
मनोहर शाम जोशी
३. पहला सफेद बाल (व्यंग्य) हरिशंकर परसाई

ईकाई-II

व्याख्यान-१२

१. ऋण जल धन जल (रिपोर्टाज अंश) फणीश्वरनाथ रेणु

२. पत्र मणि पुतुल के नाम (निबन्ध) कुबेरनाथ राय
 ३. आवारा मसीहा (जीवनी अंश) विष्णु प्रभाकर
- पाठ्यक्रम के लिए निर्धारित उपन्यास- भगदड़- डॉ.दामोदर खडसे

ईकाई-III

व्याख्यान-१२

१. डॉ. दामोदर खडसे का जीवन परिचय
२. भगदड़ उपन्यास की कथावस्तु
३. औपन्यासिक तत्वों के आधार पर चर्चा
४. भगदड़:उपन्यास का उद्देश्य

ईकाई-IV

व्याख्यान-१२

१. भगदड़ उपन्यास के पात्रों का परिचय
२. भगदड़ उपन्यास की समस्याएँ
३. महानगर में उपन्यास में महानगरीय बोध
४. भगदड़ उपन्यास की भाषा शैली

ईकाई-V

व्याकरण

व्याख्यान-१२

१. संबंधसूचक
२. समुच्चयबोधक
३. विस्मयाधिबोधक
४. काल
५. वचन
६. समास

प्रश्नपत्र का प्रारूप

Semester-II

F.Y.B.A. Optional Hindi-I (ऐच्छिक हिंदी)

कुल अंक ६०

समय : २ घंटे

- | | |
|--|----|
| प्रश्न १. सन्दर्भ सहित व्याख्या (ईकाई एक और दो में से विकल्प के साथ) | १२ |
| प्रश्न २. सन्दर्भ सहित व्याख्या (ईकाई तीन और चार में से विकल्प के साथ) | १२ |
| प्रश्न ३. दीर्घोत्तरी प्रश्न (ईकाई एक और दो में से विकल्प के साथ) | १२ |

प्रश्न ४. दीर्घोत्तरी प्रश्न (ईकाई तीन और चार में से विकल्प के साथ)	१२
प्रश्न ५. कोष्ठक की सूचनानुसार निम्नलिखित प्रश्नों के उत्तर लिखिए	१२
१. संबंधसूचक (चार में से दो)	२
२. समुच्चयबोधक (चार में से दो)	२
३. विस्मयाधिबोधक (चार में से दो)	२
४. काल (चार में से दो)	२
५. वचन (चार में से दो)	२
६. समास (चार में से दो)	२

आंतरिक मूल्यांकन

	४०
१. कक्षा परीक्षा	२०
२. इनमें से किन्हीं दो विषयों की परियोजना(प्रत्येक 10 अंक)	२०
१.समूह/व्यक्तिगत सर्वेक्षण परियोजना	
२.चयनित विषयों पर प्रस्तुतिकरण और लेखन	
३.ट्यूटोरियल पर आधारित केस स्टडी / टेस्ट	
४.पुस्तक समीक्षा / कविता प्रशंसा / ओपन बुक टेस्ट	

५. प्रश्नमंजूषा

सन्दर्भ ग्रंथ सूची

अन् क्र	किताब का नाम	लेखक/संपादक का नाम	प्रकाशक का नाम
१.	श्रेष्ठ हिंदी कहानियाँ १९९० -२०००	उमा शंकर चौधरी/ जोति चावला	पीपुल्स पब्लिकेशन हॉउस प्रा.लि
२	भगदड	डॉ.दामोदर खडसे	प्रथम संस्करण-१९९६, राधा कृष्ण प्रकाशन दिल्ली
३.	शेष यात्रा- उपन्यास	उषा प्रियंवदा	राजकमल प्रकाशन
४.	हिंदी उपन्यास साहित्य की परंपरा साठोत्तरी उपन्यास	डॉ.पारुकांत देसाई	२००२, चिंतन प्रकाशन कानपूर
५.	अकादमिक हिंदी व्याकरण	डॉ.भंडारे उद्धव	अकादमिक बुक इंडिया, दिल्ली १९००९०
६.	आधुनिक हिंदी साहित्य को अहिन्दी लेखकों का योगदान	डॉ.विलास गुप्ते	प्रथम संस्करण, १९७३, नवगीत प्रकाशन, मुंबई

७.	हिंदी उपन्यास कला	प्रताप नारायण टंडन	१९६५, हिंदी समिति सुचना विभाग, लखनऊ
८.	हिंदी साहित्य युग और प्रवृत्तियाँ	डॉ.शिवकुमार शर्मा	१२ वां. संस्करण, १९९०, अशोक प्रकाशन दिल्ली
९.	निबंधमाला: हिंदी निबन्ध	डॉ.भंडारे उद्धव	अकादमिक बुक इंडिया, दिल्ली १९००९०

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**



**Scheme of Evaluation for
Continuous Assessments and Semester
End Examinations
for
Under-graduate
Programmes
under
Faculty of Arts
Subject: Hindi**

***Under Autonomous status with Credit
Based Semester and Grading System***

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

Arts, Commerce and Science College, New Panvel

Autonomous

Affiliated to University of Mumbai



DEPARTMENT OF HINDI

Bachelor of Arts (B.A.) Revised Syllabus For

S.Y.B.A. – Hindi- Paper No - II and III

Choice Based Credit Grading and Semester System (CBCGS)

(75:25)

With effect from the Academic Year 2020-2021 to 2022-2023

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

चांगू काना ठाकूर कला, वाणिज्य और विज्ञान महाविद्यालय, स्वायत्त
नवीन पनवेल



हिंदी विभाग

बी . ए . स्नातक हिन्दी

पाठ्यक्रम

शैक्षणिक वर्ष २०२०-२०२१

हिन्दी अध्ययन मंडल

अनु . क	अध्यापक का नाम	पद	अधिष्ठान
१	डॉ . भंडारे उद्धव तुकाराम	अध्यक्ष, हिंदी विभाग	अध्यक्ष
२	डॉ . सौ . जी . एस . तँवर	सहयोगी प्राध्यापक	सदस्य
३	डॉ . बीसेन जोगेंद्रसिंग मोतिसिंग	प्रोफेसर	सदस्य
४	डॉ . हूवनाथ गोरखनाथ पाण्डेय	सहयोगी प्राध्यापक	सदस्य
५	डॉ . घरत अर्जुन जानू	पूर्व प्राध्यापक	सदस्य
७	डॉ . विजयप्रसाद के . अवस्थी	सहयोगी प्राध्यापक	सदस्य
८	श्री . विमल मिश्रा	नवभारत टाइम्स, मुंबई	सदस्य
६	प्रा . महेश श्रीराम गोडवोले	पूर्व स्नातकोत्तर विद्यार्थी	सदस्य
९	डॉ . अमित मिश्रा	पी-एच . डी . विद्यार्थी	सदस्य

॥ विद्या विनयेन शोभते ॥
Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)

Affiliated to University of Mumbai

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Choice Based Credit Grading and Semester System (CBCGS) (75:25)
With effect from the Academic Year 2019-20

Faculty of Humanities

Semester III & Semester IV

Guidelines

Syllabus Structure:

1. In S.Y.B.A. Hindi Paper II (CBCGS) in Semester III and Semester IV, there will be one paper each with 4 Credits in each Semester.
2. In S.Y.B.A. Hindi Paper III (CBCGS) in Semester III and Semester IV, there will be one Paper each with 4 credits in each semester.

Scheme of Examination
(Under-graduate Programmes)

Credit Based Evaluation System

❖ **Scheme of Examination**

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 25% marks in the first component by conducting the Semester End Examinations with 75% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 25 %**25 Marks*****(For Courses without Practical)***

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks

Question Paper Pattern***(Periodical Class Test for the Courses at Under Graduate Programmes)***

Maximum Marks: 20

Questions to be set: 02

Duration: 40 Minutes

All Questions are Compulsory

GIRDAC

Question No	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 75 %**75 Marks**

- Duration: The examination shall be of $2\frac{1}{2}$ hours duration.

Question Paper Pattern**Theory question paper pattern**

1. There shall be five questions each of 15 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, and the allocation of marks depends on the weightage of the unit.

❖ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 10 out of 25) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 30 Out of 75) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: All other rules regarding Standard of Passing, ATKT, etc, will be as per those decided by the Faculty of Humanities passed by the Academic Council from time to time

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

**ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Affiliated to University of Mumbai

CONTENT

Programme - Bachelor of Arts (B.A.)

Semester-III

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	मध्ययुगीन तथा आधुनिक कविता Medieval and Modern Poetry	II	UAR3HN2	03
2	S.Y.B.A.	आधुनिक गद्य Modern Prose	III	UAR3HN3	03

Semester-IV

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	मध्ययुगीन तथा आधुनिक कविता Medieval and Modern Poetry	II	UAR4HN2	03
2	S.Y.B.A.	आधुनिक गद्य Modern Prose	III	UAR4HN3	03

पाठ्यक्रम की प्रस्तावना:

हिंदी में कला स्नातक (बैचलर ऑफ आर्ट्स) (बी.ए.हिन्दी), चांगू काना ठाकूर कला, वाणिज्य और विज्ञान महाविद्यालय, नवीन पनवेल (स्वायत्त) के हिंदी विभाग का स्नातक पाठ्यक्रम है। इस पाठ्यक्रम के माध्यम से लागू किया जाने वाला **Choice Based Credit Grading and Semester System (CBCGS)** छात्रों को मूल सिद्धांतों में मजबूत आधार विकसित करने और उनकी पसंद और क्षमता के अनुसार विषयों में विशेषज्ञता हासिल करने का अवसर देंगे।

यह पाठ्यक्रम स्नातक विद्यार्थियों को बी.ए.हिन्दी डिग्री पाठ्यक्रम के द्वितीय वर्ष में हिंदी का ठोस ज्ञान और समझ प्रदान करने के लिए तैयार किया गया है। इस पाठ्यक्रम का लक्ष्य हिंदी के अध्ययन को यथासंभव प्रेरक, रोचक और प्रासंगिक बनाना है। अकादमिक और सामाजिक पाठ्यक्रमों में विद्यार्थी हिंदी पढ़ने में सक्षम हो, इस उद्देश्य को ध्यान में रखकर यह पाठ्यक्रम तैयार किया गया है। साथ ही विद्यार्थियों का हिंदी के विभिन्न क्षेत्रों में परिचय करवाने और उनकी रुचि विकसित करने के उद्देश्य से यह पाठ्यक्रम तैयार किया गया है।

इस पाठ्यक्रम को पढ़ने वाले विद्यार्थियों को हिंदी के विभिन्न पहलुओं की समझ विकसित करनी होगी। वैचारिक समझ, प्रायोगिक कौशल का विकास, शैक्षणिक और व्यावहारिक कौशल के लिए योग्यता विकसित करना, बहुआयामी तकनीकियों के बुनियादी विचारों और समझ को ग्रहण करना, मूलभूत भाषा प्रक्रिया को समझना और सामाजिक और भाषाई ज्ञान के अनुप्रयोग के लिए तर्कपूर्ण तत्परता आदि महत्वपूर्ण पहलू हैं।

पाठ्यक्रम के उद्देश्य:

१. हिंदी के प्रति उत्साह को बनाए रखते हुए हिंदी में आधारभूत तथ्यों और अवधारणाओं की समझ को बढ़ावा देना।
२. विद्यार्थियों को अकादमिक और सामाजिक विषयों में हिंदी पढ़ने में सक्षम बनाना।
३. विद्यार्थियों को हिंदी के विभिन्न उभरते नए क्षेत्रों से परिचित करवाना और भविष्य में उनके अध्ययन में उनकी व्यापकता और हिंदी भाषा के विभिन्न क्षेत्रों में उनके उपयोग से अवगत कराना।
४. छात्रों में समस्या निवारण कौशल विकसित कराना।
५. छात्रों को हिंदी के प्रतिनिधि गद्यकारों एवं कवियों से परिचित कराना।
६. छात्रों में राष्ट्र के प्रति प्रेम एवं सामाजिक प्रतिबद्धता की भावना विकसित करना।
७. छात्रों को हिंदी के समुच्चारित शब्दों (शब्दयुग्मों) से परिचित कराकर हिंदी भाषा की अर्थभेद की सूक्ष्म छाटाओं से अवगत कराना।
८. छात्रों में हिंदी भाषा के श्रवण, पठन तथा लेखन की क्षमताओं को विकसित कराना।
९. छात्रों की विचार क्षमता तथा कल्पनाशीलता को बढ़ावा देना।
१०. सैद्धांतिक ज्ञान को व्यावहार में लागू करते हुए विश्लेषणात्मक कौशल और सूक्ष्म चिंतन विकसित कराना।
११. हिंदी के ज्ञान का निर्माण करना और उसे लागू करना और हिंदी तथा अन्य विषयों के बीच संबंधों की सराहना करना।
१२. छात्रों में हिंदी साहित्य के प्रति अभिरूचि संवर्धित करना।
१३. विद्यार्थियों में भाषा कौशल का विकास करना।
१४. विद्यार्थियों के मन में राष्ट्रभाषा हिंदी के प्रति सम्मान व प्रेम का निर्माण।
१५. स्वभाषा के प्रति गौरव बोध का निर्माण।
१६. भारतीय संस्कृति की समझ का विकास।

पाठ्यक्रम का परिणाम:

१. पाठ्यक्रम की समाप्ति पर विद्यार्थियों में अग्रलिखित योग्यता विकसित हो जानी चाहिए।
२. हिंदी की विभिन्न विधाओं के बारे में सुसंगत और प्रभावी समझ निर्माण होनी आवश्यक है।
३. हिंदी के क्षेत्र में विद्यार्थियों की समझ और रुचि विकसित होनी चाहिए।
४. व्यावहारिक हिंदी और इसके व्यावसायिक अनुप्रयोग में बुनियादी कौशल विकसित करना।
५. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक, सांस्कृतिक विश्वदृष्टि का विकास होगा।
६. विद्यार्थियों में रसास्वाद के कौशल का विकास होगा।
७. हिंदी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा तथा ज्ञानात्मक आधार पुष्ट होगा।

॥ विद्या विनयेन शोभते ॥
Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)

Affiliated to University of Mumbai



Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Semester III

Program S.Y.B.A.

Course: Hindi

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	मध्ययुगीन तथा आधुनिक कविता Medieval and Modern Poetry	II	UAR3HN2	03

शैक्षणिक उद्देश्य-

१. मध्यकालीन एवं आधुनिक कवियों के व्यक्तित्व एवं कृतित्व का परिचय।
२. मध्यकालीन एवं आधुनिक कविता की समझ एवं समीक्षा का विकास।
३. आधुनिक कवि एवं उनकी कृतियों का परिचय।
४. आधुनिक साहित्य की समझ एवं समीक्षा का विकास।
५. रचनात्मकता की प्रवृत्ति का विकास।

परिणाम-

१. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनैतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
२. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
३. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा।
४. ज्ञानात्मक आधार पुष्ट होगा।

अध्ययन पद्धति:

१. व्याख्यान तथा विश्लेषण।
२. सस्वर काव्य पाठ।
३. गद्य एवं काव्य को भावानुसार पढ़ना।
४. ग्रंथालयों के माध्यम से संबंधित लेखकों, विषयों को मौलिक कृतियों से छात्रों का परिचय कराना।

Semester- III
S.Y.B.A. (पेपर नंबर II)
मध्ययुगीन तथा आधुनिक कविता

Name of the Programme	: B.A.
Name of the Course	: मध्ययुगीन तथा आधुनिक कविता
Course Code	: UAR3HN2
Total Lectures	: 60
Total credit	: 04

List of Text Books

१. मध्ययुगीन तथा आधुनिक कविता
संपादक- डॉ. भुरे बालाजी श्रीपती एवं डॉ. भंडारे उद्धव तुकाराम
२. यशोधरा- मैथिलीशरण गुप्त
लोकभारती प्रकाशन
पहली मंजिल, दरबारी बिल्डिंग, महात्मा गांधी मार्ग, इलाहाबाद-211001

प्राठ्यक्रम के लिए निर्धारित कवि

इकाई -१

व्याख्यान -१०

१. संत नामदेव :-

१. हरि नाम हीरा हरि नाम हीरा ।-----हरि नाम नामदेव उतरै पारा ॥ 4 ॥
२. सफल जनमु मो कउ गुर कीना ।-----जग जीवन सिउ जीउ समानां ॥ 3 ॥

२. कबीरदास

१. गुरुदेव कौ अंग
१. सतगुरु की महिमा अनंत -----अनंत दिखावणहार ॥
२. पीछें लागा जाइ था-----दीपक दीया हाथि ॥
३. कबीर गुरु गरवा मिल्या, -----, नाँव धरौगे कौण ॥
४. जाका गुरु भी अंधला, -----, दून्युं कूप पड़ंत ॥
२. माया कौ अंग
५. कबीर माया मोहिनी, -----, नहीं तो करती भाँड़ ॥
६. माया मुई न मन मुवा, -----, यौं कहि गया कबीर ॥

इकाई -२

व्याख्यान -१०

३. रहीम

१. कदली, सीप, भुजंग-सुख -----, तैसोई फल दीन ॥
२. तरुवर फल नहीं खात हैं, -----, संपति सँचहि सुजान ॥

४. तुलसीदास

१. शबरी प्रसंग

५. संत मीराबाई

१. मेरे तो गिरधर गोपाल, दूसरो न कोई ।-----दधि मथि भरत काढ़ि लियो, डारि दयी छोई ॥
२. हे री मैं तो दरद दिवानी, मेरा दरद न जाणै कोय ।-----मीरों की प्रभु पीर मिटै जब बैद सॉवलिया होय ॥

६. सूरदास

१. निर्गुन कौन देश को वासी ?-----सुनत मौन है रह्यो ठग्यो सो सूर सबै मति नासी ॥
२. ऊधो! जोग सुन्यो हम दुर्लभ ।-----सुर स्याम ज्यों देत हमें सुख, त्यों तुमको सोउ मोहत ॥

इकाई -३

व्याख्यान -१०

७. बिहारी

१. मेरी भव-बाधा हरौ, -----स्यामु हरित-दुति हाई ॥
२. नहीं परागु नहीं मधुर मधु -----, आगें कौन हवाल ॥
३. या अनुरागी चित्त की -----, त्यों त्यों उज्वलु हाइ ॥
४. बड़े न हूँ गुननु विनु -----, गहनौ गदयौ न जाइ ॥

५. वतरस-लालच लाल की-----, दैन कहैं नटि जाइ ॥
८. संत रविदास ११३
१. अब कैसे छूटै, राम नाम रट लागी ॥ टेक ।-----
प्रभु जी तुम स्वामी हम दासा, ऐसी भक्ति करै रैदासा ॥ ५ ॥
२. यशोधरा- मैथिलीशरण गुप्त (खण्ड काव्य)

इकाई -४
९.

पृष्ठ १९ से ५९

व्याख्यान -३०
४१

GIRDAC

॥ विद्या विनयेन शोभते ॥
Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
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Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Semester IV

Program S.Y.B.A.

Course: Hindi

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	मध्ययुगीन तथा आधुनिक कविता Medieval and Modern Poetry	II	UAR4HN2	03

Semester- IV

S.Y.B.A.

मध्ययुगीन तथा आधुनिक कविता (पेपर नंबर II)

Name of the Programme	: B.A.
Name of the Course	: मध्ययुगीन तथा आधुनिक कविता
Course Code	: UAR4HN2
Total Lectures	: 60
Total credit	: 04

List of Text Books

१. साये में धूप - दुष्यन्त कुमार

राधाकृष्ण प्रकाशन प्राइवेट लिमिटेड

7/31 अंसारी मार्ग, दरियागंज, नई दिल्ली- ११०००२

२. मध्ययुगीन तथा आधुनिक कविता

संपादक- डॉ. भुरे बालाजी श्रीपती, डॉ. भंडारे उद्धव तुकाराम

प्राठ्यक्रम के लिए निर्धारित कविताएँ

इकाई -१

व्याख्यान -१५

१. कहाँ तो तय था चिरागों ----- नहीं शहर के लिए।
२. भूख है तो सब कर, ----- जेरे बहस ये मुददआ।
३. हो गई है पीर पर्वत-सी ----- गंगा निकलनी चाहिए।

इकाई -२

व्याख्यान -१५

१. सिर्फ हंगामा खड़ा ----- ये सूरत बदलनी चाहिए।
२. कैसे आकाश में ----- तबीयत से उछालो यारो।
३. सामान कुछ नहीं है ----- पास कोई संविधान है।

प्राठ्यक्रम के लिए निर्धारित कविताएँ

इकाई -३

व्याख्यान -१०

१. हिमाद्री तुंग : जयशंकर प्रसाद
२. नदी के द्वीप : अज्ञेय

इकाई -४

व्याख्यान -१०

१. कवि कुछ ऐसी तान सुनाओ : बालकृष्ण शर्मा नवीन
२. मारे जाएँगे : राजेश जोशी
३. सड़क दर सड़क : भुवनेश्वर उपाध्याय

इकाई -४

व्याख्यान -१०

१. सदियों का संताप : ओमप्रकाश वाल्मीकि
२. किसान : मैथिलिशरण गुप्त

अनु क्र	किताब का नाम	संदर्भ ग्रंथ सूची : लेखक का नाम	प्रकाशक का नाम
१.	साये में धूप -	दुष्यन्त कुमार	राधाकृष्ण प्रकाशन प्राइवेट लिमिटेड 7/31 अंसारी मार्ग दरियागंज नई दिल्ली- 110002
२.	यशोधरा-	मैथिलीशरण गुप्त	लोकभारती प्रकाशन पहली मंजिल, दरवारी विल्डिंग, महात्मा गांधी मार्ग, इलाहाबाद-२११००1
३.	आधुनिक प्रतिनिधि कवि	डॉ. हरिचरण शर्मा	मलिक एण्ड कंपनी ३३७, चौड़ा रास्ता, जयपुर-३०२००३
४.	मध्ययुगीन हिन्दी काव्य	संपादक-डॉ. दिलीप के मेहरा	ज्ञान प्रकाशन १२८/९०, 'G' ब्लॉक किदवई नगर, कानपुर-२०८०११
५.	आधुनिक हिन्दी काव्य में स्वप्न- विधान	डॉ. अनीता	निर्मला पब्लिकेशन्स A-१३९ गली नं. ३, कबीर नगरशाहदरा दिल्ली-९४
६.	कबीर ग्रंथावली	डॉ. एल. बी. राम 'अनंत'	रीगल बुक डिपो, नई सडक, दिल्ली-६
७.	मीरा पदावली	सं. नीलोत्पल	प्रकाशन प्रभात पेपरवैक्स ४/१९ आसफ अली रोड, नई दिल्ली-११०००२
८.	रहीम ग्रंथावली	संपादक विद्यानिवास मिश्र, गोविन्द रजनीश	वाणी प्रकाशन, ४६९५, २१-ए, दरियागंज, नई दिल्ली-११०००२
९.	बिहारी रत्नाकर	श्री जगन्नाथदास 'रत्नाकर'	प्रकाशक- प्रकाशन संस्थान ४२६८-B/३, अंसारी रोड, दरियागंज नई दिल्ली-११०००२
१०.	कबीर	हजारीप्रसाद द्विवेदी	राजकमल प्रकाशन प्रा. लि. १-बी, नेताजी सुभाष मार्ग नई दिल्ली-११०००२
११.	रैदास रचनावली	गोविंद रजनीश	अमरसत्य प्रकाशन १०९, ब्लॉक बी, प्रीत विहार दिल्ली-११००९२
१२.	कबीर ग्रंथावली	डॉ. राजेश्वरप्रसाद चतुर्वेदी	प्रकाशन केंद्र रेलवे क्रॉसिंग, सीतापुर रोड, लखनऊ-२२६०२०

॥ विद्या विनयेन शोभते ॥
Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)

Affiliated to University of Mumbai



Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Program S.Y.B.A.

Semester III

Course: Hindi

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	आधुनिक गद्य Modern Prose	III	UAR3HN3	03

शैक्षणिक उद्देश्य-

१. आधुनिक कथाकारों एवं उनकी कृतियों का परिचय।
२. रचनात्मकता की प्रवृत्ति का विकास।
३. आधुनिक साहित्य की समझ एवं समीक्षा का विकास।
४. कहानी एवं उपन्यास विधा का क्रमिक विकास।
५. आँचलिकता को समझना तथा आँचलिक उपन्यासों के विकासक्रम को समझना।
६. विभिन्न कहानीकारों के व्यक्तित्व एवं कृतित्व को जानना।
७. जगदीशचंद्र माथुर के व्यक्तित्व एवं कृतित्व को जानना।

परिणाम-

१. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनैतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
२. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
३. ज्ञानात्मक आधार पुष्ट होगा।

अध्ययन पद्धति:

१. व्याख्यान तथा विश्लेषण।
२. गद्य एवं काव्य का भावानुसार पढ़ना।
३. ग्रंथालयों के माध्यम से संबंधित लेखकों, विषयों को मौलिक कृतियों से छात्रों का परिचय कराना।

Semester- III
S.Y.B.A.
आधुनिक गद्य (पेपर नंबर III)

Name of the Programme	: B.A.
Name of the Course	: आधुनिक गद्य (पेपर नंबर III)
Course Code	: UAR3HN3
Total Lectures	: 60
Total credit	: 04

List of Text Books

१. बाबा बटेसरनाथ : बाबा नागार्जुन (उपन्यास)

राजकमल प्रकाशन

१-बी, नेताजी सुभास मार्ग, नई दिल्ली-११०००२

२. कहानी किरीट: (चयनित कहानियाँ)

संपादक डॉ. उषा पाठक/ डॉ. अचला पाण्डेय

राधाकृष्ण प्रकाशन, प्रायवेट लिमिटेड

7/31 अंसारी मार्ग, दरियागंज, नई दिल्ली-110002

प्राठ्यक्रम के लिए निर्धारित रचना

इकाई -१			व्याख्यान -१०
१.	बाबा बटेसरनाथ	: बाबा नागार्जुन	
इकाई -२			व्याख्यान -१०
१.	बाबा बटेसरनाथ	: बाबा नागार्जुन	
इकाई -३			व्याख्यान -१०
१.	बाबा बटेसरनाथ	: बाबा नागार्जुन	

प्राठ्यक्रम हेतु निर्धारित कहानियाँ

इकाई -४			व्याख्यान -१०
१.	उसने कहा था	: चन्द्रधर शर्मा 'गुलेरी'	
२.	कफ़न	: मुंशी प्रेमचंद	
इकाई -५			व्याख्यान -१०
१.	चीफ़ की दावत	: भीष्म साहनी	
२.	वापसी	: उषा प्रियम्बदा	
इकाई -६			व्याख्यान -१०
१.	पिता	: ज्ञानरंजन	
२.	सिलिया	: सुशीला टाकभौरे	

॥ विद्या विनयेन शोभते ॥
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Syllabus

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With effect from the Academic Year 2020-21

Program S.Y.B.A.

Semester IV

Course: Hindi

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1	S.Y.B.A.	आधुनिक गद्य Modern Prose	III	UAR4HN3	03

Semester- IV

S.Y.B.A. आधुनिक गद्य (पेपर नंबर III)

Name of the Programme	: B.A.
Name of the Course	: आधुनिक गद्य (पेपर नंबर III)
Course Code	: UAR4HN3
Total Lectures	: 60
Total credit	: 04

List of Text Books

१ .कोणार्क : जगदीश चन्द्र माथुर (नाटक)

राधाकृष्ण प्रकाशन प्राइवेट लिमिटेड

जी-१७, अमृतपुरी, दिल्ली-११००५१

२ .रंग-कलश: (चयनित एकांकी)

संपादक डॉ .श्रीहरि त्रिपाठी/नवीन चन्द पटेल

राजकमल प्रकाशन, नई दिल्ली, प्रायवेट लिमिटेड, १-नेताजी सुभाष मार्ग,

दरियागंज- नई दिल्ली-११०००२

प्राढ्यक्रम के लिए निर्धारित रचना

इकाई -१			व्याख्यान -१०
१.	कोणार्क	: जगदिशचंद्र माथुर	
इकाई -२			व्याख्यान -१०
१.	कोणार्क	: जगदिशचंद्र माथुर	
इकाई -३			व्याख्यान -१०
१.	कोणार्क	: जगदिशचंद्र माथुर	

प्राढ्यक्रम हेतु निर्धारित एकांकी

इकाई -४			व्याख्यान -१०
१.	औरंगजेब की आखिरी रात	: डॉ. रामकुमार वर्मा	
२.	अंडे के छिलके	: मोहन राकेश	
इकाई -५			व्याख्यान -१०
१.	कालपुरुष और और अजन्ता की नर्तकी	: लक्ष्मीनारायण लाल	
२.	भोर का तारा	: जगदीशचंद्र गुप्त	
इकाई -६			व्याख्यान -१०
१.	जान से प्यारे	: ममता कालिया	
२.	सूखी डाली	: उपेन्द्रनाथ 'अशक'	

GIRDAC

संदर्भ ग्रंथ सूची :

आधुनिक गद्य (पेपर नंबर III)

अनु क्र	किताब का नाम	लेखक का नाम	प्रकाशक का नाम
१.	कोणार्क :	जगदीश चन्द्र माथुर	राधाकृष्ण प्रकाशन प्राइवेट लिमिटेड जी-१७, जगतपुरी, दिल्ली-११००५१
२.	रंग-कलश:	संपादक डॉ .श्रीहरि त्रिपाठी/नवीन चन्द्र पटेल	राजकमल प्रकाशन, नई दिल्ली, प्रायवेट लिमिटेड, १-नेताजी सुभाष मार्ग, दरियागंज-नई दिल्ली-११०००२
३.	बाबा बटेसरनाथ :	बाबा नागार्जुन	राजकमल प्रकाशन १-बी, नेताजी सुभास मार्ग, नई दिल्ली-११०००२
४.	कहानी किरीट:	संपादक डॉ .उषा पाठक/ डॉ .अचला पाण्डेय	राधाकृष्ण प्रकाशन, प्रायवेट लिमिटेड ७/३१ अंसारी मार्ग, दरियागंज, नई दिल्ली-११०००२
५.	दलित चेतना की कहानियाँ बदलती परिभाषाएँ	राजमणि शर्मा	वाणी प्रकाशन, ४६९५, २१-ए, दरियागंज, नई दिल्ली-११०००२
६.	दलित कथा साहित्य में स्त्री-विमर्श एक नई दृष्टि	डॉ .हेमलता सिंह	भावना प्रकाशन १०९-A, पटपड़गंज, दिल्ली-११००९१
७.	उत्तर आधुनिकता और समकालीन हिन्दी उपन्यास	चमन लाल गुप्ता	किशोर- विद्या- निकेतन बी-२/२३६-ए, भदौनी, वाराणसी-२२१००१
८.	जगदीश चंद्र का व्यक्तित्व एवं कृतित्व	डॉ .भडारे उद्धव तुकाराम	ऐक्स बुक प्राइवेट लिमिटेड ४३७८/ ४ बी, अंसारी मार्ग, दरियागंज, नई दिल्ली-११०००२
९.	हिन्दी उपन्यास नये आयाम	डॉ .दिलीप के . मेहरा	ज्ञान प्रकाशन १२८/९०, जी ब्लाक किदवई नगर कानपुर, २०८०११
१०.	हिन्दी के कालजयी उपन्यास	डॉ .ओमप्रकाश त्रिपाठी	विद्या प्रकाशन सी-४४९, गजैनी, कानपुर-२२
११.	आधुनिक हिन्दी उपन्यास साहित्य में संस्कृति	सं .प्रा .के .एम .मायावंशी	चिंतन प्रकाशन ३A/११९ आवास विकास, हंसपुरम्, कानपुर- २०८०२१
१२.	२१ वीं शती का हिन्दी उपन्यास	पुष्पपाल सिंह	राधाकृष्ण प्रकाशन, प्रायवेट लिमिटेड ७/३१ अंसारी मार्ग, दरियागंज, नई दिल्ली-११०००२
१३.	सुरेन्द्र वर्मा के नाटकों का अनुशीलन	डॉ . जयश्री सिंह	ज्ञान प्रकाशन १२८/९०, जी ब्लाक किदवई नगर कानपुर, २०८०११

तृतीय एवं चतुर्थ सत्र परीक्षा प्रारूप
पेपर नंबर II and III
(Semester –III & IV)

कुल अंक : ७५

समय : २/ ३० घंटे

प्रश्न-१	संदर्भ सहित व्याख्या (दोनों पुस्तकों से अंतरिक विकल्प के साथ)	१६
प्रश्न-२	दीर्घोत्तरी प्रश्न (दोनों पुस्तकों से अंतरिक विकल्प के साथ)	२४
प्रश्न-३	सामान्य प्रश्न (दोनों पुस्तकों से एक उत्तर अपेक्षित)	१५
प्रश्न-४	टिप्पणियाँ (दोनों पुस्तकों से अंतरिक विकल्प के साथ)	१०
प्रश्न-५	एक वाक्य में उत्तर (दोनों पुस्तकों से पाँच-पाँच)	१०

आंतरिक परीक्षण

कुल अंक-२५

क	एक कक्ष परीक्षा/आलेख लेखन/ चर्चा/ वाचन तथा अन्य रचनात्मक कार्य तथा कम्प्यूटर पर हिंदी में कार्य	२०
ख	सक्रिय सहभागिता, नेतृत्व कुशलता, शिष्टाचार तथा समग्र आचरण	०५

क एक कक्ष परीक्षा :-

प्रश्न-१	आधुनिक कहानिकारों एवं निबंधकारों की रचनाओं व जीवन का अध्ययन तथा समीक्षा ।	०५
प्रश्न-२	आलेख लेखन	०५
प्रश्न-३	उपलब्ध रचनाकारों का साक्षात्कार	१०

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**



**Scheme of Evaluation for
Continuous Assessments and Semester
End Examinations
for
Under-graduate
Programmes
under
Faculty of Arts
Subject: Hindi**

***Under Autonomous status with Credit
Based Semester and Grading System***

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

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DEPARTMENT OF HINDI

Bachelor of Arts (B.A.) Revised Syllabus For

T.Y.B.A. – Hindi- Paper No – IV, V, VI, VII, VIII, and IX

Choice Based Credit Grading and Semester System (CBCGS)

(75:25)

With effect from the Academic Year 2021-2022

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

चांगू काना ठाकूर कला, वाणिज्य और विज्ञान महाविद्यालय, (स्वायत्त)
नवीन पनवेल.



हिन्दी-विभाग

बी. ए. स्नातक हिन्दी

पाठ्यक्रम

शैक्षणिक वर्ष-2021-2022

हिन्दी अध्ययन मण्डल

अनु. क्र	अध्यापक का नाम	पद	अधिष्ठान
१.	डॉ . भंडारे उद्धव तुकाराम	अध्यक्ष, हिन्दी विभाग	अध्यक्ष
२.	डॉ . सौ . जी. एस. तँवर	सहयोगी प्राध्यापक	सदस्य
३.	डॉ . बिसेन जोगेन्द्रसिंग मोतीसिंग	प्रोफेसर	सदस्य
४.	डॉ . हुबनाथ गोरखनाथ पाण्डेय	सहयोगी प्राध्यापक	सदस्य
५.	डॉ . घरत अर्जुन जानू	पूर्व प्रोफेसर	सदस्य
६.	डॉ . विजयप्रसाद के . अवस्थी	सहयोगी प्राध्यापक	सदस्य
७.	श्री . विमल कुमार मिश्र	नवभारत टाइम्स, मुंबई	सदस्य
८.	प्रा . महेश श्रीराम गोडबोले	पूर्व स्नातकोत्तर छात्र	सदस्य
९.	डॉ . अमित कुमार प्रेमनाथ मिश्रा	पीएच. डी . छात्र	सदस्य

॥ विद्या विनयेन शोभते ॥
Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)

Affiliated to University of Mumbai

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Choice Based Credit Grading and Semester System (CBCGS) (75:25)
With effect from the Academic Year 2021-22

Faculty of Humanities

Semester V & Semester VI

Guidelines

Syllabus Structure:

1. In T.Y.B.A. Hindi Paper IV (CBCGS) in Semester V and Semester VI, there will be one paper each with 4 Credits in each Semester.
2. In T.Y.B.A. Hindi Paper V (CBCGS) in Semester V and Semester VI, there will be one paper each with 4 Credits in each Semester.
3. In T.Y.B.A. Hindi Paper VI (CBCGS) in Semester V and Semester VI, there will be one paper each with 4 Credits in each Semester.
4. In T.Y.B.A. Hindi Paper VII (CBCGS) in Semester V and Semester VI, there will be one paper each with 4 Credits in each Semester.
5. In T.Y.B.A. Hindi Paper VIII (CBCGS) in Semester V and Semester VI, there will be one paper each with 4 Credits in each Semester.
6. In T.Y.B.A. Hindi Paper IX (CBCGS) in Semester V and Semester VI, there will be one paper each with 4 Credits in each Semester.

Scheme of Examination (Under-graduate Programmes)

Credit Based Evaluation System

❖ Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 25% marks in the first component by conducting the Semester End Examinations with 75% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 25 % **25 Marks** *(For Courses without Practical)*

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks

Question Paper Pattern

(Periodical Class Test for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Questions to be set: 02

Duration: 40 Minutes

All Questions are Compulsory

Question No	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 75 %**75 Marks**

- Duration: The examination shall be of $2\frac{1}{2}$ hours duration.

Question Paper Pattern**Theory question paper pattern**

1. There shall be five questions each of 15 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, and the allocation of marks depends on the weightage of the unit.

❖ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 10 out of 25) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 30 Out of 75) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: All other rules regarding Standard of Passing, ATKT, etc, will be as per those decided by the Faculty of Humanities passed by the Academic Council from time to time

॥ विध्या विनयेन शोभते ॥

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शैक्षणिक वर्ष-2021-2022

CONTENT

Programme - Bachelor of Arts (B.A.)

Semester V

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1.	T.Y.B.A.	हिन्दी साहित्य का इतिहास	IV	UAR5HN4	04
2.	T.Y.B.A.	स्वातंत्र्योत्तर हिन्दी साहित्य	V	UAR5HN5	04
3.	T.Y.B.A.	हिन्दी में सूचना प्रौद्योगिकी	VI	UAR5HN6	04
4.	T.Y.B.A.	साहित्य समीक्षा : छंद एवं अलंकार	VII	UAR5HN7	04
5.	T.Y.B.A.	भाषा विज्ञान : हिन्दी भाषा और व्याकरण	VIII	UAR5HN8	04
6.	T.Y.B.A.	जनसंचार माध्यम	IX	UAR5HN9	04

Semester VI

Sr.No	Class	Course Name of the Paper	Paper No.	Paper Code	Credits
1.	T.Y.B.A.	आधुनिक हिन्दी साहित्य का इतिहास	IV	UAR6HN4	04
2.	T.Y.B.A.	स्वातंत्र्योत्तर हिन्दी साहित्य	V	UAR6HN5	04
3.	T.Y.B.A.	सोशल मीडिया	VI	UAR6HN6	04
4.	T.Y.B.A.	साहित्य समीक्षा : छंद एवं अलंकार	VII	UAR6HN7	04
5.	T.Y.B.A.	भाषा विज्ञान : हिन्दी भाषा और व्याकरण	VIII	UAR6HN8	04
6.	T.Y.B.A.	जनसंचार माध्यम	IX	UAR6HN9	04

पाठ्यक्रम की प्रस्तावना :

हिन्दी में कला स्नातक (बी. ए. हिन्दी)

पाठ्यक्रम के उद्देश्य :

1. साहित्यिक कृतियों के पाठन एवं आस्वादन हेतु विद्यार्थियों में रुचि विकसित करना।
2. साहित्य के माध्यम से देश की सामाजिक, आर्थिक और राजनीतिक स्थिति से विद्यार्थियों को अवगत कराना।
3. साहित्य के माध्यम से समाज की स्थिति को स्पष्ट करना।
4. साहित्य के माध्यम से भारतीय संस्कृति की जानकारी देना।
5. साहित्य के पठन-पाठन से दो भाषाओं के मध्य की खाई को पाटना।
6. साहित्य के माध्यम से समाज या दो भाषाओं के मध्य सांस्कृतिक आदान-प्रदान से प्रेम तथा सद्भाव लाना।
7. विद्यार्थियों में भाषिक कौशल्य का विकास करना।
8. विद्यार्थियों में व्याकरणिक कौशल्य का विकास करना।
9. विद्यार्थियों में रिपोर्ट लेखन के कौशल्य का विकास करना।

पाठ्यक्रम का परिणाम :

1. पाठ्यक्रम की समाप्ति पर विद्यार्थियों में अग्रलिखित योग्यता विकसित हो जानी चाहिए।
2. हिन्दी की विभिन्न विधाओं के बारे में सुसंगत और प्रभावी समझ निर्माण होनी आवश्यक है।

3. हिन्दी के क्षेत्र में विद्यार्थियों की समझ और रुचि विकसित होनी चाहिए।
4. व्यावहारिक हिन्दी और व्यावसायिक अनुप्रयोग में बुनियादी कौशल विकसित करना।
5. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक, सांस्कृतिक, विश्वदृष्टि का विकास होगा।
6. विद्यार्थियों में रसास्वाद के कौशल का विकास होगा।
7. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा तथा ज्ञानात्मक आधार पुष्ट होगा।

॥ विद्या विनयेन शोभते ॥
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Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2021-22

Semester V

Program T.Y.B.A.

Course: Hindi

हिन्दी साहित्य का इतिहास-IV

शैक्षणिक उद्देश्य :

1. हिन्दी साहित्य के इतिहास एवं काल विभाजन से विद्यार्थियों को अवगत कराना।
2. हिन्दी साहित्य के विभिन्न कालों की परिस्थितियों एवं प्रवृत्तियों से विद्यार्थियों को अवगत कराना।
3. हिन्दी के पद्य एवं गद्य साहित्य के क्रमिक विकास को स्पष्ट करना।
4. आधुनिक साहित्य की समझ एवं समीक्षा का विकास।

परिणाम :

1. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
2. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
3. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा।
4. ज्ञानात्मक आधार पुष्ट होगा।

अध्ययन पद्धति :

1. व्याख्यान तथा विश्लेषण।
2. संगोष्ठी, स्वाध्याय तथा समूह चर्चा।
3. पावर पॉइंट प्रेजेंटेशन, यू ट्यूब वीडियो आदि साधनों का उपयोग।
4. अतिथि विषय विशेषज्ञों के व्याख्यान।

Semester- V
T.Y.B.A. Paper No- IV
हिन्दी साहित्य का इतिहास

Name of the Programme	: B.A.
Name of the Course	: हिन्दी साहित्य का इतिहास
Course Code	: UAR5HN4
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I -05

१. हिन्दी साहित्य का इतिहास -
1. नामकरण
 2. कालविभाजन
 3. समस्याएँ ।

इकाई II आदिकाल -20

1. आदिकालीन हिन्दी साहित्य की परिस्थितियाँ -
1. राजनीतिक
 2. धार्मिक
 3. सामाजिक
 4. साहित्यिक
 5. सांस्कृतिक
2. आदिकालीन हिन्दी साहित्य का सामान्य परिचय एवं विशेषताएँ-
1. सिद्ध साहित्य
 2. नाथ साहित्य
 3. जैन साहित्य
 4. रासो साहित्य
 5. वीरगाथा

इकाई III भक्तिकाल

-20

1. भक्तिकालीन हिन्दी साहित्य की परिस्थितियाँ –
 1. राजनीतिक
 2. धार्मिक
 3. सामाजिक
 4. साहित्यिक
 5. सांस्कृतिक
2. भक्तिकालीन हिन्दी साहित्य का सामान्य परिचय एवं विशेषताएँ
 1. संत काव्य धारा
 2. सूफी काव्य धारा
 3. राम काव्य धारा
 4. कृष्ण काव्य धारा

इकाई IV रीतिकाल

-15

1. रीतिकालीन हिन्दी साहित्य की परिस्थितियाँ –
 1. राजनीतिक
 2. धार्मिक
 3. सामाजिक
 4. साहित्यिक
 5. सांस्कृतिक
2. रीतिकालीन हिन्दी साहित्य का सामान्य परिचय एवं विशेषताएँ-
 1. रीतिबद्ध काव्य
 2. रीतिसिद्ध काव्य
 3. रीतिमुक्त काव्य

संदर्भ ग्रंथ

1. हिन्दी साहित्य का इतिहास – आचार्य रामचन्द्र शुक्ल
2. हिन्दी साहित्य की पृष्ठभूमि – आचार्य हज़ारिप्रसाद द्विवेदी
3. हिन्दी साहित्य का आदिकाल - आचार्य हज़ारिप्रसाद द्विवेदी
4. हिन्दी साहित्य का उद्भव और विकास - आचार्य हज़ारिप्रसाद द्विवेदी
5. हिन्दी साहित्य का आलोचनात्मक इतिहास – रामकुमार वर्मा
6. हिन्दी साहित्य का वैज्ञानिक इतिहास – डॉ . गणपतिचंद्र गुप्त
7. हिन्दी साहित्य का इतिहास – डॉ . विजयेद्र स्नातक
8. हिन्दी साहित्य का इतिहास – डॉ . भंडारे उद्धव तुकाराम
9. निबंधमाला हिन्दी निबंध –डॉ . भंडारे उद्धव तुकाराम
10. हिन्दी साहित्य का दूसरा इतिहास – डॉ . बच्चन सिंह
11. हिन्दी साहित्य (तीन खंड) – संपादक – डॉ . नगेन्द्र और हरदयाल
12. हिन्दी साहित्य का संक्षिप्त इतिहास – लक्ष्मी सागर

Semester- VI
T.Y.B.A. Paper No- IV

आधुनिक हिन्दी साहित्य का इतिहास

Name of the Programme	: B.A.
Name of the Course	: आधुनिक हिन्दी साहित्य का इतिहास
Course Code	: UAR6HN4
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I आधुनिक हिन्दी कविता का विकास -20

1. आधुनिक हिन्दी साहित्य की परिस्थितियाँ –
 1. राजनीतिक
 2. धार्मिक
 3. सामाजिक
 4. साहित्यिक
 5. सांस्कृतिक
2. आधुनिक हिन्दी कविता का सामान्य परिचय एवं विशेषताएँ
 1. भारतेन्दु-युग
 2. द्विवेदी-युग
 3. छायावाद
 4. प्रगतिवाद

इकाई II -20

१.
 1. प्रयोगवाद
 2. नई कविता
 3. समकालीन कविता
 4. भूमंडलीकरण के बाद की कविता

- इकाई III आधुनिक हिन्दी गद्य का विकास -10
1. 1. आधुनिक गद्य का उद्भव और विकास
 2. उपन्यास
 3. कहानी
 4. नाटक
- इकाई IV -10
१. 1. निबंध
 2. आलोचना
 3. आत्मकथा

संदर्भ ग्रंथ

1. आधुनिक हिन्दी साहित्य का इतिहास – डॉ . बच्चन सिंह
2. स्वातंत्र्योत्तर हिन्दी साहित्य का इतिहास – डॉ . लक्ष्मीनारायण
3. हिन्दी का गद्य साहित्य – डॉ . रामचन्द्र तिवारी
4. छायावाद – डॉ . नामवर सिंह
5. आधुनिक हिन्दी काव्य की प्रवृत्तियाँ - डॉ . नामवर सिंह
6. भारतेन्दु हरिश्चंद्र – डॉ . रामविलास शर्मा
7. भारतेन्दु युग और हिन्दी भाषा की विकास परंपरा - डॉ . रामविलास शर्मा
8. आचार्य महावीर प्रसाद द्विवेदी और हिन्दी नवजागरण - डॉ . रामविलास शर्मा
9. प्रेमचंद और उनका युग - डॉ . रामविलास शर्मा
10. कहानी नई कहानी – डॉ . नामवर सिंह
11. नई कहानी संवेदना और शिल्प – देवीशंकर अवस्थी
12. हिन्दी नाटक – डॉ . बच्चन सिंह
13. हिन्दी साहित्य का इतिहास – डॉ . भंडारे उद्धव तुकाराम
14. निबंधमाला हिन्दी निबंध –डॉ . भंडारे उद्धव तुकाराम
15. नटरंग – डॉ . नेमिचन्द्र जैन
16. नया साहित्य नए प्रश्न – आचार्य नन्ददुलारे वाजपेयी
17. नई कविता के प्रतिमान – लक्ष्मीनारायण वर्मा
18. कविता के नए प्रतिमान – डॉ . नामवर सिंह
19. जगदीश गुप्त हिन्दी गद्य विन्यास और विकास – रामस्वरूप चतुर्वेदी
20. आधुनिक साहित्य - आचार्य नन्ददुलारे वाजपेयी
21. हिन्दी साहित्य (तीन खंड) – संपादक – डॉ . नगेन्द्र और हरदयाल

प्रश्नपत्र प्रारूप
पेपर नंबर -IV
(Semester –V & VI)

		कुल अंक 75
		समय : 2:30 घंटे
प्रश्न-1	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- I से)	15
प्रश्न-2	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- II से)	15
प्रश्न-3	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- III से)	15
प्रश्न-4	टिप्पणी (आंतरिक विकल्प सहित –इकाई- IV से)	15
प्रश्न-5	क) वस्तुनिष्ठ प्रश्न	10
	ख) बहुविकल्पी प्रश्न	05

आंतरिक परीक्षण

		कुल अंक-25
क	एक कक्ष परीक्षा	20
ख	सक्रिय सहभागिता, नेतृत्व कुशलता, शिष्टाचार तथा समग्र आचरण	05
क	<u>एक कक्ष परीक्षा :-</u>	
प्रश्न-1	सही जोड़ियाँ / रिक्त स्थान / बहुविकल्पीय प्रश्न	05
प्रश्न-2	अतिलघुत्तरी / एक पंक्ति में उत्तर	05
प्रश्न-3	लघुत्तरी प्रश्न (तीन प्रश्नों में से दो के उत्तर अपेक्षित – प्रत्येक प्रश्न के लिए 05 अंक)	10

॥ विद्या विनयेन शोभते ॥
Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
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Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2021 -22

Semester V

Program T.Y.B.A.

Course: Hindi

स्वातंत्र्योत्तर हिन्दी साहित्य-V

शैक्षणिक उद्देश्य :

1. स्वातंत्र्योत्तर हिन्दी उपन्यास एवं उसके कथ्य से विद्यार्थियों को अवगत कराना।
2. स्वातंत्र्योत्तर हिन्दी काव्य एवं काव्य नाटक व उसकी तत्कालीन परिस्थितियों से अवगत कराना।
3. काव्य नाटक की परंपरा से अवगत कराना।
4. आधुनिक साहित्य की समझ एवं समीक्षा का विकास।

परिणाम :

1. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
2. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
3. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा।
4. ज्ञानात्मक आधार पुष्ट होगा।

अध्ययन पद्धति :

1. व्याख्यान तथा विश्लेषण।
2. संगोष्ठी, स्वाध्याय तथा समूह चर्चा।
3. पावर पॉइंट प्रेजेंटेशन, यू ट्यूब वीडियो आदि साधनों का उपयोग।
4. अतिथि विषय विशेषज्ञों के व्याख्यान।

Semester- V
T.Y.B.A. Paper No.V

स्वातंत्र्योत्तर हिन्दी साहित्य

Name of the Programme	: B.A.
Name of the Course	स्वातंत्र्योत्तर हिन्दी साहित्य
Course Code	: UAR5HN5
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I **खजुराहो का शिल्पी –नाटक-लेखक -शंकर शेष** **-15**

1. नाटककार शंकर शेष का परिचय ।
2. 'खजुराहो का शिल्पी' नाटक की कथावस्तु एवं कथावस्तु की आलोचना ।
3. 'खजुराहो का शिल्पी' - कल्पना एवं ऐतिहासिकता ।
4. 'खजुराहो का शिल्पी' में पात्र एवं चरित्र-चित्रण ।
5. 'खजुराहो का शिल्पी' नाटक में युगीन अभिव्यक्ति एवं मूल्यबोध

इकाई II **खजुराहो का शिल्पी – नाटक - लेखक - शंकर शेष** **-15**

1. 'खजुराहो का शिल्पी' – देशकाल – वातावरण ।
2. 'खजुराहो का शिल्पी' – संवाद योजना ।
3. 'खजुराहो का शिल्पी' – उद्देश्य एवं समस्याएँ ।
4. 'खजुराहो का शिल्पी' – भाषा-शैली ।
5. 'खजुराहो का शिल्पी' की रंगमंचीयता ।

इकाई III रश्मिरथी – कवि - रामधारी सिंह दिनकर -15

1. रामधारी सिंह दिनकर का परिचय ।
2. 'रश्मिरथी' कथावस्तु- आलोचना ।
3. सर्ग – एक से तीन का अध्ययन ।

इकाई IV रश्मिरथी- कवि – रामधारी सिंह दिनकर -15

1. प्रमुख पात्रों का परिचय ।
2. समस्याएँ ।
3. उद्देश्य ।
4. भाषा-शैली ।
5. सर्ग - चार से सात का अध्ययन ।

संदर्भ ग्रंथ

1. खजुराहो का शिल्पी – लेखक – शंकर शेष
2. रश्मि रथी – लेखक - रामधारी सिंह दिनकर
3. समकालीन हिन्दी कविता – रवींद्र भ्रमर
4. नाटककार शंकर शेष – डॉ . सुनीलकुमार लवटे
5. रंगधर्मी नाटककार शंकर शेष – डॉ . प्रकाश जाधव
6. शंकर शेष का नाटक साहित्य - डॉ . प्रकाश जाधव
7. शंकर शेष - रचनावली - एक – संपादक – डॉ . विनय
8. राजपद से जनपद नटशिल्पी शंकर शेष – डॉ . सुरेश और डॉ . वीणा गौतम
9. राष्ट्रीय कवि दिनकर और उनकी काव्य कला – भूमिका – डॉ . शेखर चंद्र जैन
10. दिनकर व्यक्तित्व एवं कृतित्व –संपादक –जगदिशप्रसाद चतुर्वेदी
11. आधुनिक हिन्दी काव्य में राष्ट्रीय चेतना का विकास –
डॉ.जितराम पाठक

Semester- VI
T.Y.B.A. Paper No.V

स्वातंत्र्योत्तर हिन्दी साहित्य

Name of the Programme	: B.A.
Name of the Course	स्वातंत्र्योत्तर हिन्दी साहित्य
Course Code	: UAR6HN5
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

- इकाई I 'गांधी से पहले गांधी' -उपन्यास-लेखक-इकबाल -15
दुरानी
1. उपन्यासकार इकबाल दुरानी का परिचय ।
 2. उपन्यास की कथावस्तु एवं आलोचना ।
 3. देशकाल- वातावरण ।
 4. पात्र-एवं चरित्र- चित्रण ।
 5. अहिंसात्मक आंदोलन ।
- इकाई II 'गांधी से पहले गांधी'-उपन्यास लेखक-इकबाल -15
दुरानी
1. लोक जीवन ।
 2. समस्याएँ ।
 3. उद्देश्य ।
 4. भाषा शैली ।
- इकाई III अंधायुग -नाटक - लेखक - धर्मवीर भारती -15
1. धर्मवीर भारती का परिचय ।
 2. गीति नाटक का स्वरूप ।
 3. अंधायुग नाटक की सप्रसंग व्याख्या ।
 4. अंधायुग - कथावस्तु एवं आलोचना ।
 5. अंधायुग - पात्र एवं चरित्र-चित्रण ।
 6. अंधायुग - देशकाल वातावरण ।

इकाई IV अंधायुग- लेखक – धर्मवीर भारती

-15

1. अंधायुग –समस्याएँ ।
2. अंधायुग – उद्देश्य ।
3. अंधायुग – शीर्षक की सार्थकता ।
4. अंधायुग – भाषा शैली ।
5. काव्य नाटक के रूप में ‘ अंधायुग ‘
6. अंधायुग की रंग प्रस्तुति ।
7. अभिनेयता एवं रंगमंचीयता ।

संदर्भ ग्रंथ

1. गांधी से पहले गांधी - इकबाल दुरानी
2. अंधायुग : पाठ और दर्शन – जयदेवी तनेजा, राष्ट्रीय नाट्य विद्यालय
3. धर्मवीर भारती ग्रंथावली – संपादक – चन्द्रकान्त बांदिवडेकर
4. धर्मवीर भारती की साहित्य साधना – संपादक – पुष्पा भारती
5. हिन्दी नाट्य काव्य : पुनर्मूल्यांकन – हुकूमचंद राजपाल
6. अंधायुग – धर्मवीर भारती

प्रश्नपत्र प्रारूप
पेपर नंबर -V
(Semester –V & VI)

कुल अंक 75

समय : 2:30 घंटे

प्रश्न-1	संदर्भ सहित व्याख्या (दोनों पुस्तकों से आंतरिक विकल्प सहित)	15
प्रश्न-2	दीर्घोत्तरी प्रश्न (इकाई I और II से आंतरिक विकल्प सहित)	15
प्रश्न-3	सामान्य प्रश्न (इकाई III और IV से आंतरिक विकल्प सहित)	15
प्रश्न-4	टिप्पणियाँ (दोनों पुस्तकों से आंतरिक विकल्प सहित)	15
प्रश्न-5	क) वस्तुनिष्ठ प्रश्न	10
	ख) बहुविकल्पी प्रश्न	05

आंतरिक परीक्षण

कुल अंक-25

क	एक कक्ष परीक्षा	20
ख	सक्रिय सहभागिता, नेतृत्व कुशलता, शिष्टाचार तथा समग्र आचरण	05

क एक कक्ष परीक्षा :-

प्रश्न-1	सही जोड़ियाँ / रिक्त स्थान / बहुविकल्पीय प्रश्न	05
प्रश्न-2	अतिलघुत्तरी / एक पंक्ति में उत्तर	05
प्रश्न-3	लघुत्तरी प्रश्न (तीन प्रश्नों में से दो के उत्तर अपेक्षित – प्रत्येक प्रश्न के लिए 05 अंक)	10

॥ विद्या विनयेन शोभते ॥
Janardan Bhagat Shikshan Prasarak Sanstha's
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Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2021 - 22

Semester V

Program T.Y.B.A.

Course: Hindi

हिन्दी में सूचना प्रौद्योगिकी -VI

शैक्षणिक उद्देश्य :

1. सूचना प्रौद्योगिकी के विकास एवं हिन्दी में उसके उपयोग से विद्यार्थियों को अवगत कराना।
2. कंप्यूटर पर हिन्दी में कामकाज से विद्यार्थियों को अवगत कराना।
3. संचार माध्यम और रोजगार की संभावनाओं को स्पष्ट करना।
4. सोशल मीडिया और बदलते हुए भारतीय परिवेश की समझ का विकास करना।

परिणाम :

1. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
2. तकनीकी गुणों की समझ विकसित होगी।
3. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा।
4. ज्ञानात्मक आधार पुष्ट होगा।
5. सोशल मीडिया के सकारात्मक एवं नकारात्मक पक्ष की समझ का विकास होगा।

अध्ययन पद्धति :

1. व्याख्यान तथा विश्लेषण।
2. संगोष्ठी, स्वाध्याय तथा समूह चर्चा।
3. पावर पॉइंट प्रेजेंटेशन, यू ट्यूब वीडियो आदि साधनों का उपयोग।
4. अतिथि विषय विशेषज्ञों के व्याख्यान।

Semester- V
T.Y.B.A. Paper No.VI

हिन्दी में सूचना प्रौद्योगिकी

Name of the Programme	: B.A.
Name of the Course	हिन्दी में सूचना प्रौद्योगिकी
Course Code	: UAR5HN6
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I सूचना प्रौद्योगिकी -15

1. सूचना प्रौद्योगिकी : अवधारणा, अर्थ, परिभाषा और स्वरूप ।
2. सूचना प्रौद्योगिकी का महत्व ।
3. कंप्यूटर पर हिन्दी में कामकाज समस्याएँ एवं समाधान ।
4. सूचना प्रौद्योगिकी की जीवन में सकारात्मक एवं नकारात्मक भूमिका।

इकाई II इंटरनेट और हिन्दी -15

1. हिन्दी में ईमेल
2. इंटरनेट पर हिन्दी में विज्ञापन
3. सोशल मीडिया में हिन्दी
4. हिन्दी ब्लॉगिंग –
 - 1.इतिहास एवं विकास
5. हिन्दी साहित्यिक एवं गैर साहित्यिक ई-पत्रिकाएँ

इकाई III

-15

1. हिन्दी सूचना प्रौद्योगिकी- रोजगार की संभावनाएँ।
2. सूचना प्रौद्योगिकी का शिक्षा के क्षेत्र में योगदान ।
3. भारत की ग्रामीण अर्थव्यवस्था के विकास पर सूचना प्रौद्योगिकी का प्रभाव
4. सूचना प्रौद्योगिकी के कारण भारतीय समाज जीवन में परिवर्तन –
 1. सामाजिक
 2. आर्थिक
 3. पारिवारिक

इकाई IV

-15

1. भारत में डिजिटलाजेशन का विकास, उपयोगिता एवं कठिनाइयाँ ।
2. सूचना प्रौद्योगिकी की चुनौतियाँ, समस्याएँ एवं समाधान ।
3. . सूचना प्रौद्योगिकी में सायबर अपराध एवं सुरक्षा की चुनौतियाँ
4. साइबर शिक्षा का महत्व एवं संवैधानिक प्रावधान ।

संदर्भ ग्रंथ

1. आधुनिक जनसंचार और हिन्दी : हरिमोहन
2. कंप्यूटर के भाषिक अनुप्रयोग : विजय कुमार मल्होत्रा
3. कंप्यूटर और हिन्दी : हरिमोहन
4. पत्रकारिता से मीडिया तक : मनोज कुमार
5. इंटरनेट : शशि शुक्ला
6. प्रयोजनमूलक हिन्दी : डॉ . पी. लता
7. प्रयोजनमूलक हिन्दी : रमेश जैन
8. जनसंचार और हिन्दी पत्रकारिता : डॉ . अर्जुन तिवारी
9. प्रयोजनमूलक हिन्दी : डॉ . विनोद गोदरे
10. वर्चुअल रीएलिटी और इंटरनेट : जगदीश्वर चतुर्वेदी
11. आधुनिक सूचना प्रौद्योगिकी का भारतीय समाज पर प्रभाव : संपादक - हरिमोहन धवन
12. भारत की आंतरिक सुरक्षा : अशोक कुमार
13. भारताची अंतर्गत सुरक्षा : डॉ . देवेन्द्र विसपूते
14. सायबर गुन्हे, 21 व्या शतकातील तंत्रज्ञानातील धोका - डॉ . दीपक शिकारपुरे
15. विश्वविद्यालय अनुदान आयोग (बाहरी वेबसाइट जो एक नई विंडो में खुलती हैं)
16. केंद्रीय माध्यमिक शिक्षा मण्डल (बाहरी वेबसाइट जो एक नई विंडो में खुलती हैं)
17. राष्ट्रीय शैक्षणिक अनुसंधान और प्रशिक्षण परिषद (बाहरी वेबसाइट जो एक नई विंडो में खुलती हैं)
18. उच्चतर शिक्षा विभाग (बाहरी वेबसाइट जो एक नई विंडो में खुलती हैं)
19. जनसंपर्क और विज्ञापन : संतोष गोयल
20. भारत में संचार माध्यम जनसंचार : संजीव भानावत
21. सूचना प्रौद्योगिकी, सोशल मीडिया और डिजिटल इंडिया - डॉ. अमरीश सिन्हा
22. आधुनिक सूचना प्रौद्योगिकी का भारतीय समाज पर प्रभाव

Semester- VI
T.Y.B.A. Paper No.VI

सोशल मीडिया

Name of the Programme	: B.A.
Name of the Course	सोशल मीडिया
Course Code	: UAR6HN6
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I **सोशल मीडिया** **-15**

1. परिभाषा, स्वरूप एवं विकासक्रम ।
2. सोशल मीडिया के गुण और दोष ।
3. सोशल मीडिया के प्रकार –
 1. फ़ेसबुक
 2. व्हाट्सअप
 3. ट्विटर
 4. इंस्टाग्राम

इकाई II **-15**

1. सोशल मीडिया से प्रभावित क्षेत्र -
 1. राजनीतिक
 2. सामाजिक
 3. युवाओं
 4. बच्चों
 5. महिलाओं
2. मुक्त अभिव्यक्ति और सोशल मीडिया ।
3. सोशल मीडिया की प्रचलित भाषा समाज और संस्कृति के अंतर-प्रभाव ।

इकाई III

-15

- 1.सोशल मीडिया और कानून।
- 2.सोशल मीडिया और बदलता हुआ भारतीय परिवेश ।
- 3.सोशल मीडिया की उपयोगिता एवं उपलब्धियाँ ।
- 4.युनिकोड के माध्यम से देवनागरी लिपि का वैश्विक प्रसार।

इकाई IV

-15

- 1.सोशल मीडिया में हिन्दी का प्रसार और प्रयोग।
- 2.सोशल मीडिया और हिन्दी।
- 3.सोशल मीडिया समस्याएँ, चुनौतियाँ और सीमाएँ।
- 4.सोशल मीडिया का भारतीय समाज और संस्कृति पर प्रभाव।

संदर्भ ग्रंथ

1. सोशल नेटवर्किंग : नए समय का संवाद – संपादक – संजय द्विवेदी
2. नये जमाने की पत्रकारिता : सौरभ शुक्ला
3. सोशल मीडिया : योगेश पटेल
4. उत्तर आधुनिक मीडिया तकनीक : हर्षदेव
5. नई संचार प्रौद्योगिकी पत्रकारिता : कृष्ण कुमार रत्नू
6. हिन्दी भाषा का प्रयोजनमूलक स्वरूप : कैलाश चंद्र भाटिया
7. इंटरनेट : शशि शुक्ला
8. सूचना प्रौद्योगिकी, सोशल मीडिया और डिजिटल इंडिया – डॉ. अमरीश सिन्हा
9. आधुनिक सूचना प्रौद्योगिकी का भारतीय समाज पर प्रभाव

प्रश्नपत्र प्रारूप
पेपर नंबर -V
(Semester –V & VI)

		कुल अंक 75
		समय : 2:30 घंटे
प्रश्न-1	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- I से)	15
प्रश्न-2	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- II से)	15
प्रश्न-3	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- III से)	15
प्रश्न-4	टिप्पणी (आंतरिक विकल्प सहित –इकाई- IV से)	15
प्रश्न-5	क) वस्तुनिष्ठ प्रश्न	10
	ख) बहुविकल्पी प्रश्न	05

आंतरिक परीक्षण

		कुल अंक-25
क	एक कक्ष परीक्षा	20
ख	सक्रिय सहभागिता, नेतृत्व कुशलता, शिष्टाचार तथा समग्र आचरण	05
क	<u>एक कक्ष परीक्षा :-</u>	
प्रश्न-1	सही जोड़ियाँ / रिक्त स्थान / बहुविकल्पीय प्रश्न	05
प्रश्न-2	अतिलघुतरी / एक पंक्ति में उत्तर	05
प्रश्न-3	लघुतरी प्रश्न (तीन प्रश्नों में से दो के उत्तर अपेक्षित – प्रत्येक प्रश्न के लिए 05 अंक)	10

॥ विद्या विनयेन शोभते ॥
Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)

Affiliated to University of Mumbai



Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2021–22

Program T.Y.B.A.

Semester V

Course: Hindi

साहित्य समीक्षा : छंद एवं अलंकार -VII

शैक्षणिक उद्देश्य :

1. साहित्य की परिभाषा, स्वरूप, तत्व, हेतु एवं प्रयोजनों को स्पष्ट करना।
2. कला एवं साहित्य के अंतर तथा संबंधों पर प्रकाश डालना।
3. काव्य के विविध रूपों को स्पष्ट करना।
4. शब्द-शक्ति, रस के विभिन्न पहलुओं को स्पष्ट करना।
5. छंद एवं अलंकारों को स्पष्ट करना।
6. गद्य साहित्य के तत्वों पर प्रकाश डालना।
7. काव्य शास्त्रीय साधनों के आधार पर रचनात्मकता को बढ़ावा देना।

परिणाम :

1. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
2. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
3. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा।
4. ज्ञानात्मक आधार पुष्ट होगा।

अध्ययन पद्धति :

1. व्याख्यान तथा विश्लेषण।
2. संगोष्ठी, स्वाध्याय तथा समूह चर्चा।
3. पावर पॉइंट प्रेजेंटेशन, यू ट्यूब वीडियो आदि साधनों का उपयोग।
4. अतिथि विषय विशेषज्ञों के व्याख्यान।

Semester- V

T.Y.B.A.
साहित्य समीक्षा छंद एवं अलंकार -VII

Name of the Programme	: B.A.
Name of the Course	: साहित्य समीक्षा : छंद एवं अलंकार-VII
Course Code	: UAR5HN7
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

- इकाई I काव्य -10**
१. काव्य का स्वरूप और परिभाषा (भारतीय एवं पाश्चात्य) ।
 २. काव्य के तत्व ।
 ३. काव्य के हेतु ।
 ४. काव्य के प्रयोजन (केवल भारतीय) ।
- इकाई II कला -10**
१. कला की परिभाषा और वर्गीकरण ।
 २. कला और साहित्य का अंतःसंबंध ।
 ३. कला के प्रयोजन ।
- इकाई III काव्य के रूप -20**
१. महाकाव्य : भारतीय एवं पाश्चात्य मान्यताओं का परिचय ।
 २. खंडकाव्य : स्वरूप और विशेषताएँ ।
 ३. मुक्तक काव्य : स्वरूप और विशेषताएँ ।
 ४. गीतिकाव्य : स्वरूप और विशेषताएँ ।
 ५. गजल का स्वरूप और विशेषताएँ ।
 ६. रुबाइयाँ सामान्य परिचय ।

I मॉत्रिक छंद

१. चौपाई

२. रोला

३. दोहा

४. बरवै

५. हरिगीतिका

६. गीतिका

७. छप्पय

८. कुण्डलिया

II वर्णिक छंद

१. इंद्रवज्रा

२. शार्दूलविक्रीडित

३. भूजंगप्रयात

४. द्रुतविलंबित

५. मालिनी

६. मन्दाक्रान्ता

७. सवैया

८. कवित्त

संदर्भ ग्रंथ

1. काव्य के रूप – बाबू गुलाबराय
2. भारतीय काव्यशास्त्र की परंपरा – डॉ . नगेन्द्र
3. सिद्धांत और अध्ययन – बाबू गुलाबराय
4. काव्यशास्त्र – डॉ . भगिरथ मिश्र
5. काव्य प्रदीप – श्री . रामबहोरी शुक्ल
6. छंद प्रकाश – श्री . रघुनन्दन शास्त्री
7. अकादमिक हिन्दी व्याकरण – डॉ . भंडारे उद्धव तुकाराम
8. निबंधमाला हिन्दी निबंध – डॉ . भंडारे उद्धव तुकाराम
9. साहित्य सहचर –आचार्य हजारी प्रसाद द्विवेदी
- 10.साहित्य विवेचन – सुमन एवं मलिक
- 11.हिन्दी आलोचना के बीज शब्द – डॉ . बच्चन सिंह
- 12.हिन्दी साहित्य कोश – ज्ञानमंडल प्रकाशन वाराणसी
- 13.हिन्दी नाटक – डॉ . बच्चन सिंह
- 14.साहित्य विधाओं की प्रकृति – संपादक – देवीशंकर अवस्थी
- 15.कला – हंस कुमार तिवारी
- 16.आधुनिक साहित्य चिंतन – डॉ . हरीश अरोड़ा, डॉ . गुँजनकुमार झा
- 17.भारतीय कला का इतिहास – डॉ . भागवत शरण उपाध्याय
- 18.भारतीय काव्यशास्त्र के सिद्धांत – डॉ . कृष्णदेव झारी
- 19.भारतीय काव्यशास्त्र – डॉ . मानवेंद्र पाठक
- 20.आधुनिक गीतिकाव्य – डॉ . उमाशंकर तिवारी
- 21.भारतीय साहित्य शास्त्र – डॉ . बलदेव उपाध्याय
- 22.भारतीय काव्यशास्त्र – डॉ . योगेंद्र प्रताप सिंह

Semester- VI
T.Y.B.A.

साहित्य समीक्षा: छंद एवं अलंकार –VII

Name of the Programme	: B.A.
Name of the Course	साहित्य समीक्षा : छंद एवं अलंकार-VII
Course Code	: UAR6HN7
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

- इकाई I शब्द-शक्ति -10**
१. शब्द-शक्ति: अर्थ, परिभाषा और स्वरूप ।
 २. शब्द-शक्ति के प्रकार-
(अभिधा, लक्षणा एवं व्यंजना का सामान्य परिचय)
- इकाई II रस -10**
१. रस का अर्थ एवं स्वरूप ।
 २. रस के विविध अंग ।
 ३. रस के भेद : सामान्य परिचय ।
- इकाई III गद्य के विविध रूप -20**
१. नाटक के तत्व (भारतीय मान्यता के अनुसार)।
 २. उपन्यास : परिभाषा, स्वरूप, एवं प्रमुख तत्व ।
 ३. कहानी : परिभाषा, स्वरूप, एवं प्रमुख तत्व ।
 ४. निबंध : स्वरूप तथा सामान्य विशेषताएँ ।
 ५. आत्मकथा का तात्विक विवेचन ।
 ६. जीवनी का तात्विक विवेचन ।
 ७. संस्मरण का तात्विक विवेचन ।
 ८. रेखाचित्र तात्विक विवेचन ।

सामान्य परिचय

I शब्दालंकार

१. अनुप्रास
२. यमक
३. श्लेष
४. पुनरुक्तिप्रकाश
५. वीप्सा
६. वक्रोक्ति

II अर्थालंकार

१. उपमा
२. रूपक
३. अतिशयोक्ति
४. विभावना
५. उत्प्रेक्षा
६. प्रतीप
७. व्याजस्तुति
८. भ्रान्तिमान
९. दृष्टान्त

संदर्भ ग्रंथ

- 23.काव्य के रूप – बाबू गुलाबराय
- 24.भारतीय काव्यशास्त्र की परंपरा – डॉ . नगेन्द्र
- 25.सिद्धांत और अध्ययन – बाबू गुलाबराय
- 26.काव्यशास्त्र – डॉ . भगिरथ मिश्र
- 27.काव्य प्रदीप – श्री . रामबहोरी शुक्ल
- 28.छंद प्रकाश – श्री . रघुनन्दन शास्त्री
- 29.अकादमिक हिन्दी व्याकरण – डॉ . भंडारे उद्धव तुकाराम
- 30.निबंधमाला हिन्दी निबंध – डॉ . भंडारे उद्धव तुकाराम
- 31.साहित्य सहचर –आचार्य हजारी प्रसाद द्विवेदी
- 32.साहित्य विवेचन – सुमन एवं मलिक
- 33.हिन्दी आलोचना के बीज शब्द – डॉ . बच्चन सिंह
- 34.हिन्दी साहित्य कोश – ज्ञानमंडल प्रकाशन वाराणसी
- 35.हिन्दी नाटक – डॉ . बच्चन सिंह
- 36.साहित्य विधाओं की प्रकृति – संपादक – देवीशंकर अवस्थी
- 37.कला – हंस कुमार तिवारी
- 38.आधुनिक साहित्य चिंतन – डॉ . हरीश अरोड़ा, डॉ . गुँजनकुमार झा
- 39.भारतीय कला का इतिहास – डॉ . भागवत शरण उपाध्याय
- 40.भारतीय काव्यशास्त्र के सिद्धांत – डॉ . कृष्णदेव झारी
- 41.भारतीय काव्यशास्त्र – डॉ . मानवेंद्र पाठक
- 42.आधुनिक गीतिकाव्य – डॉ . उमाशंकर तिवारी
- 43.भारतीय साहित्य शास्त्र – डॉ . बलदेव उपाध्याय
- 44.भारतीय काव्यशास्त्र – डॉ . योगेंद्र प्रताप सिंह

प्रश्नपत्र प्रारूप
पेपर नंबर -VII
(Semester –V & VI)

		कुल अंक- 75
		समय : 2:30 घंटे
प्रश्न-1	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- I से)	15
प्रश्न-2	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- II से)	15
प्रश्न-3	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- III से)	15
प्रश्न-4	छंद /अलंकार (छः में से तीन अपेक्षित –इकाई- IV से)	15
प्रश्न-5	क) वस्तुनिष्ठ प्रश्न	10
	ख) बहुविकल्पी प्रश्न	05

आंतरिक परीक्षण

		कुल अंक-25
क	एक कक्ष परीक्षा	20
ख	सक्रिय सहभागिता, नेतृत्व कुशलता, शिष्टाचार तथा समग्र आचरण	05
क	<u>एक कक्ष परीक्षा :-</u>	
प्रश्न-1	सही जोड़ियाँ / रिक्त स्थान / बहुविकल्पीय प्रश्न	05
प्रश्न-2	अतिलघुत्तरी / एक पंक्ति में उत्तर	05
प्रश्न-3	लघुत्तरी प्रश्न (तीन प्रश्नों में से दो के उत्तर अपेक्षित – प्रत्येक प्रश्न के लिए 05 अंक)	10

॥ विद्या विनयेन शोभते ॥
Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
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Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2021-22

Program T.Y.B.A.

Semester V

Course: Hindi

भाषा विज्ञान : हिन्दी भाषा और व्याकरण –VIII

शैक्षणिक उद्देश्य :

1. भाषा विज्ञान एवं उसके विविध अंगों को स्पष्ट करना।
2. भाषा में परिवर्तन के विविध रूपों को स्पष्ट करना।
3. हिन्दी वर्ण विचार को स्पष्ट करना।
4. भाषा विज्ञान एवं व्याकरण की संकल्पनाओं का दैनंदिन जीवन में प्रयोग हेतु विद्यार्थियों को प्रेरित करना।

परिणाम :

1. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
2. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
3. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा।
4. भाषिक आधार पुष्ट होगा।
5. व्याकरणिक आधार पुष्ट होगा।

अध्ययन पद्धति :

5. व्याख्यान तथा विश्लेषण।
6. संगोष्ठी, स्वाध्याय तथा समूह चर्चा।
7. पावर पॉइंट प्रेजेंटेशन, यू ट्यूब वीडियो आदि साधनों का उपयोग।
8. अतिथि विषय विशेषज्ञों के व्याख्यान।

Semester- V

T.Y.B.A.

भाषा विज्ञान : हिन्दी भाषा और व्याकरण –VIII

Name of the Programme	: B.A.
Name of the Course	: भाषा विज्ञान : हिन्दी भाषा और व्याकरण –VIII
Course Code	: UAR5HN8
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I	भाषा	-20
	१. भाषा की परिभाषा एवं अभिलक्षण ।	
	२. भाषा के विविध रूप । (बोली, राष्ट्रभाषा, राजभाषा, संपर्क भाषा)	
	३. भाषा परिवर्तन के प्रमुख कारण ।	
इकाई II	भाषा विज्ञान	-10
	१. भाषा विज्ञान : परिभाषा और उपयोगिता	
	२. भाषा विज्ञान की प्रमुख शाखाएँ, सामान्य परिचय । (ध्वनि विज्ञान, शब्द विज्ञान, रूप विज्ञान, वाक्य विज्ञान, अर्थ विज्ञान)	
इकाई III	हिन्दी व्याकरण	-10
	१. वर्णविचार : हिन्दी ध्वनियों का वर्गीकरण ।	
	२. कारक के भेद एवं उनकी विभक्तियाँ ।	

१. संज्ञा : रूपांतर के आधार ।
२. सर्वनाम : कारक रचना ।
३. विशेषण : रूपांतर के आधार ।
४. क्रिया के रूपांतर के आधार । (वाच्य, काल, पुरुष, वचन और लिंग)

संदर्भ ग्रंथ

1. हिन्दी भाषा और लिपि – डॉ . धीरेन्द्र वर्मा
2. हिन्दी भाषा का इतिहास – डॉ . भोलानाथ तिवारी
3. भाषा विज्ञान – डॉ . भोलानाथ तिवारी
4. हिन्दी ध्वनियों का विकास – डॉ . भोलानाथ तिवारी
5. हिन्दी व्याकरण – पं . कामता प्रसाद गुरु
6. हिन्दी शब्दानुशासन –आचार्य किशोरीदास वाजपेयी
7. भाषा विज्ञान की भूमिका – डॉ . देवेंद्रनाथ शर्मा
8. भाषा विज्ञान और भाषा शास्त्र – डॉ . कपिलदेव द्विवेदी
9. हिन्दी व्याकरण और रचना – वासुदेवनन्दन प्रसाद
10. हिन्दी व्याकरण मीमांसा – डॉ . उदय नारायण तिवारी
11. आधुनिक भाषा विज्ञान के सिद्धांत – डॉ . राम किशोर शर्मा
12. व्यावहारिक हिन्दी – डॉ . मानवेंद्र पाठक

Semester- VI

T.Y.B.A.

भाषा विज्ञान : हिन्दी भाषा और व्याकरण –VIII

Name of the Programme	: B.A.
Name of the Course	: भाषा विज्ञान : हिन्दी भाषा और व्याकरण –VIII
Course Code	: UAR6HN8
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I हिन्दी भाषा का स्वरूप और विकास - -20

१. प्राचीन एवं मध्यकालीन भारतीय आर्य भाषाओं का सामान्य परिचय ।
 1. वैदिक
 2. संस्कृत
 3. पालि
 4. प्राकृत अपभ्रंश
२. हिन्दी भाषा की उत्पत्ति और विकास ।

इकाई II -10

१. हिन्दी की प्रमुख बोलियों का सामान्य परिचय -
 1. ब्रज
 2. खड़ी बोली
 3. अवधी
 4. भोजपुरी
 5. राजस्थानी (मारवाड़ी)
 6. पहाड़ी (गढ़वाली)

२. खड़ी बोली हिन्दी के विविध रूप -

1. हिन्दी
2. हिंदुस्तानी
3. दक्खिनी

इकाई III

-10

१. हिन्दी का शब्द समूह ।
२. देवनागरी लिपि : विशेषताएँ एवं महत्व ।

इकाई IV हिन्दी व्याकरण

-20

१. वाक्य रचना -
 1. वाक्य की परिभाषा, अर्थ और रचना की दृष्टि से प्रकार ।
 2. हिन्दी वाक्य रचना में पदक्रम, अध्याहार संबंधी सामान्य नियम ।
२. समास एवं संधि -
 1. समास : अर्थ, स्वरूप तथा प्रमुख भेदों का सामान्य परिचय ।
 2. संधि : अर्थ, स्वरूप तथा प्रमुख भेदों का सामान्य परिचय ।

संदर्भ ग्रंथ

1. हिन्दी भाषा और लिपि – डॉ . धीरेन्द्र वर्मा
2. हिन्दी भाषा का इतिहास – डॉ . भोलानाथ तिवारी
3. भाषा विज्ञान – डॉ . भोलानाथ तिवारी
4. हिन्दी ध्वनियों का विकास – डॉ . भोलानाथ तिवारी
5. हिन्दी व्याकरण – पं. कामता प्रसाद गुरु
6. हिन्दी शब्दानुशासन –आचार्य किशोरीदास वाजपेयी
7. भाषा विज्ञान की भूमिका – डॉ . देवेंद्रनाथ शर्मा
8. भाषा विज्ञान और भाषा शास्त्र – डॉ . कपिलदेव द्विवेदी
9. हिन्दी व्याकरण और रचना – वासुदेवनन्दन प्रसाद
10. हिन्दी व्याकरण मीमांसा – डॉ . उदय नारायण तिवारी
11. आधुनिक भाषा विज्ञान के सिद्धांत – डॉ . राम किशोर शर्मा
12. व्यावहारिक हिन्दी – डॉ . मानवेंद्र पाठक

प्रश्नपत्र प्रारूप
पेपर नंबर -VIII
(Semester –V & VI)

		कुल अंक- 75
		समय : 2:30 घंटे
प्रश्न-1	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- I से)	15
प्रश्न-2	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- II से)	15
प्रश्न-3	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- III से)	15
प्रश्न-4	टिप्पणी (आंतरिक विकल्प सहित –इकाई- IV से)	15
प्रश्न-5	क) वस्तुनिष्ठ प्रश्न	10
	ख) बहुविकल्पी प्रश्न	05

आंतरिक परीक्षण

		कुल अंक-25
क	एक कक्ष परीक्षा	20
ख	सक्रिय सहभागिता, नेतृत्व कुशलता, शिष्टाचार तथा समग्र आचरण	05
क	<u>एक कक्ष परीक्षा :-</u>	
प्रश्न-1	सही जोड़ियाँ / रिक्त स्थान / बहुविकल्पीय प्रश्न	05
प्रश्न-2	अतिलघुत्तरी / एक पंक्ति में उत्तर	05
प्रश्न-3	लघुत्तरी प्रश्न (तीन प्रश्नों में से दो के उत्तर अपेक्षित – प्रत्येक प्रश्न के लिए 05 अंक)	10

॥ विद्या विनयेन शोभते ॥
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Syllabus

Question Paper Pattern (75:25)

Choice Based Credit Grading and Semester System (CBCGS)
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Program T.Y.B.A.

Semester V

Course: Hindi

जनसंचार माध्यम -IX

शैक्षणिक उद्देश्य :

1. जनसंचार की अवधारणा, तत्त्व, प्रक्रिया एवं उपयोगिता से अवगत कराना।
2. विविध जनसंचार माध्यमों से अवगत करना।
3. जनसंचार माध्यमों की भाषा से अवगत करना।
4. लघुफिल्म तथा वृत्तचित्र के सभी अंगों से अवगत कराना।
5. विज्ञापन और कानून से अवगत कराना।
6. विज्ञापन की भाषा, स्वरूप आदि से अवगत कराना।

परिणाम :

1. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
2. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
3. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा।
4. ज्ञानात्मक आधार पुष्ट होगा।

अध्ययन पद्धति :

1. व्याख्यान तथा विश्लेषण।
2. संगोष्ठी, स्वाध्याय तथा समूह चर्चा।
3. पावर पॉइंट प्रेजेंटेशन, यू ट्यूब वीडियो आदि साधनों का उपयोग।
4. अतिथि विषय विशेषज्ञों के व्याख्यान।

Semester- V

T.Y.B.A.

संचार माध्यम -IX

Name of the Programme	: B.A.
Name of the Course	: संचार माध्यम -IX
Course Code	: UAR5HN9
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I जनसंचार माध्यम -15

1. जनसंचार की अवधारणा एवं स्वरूप ।
2. जनसंचार के तत्व ।
3. जनसंचार की प्रक्रिया, उपयोगिता ।

इकाई II जनसंचार माध्यमों का सामान्य परिचय - 15

1. पारंपारिक जनसंचार माध्यम -

1. तमाशा
2. लावणी
3. कठपुतली
4. रामलीला
5. नौटंकी

2. आधुनिक जनसंचार माध्यम -

1. समाचार -पत्र
2. रेडियो
3. सिनेमा
4. दूरदर्शन
5. मोबाईल

इकाई III आधुनिक जनसंचार माध्यमों का विकास एवं

-15

उपयोगिता

1. समाचार-पत्र
2. रेडियो
3. सिनेमा
4. दूरदर्शन
5. मोबाईल

इकाई IV जनसंचार माध्यमोपयोगी लेखन-

-15

1. समाचार लेखन
2. पटकथा लेखन
3. साक्षात्कार लेखन
4. संवाद लेखन
5. फीचर लेखन

संदर्भ ग्रंथ

१. जनसंचार माध्यम और पत्रकारिता सर्वांग –जीतेंद्र व्यास
२. जनसंचार माध्यम और हिन्दी पत्रकारिता – डॉ . अर्जुन तिवारी
३. जनसंचार माध्यम – हरीश अरोड़ा
४. प्रयोजनमूलक तथा व्यावहारिक हिन्दी – डॉ . अंबादास देशमुख
५. प्रयोजनमूलक हिन्दी – डॉ . माधव सोनटक्के
६. हिन्दी सिनेमा – डॉ . चन्द्रकान्त मिसाल
७. हिन्दी पत्रकारिता – डॉ . कृष्ण बिहारी मिश्र
८. समाचार पत्रों का इतिहास – अंबिका प्रसाद वाजपेयी
९. भारतीय पत्रकारिता कोश – विजय दत्त श्रीधर

Semester- VI

T.Y.B.A.

संचार माध्यम -IX

Name of the Programme	: B.A.
Name of the Course	: संचार माध्यम -IX
Course Code	: UAR6HN9
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I संचार माध्यम की भाषा - -10

1. मुद्रित माध्यम ।
2. रेडियो ।
3. सिनेमा ।
४. दूरदर्शन ।

इकाई II विज्ञापन - -20

1. परिभाषा एवं स्वरूप ।
2. विज्ञापन की भाषा ।
3. मुद्रित विज्ञापन ।
4. रेडियो विज्ञापन ।
5. दूरदर्शन विज्ञापन ।
6. विज्ञापन और नैतिकता ।
7. विज्ञापन और कानून ।

इकाई III वृत्तचित्र और लघु फिल्म -

-20

1. वृत्तचित्र :अर्थ, स्वरूप एवं लेखन ।

2. वृत्तचित्र की उपयोगिता एवं महत्त्व ।

3. लघुफिल्म का अर्थ एवं स्वरूप ।

4. लघु फिल्मों की उपयोगिता एवं महत्त्व ।

इकाई IV फिल्म प्रभाव -

-10

1. फिल्म सोससीटी आंदोलन ।

2. फिल्म प्रभाग का सामान्य परिचय ।

3. भारतीय बाल चित्र समिति ।

4. भारतीय फिल्म संस्थान पुणे का सामान्य परिचय एवं योगदान ।

संदर्भ ग्रंथ

१. जनसंचार माध्यम और पत्रकारिता सर्वांग –जीतेंद्र व्यास
२. जनसंचार माध्यम और हिन्दी पत्रकारिता – डॉ . अर्जुन तिवारी
३. जनसंचार माध्यम – हरिश अरोड़ा
४. प्रयोजनमूलक तथा व्यावहारिक हिन्दी – डॉ . अंबादास देशमुख
५. प्रयोजनमूलक हिन्दी – डॉ . माधव सोनटक्के
६. हिन्दी सिनेमा – डॉ . चन्द्रकान्त मिसाल
७. हिन्दी पत्रकारिता – डॉ . कृष्ण बिहारी मिश्र
८. समाचार पत्रों का इतिहास – अंबिका प्रसाद वाजपेयी
९. भारतीय पत्रकारिता कोश – विजय दत्त श्रीधर

प्रश्नपत्र प्रारूप
पेपर नंबर -IX
(Semester –V & VI)

		कुल अंक- 75
		समय : 2: 30 घंटे
प्रश्न-1	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- I से)	15
प्रश्न-2	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- II से)	15
प्रश्न-3	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- III से)	15
प्रश्न-4	टिप्पणी (आंतरिक विकल्प सहित –इकाई- IV से)	15
प्रश्न-5	क) वस्तुनिष्ठ प्रश्न	10
	ख) बहुविकल्पी प्रश्न	05

आंतरिक परीक्षण

		कुल अंक-25
क	एक कक्ष परीक्षा	20
ख	सक्रिय सहभागिता, नेतृत्व कुशलता, शिष्टाचार तथा समग्र आचरण	05
क	<u>एक कक्ष परीक्षा :-</u>	
प्रश्न-1	सही जोड़ियाँ / रिक्त स्थान / बहुविकल्पीय प्रश्न	05
प्रश्न-2	अतिलघुत्तरी / एक पंक्ति में उत्तर	05
प्रश्न-3	लघुत्तरी प्रश्न (तीन प्रश्नों में से दो के उत्तर अपेक्षित – प्रत्येक प्रश्न के लिए 05 अंक)	10

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Board of Examinations and Evaluation, C.K. Thakur A.C.S. College, New Panvel 63 |

Page

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Affiliated to University of Mumbai



Syllabus

Question Paper Pattern (75:25)

**Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2021-22**

Program T.Y.B.A.

Semester V

Course: Hindi

आधुनिक हिन्दी साहित्य की वैचारिक पृष्ठभूमि -IX

शैक्षणिक उद्देश्य :

1. आधुनिक हिन्दी साहित्य की वैचारिक पृष्ठभूमि को स्पष्ट करना।
2. आर्य सामाज्य के सामाजिक, दार्शनिक सिद्धांत को स्पष्ट करते हुए विद्यार्थियों को उस मार्ग पर चलने के लिए मार्गदर्शन देना।
3. मार्क्सवाद, दलित चेतना एवं मनोविक्षेपणवाद के माध्यम से विद्यार्थियों में जागरूकता लाना।
4. राष्ट्रीय चेतना के विकास में हिन्दी पत्र-पत्रिकाओं के योगदान से विद्यार्थियों को अवगत कराना।

परिणाम :

5. पाठ्यक्रम के माध्यम से विद्यार्थियों में सामाजिक, राजनीतिक, धार्मिक एवं सांस्कृतिक विश्वदृष्टि का विकास होगा।
6. विद्यार्थियों में रसास्वादन के कौशल्य का विकास होगा।
7. हिन्दी हेतु उपलब्ध रोजगारों के लिए आवश्यक गुणों का विकास होगा।
8. ज्ञानात्मक आधार पुष्ट होगा।

अध्ययन पद्धति :

5. व्याख्यान तथा विक्षेपण।
6. संगोष्ठी, स्वाध्याय तथा समूह चर्चा।
7. पावर पॉइंट प्रेजेंटेशन, यू ट्यूब वीडियो आदि साधनों का उपयोग।
8. अतिथि विषय विशेषज्ञों के व्याख्यान।

Semester- V

T.Y.B.A.

आधुनिक हिन्दी साहित्य की वैचारिक पृष्ठभूमि -IX

Name of the Programme	: B.A.
Name of the Course	: आधुनिक हिन्दी साहित्य की वैचारिक पृष्ठभूमि-IX
Course Code	: UAR5HN9
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

इकाई I भारतीय नव जागरण आंदोलन और हिन्दी साहित्य -20
पर उसका प्रभाव (सामाजिक दृष्टि से होने वाले
वैचारिक एवं व्यावहारिक बदलाव के विशेष संदर्भ में)

1. भारतीय नवजागरण आंदोलन ।

(1. ब्रम्ह समाज

(2. प्रार्थना समाज

(3. रामकृष्ण मिशन

(4. थियोसोफिकल सोसायटी

(5. सत्यशोधक समाज का परिचय एवं मान्यताएँ

२. आर्य समाज के सामाजिक दार्शनिक सिद्धांतों का हिन्दी
कविता और उपन्यास पर प्रभाव

इकाई II गाँधीवादी चिंतन का हिन्दी कविता और उपन्यास पर -10
प्रभाव

इकाई III मार्क्सवाद : हिन्दी कविता और हिन्दी कथा साहित्य -10
पर प्रभाव

इकाई IV राष्ट्रीय चेतना के विकास में हिन्दी पत्र-पत्रिकाओं का -20

योगदान -

1. हरिश्चंद्र मैगजीन
2. हिन्दुस्थान
3. हिन्दी प्रदीप
4. सरस्वती
5. स्वराज
6. कर्मवीर
7. चांद और मतवाला के विशेष संदर्भ में ।

संदर्भ ग्रंथ :

1. बंगाल में स्वदेशी आंदोलन –सुमित सरकार
2. आज का भारत – रजनी पामदत्त
3. सत्य के प्रयोग – मोहनदास करमचंद गांधी
4. गुलामी – ज्योतिराव फुले
5. हिन्दी साहित्य में प्रतिबंधित चिंतन प्रवाह – सुधाकर गोकाकर और गो. रा. कुलकर्णी
6. हिन्दी साहित्य पर गाँधीवादी प्रभाव – डॉ . अरविंद जोशी
7. मार्क्सवाद – यशपाल
8. निबंधमाला हिन्दी निबंध – डॉ . भंडारे उद्धव तुकाराम
9. दलित देवो भव – किशोर कुणाल
10. समाचार पत्रों का इतिहास – अंबिका प्रसाद वाजपेयी
11. हिन्दी पत्रकारिता – डॉ . कृष्ण बिहारी मिश्र
12. मनोविश्लेषण – सिगमंड , फ्राइड
13. भारतीय पत्रकारिता कोश – विजय दत्त श्रीधर
14. मार्क्सवादी साहित्य चिंतन – शिवकुमार मिश्र
15. दलित साहित्य का समाज शास्त्र – ओमप्रकाश वाल्मीकि
16. आधुनिकता के आईने में दलित – अभी कुमार दुबे
17. भारतीय समाज में नारी – नीरा देसाई
18. आधुनिक हिन्दी कविता में मनोविज्ञान – डॉ . उर्वशी ज. सुरती
19. भारतीय दलित आंदोलन का इतिहास – मोहनदास नैमिशराय
20. आधुनिक हिन्दी कथा साहित्य और मनोविज्ञान – डॉ . देवराज उपाध्याय
21. मनोविज्ञान का इतिहास – डॉ . सप्रसाद पांडे
22. दलित वैचारिकी की दिशाएँ – सं . बद्दीनारायण
23. हिन्दी उपन्यास में दलित वर्ग – कुसुम मेघवाल
24. दलित चेतना और समकालीन हिन्दी उपन्यास – डॉ. मुन्ना तिवारी
25. आदिवासी शौर्य और विद्रोह – सं . रमणिका गुप्ता
26. आदिवासी साहित्य यात्रा - सं . रमणिका गुप्ता

Semester- VI

T.Y.B.A.

आधुनिक हिन्दी साहित्य की वैचारिक पृष्ठभूमि -IX

Name of the Programme	: B.A.
Name of the Course	: आधुनिक हिन्दी साहित्य की वैचारिक पृष्ठभूमि-IX
Course Code	: UAR6HN9
Total Lectures	: 60
Total credit	: 04

पाठ्यक्रम

- इकाई I मनोविक्षेपणवाद : सामान्य परिचय और हिन्दी उपन्यास पर उसका प्रभाव । -10
- इकाई II दलित चेतना : हिन्दी कविता तथा कथा साहित्य पर प्रभाव । -20
- इकाई III समकालीन कथा साहित्य में आदिवासी विमर्श । -10
- इकाई IV स्वातंत्र्योत्तर जन चेतना और हिन्दी पत्रकारिता : -20
1. धर्मयुग
 2. आलोचना
 3. हंस
 4. कथादेश
 5. इंडिया टुडे
 6. आज और नवभारत टाइम्स (अभिव्यक्ति के विशेष संदर्भ में)

संदर्भ ग्रंथ :

1. बंगाल में स्वदेशी आंदोलन –सुमित सरकार
2. आज का भारत – रजनी पामदत्त
3. सत्य के प्रयोग – मोहनदास करमचंद गांधी
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13. भारतीय पत्रकारिता कोश – विजय दत्त श्रीधर
14. मार्क्सवादी साहित्य चिंतन – शिवकुमार मिश्र
15. दलित साहित्य का समाज शास्त्र – ओमप्रकाश वाल्मीकि
16. आधुनिकता के आईने में दलित – अभी कुमार दुबे
17. भारतीय समाज में नारी – नीरा देसाई
18. आधुनिक हिन्दी कविता में मनोविज्ञान – डॉ . उर्वशी ज. सुरती
19. भारतीय दलित आंदोलन का इतिहास – मोहनदास नैमिशराय
20. आधुनिक हिन्दी कथा साहित्य और मनोविज्ञान – डॉ . देवराज उपाध्याय
21. मनोविज्ञान का इतिहास – डॉ . सप्रसाद पांडे
22. दलित वैचारिकी की दिशाएँ – सं . बट्टीनारायण
23. हिन्दी उपन्यास में दलित वर्ग – कुसुम मेघवाल
24. दलित चेतना और समकालीन हिन्दी उपन्यास – डॉ. मुन्ना तिवारी
25. आदिवासी शौर्य और विद्रोह – सं . रमणिका गुप्ता
26. आदिवासी साहित्य यात्रा – डॉ. रमणिका गुप्ता

प्रश्नपत्र प्रारूप
पेपर नंबर -IX
(Semester –V & VI)

		कुल अंक 75
		समय : 2:30 घंटे
प्रश्न-1	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- I से)	15
प्रश्न-2	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- II से)	15
प्रश्न-3	दीर्घोत्तरी प्रश्न (आंतरिक विकल्प सहित –इकाई- III से)	15
प्रश्न-4	टिप्पणी (आंतरिक विकल्प सहित –इकाई- IV से)	15
प्रश्न-5	क) वस्तुनिष्ठ प्रश्न	10
	ख) बहुविकल्पी प्रश्न	05

आंतरिक परीक्षण

		कुल अंक-25
क	एक कक्ष परीक्षा	20
ख	सक्रिय सहभागिता, नेतृत्व कुशलता, शिष्टाचार तथा समग्र आचरण	05
क	<u>एक कक्ष परीक्षा :-</u>	
प्रश्न-1	सही जोड़ियाँ / रिक्त स्थान / बहुविकल्पीय प्रश्न	05
प्रश्न-2	अतिलघुत्तरी / एक पंक्ति में उत्तर	05
प्रश्न-3	लघुत्तरी प्रश्न (तीन प्रश्नों में से दो के उत्तर अपेक्षित – प्रत्येक प्रश्न के लिए 05 अंक)	10

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**



**Scheme of Evaluation for
Continuous Assessments and Semester
End Examinations
for
Post-graduate Programmes
under
Faculty of Arts**

***Under Autonomous status with Credit
Based Semester and Grading System***

(To be implemented from Academic Year 2022-2023)

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

Arts, Commerce and Science College, New Panvel

Autonomous

Affiliated to University of Mumbai



DEPARTMENT OF HINDI

Master of Arts (M.A. Part -I) Revised Syllabus For

M.A. Hindi Part-I

***Choice Based Credit Grading and Semester System (CBCGS)
(60:40)***

With effect from the Academic Year 2022-23

जनार्दन भगत शिक्षण प्रसारक संस्था का
चांगू काना ठाकूर कला वाणिज्य और विज्ञान महाविद्यालय
नवीन पनवेल (स्वायत्त)



हिंदी विभाग

एम् . ए . स्नातकोत्तर हिन्दी

पाठ्यक्रम

शैक्षणिक वर्ष 2022-2023

हिन्दी अध्ययन मंडल

अनु.क्र	अध्यापक का नाम	पद	अधिष्ठान
1	डॉ. भंडारे उद्धव तुकाराम	प्रोफेसर, अध्यक्ष, हिंदी विभाग	अध्यक्ष
2	डॉ. गीतिका एस. तंवर	सहायक प्राध्यापिका	सदस्य
3	डॉ. बीसेन जोगेंद्रसिंग मोतीसिंह	प्रोफेसर	सदस्य
4	डॉ. हूबनाथ गोरखनाथ पाण्डेय	सहयोगी प्राध्यापक	सदस्य
5	डॉ. बालकवि सुरंजे	सहयोगी प्राध्यापक	सदस्य
6	डॉ. घरत अर्जुन जानू	पूर्व प्रोफेसर	सदस्य
7	डॉ. सुनीता साखरे	सहयोगी प्राध्यापिका	सदस्य
8	श्री. वी. एन. एकंबे	अध्यक्ष, रोटरी क्लब, न्यू पनवेल	सदस्य
9	कविता शर्मा	पूर्व स्नातकोत्तर विद्यार्थी	सदस्य

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Affiliated to University of Mumbai

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

**Choice Based Credit Grading and Semester System (CBCGS) (60:40)
With effect from the Academic Year 2022-23**

Faculty of Humanities

Semester I & Semester II

Guidelines

Syllabus Structure:

1. In M.A. Hindi Part-I (CBCGS) in Semester I and Semester II the Core Courses will be Core Courses 1 to 8

**Scheme of Examination
Faculty of Arts
(Post-graduate Programmes)**

Credit Based Evaluation System

❖ Scheme of Examination

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below-

A) Internal Assessment: 40 %**40 Marks**

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	One case study / project with presentation based on curriculum to be assessed by the teacher concerned	15 Marks
	Presentation	10 Marks
	Written Document	05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks

Question Paper Pattern**(Periodical Class Test for the Courses at Under Graduate Programmes)**

Maximum Marks: 20

Duration: 40 Minutes

Questions to be set: 02

All Questions are Compulsory

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 %**60 Marks**

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
<ol style="list-style-type: none"> 1. There shall be four questions each of 15 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

❖ **Passing Standard**

The learners shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of grade D in each project wherever applicable to pass a particular semester.

Note: All other rules regarding Standard of Passing, ATKT, etc, will be as per those decided by the Faculty of Humanities passed by the Academic Council from time to time

❖ **Guidelines and Evaluation pattern for project work (100 Marks)**

Introduction

Inclusion of project work in the course curriculum of the M.A. programme is one of the ambitious aspect in the programme structure. The main objective of inclusion of project work is to inculcate the element of research work challenging the potential of learner as regards to his/ her eager to enquire and ability to interpret particular aspect of the study in his/ her own words. It is expected that the guiding teacher should undertake the counselling sessions and make the awareness among the learners about the methodology of formulation, preparation and evaluation pattern of the project work.

- There are two modes of preparation of project work
 1. Project work based on research methodology in the study area
 2. Project work based on internship in the study area

Guidelines for preparation of Project Work

Work Load

Work load for Project Work is 01 (one) hour per batch of 15-20 learners per week for the teacher. The learner (of that batch) shall do field work and library work in the remaining 03 (three) hours per week.

1. General guidelines for preparation of project work based on research methodology

- The project topic may be undertaken in any area of Elective Courses.
- Each of the learner has to undertake a Project individually under the supervision of a teacher-guide.
- The learner shall decide the topic and title which should be specific, clear and with definite scope in consultation with the teacher-guide concerned.
- University/college shall allot a guiding teacher for guidance to the students based on her / his specialization.
- The project report shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.
 - The project report should be 80 to 100 pages

Format

1st page (Main Page)

Title of the problem of the Project

A Project Submitted to
University of Mumbai for partial completion of the degree of
Master in Arts
Under the Faculty of Arts

By

Name of the Learner

Under the Guidance of

Name of the Guiding Teacher

Name and address of the College

Month and Year

2nd Page

This page to be repeated on 2nd page (i.e. inside after main page)

On separate page

Index

Chapter No. 1 (sub point 1.1, 1.1.1, And so on)	Title of the Chapter	Page No.
Chapter No. 2	Title of the Chapter	
Chapter No. 3	Title of the Chapter	
Chapter No. 4	Title of the Chapter	
Chapter No. 5	Title of the Chapter	

List of tables, if any, with page numbers.

List of Graphs, if any, with page numbers.

List of Appendix, if any, with page numbers.

Abbreviations used:

Structure to be followed to maintain the uniformity in formulation and presentation of Project Work

(Model Structure of the Project Work)

- **Chapter No. 1: Introduction**

In this chapter Selection and relevance of the problem, historical background of the problem, brief profile of the study area, definition/s of related aspects, characteristics, different concepts pertaining to the problem etc can be incorporated by the learner.

- **Chapter No. 2: Research Methodology**

This chapter will include Objectives, Hypothesis, Scope of the study, limitations of the study, significance of the study, Selection of the problem, Sample size, Data collection, Tabulation of data, Techniques and tools to be used, etc can be incorporated by the learner.

- **Chapter No. 3: Literature Review**

This chapter will provide information about studies done on the respective issue. This would specify how the study undertaken is relevant and contribute for value addition in information/ knowledge/ application of study area which ultimately helps the learner to undertake further study on same issue.

- **Chapter No. 4: Data Analysis, Interpretation and Presentation**

This chapter is the core part of the study. The analysis pertaining to collected data will be done by the learner. The application of selected tools or techniques will be used to arrive at findings. In this, table of information's, presentation of graphs etc. can be provided with interpretation by the learner.

- **Chapter No. 5: Conclusions and Suggestions**

In this chapter of project work, findings of work will be covered and suggestion will be enlisted to validate the objectives and hypotheses.

Note: If required more chapters of data analysis can be added.

- **Bibliography**
- **Appendix**

On separate page

Name and address of the college

Certificate

This is to certify that Ms/Mr has worked and duly completed her/his Project Work for the degree of Master in Arts under the Faculty of Arts in the subject of _____ and her/his project is entitled, “ _____
Title of the Project _____ ” under my supervision.

I further certify that the entire work has been done by the learner under my guidance and that no part of it has been submitted previously for any Degree or Diploma of any University.

It is her/ his own work and facts reported by her/his personal findings and investigations.



Name and Signature of
Guiding Teacher

Date of submission:

On separate page

Declaration by learner

I the undersigned Miss / Mr. _____ *Name of the learner* here by,
declare that the work embodied in this project work titled “ _____
_____ *Title of the Project* _____ ”,

forms my own contribution to the research work carried out under the guidance of
_____ *Name of the guiding teacher* _____ is a result of my own research work and has
not been previously submitted to any other University for any other Degree/ Diploma
to this or any other University.

Wherever reference has been made to previous works of others, it has been clearly
indicated as such and included in the bibliography.

I, here by further declare that all information of this document has been obtained and
presented in accordance with academic rules and ethical conduct.

Name and Signature of the learner

Certified by

Name and signature of the Guiding Teacher

On separate page

Acknowledgment

(Model structure of the acknowledgement)

To list who all have helped me is difficult because they are so numerous and the depth is so enormous.

I would like to acknowledge the following as being idealistic channels and fresh dimensions in the completion of this project.

I take this opportunity to thank the **University of Mumbai** for giving me chance to do this project.

I would like to thank my **Principal**, _____ for providing the necessary facilities required for completion of this project.

I take this opportunity to thank our **Head** _____, for her moral support and guidance.

I would also like to express my sincere gratitude towards my project guide _____ whose guidance and care made the project successful.

I would like to thank my **College Library**, for having provided various reference books and magazines related to my project.

Lastly, I would like to thank each and every person who directly or indirectly helped me in the completion of the project especially **my Parents and Peers** who supported me throughout my project.

2. Guidelines for Internship based project work

- Minimum 20 days/ 100 hours of Internship with an Organisation/ NGO/ Charitable Organisation/ Private firm.
- The theme of the internship should be based on any study area of the elective courses
- Project Report should be of minimum 50 pages
- Experience Certificate is Mandatory
- A project report has to be brief in content and must include the following aspects:
 - **Executive Summary:**
A bird's eye view of your entire presentation has to be precisely offered under this category.
 - **Introduction on the Company:**
A Concise representation of company/ organization defining its scope, products/ services and its SWOT analysis.
 - **Statement and Objectives:**
The mission and vision of the organization need to be stated enshrining its broad strategies.
 - **Your Role in the Organisation during the internship:**
The key aspects handled, the department under which you were deployed and brief summary report duly acknowledged by the reporting head.
 - **Challenges:**
The challenges confronted while churning out theoretical knowledge into world.
 - **Conclusion:**
A brief overview of your experience and suggestions to bridge the gap between theory and practice.
- The project report based on internship shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.

Evaluation pattern of the project work

The Project Report shall be evaluated in two stages viz.	
• Evaluation of Project Report (Bound Copy)	60 Marks
▪ Introduction and other areas covered	20 Marks
▪ Research Methodology, Presentation, Analysis and interpretation of data	30 Marks
▪ Conclusion & Recommendations	10 Marks
• Conduct of Viva-voce	40 Marks
▪ In the course of Viva-voce, the questions may be asked such as importance / relevance of the study, objective of the study, methodology of the study/ mode of Enquiry (question responses)	10 Marks
▪ Ability to explain the analysis, findings, concluding observations, recommendation, limitations of the Study	20 Marks
▪ Overall Impression (including Communication Skill)	10 Marks

Note:

- *The guiding teacher along with the external evaluator appointed by the University/ College for the evaluation of project shall conduct the viva-voce examination as per the evaluation pattern*
- *The plagiarism should be maintained as per the UGC guidelines.*

Passing Standard

- Minimum of Grade D in the project component.
- In case of failing in the project work, the same project can be revised for ATKT examination.
- Absence of student for viva voce: If any student fails to appear for the viva voce on the date and time fixed by the department such student shall appear for the viva voce on the date and time fixed by the Department, such student shall appear for the viva voce only along with students of the next batch.

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**

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2.	M.A. I	आधुनिक गद्य	3	PAR1HN3	06
3.	M.A. I	भाषा विज्ञान एवं हिंदी भाषा	5	PAR1HN5	06
4.	M.A. I	प्राचीन एवं मध्यकालीन काव्य	7	PAR1HN7	06
5.	M.A. I	हिन्दी साहित्य का इतिहास	2	PAR2HN2	06
6.	M.A. I	आधुनिक गद्य	4	PAR2HN4	06
7.	M.A. I	भाषा विज्ञान एवं हिंदी भाषा	6	PAR2HN6	06
8.	M.A. I	प्राचीन एवं मध्यकालीन काव्य	8	PAR2HN8	06

Janardan Bhagat Shikshan Prasarak Sanstha's

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**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Affiliated to University of Mumbai



Syllabus

Question Paper Pattern (60:40)

**Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2022-23**

Program M.A. Part-I

Semester I & Semester II

**M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)**

Course: Hindi

Course Code : PAR1HN1 & PAR2HN2

प्रश्नपत्र : 1 एवं 2

हिन्दी साहित्य का इतिहास

Semester I & II
M.A. Hindi Part-I

प्रश्नपत्र : 1 एवं 2

हिन्दी साहित्य का इतिहास

Name of the Programme : M.A.

Name of the Course : Hindi

Course Code : PAR1HN1 & PAR2HN2

Total Lectures : 60 + 60

Total credit : 06 + 06

पाठ्यक्रम के उद्देश्य:

1. हिन्दी की आदिकालीन तथा भक्तिकालीन एवं रीतिकालीन काव्य प्रवृत्तियों की जानकारी देना
2. छात्रों को प्राचीन तथा मध्यकालीन काव्य प्रवृत्तियों की जानकारी देना
3. प्राचीन तथा मध्यकालीन कवियों की काव्य कला से छात्रों को अवगत कराना
4. छात्रों को हिन्दी की प्राचीन तथा मध्यकालीन काव्य परंपरा से परिचित कराना
5. छात्रों को प्राचीन तथा मध्यकालीन हिन्दी भाषा से अवगत कराना
6. छात्रों में प्राचीन तथा मध्यकालीन काव्य अध्ययन के माध्यम से समीक्षात्मक दृष्टि विकसित करना
7. गद्य की प्रमुख विधाओं के तात्त्विक स्वरूप का परिचय देना
8. प्रामुख गद्य विधाओं के क्रमिक विकासक्रम की जानकारी देना
9. रचना के आस्वादन एवं समीक्षण की क्षमता विकसित करना

अध्ययन पद्धति:

1. व्याख्यान तथा विश्लेषण
2. संगोष्ठ, स्वाध्याय तथा गुटचर्चा
3. दृक्-श्राव्य माध्यमों साधनों का प्रयोग
4. पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग
5. अतिथि विशेषज्ञों के व्याख्यान
6. अध्ययन यात्रा का आयोजन करना

Semester I
M.A., Hindi Part-I

प्रश्नपत्र : १

Course Code : PAR1HN1

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Semester II
M.A. Hindi Part-I

प्रश्नपत्र : २

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- 4.5. : जीवनी
- 4.6. : आत्मकथा
- 4.7. : रेखाचित्र
- 4.8. : संस्मरण

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3.	जायसी के पद्मावत का मूल्यांकन	: प्रो. हरेंद्रप्रताप सिन्हा
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22.	हिन्दी साहित्य का आलोचनात्मक इतिहास	: डॉ. रामकुमार वर्मा
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29. रीतिकाव्य की भूमिका : डॉ. नगेन्द्र
30. आधुनिक हिन्दी साहित्य का आदिकाल : श्री नारायण चतुर्वेदी
31. हिन्दी साहित्य : युग और प्रवृत्तियाँ : डॉ. शिवकुमार शर्मा
32. हिन्दी साहित्य का प्रवृत्तिगत इतिहास : डॉ. सभापति मिश्र
33. हिन्दी साहित्य का इतिहास : डॉ. माधव सोनटक्के
34. हिन्दी साहित्य का अद्यतन इतिहास : डॉ. मोहन अवस्थी
35. हिन्दी साहित्य का सही इतिहास : डॉ. चंद्रभाणु सोनवने, डॉ. सूर्यनारायण रणसुभे
36. हिन्दी साहित्य का आध इतिहास : डॉ. सुमन राजे
37. हिन्दी साहित्य की नवीन विधाएँ : डॉ. कैलाशचंद्र भाटिया
38. आधुनिक हिंदी कविता में काव्य चिंतन : डॉ. करुणाशंकर उपाध्याय
39. साहित्य और संस्कृति के सरोकार : डॉ. करुणाशंकर उपाध्याय
40. आधुनिक हिन्दी साहित्य: वाद, प्रवृत्तियाँ एवं विमर्श : डॉ. दत्तात्रय मुरुमकर
41. हिन्दी साहित्य का इतिहास: नए विचार नई दिशाएँ : डॉ. सुरेशकुमार जैन
42. हिन्दी साहित्य का इतिहास : डॉ. सज्जनराम केनी
43. हिन्दी साहित्य : डा. धर्मवीर भारती

Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2022-23

Program M.A. Part-I

Semester I & Semester II

**M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)**

Course: Hindi

Course Code : PAR1HN3 & PAR2HN4

प्रश्नपत्र : 3 & 4

आधुनिक गद्य

Semester I & II
M.A. Hindi Part-I

प्रश्नपत्र : 3 & 4

आधुनिक गद्य

Name of the Programme	: M.A.
Name of the Course	Hindi
Course Code	: PAR1HN3 & PAR2HN4
Total Lectures	: 60 + 60
Total credit	: 06 + 06

पाठ्यक्रम के उद्देश्य:

1. गद्य की प्रमुख विधाओं के तात्त्विक स्वरूप का परिचय देना
2. प्रमुख गद्य विधाओं के क्रमिक विकासक्रम की जानकारी देना
3. रचना के आस्वादन एवं समीक्षा की क्षमता को विकसित करना
4. हिन्दी निबंधकारों के व्यक्तित्व और कृतित्व को समझना
5. हिन्दी निबंधों के माध्यम से भारतीय संस्कृति से अवगत होना
6. हिन्दी उपन्यासकार के जीवन का परिचय प्राप्त करना
7. उपन्यास तथा नाटकों का तात्त्विक विवेचन कराना
8. हिन्दी साहित्यकारों के व्यक्तित्व एवं कृतित्व से परिचित होना
9. हिन्दी नाटकों के माध्यम से समाज और परिवेश के प्रति जागरूक होना

अध्ययन पद्धति:

1. व्याख्यान तथा विश्लेषण
2. संगोष्ठ, स्वाध्याय तथा गुटचर्चा
3. दृक्-श्राव्य माध्यमों साधनों का प्रयोग
4. पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग
5. अतिथि विशेषज्ञों के व्याख्यान
6. अध्ययन यात्रा का आयोजन करना

Semester I
M.A., Hindi Part-I

प्रश्नपत्र : ३

Course Code : PAR1HN3

आधुनिक गद्य

List of New Textbooks:

1. गोदान - मुंशी प्रेमचंद (उपन्यास)
वाणी प्रकाशन, 21-A, नई दिल्ली
2. आठवां सर्ग - सुरेंद्र वर्मा (नाटक)
राधाकृष्ण प्रकासन, नई दिल्ली

3. अध्यापक पूर्ण सिंह के निबंध - अध्यापक पूर्ण सिंह (निबंध)

इकाई-	1 एवं 2	गोदान - मुंशी प्रेमचंद (उपन्यास)	व्याख्यान -20
इकाई-	3	आठवां सर्ग - सुरेंद्र वर्मा (नाटक)	व्याख्यान -20
इकाई-	4	अध्यापक पूर्ण सिंह के निबंध - अध्यापक पूर्ण सिंह (निबंध)	व्याख्यान -20
	4.1.	सच्ची वीरता	
	4.2.	कन्यादान	
	4.3.	पवित्रता	
	4.4.	आचरण की सभ्यता	
	4.5	मजदूरी और प्रेम	

Semester II
M.A., Hindi Part-I

प्रश्नपत्र : ४

Course Code : PAR2HN4

आधुनिक गद्य

List of New Textbooks:

1. दोहरा अभिशाप - कौशल्या बैसंत्री (आत्मकथा)
परमेश्वरि प्रकाशन, नई दिल्ली

2. घुमक्कड़ शास्त्र - राहुल सांस्कृत्यायन (यात्रावृत्तांत)
किताब महल, नई दिल्ली

3. कहानी संग्रह (समकालीन हिंदी कहियाँ)

इकाई- 1 एवं 2

व्याख्यान -20

दोहरा अभिशाप - कौशल्या बैसंत्री (आत्मकथा)

इकाई- 3

व्याख्यान -20

घुमक्कड़ शास्त्र - राहुल सांस्कृत्यायन (यात्रावृत्तांत)

3.1. अथा तो घुमक्कड़ जिजासा

3.2. जंगल तोड़ो

3.3. पिछड़ी जातियों में

3.4. घुमक्कड़ जातियों में

3.5. स्त्री घुमक्कड़

इकाई- 4

व्याख्यान -20

कहानी संग्रह (समकालीन हिंदी कहियाँ)

4.1 उसने कहा था - चंद्रधर शर्मा "गुलेरी"

- 4.2. सद्गति - प्रेमचंद
4.3. आकाशदीप - जयशंकर प्रसाद
4.4. सलाम - ओम प्रकाश वाल्मीकि
4.5 नो बार - जयप्रकाश कर्दम

संदर्भ ग्रंथ सूची :

प्रश्नपत्र-३ और-४

अनु क्र	किताब का नाम	लेखक का नाम
1.	हिंदी गद्य का इतिहास	:डॉ. रामचंद्र तिवारी
2.	हिंदी गद्य का इतिहास	: डॉ. बच्चन सिंह
3.	हन्दी साहित्य का इतिहास	: आचार्य रामचंद्र शुक्ल
4.	हिन्दी उपन्यास का इतिहास	: डॉ.गोपाल राय
5.	हिन्दी उपन्यास स्थिति और गति	: डॉ. चंद्रकांत बांदिवाडेक
6.	कहानीकार प्रेमचंद उ रचना दृष्टि	: डॉ. शिवकुमार मिश्र
7.	प्रेमचंद: व्यक्तित्व और रचना दृष्टि	: डॉ. दयानंद पाण्डेय
8.	प्रेमचंद	: नंददुलारे वाजपेयी
9.	प्रेमचंद और उनका युग	: डॉ. रामविलास शमा
10.	कहानीकार प्रेमचंद रचना दृष्टि	: डॉ. शिवकुमार मिश्र
11.	प्रेमचंद: व्यक्तित्व और रचना दृष्टि	: डॉ. दयानंद पाण्डेय
12.	नाटकालोचन के सिद्धांत	: सिद्धनाथ कुमार
13.	हिन्दी नाटक और रंगमंच: पहचान एवं परख	: डॉ. इन्द्रनाथ मदान्
14.	नाटक और रंग परिकल्पना	: डॉ. गिरिश रस्तोगी
15.	स्वातंत्रयोत्तर हिन्दी नाटक	: डॉ. रामजन्म शमा
16.	उत्तर आधुनिकता साहित्य विमर्श	: सुधीश पचौरी
17.	सुरेंद्र वर्मा की नाट्य समीक्षा	: डॉ. सिम्मी सिंह
18.	सुरेंद्र वर्मा के साहित्य में संघर्ष चेतना	: डॉ मंजुला चव्हाण
19.	सुरेंद्र वर्मा के नाटकों का अनुशीलन	: डॉ जयश्री सिंह
20.	प्रातिनिधि निबंधकार	: डॉ. विभुराम मिश्र
21.	हिन्दी निबंधकार	: जयनाथ नलिन
22.	हिंदी साहित्य में दलित चेतना	: डॉ. जालिंदर इंगले
23.	मुक्ति का प्रश्न और दलित साहित्य	: दिनेश राम
24.	हिंदी का दलित आत्मकथा साहित्य	: डॉ. संजय मुनेश्वर
25.	मुख्यधारा और दलित साहित्य	: ओम प्रकाश वाल्मीकि
26.	हिंदी दलित आत्मकथा	: डॉ संजय नवले
27.	हिंदी दलित आत्म कथाएं एक अनुशीलन	: डॉ अभय परमार

28. हिंदी का यात्रा साहित्य : विश्व मोहन तिवारी
29. हिंदी यात्रा साहित्य और स्त्री यात्रा साहित्यकार : डॉक्टर बीआर थापसे
30. यात्रा साहित्य का उद्भव और विकास : सुरेंद्र माथुर
31. हिंदी यात्रा साहित्य : शशि शेखर तिवारी
32. हिंदी यात्रा साहित्य की सांस्कृतिक पृष्ठभूमि : डॉ. संध्या शर्मा
33. समकालीन कहानी नया परिप्रेक्ष्य : पुष्पपाल सिंह
34. हिंदी कहानी के नए प्रतिमान : डॉ अमय कुमार खैरनार
35. समकालीन हिंदी कहानी: अंतरंग परिचय : सी. एम. योहन्नान
36. कहानी समकालीन चुनौतियां : शंभू गुप्त

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Syllabus

Question Paper Pattern (60:40)

**Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2022-23**

Program M.A. Part-I

Semester I & Semester II

**M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)**

Course: Hindi

Course Code : PAR1HN5 & PAR2HN6

प्रश्नपत्र : ५ और ६

भाषा विज्ञान एवं हिन्दी भाषा

Semester I & II
M.A. Hindi Part-I

प्रश्नपत्र : 5 & 6

भाषा विज्ञान एवं हिन्दी भाषा

Name of the Programme	: M.A.
Name of the Course	: Hindi
Course Code	: PAR1HN5 & PAR2HN6
Total Lectures	: 60 + 60
Total credit	: 06 + 06

पाठ्यक्रम के उद्देश्य:	
1.	हिन्दी भाषा की व्यवस्था और उसके व्यवहार की जानकारी देना
2.	भाषा की व्याप्ति तथा भाषा विज्ञान के अध्ययन क्षेत्र की जानकारी देना
3.	भाषा विज्ञान के माध्यम से वाग्यंत्र तथा उसके कार्यों से अवगत कराना
4.	हिन्दी भाषा के उद्भव एवं विकास की परंपरा को समझाना
5.	प्राचीन तथा मध्यकालीन आर्य भाषाओं से अवगत कराना
6.	देवनागरी लिपि के उद्भव एवं विकास से अवगत कराना
7.	भाषा के महत्व की जानकारी देना
8.	भाषा के रूप, अर्थ, वाक्य, उसकी रूप रचना की जानकारी देना

अध्ययन पद्धति:	
1.	व्याख्यान तथा विश्लेषण
2.	संगोष्ठ, स्वाध्याय तथा गुटचर्चा
3.	दृक्-श्राव्य माध्यमों साधनों का प्रयोग
4.	पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग
5.	अतिथि विशेषज्ञों के व्याख्यान
6.	अध्ययन यात्रा का आयोजन करना

Semester I
M.A., Hindi Part-I

प्रश्नपत्र : ५

Course Code : PAR1HN5

भाषा विज्ञान एवं हिंदी भाषा

इकाई-

1.

खण्ड -क

व्याख्यान -15

1.

भाषा

:-

: भाषा की परिभाषा

: अभिलक्षण

: भाषा व्यवस्था और भाषा व्यवहार

: भाषा संरचना और भाषिक प्रकार्य

2.

भाषा विज्ञान

:-

: भाषा विज्ञान का नामकरण

: परिभाषा

: स्वरूप और व्याप्ति

इकाई-

2.

व्याख्यान 15

3.

स्वन विज्ञान

:-

: परिभाषा

: स्वरूप

: वाग अवयव और उनके कार्य

: स्वनिम की विशेषताएँ

: स्वनिम के भेद:-

: खण्डेय स्वनिम

: खण्डयेतर स्वनिम

: स्वन परिवर्तन की दिशाएँ

: स्वन परिवर्तन के कारण

: हिन्दी स्वरों तथा व्यंजनों का वर्गीकरण

इकाई-

3.

व्याख्यान -20

खण्ड -ख

1.

हिन्दी की ऐतिहासिक पृष्ठभूमि:-

: प्राचीन भारतीय आर्य भाषाएँ-

: वैदिक तथा लौकिक संस्कृत और उसकी विशेषताएँ

: मध्यकालीन भारतीय आर्य भाषाएँ-

: पाली

: प्राकृत

: अपभ्रंश और उसकी विशेषताएँ

इकाई-

4.

व्याख्यान -20

आधुनिक भारतीय भाषाओं का सामान्य परिचय:-

: मराठी

: गुजराती

: राजस्थानी

: पंजाबी

: तेलगु

: कन्नड,

: तमिल

: मलयालम

Semester II
M.A., Hindi Part-I

प्रश्नपत्र : ६

Course Code : PAR2HN6

भाषा विज्ञान एवं हिंदी भाषा

- इकाई- 1. व्याख्यान -20
- खण्ड -क
1. रूप विज्ञान :-
- : रूप विज्ञान का स्वरूप
 - : शब्द और रूप
 - : अर्थतत्त्व और संबंध तत्त्व के प्रकार
 - : रूप परिवर्तन की दिशाएँ एवं कारण
 - : रूपिम और संरूप
 - : रूपिम के भेद
2. वाक्य विज्ञान :-
- : परिभाषा
 - : अभिहितान्वयवाद और अन्विताभिधानवाद
 - : वाक्य परिवर्तन की दिशाएँ और कारण
 - : पद एवं पदक्रम
 - : वाक्य के भेद
- इकाई- 2. व्याख्यान 10
3. अर्थ विज्ञान :-
- : अवधारणा
 - : शब्द और अर्थ का संबंध
 - : अर्थ परिवर्तन की दिशाएँ
 - : अर्थ परिवर्तन के कारण

इकाई -3.
खण्ड -ख

व्याख्यान -20

1. हिन्दी की रूप रचना:-

1.1. : हिन्दी की शब्द रचना

: धातु

: उपसर्ग

: प्रत्यय

: समास

1.2. : लिंग, वचन, कारक के संदर्भ में हिन्दी के संज्ञा

: सर्वनाम

: विशेषण और क्रिया का रूपांतरण

इकाई -4.

व्याख्यान 10

2. देवनागरी लिपि:-

: नामकरण

: उद्भव और विकास

: विशेषताएँ

: मानक रूप एवं त्रुटियाँ

संदर्भ ग्रंथ सूची :

प्रश्नपत्र-५ और-६

अनु क्र	किताब का नाम	लेखक का नाम
1	भाषा विज्ञान	: डॉ. भोलानाथ तिवारी
2	भाषा विज्ञान एवं भाषा शास्त्र	: डॉ. कपिलदेव द्विवेदी
3	हिन्दी भाषा का उद्भव और विकास	: डॉ. उदयनारायण तिवारी
4	हिन्दी भाषा	: डॉ. भोलानाथ तिवारी
5	सरल भाषा विज्ञान	: डॉ. अशोक केशाह
6	भाषिकी, हिन्दी भाषा तथा भाषा शिक्षण	: डॉ. अंबादास देशमुख
7	भाषा विज्ञान के अधुनातन आयाम	: डॉ. अंबादास देशमुख
8	सामान्या भाषा विज्ञान सैद्धांतिक विवेचन	: डॉ. विद्यासागर दयाल
9	वर्ण विज्ञान	: श्री. प्रभात रज्जन सरकार
10	अकादमिक हिन्दी व्याकरण	: डॉ. भंडारे उद्धव तुकाराम
11	भाषाशास्त्र तथा हिन्दी भाषा की रूपरेखा	: डॉ. देवेन्द्र कुमार शास्त्री
12	हिन्दी व्याकरण प्रकाश	: डॉ. महेन्द्र कुमार राना
13	भाषा विज्ञान की रूपरेखा	: द्वारका प्रसाद सक्सेना
14	नागरी लिपि: रूप और सुधार	: मोहन ब्रज
15	हिन्दी उद्भव विकास और रूप	: हरदेव बाहरी
16	भाषा और भाषिका	: डॉ. देवीशंकर द्विवेदी
17	सामान्य भाषा विज्ञान	: डॉ. बाबुराव सक्सेना
18	हिन्दी भाषा एवं भाषा विज्ञान	: डॉ. महावीरसरन जैन
19	आधुनिक भाषा विज्ञान के सिद्धांत	: डॉ. रामकिशोर शर्मा

20	भाषा	: संपादक. राजकमल बोरा
21	भाषा विज्ञान और हिन्दी भाषा स्वरूप का विकास	: डॉ. देवेन्द्र सिंह
22	भाषा विज्ञान	: रमेश रावत
23	भाषा और सूचना प्रौद्योगिकी	: डॉ. अमर सिंह वधान
24	भाषा और सूचना प्रौद्योगिकी एवं भाषा प्रबंधन	: रामगोपाल शर्मा
25	हिन्दी भाषा: कल और आज	: पूरनचंद्र टंडन
26	हिन्दी भाषा, व्याकरण और रचना	: डॉ. अर्जुन तिवारी
27	भारतीय भाषा विज्ञान	: आचार्य किशोरीदास वाजपेयी
28	आधुनिक भाषा विज्ञान	: राजमणि शर्मा
29	भाषा और प्रौद्योगिकी	: डॉ. विनोद प्रसाद
30	भाषा शिक्षण	: रवीन्द्रनाथ श्रीवास्तव
31	हिन्दी भाषा का इतिहास	: डॉ. भोलानाथ तिवारी
32	हिन्दी भाषा की संरचना	: डॉ. भोलानाथ तिवारी
33	राजभाषा हिन्दी	: कैलाश चंद्र भाटिया
34	भाषा की उत्पत्ति, रचना और विकास	: विनोद दिवाकर
35	हिन्दी व्याकरण	: कामताप्रसाद गुरु
36	हिन्दी वर्तनी का विकास	: अनिता गुप्ता
37	हिन्दी का विश्व संदर्भ	: डॉ. करुणाशंकर उपाध्याय
38	हिन्दी भाषा: इतिहास और स्वरूप	: राजमणि शर्मा

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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2022-23

Program M.A. Part-I

Semester I & Semester II

**M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)**

Course: Hindi

Course Code : PAR1HN7 & PAR2HN8

प्रश्नपत्र : 7 & 8

प्राचीन एवं मध्यकालीन काव्य

Semester I & II

M.A. Hindi Part-I

प्रश्नपत्र : 7 & 8

प्राचीन एवं मध्यकालीन काव्य

Name of the Programme : M.A.

Name of the Course : Hindi

Course Code : PAR1HN7 & PAR2HN8

Total Lectures : 60 + 60

Total credit : 06 + 06

पाठ्यक्रम के उद्देश्य:

१. हिन्दी साहित्य की आदिकालीन तथा भक्तिकालीन काव्य प्रवृत्तियों की जानकारी देना
२. छात्रों को प्राचीन तथा मध्ययुगीन काव्य कृतियों का परिचय कराना
३. प्राचीन तथा मध्ययुगीन कवियों की काव्य कला से छात्रों को अवगत कराना
४. छात्रों को हिन्दी की प्राचीन तथा मध्ययुगीन काव्य परंपरा से परिचित कराना
५. छात्रों को प्राचीन तथा मध्ययुगीन हिन्दी भाषा से अवगत कराना
६. छात्रों में प्राचीन तथा मध्ययुगीन काव्य अध्ययन के माध्यम से समीक्षात्मक दृष्टि विकसित करना

अध्ययन पद्धति:

1. व्याख्यान तथा विश्लेषण
2. संगोष्ठ, स्वाध्याय तथा गुटचर्चा
3. दृक्-श्राव्य माध्यमों साधनों का प्रयोग
4. पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग

5. अतिथि विशेषज्ञों के व्याख्यान
6. अध्ययन यात्रा का आयोजन करना

Semester I
M.A., Hindi Part-I

प्रश्नपत्र : ७

Course Code : PAR1HN7

प्राचीन एवं मध्यकालीन काव्य

इकाई- 1

व्याख्यान - 20

संत कबीर दास- संपादक -आचार्य हजारी प्रसाद द्विवेदी

प्रकाशक -मुंबई विश्वविद्यालय मुंबई

व्याख्या हेतु पद-

१ - गुरु को अंग ३,१,६,२७,२८,३४ कुल ६

२ - विराट को अंग - १, ५, ६, २२, ४०, ४५ कुल ६

३ - परचा को अंग - ४,८,२३,२७,३८,४८ कुल ६

पद-१,३,६७,९७,१३४,१६२,१६३,१६८,१७५,१७६,१७७,१९९,२००,२०२,२१७,२२०,२२४,२३४,२४१,२५४ कुल २०

इकाई- 2

व्याख्यान - 20

पद्मावत- मलिक मोहम्मद जायसी

संपादक- आचार्य रामचंद्र शुक्ल

व्याख्या हेतु खंड-

१-सिंहल द्वीप वर्णन खंड

२ नागमती वियोग खंड

इकाई 3 और 4

व्याख्यान - 20

३-सुंदरकांड -गोस्वामी तुलसीदास गीता प्रेस गोरखपुर

Semester II
M.A., Hindi Part-I

प्रश्नपत्र : ८

Course Code : PAR2HN8

प्राचीन एवं मध्यकालीन काव्य

इकाई- 1और 2

व्याख्यान -25

१ भ्रमरगीत सार संपादक आचार्य रामचंद्र शुक्ल

व्याख्या हेतु पद

१, ५, ७, ९, ११, १६, २६, ३८, ४२, ५१, ५७, ६४, ९०, १०५, ११५, १३१, १३८, १४३, १५७, १७७, १९६, २००, २७९,
३१६, ३६६ कुल २५

इकाई- 3

व्याख्यान -15

बिहारी रत्नाकर संपादन जगन्नाथदास रत्नाकर

व्याख्या हेतु पद

१, १६, २५, ३२, ३८, ३९, ४६, ६०, ६२, ७३, ९४, १२१, १६१, १९२, २०१, २०७, २२
८, २६२, ३०१, ३२७, ३३१, ४१७, ४७२, ६०१, ६७७ कुल २५

इकाई- 4

व्याख्यान -20

घनानंद कवित्त-विश्वनाथ प्रसाद मिश्र

व्याख्या हेतु पद १- २० कुल २०

संदर्भ ग्रंथ सूची :

प्रश्नपत्र-५ और-६

अनु क्र	किताब का नाम	लेखक का नाम
1.	जायसी के पद्मावत का मूल्यांकन	: प्रो. हरेंद्र प्रसाद सिन्हा
2.	महाकवि जायसी और उनका काव्य	: डॉ. इकबल अहमद
3.	मलिक मुहम्मद जायसी और उनका काव्य	: डॉ. शिवसहाय पाठक
4.	जायसी पद्मावत काव्य और दर्शन	: डॉ. गोविंद त्रिगुणायत
5.	पद्मावत में काव्य, संस्कृति और दर्शन	: डॉ. द्वारिकाप्रसाद सक्सेना
6.	पद्मावत का काव्य सौंदर्य	: डॉ. चंद्रबली पाण्डेय
7.	हिन्दी के प्रतिनिधि कवि	: डॉ. सुरेश अग्रवाल
8.	मूलपाठ जायसी ग्रंथावली पद्मावत	: संपादक. श्री राकेश एम.ए.
9.	कबीर	: हजारीप्रसाद द्विवेदी
10.	भूषण ग्रंथवली	: आर्चा विश्वनाथप्रसाद मिश्र
11.	सूफ़ी तत्वज्ञान: स्वरूप एवं चिंतन	: डॉ. मुहम्मद आजम
12.	कबीर की विचारधारा	: डॉ. गोविंद त्रिगुणायत
13.	कबीर रहस्यवाद	: डॉ. रामकुमार वर्मा
14.	कबीर साहित्य की परख	: आचार्य परशुराम चतुर्वेदी
15.	जायसी एवं उनका काव्य	: डॉ. सिवसहाय पाठक
16.	जायसी	डॉ. विजयदेव नारायण साहि
17.	तुलसीदास: आधुनिक वातायन से	: डॉ. रमेश कुंतल 'मेघ'
18.	जायसी का काव्य शिल्प	: डॉ. दर्शनलाल सेठी
19.	तुलसीदास और उनका युग	: डॉ. राजमति दीक्षित
20.	रामचरितमानस में अलंकार योजना	: डॉ. वचनदेव कुमार

21. कबीर और तुकाराम के काव्य में अभिव्यक्त : डॉ. बालकवि सुरंजे
सांस्कृतिक चेतना का तुलनात्मक अनुशीलन
22. मध्यकालीन कवि और कविता : डॉ. रतनकुमार पाण्डेय
23. कालजयी संत तुलसीदास : डॉ. उमापति दीक्षित
24. मध्यकालीन काव्य: चिंतन और संवेदना : डॉ. करुणाशंकर उपाध्याय
25. रीतिकालीन काव्य परंपरा में पद्मावत : डॉ. द्वारिकानाथ रा.
26. देव और उनकी कविता : डॉ. नगेन्द्र
27. मध्ययुगीन हिन्दी साहित्य में नारी भावना : डॉ. उषा पाण्डेय
28. रीति परंपरा के प्रमुख आचार्य : डॉ. सयदेव चौधरी
29. हिन्दी काव्य में श्रृंगार परंपरा और बिहारी : डॉ. गणपतिचंद्र गुप्त
30. हिन्दी रीतिकालीन काव्य पर संस्कृत काव्य का : डॉ. दयानंद शर्मा
प्रभाव
31. मीरा और मीरा : महादेवी वर्मा
32. भक्तिमति मीराबाई: जीवन और काव्य : लालबहादूर सिंह चौहान
33. भक्ति साहित्य में विश्वबंधुत्व की भावना : संपादक डॉ. अनिल सिंह
34. वाल्मीकि एवं तुलसी के नारी पात्र : डॉ. संतोष मोटवानी

॥ विद्या विनयेन शोभते ॥

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DEPARTMENT OF HINDI

Master of Arts (M.A. Part -I) Revised Syllabus For

M.A. Hindi Part-I

Choice Based Credit Grading and Semester System

(CBCGS) (60:40)

With effect from the Academic Year 2022-23

EXAMINATION

1. **External Examination (Semester end Examination)**

Total Marks - 60

2. **Internal Examination**

Total Marks - 40

1. आंतरिक परीक्षा	कुल अंक	20
2. प्रास्तुतीकरण / रचनात्मक कार्य / पुस्तक समीक्षा / प्रकल्प	कुल अंक	20

एम.ए. प्रथम वर्ष सेमेस्टर I एवं II के लिए

प्रश्न पत्र का प्रारूप

पेपर क्रमांक :- 1, 2, 5, 6

प्राश्न क्र 1.	पूछे गए दो दिर्घोत्तरी प्रश्नों में से एक का उत्तर अपेक्षित है -	15 अंक
प्राश्न क्र 2.	पूछे गए दो दिर्घोत्तरी प्रश्नों में से एक का उत्तर अपेक्षित है -	15 अंक
प्राश्न क्र 3.	पूछे गए दो दिर्घोत्तरी प्रश्नों में से एक का उत्तर अपेक्षित है -	15 अंक
प्राश्न क्र 4.	पूछे गए चार टिप्पणियों में से दो के उत्तर अपेक्षित है -	15 अंक
		60 अंक

पेपर क्रमांक :- 3, 4, 7, 8

प्राश्न क्र 1	पूछे गए तीन संदर्भ सहित व्याख्या में से दो के उत्तर अपेक्षित है -	15 अंक
प्राश्न क्र 2	पूछे गए दो दिर्घोत्तरी प्रश्नों में से एक का उत्तर अपेक्षित है -	15 अंक
प्राश्न क्र 3	पूछे गए दो दिर्घोत्तरी प्रश्नों में से एक का उत्तर अपेक्षित है -	15 अंक
प्राश्न क्र 4	पूछे गए दो दिर्घोत्तरी प्रश्नों में से एक का उत्तर अपेक्षित है -	15 अंक
		60 अंक

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

**Arts, Commerce and Science College, New Panvel
Autonomous**



**Scheme of Evaluation for
Continuous Assessments and Semester
End Examinations
for
Post-graduate Programmes
under
Faculty of Arts**

***Under Autonomous status with Credit
Based Semester and Grading System***

(To be implemented from Academic Year 2020-2021)

॥ विद्या विनयेन शोभते ॥

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DEPARTMENT OF HINDI

Master of Arts (M.A. Part -II) Revised Syllabus For

M.A. Hindi Part-II

Choice Based Credit Grading and Semester System (CBCGS) (60:40)

With effect from the Academic Year 2020-21

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

चांगू काना ठाकूर कला, वाणिज्य और विज्ञान महाविद्यालय, (स्वायत्त)
नवीन पनवेल



हिंदी विभाग

एम . ए . स्नातकोत्तर हिन्दी

पाठ्यक्रम

शैक्षणिक वर्ष -२०२०-२०२१

हिन्दी अध्ययन मंडल

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३	डॉ . बीसेन जोगेंद्रसिंग मोतिसिंग	प्रोफेसर	सदस्य
४	डॉ . हूवनाथ गोरखनाथ पाण्डेय	सहयोगी प्राध्यापक	सदस्य
५	डॉ . घरत अर्जुन जानू	पूर्व प्राध्यापक	सदस्य
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८	श्री . विमल मिश्रा	नवभारत टाइम्स, मुंबई	सदस्य
६	प्रा . महेश श्रीराम गोडवोले	पूर्व स्नातकोत्तर विद्यार्थी	सदस्य
९	डॉ . अमित मिश्रा	पी-एच . डी . विद्यार्थी	सदस्य

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur
Arts, Commerce and Science College, New Panvel
(AUTONOMOUS)

Affiliated to University of Mumbai

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Choice Based Credit Grading and Semester System (CBCGS) (60:40)
With effect from the Academic Year 2020-21

Faculty of Humanities

Semester III & Semester IV

Guidelines

Syllabus Structure:

1. In M.A. Hindi Part-II (CBCGS) in Semester III and Semester IV the Core Courses will be Core Courses 9 to 16

Scheme of Examination
Faculty of Arts
(Post-graduate Programmes)

Credit Based Evaluation System

❖ **Scheme of Examination**

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below-

A) Internal Assessment: 40 %**40 Marks**

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	One case study / project with presentation based on curriculum to be assessed by the teacher concerned	15 Marks
	Presentation	10 Marks
	Written Document	05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks

Question Paper Pattern**(Periodical Class Test for the Courses at Under Graduate Programmes)**

Maximum Marks: 20

Duration: 40 Minutes

Questions to be set: 02

All Questions are Compulsory

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 %**60 Marks**

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern**Theory question paper pattern**

1. There shall be four questions each of 15 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

❖ Passing Standard

The learners shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of grade D in each project wherever applicable to pass a particular semester.

Note: All other rules regarding Standard of Passing, ATKT, etc, will be as per those decided by the Faculty of Humanities passed by the Academic Council from time to time

❖ Guidelines and Evaluation pattern for project work (100 Marks)

Introduction

Inclusion of project work in the course curriculum of the M.A. programme is one of the ambitious aspect in the programme structure. The main objective of inclusion of project work is to inculcate the element of research work challenging the potential of learner as regards to his/ her eager to enquire and ability to interpret particular aspect of the study in his/ her own words. It is expected that the guiding teacher should undertake the counselling sessions and make the awareness among the learners about the methodology of formulation, preparation and evaluation pattern of the project work.

- There are two modes of preparation of project work
 1. Project work based on research methodology in the study area
 2. Project work based on internship in the study area

Guidelines for preparation of Project Work

Work Load

Work load for Project Work is 01 (one) hour per batch of 15-20 learners per week for the teacher. The learner (of that batch) shall do field work and library work in the remaining 03 (three) hours per week.

1. General guidelines for preparation of project work based on research methodology

- The project topic may be undertaken in any area of Elective Courses.
- Each of the learner has to undertake a Project individually under the supervision of a teacher-guide.
- The learner shall decide the topic and title which should be specific, clear and with definite scope in consultation with the teacher-guide concerned.
- University/college shall allot a guiding teacher for guidance to the students based on her / his specialization.
- The project report shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.
 - The project report should be 80 to 100 pages

Format

1st page (Main Page)

Title of the problem of the Project

A Project Submitted to
University of Mumbai for partial completion of the degree of
Master in Arts
Under the Faculty of Arts

By

Name of the Learner

Under the Guidance of

Name of the Guiding Teacher

Name and address of the College

Month and Year

2nd Page

This page to be repeated on 2nd page (i.e. inside after main page)

On separate page

Index

Chapter No. 1	Title of the Chapter	Page No.
(sub point 1.1, 1.1.1, And so on)		
Chapter No. 2	Title of the Chapter	
Chapter No. 3	Title of the Chapter	
Chapter No. 4	Title of the Chapter	
Chapter No. 5	Title of the Chapter	

List of tables, if any, with page numbers.

List of Graphs, if any, with page numbers.

List of Appendix, if any, with page numbers.

Abbreviations used:

Structure to be followed to maintain the uniformity in formulation and presentation of Project Work

(Model Structure of the Project Work)

- **Chapter No. 1: Introduction**

In this chapter Selection and relevance of the problem, historical background of the problem, brief profile of the study area, definition/s of related aspects, characteristics, different concepts pertaining to the problem etc can be incorporated by the learner.

- **Chapter No. 2: Research Methodology**

This chapter will include Objectives, Hypothesis, Scope of the study, limitations of the study, significance of the study, Selection of the problem, Sample size, Data collection, Tabulation of data, Techniques and tools to be used, etc can be incorporated by the learner.

- **Chapter No. 3: Literature Review**

This chapter will provide information about studies done on the respective issue. This would specify how the study undertaken is relevant and contribute for value addition in information/ knowledge/ application of study area which ultimately helps the learner to undertake further study on same issue.

- **Chapter No. 4: Data Analysis, Interpretation and Presentation**

This chapter is the core part of the study. The analysis pertaining to collected data will be done by the learner. The application of selected tools or techniques will be used to arrive at findings. In this, table of information's, presentation of graphs etc. can be provided with interpretation by the learner.

- **Chapter No. 5: Conclusions and Suggestions**

In this chapter of project work, findings of work will be covered and suggestion will be enlisted to validate the objectives and hypotheses.

Note: If required more chapters of data analysis can be added.

- **Bibliography**
- **Appendix**

On separate page

Name and address of the college

Certificate

This is to certify that Ms/Mr has worked and duly completed her/his Project Work for the degree of Master in Arts under the Faculty of Arts in the subject of _____ and her/his project is entitled, “ _____
Title of the Project _____ ” under my supervision.

I further certify that the entire work has been done by the learner under my guidance and that no part of it has been submitted previously for any Degree or Diploma of any University. It is her/ his own work and facts reported by her/his personal findings and investigations.



Name and Signature of
Guiding Teacher

Date of submission:

On separate page

Declaration by learner

I the undersigned Miss / Mr. श्री. प्रथमेश उद्धव भंडारे here by, declare that the work embodied in this project work titled “सोशल मीडिया का भारतीय महिलाओं पर पडता पर भाव”, forms my own contribution to the research work carried out under the guidance of डॉ. भंडारे उद्धव तुकाराम is a result of my own research work and has not been previously submitted to any other University for any other Degree/ Diploma to this or any other University.

Wherever reference has been made to previous works of others, it has been clearly indicated as such and included in the bibliography.

I, here by further declare that all information of this document has been obtained and presented in accordance with academic rules and ethical conduct.

Name and Signature of the learner

श्री. प्रथमेश उद्धव भंडारे

Certified by

Name and signature of the Guiding Teacher

डॉ. भंडारे उद्धव तुकाराम

On separate page

Acknowledgment

(Model structure of the acknowledgement)

To list who all have helped me is difficult because they are so numerous and the depth is so enormous.

I would like to acknowledge the following as being idealistic channels and fresh dimensions in the completion of this project.

I take this opportunity to thank the **University of Mumbai** for giving me chance to do this project.

I would like to thank my **Principal**, _____ for providing the necessary facilities required for completion of this project.

I take this opportunity to thank our **Head** _____, for her moral support and guidance.

I would also like to express my sincere gratitude towards my project guide _____ whose guidance and care made the project successful.

I would like to thank my **College Library**, for having provided various reference books and magazines related to my project.

Lastly, I would like to thank each and every person who directly or indirectly helped me in the completion of the project especially **my Parents and Peers** who supported me throughout my project.

2. Guidelines for Internship based project work

- Minimum 20 days/ 100 hours of Internship with an Organisation/ NGO/ Charitable Organisation/ Private firm.
- The theme of the internship should be based on any study area of the elective courses
- Project Report should be of minimum 50 pages
- Experience Certificate is Mandatory
- A project report has to be brief in content and must include the following aspects:
 - **Executive Summary:**
A bird's eye view of your entire presentation has to be precisely offered under this category.
 - **Introduction on the Company:**
A Concise representation of company/ organization defining its scope, products/ services and its SWOT analysis.
 - **Statement and Objectives:**
The mission and vision of the organization need to be stated enshrining its broad strategies.
 - **Your Role in the Organisation during the internship:**
The key aspects handled, the department under which you were deployed and brief summary report duly acknowledged by the reporting head.
 - **Challenges:**
The challenges confronted while churning out theoretical knowledge into practical world.
 - **Conclusion:**
A brief overview of your experience and suggestions to bridge the gap between theory and practice.
- The project report based on internship shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.

Evaluation pattern of the project work

The Project Report shall be evaluated in two stages viz.	
• Evaluation of Project Report (Bound Copy)	60 Marks
▪ Introduction and other areas covered	20 Marks
▪ Research Methodology, Presentation, Analysis and interpretation of data	30 Marks
▪ Conclusion & Recommendations	10 Marks
• Conduct of Viva-voce	40 Marks
▪ In the course of Viva-voce, the questions may be asked such as importance / relevance of the study, objective of the study, methodology of the study/ mode of Enquiry (question responses)	10 Marks
▪ Ability to explain the analysis, findings, concluding observations, recommendation, limitations of the Study	20 Marks
▪ Overall Impression (including Communication Skill)	10 Marks

Note:

- *The guiding teacher along with the external evaluator appointed by the University/ College for the evaluation of project shall conduct the viva-voce examination as per the evaluation pattern*
- *The plagiarism should be maintained as per the UGC guidelines.*

Passing Standard

- Minimum of Grade D in the project component.
- In case of failing in the project work, the same project can be revised for ATKT examination.
- Absence of student for viva voce: If any student fails to appear for the viva voce on the date and time fixed by the department such student shall appear for the viva voce on the date and time fixed by the Department, such student shall appear for the viva voce only along with students of the next batch.

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

Arts, Commerce and Science College, New Panvel

Autonomous

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2.	M.A.II	आधुनिक काव्य Modern Poetry	11	PAR3HN11	06
3.	M.A.II	विशेष अध्ययन: मराठी संतों का हिन्दी काव्य Special Study: Hindi Poetry of Marathi Saint	13	PAR3HN13	06
4.	M.A.II	प्रयोजनमूलक हिन्दी Functional Hindi	15	PAR3HN15	06
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॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur
Arts, Commerce and Science College, New Panvel
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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Program M.A. Part-II

Semester- III

M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)

Course: Hindi

Course Code : PAR3HN9

Paper No. 9

आधुनिक गद्य

Modern Prose

Semester III
M.A. Hindi Part-II
Paper No. 9
आधुनिक गद्य

Name of the Programme	: M.A.
Name of the Course	: Hindi
Course Code	: PAR3HN9
Total Lectures	: 60
Total credit	: 06

पाठ्यक्रम के उद्देश्य :

१. गद्य की प्रमुख विधाओं के तात्त्विक स्वरूप का परिचय देना ।
२. प्रमुख गद्य विधाओं के क्रमिक विकासक्रम की जानकारी देना ।
३. हिन्दी नाटक के माध्यम से मानव के अधूरेपन को समझना ।
४. रचना के आस्वादन एवं समीक्षा की क्षमता को विकसित करना ।
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१. व्याख्यान तथा विश्लेषण ।
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४. पावर पॉइंट प्रजेन्टेशन (PPT) ।
५. अतिथि विशेषज्ञों के व्याख्यान ।

Semester III
M.A., Hindi Part-II
प्रश्नपत्र : ९
Course Code : PAR3HN9
आधुनिक गद्य

List of Text Books

१ .गोदान-मुंशी प्रेमचंद (उपन्यास)

वाणी प्रकाशन ,२१-A, दरियागंज, नई दिल्ली-११०००२

२ .आधे-अधूरे-मोहन राकेश (नाटक)

३ .आशोक के फूल-हजारीप्रसाद द्विवेदी (निबंध)

लोकभारती प्रकाशन

पहली मंजील, दरबारी बिल्डिंग, महात्मा गांधी मार्ग, इलाहाबाद-२११००१

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॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur
Arts, Commerce and Science College, New Panvel
(AUTONOMOUS)

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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Program M.A. Part-II

Semester -III

**M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)**

Course: Hindi

Semester- III

Course Code : PAR3HN11

Paper No. 11

आधुनिक काव्य

Modern Poetry

Semester III
M.A. Hindi Part-II
Paper No. 11
आधुनिक काव्य

Name of the Programme	: M.A.
Name of the Course	: Hindi
Course Code	: PAR3HN11
Total Lectures	: 60
Total credit	: 06

पाठ्यक्रम के उद्देश्य :

१. आधुनिक कवियों के व्यक्तित्व और कृतित्व का परिचय देना।
२. आधुनिक काव्य की भूमिका को समझना।
३. आधुनिक कविता का परिचय प्राप्त कराना।
४. आधुनिक कविता के माध्यम से तत्कालीन परिस्थितियों को समझना।
५. रचना के आस्वादन एवं समीक्षण की क्षमता विकसित करना।

अध्ययन पद्धति:

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२. संगोष्ठी, स्वाध्याय तथा गुटचर्चा।
३. दृक्-श्राव्य माध्यमों/ साधनों का प्रयोग।
४. पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग।
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Semester III
M.A. Hindi Part-II

प्रश्नपत्र : ११

Course Code : PAR3HN11

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३. प्रतिनिधि कविताएँ- गजानन माधव मुक्तिबोध

राजकमल प्रकाशन प्रा. लि. १-बी, नेताजी सुभाष मार्ग, दरियागंज, नई दिल्ली- ११०००२

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	३. इंद्रा सर्ग	
इकाई -२		व्याख्यान -२०
	राग विराग- संपादक: डॉ. रामविलास शर्मा	
	१. सरोज स्मृति	
	२. राम की शक्ति पूजा	
	३. तोडती पत्थर	
इकाई -३		व्याख्यान -२०
	प्रतिनिधि कविताएँ- गजानन माधव मुक्तिबोध	
	१. भूल गलती	
	२. अंधेरे में	
	३. ब्रह्मराक्षस	

संदर्भ ग्रंथ सूची :

अनु क्र	किताब का नाम	लेखक का नाम
१.	कामायनी का पुनर्मूल्यांकन	: डॉ .रामस्वरूप चतुर्वेदी
२.	कामायनी एक पुनर्विचार	: मुक्तिबोध
३.	कामायनी पढ़ते हुए	: डॉ .अशोक प्रियदर्शनी
४.	कामायनी के अध्ययन की समस्याएँ	: डॉ .नरेंद्र
५.	कामायनी मूल्यांकन और मूल्यांकन	: डॉ .इंद्रनाथ मदान
६.	आधुनिक कविता का पुनर्पाठ	: डॉ .करूणाशंकर उपाध्याय
७.	प्रसाद निराला अज्ञेय	: डॉ .रामस्वरूप चतुर्वेदी
८.	मुक्तिबोध की काव्यदृष्टि	: डॉ .सुरेश रित्तिपूर्ण
९.	निराला और मुक्तिबोध: चार लंबी कविताएँ	: नंदकिशोर नवल
१०.	मुक्तिबोध: ज्ञान और संवेदना	: नंदकिशोर नवल
११.	मुक्तिबोध की कविताएँ	: डॉ .अशोक चक्रधर
१२.	नई कविता : निराला अज्ञेय और मुक्तिबोध	: विद्या सिन्हा
१३.	निराला के काव्य का राजनीतिक संदर्भ	: डॉ .संध्या सिंह
१४.	समकालीन हिन्दी कविता : अज्ञेय और मुक्तिबोध के संदर्भ में	: शशि शर्मा
१५.	निराला कृति से साक्षात्कार	: नंदकिशोर नवल
१६.	निराला	: रामविलास शर्मा
१७.	मुक्तिबोध : कविता व जीवन विवेक	: चंद्रकांत देवताले
१८.	निराला और मुक्तिबोध: चार लंबी कविताएँ	: नंदकिशोर नवल
१९.	प्रसाद का काव्य	: प्रेम शंकर
२०.	कामायनी की आलोचना प्रक्रिया	: डॉ .गीरिजा राय
२१.	हिन्दी काव्य का इतिहास	: डॉ .रामस्वरूप चतुर्वेदी
२२.	आधुनिक हिन्दी कविता का इतिहास	: हेतु भारद्वाज
२३.	आधुनिक कविता और युग संदर्भ	: शिव कुमार मिश्र
२४.	कामायनी का पुनर्मूल्यांकन	: डॉ .रामस्वरूप चतुर्वेदी
२५.	निराला: एक पुनर्मूल्यांकन	: सं . ए .अरविंदाक्षन

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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Program M.A. Part-II

Semester- III

M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)

Course: Hindi

Semester- III

Course Code : PAR3HN13

प्रश्नपत्र : १३

विशेष अध्ययन :- मराठी संतां का हिन्दी काव्य

Special Study: Hindi Poetry of Marathi Saint

Semester III
M.A. Hindi Part-II

प्रश्नपत्र : १३

विशेष अध्ययन :-मराठी संतों का हिन्दी काव्य

Name of the Programme	: M.A.
Name of the Course	: Hindi
Course Code	: PAR3HN13
Total Lectures	: 60
Total credit	: 06

पाठ्यक्रम के उद्देश्यः

१. मराठी संतों के हिन्दी काव्य का परिचय देना।
२. मराठी संतों से अवगत कराना।
३. मराठी संतों के काव्य के माध्यम से महाराष्ट्र की संस्कृति से अवगत कराना।
४. संत तुकाराम संत नामदेव के काव्य के माध्यम से मानवतावादी संदेडा से परिचय कराना।
५. वसुदेव कुटुंबकम् की संकल्पना से परिचित कराना।
६. विद्यार्थियों को महाराष्ट्र के संतों के व्यक्तित्व और कृतित्व का परिचय कराना।

अध्ययन पद्धति:

१. व्याख्यान तथा विश्लेषण।
२. संगोष्ठी, स्वाध्याय तथा गुटचर्चा।
३. दृक्-श्राव्य माध्यमों/ साधनों का प्रयोग।
४. पावर पॉइंट प्रजेन्टेशन ह्यण्टह भाषा प्रयोगशाला का प्रयोग।
५. अतिथि विशेषज्ञों के व्याख्यान।

Semester III
M.A., Hindi Part-II

प्रश्नपत्र : १३

Course Code : PAR3HN13

विशेष अध्ययन (मराठी संतों का हिन्दी काव्य)

List of Text Books

१. संत नामदेव की हिन्दी पदावली-

संपादक डॉ. भगीरथ मिश्र, डॉ. राजनारायण मौर्य

२. तुकाराम पदावली-

प्रा. प्राचार्य वेदकुमार वेदालंकार, विकास प्रकाशन, उस्मानाबाद

इकाई-	१.	संत नामदेव की हिन्दी पदावली- पद संख्या:- 01, 03, 09, 12, 15, 18, 19, 23, 32, 42, 48, 51, 64, 65, 74, 76, 92, 96, 97, 105,	व्याख्यान -३०
	२.	तुकाराम पदावली- पद संख्या:- 51, 60, 85, 108, 161, 164, 196, 201, 278, 302, 379, 417, 446,	व्याख्यान -३०

संदर्भ ग्रंथ सूची :

अनु क्र	किताब का नाम	लेखक का नाम
१.	संत नामदेव और हिन्दी पद साहित्य	: डॉ. रामचंद्र मिश्र
२.	हिन्दी निर्गुण काव्य का प्रारंभ और संत नामदेव की कविता	: डॉ. शं.के. आडकर
३.	हिन्दी और मराठी वैष्णव संत साहित्य का तुलनात्मक अध्ययन	: डॉ. न.चिं. जोगळेकर
४.	हिन्दी और मराठी का निर्गुण संत काव्य	: डॉ. प्रभाकर माचवे
५.	मराठी का भक्ति साहित्य	: डॉ. भी. गो. देशपांडे
६.	मराठी संतों का सामाजिक कार्य	: डॉ. वि. भा. कोलते
७.	मराठी संतों की हिन्दी वाणी	: संपादक डॉ. आनंदप्रकाश दीक्षित
८.	मराठी संत काव्याची सामाजिक फलश्रुति	: श्री. गं. वात्र सरदार
९.	पंच संत कवि	: डॉ. शं. गो. तुळपुळे
१०.	मराठी संतों की हिन्दी वाणी	: डॉ. यु. म. पठाण
११.	महाराष्ट्र के नाथपंथी कवियों का हिन्दी काव्य	: डॉ. अशोक कामत
१२.	महाराष्ट्र के प्रमुख साधना संप्रदाय	: डॉ. र. वा. विवलकर
१३.	हिन्दी के विकास में मराठी संतों का योगदान	: डॉ. सी. एल. प्रभात

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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Program M.A. Part-II

Semester- III

M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)
Course: Hindi

Course Code : PAR3HN15

प्रश्नपत्र : १५

प्रयोजनमूलक हिन्दी

Functional Hindi

Semester III
M.A. Hindi Part-II

प्रश्नपत्र : १५

प्रयोजनमूलक हिन्दी

Name of the Programme	: M.A.
Name of the Course	: Hindi
Course Code	: PAR3HN15
Total Lectures	: 60
Total credit	: 06

पाठ्यक्रम के उद्देश्यः

१. प्रयोजनमूलक हिन्दी की संकल्पना का परिचय करना।
२. प्रयोजनमूलक हिन्दी के विविध रूपों का परिचय प्राप्त करना।
३. अनुवाद की संकल्पना को समझाना।
४. हिन्दी भाषा के विविध रूपों का परिचय करना।
५. विज्ञापन की संकल्पना का परिचय करना।
६. हिन्दी के अंतर्राष्ट्रीय स्वरूप का परिचय प्राप्त करना।

अध्ययन पद्धति:

१. व्याख्यान तथा विश्लेषण।
२. संगोष्ठी, स्वाध्याय तथा गुटचर्चा।
३. दृक्-श्राव्य माध्यमों/ साधनों का प्रयोग।
४. पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग।
५. अतिथि विशेषज्ञों के व्याख्यान।

Semester III
M.A., Hindi Part-II

प्रश्नपत्र : १५

Course Code : PAR3HN15

प्रयोजनमूलक हिन्दी

इकाई-	१ .	प्रयोजनमूलक हिन्दी १. स्वरूप, अर्थ, परिभाषा २. विशेषताएँ ३. प्रयोजनमूलक हिन्दी के विविध रूप ४. ऐतिहासिक परिप्रेक्ष्य	व्याख्यान	-१५
इकाई-	२ .	हिन्दी के विविध रूप १. सर्जनात्मक भाषा २. संचार भाषा ३. संपर्क भाषा ४. राजभाषा	व्याख्यान	-१०
इकाई-	३	अनुवाद १. स्वरूप, अर्थ, परिभाषा २. अनुवाद के सिद्धांत ३. महत्व ४. प्रक्रिया ५. प्रकार ६. अनुवादक के गुण	व्याख्यान	-१५
इकाई-	४	विज्ञापन १. स्वरूप, अर्थ, परिभाषा २. विज्ञापन का उद्देश्य ३. विज्ञापन के भेद ४. विज्ञापन और विभिन्न जनसंचार माध्यम		१०
इकाई-	५	सूचना प्रौद्योगिकी में हिन्दी		०५
इकाई-	६	हिन्दी का अंतर्राष्ट्रीय स्वरूप		०५

संदर्भ ग्रंथ सूची :

अनु क्र	किताब का नाम	लेखक का नाम
१.	खड़ीबोली का आंदोलन	: डॉ .शितिकंठ मिश्र
२.	भारतीय राष्ट्रभाषा की सीमाएँ	: डॉ .सत्यव्रत
३.	राजभाषा के संदर्भ में हिन्दी आंदोलन का इतिहास	: डॉ .उदयनारायण दुवे
४.	राजभाषा हिन्दी	: डॉ .कैलाशचंद्र भाटिया
५.	प्रयोजनमूलक हिन्दी	: डॉ . विनोद गोदरे
६.	प्रयोजनमूलक हिन्दी : संरचना एवं अनुप्रयोग	: डॉ .रामप्रकाश, डॉ . दिनेश गुप्ता
७.	प्रयोजनमूलक हिन्दी : सिद्धांत एवं व्यवहार	: डॉ .रघुनंदन प्रसाद शर्मा
८.	अनुवाद सिद्धांत की रूपरेखा	: डॉ .सुरेशकुमार
९.	अनुवाद विज्ञान	: डॉ .भोलानाथ तिवारी
१०.	अनुवाद सिद्धांत एवं व्यवहार	: एस .के . शर्मा
११.	अनुवाद सिद्धांत और प्रयोग	: डॉ .जी .गोपीनाथन
१२.	अनुवाद सिद्धांत और प्रयोग	: डॉ .कैलाशचंद्र भाटिया
१३.	अनुवाद सिद्धांत और समस्याएँ	: डॉ .रवींद्रनाथ श्रीवास्तव
१४.	अनुवाद बोध	: संपा .डॉ .गार्गी गुप्ता
१५.	काव्यानुवाद की समस्याएँ साहित्य का अनुवाद	: डॉ .भोलानाथ तिवारी
१६.	अनुवाद भाषाएँ समस्याएँ	: डॉ .एन .ई .विश्वनाथ अय्यर
१७.	अनुवाद और मशीनी अनुवाद	: वृषभ प्रसाद जैन
१८.	प्रयोजनमूलक हिन्दी तथा भाषा कथने	: संपा .डॉ .जमादार ए .एच

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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Program M.A. Part-II

Semester- IV

M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)
Course: Hindi

Course Code : (PAR4HN12)

प्रश्नपत्र : १०

आधुनिक गद्य

Semester IV
M.A. Hindi Part-II

प्रश्नपत्र : १०

आधुनिक गद्य

Name of the Programme	: M.A.
Name of the Course	: Hindi
Course Code	: PAR4HN10
Total Lectures	: 60
Total credit	: 06

पाठ्यक्रम के उद्देश्यः

१. उपन्यास के माध्यम से डॉ. बाबासाहेब आंबेडकर के व्यक्तित्व एवं कृतित्व को समझना।
२. हिन्दी उपन्यासकार के जीवन का परिचय प्राप्त करना।
३. हिन्दी नाटक के माध्यम से विश्व के अंधत्व प्राप्त व्यक्तियों की समस्याओं से विद्यार्थियों को परिचित करना।
४. उपन्यास तथा नाटकों का तत्विक विवेचन करना।
५. हिन्दी कहानियों के माध्यम से भारतीय संस्कृति, मानवीयता, जातियता तथा पारिवारिक जीवन से परिचय करना।

अध्ययन पद्धति:

१. व्याख्यान तथा विश्लेषण।
२. संगोष्ठ, स्वाध्याय तथा गुटचर्चा।
३. दृक्-श्राव्य माध्यमों/ साधनों का प्रयोग।
४. पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग।
५. अतिथि विशेषज्ञों के व्याख्यान।

Semester IV
M.A., Hindi Part-II

प्रश्नपत्र : १०

Course Code : PAR4HN10

आधुनिक गद्य

List of Text Books

१. महानायक बाबा साहेब डॉ. अम्बेडकर- (उपन्यास) मोहनदास नैमिशराय
धम्म ज्योति चैरिटेबल ट्रस्ट, गली नं .६ डी-ब्लॉक,
हर्ष विहार, दिल्ली-११००९३

२. वीमा -(नाटक)- रत्नकुमार सांभरिया
अनामिका पब्लिशर्स एंड डिस्ट्रीब्यूटर्स प्रा. लि.
४६९७/३, २१ए, अंसारी रोड, दरियागंज, नई दिल्ली-११०००२

३. मानसरोवर-भाग एक-(कहानी संग्रह)- मुंशी प्रेमचंद-

इकाई- -१ .	महानायक बाबा साहेब डॉ. अम्बेडकर- (उपन्यास) मोहनदास नैमिशराय	व्याख्यान -२०
इकाई- -२ .	वीमा -(नाटक)- रत्नकुमार सांभरिया	व्याख्यान -२०
इकाई -३	मानसरोवर-भाग एक-(कहानी संग्रह)- मुंशी प्रेमचंद	व्याख्यान -२०

१. अलगयोझा
२. ईदगाह
३. बडे भाई साहव
४. नशा
५. ठाकुर का कुआँ
६. घरजमाई
७. पुस की रात
८. गुल्ली डण्डा
९. धिक्कार
१०. लांछन

संदर्भ ग्रंथ सूची :

अनु क्र	किताब का नाम	लेखक का नाम
१.	हिन्दी गद्य का इतिहास	:डॉ . रामचंद्र तिवारी
२.	हिन्दी गद्य का इतिहास	: डॉ . वच्चन सिंह
३.	प्रसाद के नाटकों का शास्त्रिय अध्ययन	: डॉ . जगन्नाथ प्रसाद शर्मा
४.	प्रसाद का नाट्य साहित्य	: डॉ . भानुदेव शुक्ल
५.	प्रसाद के नाटकों का ऐतिहासिक एवं सामाजिक विवेचन	: डॉ . जगदीश चंद्र जोशी
६.	नाटककार जयशंकर प्रसाद	: सं . डॉ . सत्येद्र कुमार तनेजा
७.	हिन्दी नाटक और रंगमंच: पहचान एवं परख	: डॉ . इन्द्रनाथ मदान
८.	नाटक और रंग परिकल्पना	: डॉ . गिरिश रस्तोगी
९.	स्वातंत्रयोत्तर हिन्दी नाटक	: डॉ . रामजन्म शर्मा
१०.	मोहन राकेश के नाटक	: डॉ . शिवराज यादव
११.	नाटककार मोहन राकेश	: डॉ . रीता कुमार
१२.	आधुनिक नाटक का अग्रदूत मोहन राकेश	: गोविंद चातक
१३.	कहानीकार प्रेमचंद, रचना दृष्टि	: डॉ . शिवकुमार मिश्र
१४.	प्रेमचंद : व्यक्तित्व और रचना दृष्टि	: डॉ . दयानंद पाण्डेय
१५.	डॉ . हजारी प्रसाद द्विवेदी : व्यक्तित्व और साहित्य	: डॉ . गणपति चंद्र गुप्त
१६.	हजारी प्रसाद द्विवेदी के साहित्य में लालित्य योजना	: डॉ . कविता रानी
१७.	प्रतिनिधि निबंधकार	: डॉ . विभुराम मिश्र
१८.	हिन्दी निबंधकार	: जयनाथ नलिन

॥ विद्या विनयेन शोभते ॥

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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Program M.A. Part-II

Semester -IV

M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)

Course: Hindi

Semester- IV

Course Code : PAR4HN12

Paper No. 12

आधुनिक काव्य

Semester IV
M.A. Hindi Part-II
Paper No. 12
आधुनिक काव्य

Name of the Programme	: M.A.
Name of the Course	: Hindi
Course Code	: PAR4HN12
Total Lectures	: 60
Total credit	: 06

पाठ्यक्रम के उद्देश्य :

१. आधुनिक कवियों के व्यक्तित्व और कृतित्व का परिचय देना।
२. आधुनिक काव्य की भूमिका को समझना।
३. आधुनिक कविता का परिचय प्राप्त करना।
४. आधुनिक कविता के माध्यम से तत्कालीन परिस्थितियों का समझना।
५. रचना के आस्वादन एवं समीक्षण की क्षमता विकसित करना।

अध्ययन पद्धति:

१. व्याख्यान तथा विश्लेषण।
२. संगोष्ठी, स्वाध्याय तथा गुटचर्चा।
३. दृक्-श्राव्य माध्यमों/ साधनों का प्रयोग।
४. पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग।
५. अतिथि विशेषज्ञों के व्याख्यान।

Semester IV
M.A. Hindi Part-II

प्रश्नपत्र : १२

Course Code : PAR4HN12

आधुनिक काव्य

List of Text Books

१. आंगन के पार द्वार- अज्ञेय

भारतीय ज्ञानपीठ, १८, इस्टीट्यूशनल एरिया, लादी रोड, नई दिल्ली-११०००३

२. संसद से सड़क तक: धूमिल

राजकमल प्रकाशन, १-वी, नेताजी सुभाष मार्ग, दरियागंज, नई दिल्ली-११०००२

३. प्रतिनिधि कविताएँ- ओमप्रकाश वाल्मीकि

शिल्पायन पब्लिशर्स एण्ड डिस्ट्रीब्यूटर्स, १०२९५, लेन नं. १, वैस्ट गोरखपार्क, शाहदरा, दिल्ली-११००३२

इकाई -१

व्याख्यान -२०

आंगन के पार द्वार- अज्ञेय

१. वना दे चित्तेरे
२. चिड़िया ने
३. अंतःसलिला
४. असाध्य वीणा

इकाई -२

व्याख्यान -२०

संसद से सड़क तक- धूमिल

१. बीस साल बाद
२. जनतन्त्र के सूर्योदय में
३. अकाल -दर्शन
४. मोचीराम
५. मुनासिव कार्रवाई

इकाई -३

व्याख्यान -२०

प्रतिनिधि कविताएँ- ओमप्रकाश वाल्मीकि

१. ठाकुर का कुआँ
२. शम्बूक का कटा सिर
३. कुदाल
४. सदियों का संताप
५. तब तुम क्या करोगे ?
६. तीन मुट्ठियाँ
७. कर्पूर के बावजूद
८. प्रतिबंध
९. पहाड़
१०. वसुधैव कुटुम्बकम्

संदर्भ ग्रंथ सूची :

अनु क्र	किताब का नाम	लेखक का नाम
१ .	अज्ञेय: एक अध्ययन	: भोलाभाई पटेल
२ .	अज्ञेय: कवि और काव्य	: डॉ . राजेंद्र कुमार
३ .	समकालीन हिन्दी कविता: अज्ञेय और मुक्तिबोध के संदर्भ में	: शशि शर्मा
४ .	अज्ञेय काव्य में प्रतिविंब और मिथक	: डॉ . सी . एम . राजन
५ .	अज्ञेय का काव्य	: प्रणय कृष्ण
६ .	अज्ञेय: कविकर्म का संकट	: सुमनिका सेठी
७ .	ओमप्रकाश वाल्मीकि: प्रतिनिधि कविताएँ	: संपादक-डॉ . रामचंद्र
८ .	संसद से सड़क तक	: धूमिल
९ .	धूमिल की कविता में विरोध और संघर्ष	: नीलम सिंह
१० .	आज का दलित साहित्य	: तेज सिंह
११ .	आंबेडकरवादी साहित्य का समाजशास्त्र	: तेज सिंह
१२ .	दलित समाज और संस्कृति	: तेज सिंह
१३ .	आंबेडकरवादी विचारधारा और समाज	: स्वराज प्रकाशन
१४ .	भारतीय दलित साहित्य: परिप्रेक्ष्य	: पुन्नी सिंह
१५ .	दलित साहित्य का सौंदर्यशास्त्र	: शरणकुमार लिंगवाले
१६ .	दलित साहित्य: वुनियादी सरोकार	: कृष्णदत्त पालीवाल
१७ .	परंपरागत वर्णव्यवस्था और दलित साहित्य	: साक्षंत मस्के

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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Program M.A. Part-II

Semester- IV

M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)

Course: Hindi

Course Code : (PAR4HN14)

प्रश्नपत्र : १४

जनसंचार माध्यम

Mass Media

Semester IV
M.A. Hindi Part-II

प्रश्नपत्र : १४

जनसंचार माध्यम

Name of the Programme	: M.A.
Name of the Course	: Hindi
Course Code	: PAR4HN14
Total Lectures	: 60
Total credit	: 06

पाठ्यक्रम के उद्देश्यः

१. हिन्दी जनसंचार माध्यमों का सामान्य परिचय प्राप्त करना।
२. संचार की प्रक्रिया एवं उसके तत्वों को समझना।
३. सामाजिक विकास में जनसंचार माध्यमों की भूमिका का परिचय देना।
४. जनसंचार माध्यमों की भाषा से अवगत करना।
५. जनसंचार माध्यमों के विकासक्रम का परिचय देना।
६. माध्यमोपयोगि लेखन के प्रकारों से अवगत कराना।

अध्ययन पद्धति:

१. व्याख्यान तथा विश्लेषण
२. संगोष्ठी, स्वाध्याय तथा गुटचर्चा
३. दृक्-श्राव्य माध्यमों/ साधनों का प्रयोग
४. पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग
५. अतिथि विशेषज्ञों के व्याख्यान

Semester IV
M.A., Hindi Part-II
प्रश्नपत्र : १४
Course Code : PAR4HN14

जनसंचार माध्यम

- इकाई- १. व्याख्यान -२०
१. जनसंचार माध्यम :-
- स्वरूप, अर्थ, परिभाषा
 - महत्व
२. संचार प्रक्रिया के तत्व
३. सामाजिक विकास में जनसंचार की भूमिका
४. जनसंचार माध्यमों का विकास
- मुद्रित जनसंचार माध्यम
 - श्रव्य जनसंचार माध्यम
 - दृश्य जनसंचार माध्यम
 - नव इलेक्ट्रॉनिक माध्यम
- इकाई- २. व्याख्यान -२०
५. जनसंचार माध्यमों की भाषा
- रेडियो
 - टेलिविजन
 - विज्ञापन
 - समाचर-पत्र
 - फिल्म
 - कम्प्यूटर
- इकाई -३ व्याख्यान २०
६. माध्यमोपयोगी लेखन- स्वरूप एवं प्रकार
- समाचर लेखन
 - रेडियो नाटक लेखन
 - उद्घोषणा लेखन
 - विज्ञापन लेखन
 - फीचर लेखन
 - रिपोर्टाज
 - पटकथा
 - टेलीड्रामा
 - वृत्तचित्र (डाक्यूमेंट्री)
 - धारावाहिक
 - संवाद

संदर्भ ग्रंथ सूची :

अनु क्र	किताब का नाम	लेखक का नाम
१.	जनसंचार माध्यम	: गौरीशंकर रैना
२.	मीडिया लेखन	: सुमित मोहन
३.	नये जनसंचार माध्यम और हिन्दी	: सुधीर पचौरी, अंचला नागर
४.	मीडिया और जनसंवाद	: वर्तिका नंदा
५.	जनसंचार सिद्धांत और अनुप्रयोग	: विष्णु राजगढ़ियाँ
६.	आधुनिक विज्ञापन	: पुष्पदंत
७.	विज्ञापन	: पातंजलि
८.	मीडिया और बाजारवाद	: संपादक . रामशरण जोशी
९.	भारत में जनसंचार और प्रसारण मीडिया	: मधुकर लेले
१०.	फीचर लेखन स्वरूप और शिल्प	: डॉ . मनोहर प्रभाकर
११.	पत्रकारिता और पत्रकारिता	: डॉ . अरुण जैन
१२.	मीडिया लेखन	: विजय कुलश्रेष्ठ
१३.	आधुनिक जनसंचार माध्यम और हिन्दी	: डॉ . हरिमोहन
१४.	इलेक्ट्रॉनिक माध्यम रेडियो और दूरदर्शन	: डॉ . राममोहन पाठक
१५.	समाचार लेखन और संपादन कला	: डॉ . हरिमोहन
१६.	संचार माध्यम लेखन	: गौरीशंकर रैना
१७.	मीडिया लेखन	: डॉ . चंद्रप्रकाश मिश्र
१८.	इलेक्ट्रॉनिक मीडिया और हिन्दी	: डॉ . रेशमा नदाफ
१९.	प्रयोजनमूलक हिन्दी अधुनातन आयाम	: डॉ . अंबादास देशमुख
२०.	प्रयोजनमूलक हिन्दी के आधुनिक आयाम	: डॉ . महेंद्र सिंह राणा

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Syllabus

Question Paper Pattern (60:40)

Choice Based Credit Grading and Semester System (CBCGS)
With effect from the Academic Year 2020-21

Program M.A. Part-II

Semester- IV

**M.A. Syllabus According to Choice Based Credit Grading and
Semester System (CBCGS)**

Course: Hindi

Course Code : (PAR4HN16)

प्रश्नपत्र : १६

प्रकल्प लेखन

Project Writing

Semester IV
M.A. Hindi Part-II

प्रश्नपत्र : १६

प्रकल्प लेखन

Name of the Programme	: M.A.
Name of the Course	: Hindi
Course Code	: PAR4HN16
Total Lectures	: 60
Total credit	: 06

पाठ्यक्रम के उद्देश्यः

१. अनुसंधान की पद्धति का अध्ययन करना।
२. अनुसंधान के तत्वों से परिचित होना।
३. अनुसंधान की रूपरेखा को समझना।
४. अनुसंधान के आयामों को अवगत करना।
५. विषय चयन की प्रविधि को समझना।

अध्ययन पद्धति:

१. व्याख्यान तथा विश्लेषण।
२. संगोष्ठी, स्वाध्याय तथा गुटचर्चा।
३. दृक्-श्राव्य माध्यमों/ साधनों का प्रयोग।
४. पावर पॉइंट प्रजेन्टेशन (PPT) भाषा प्रयोगशाला का प्रयोग।
५. अतिथि विशेषज्ञों के व्याख्यान।

Semester IV
M.A., Hindi Part-II

प्रश्नपत्र : १६

Course Code : PAR4HN16

प्रकल्प लेखन

इकाई-

1.

व्याख्यान -60

अंक विभाजन- :

1. 60 अंक प्रकल्प के लिए
2. 40 अंक मौखिकी के लिए

सूचना:- चांगू काना ठाकूर कला, वाणिज्य और विज्ञान महाविद्यालय (स्वातात्त), नवीन पनवेल का हिन्दी अध्ययन मंडल प्रकल्प के लिए विषय उपलब्ध कराएगा। चांगू काना ठाकूर कला, वाणिज्य और विज्ञान महाविद्यालय (स्वातात्त), नवीन पनवेल, अन्य विश्वविद्यालय तथा महाविद्यालयों के हिन्दी विभाग के प्राध्यापक प्रकल्प प्रस्तुत करने वाले छात्रों की मौखिकी लेने के लिए उपस्थित रहेंगे। विषय विशेषज्ञ के रूप में उपस्थित रहने वाले परीक्षक का मानधन संबंधित संस्थान को देय होगा।

EXAMINATION

1. External Examination (Semester end Examination)	Total Marks - 60
2. Internal Examination	Total Marks - 40
1. पुस्तक समीक्षा / प्रकल्प	कुल अंक - 20
2. प्रस्तुतीकरण / रचनात्मक कार्य	कुल अंक - 10
3. कक्ष शिक्षण के दौरान सहभागिता	कुल अंक - 05
4. शिष्टाचार एवं समग्र आचरण	कुल अंक - 05

एम.ए. द्वितीय वर्ष सेमिस्टर III से IV के लिए

प्रश्न पत्र का प्रारूप

♦ पेपर क्रमांक :- 14, 15,

प्रश्न क्र 1.	पूछे गए चार प्रश्नों में से दो प्रश्नों के उत्तर अपेक्षित -	40 अंक
प्रश्न क्र 2.	पूछे गए चार टिप्पणियों में से दो के उत्तर अपेक्षित -	10 अंक
प्रश्न क्र 3.	वस्तुनिष्ठ प्रश्न	
	अतिलघुत्तरी प्रश्न -05	05 अंक
	बहुविकल्पीय प्रश्न -05	05 अंक
	कुल योग	60 अंक

♦ पेपर क्रमांक :- 9, 10, 11, 12,

प्रश्न क्र 1.	संदर्भ सहित व्याख्या (तीनों पुस्तकों में से) दो प्रश्नों के उत्तर अपेक्षित -	20 अंक
प्रश्न क्र 2.	दीर्घोत्तरी प्रश्न (तीनों पुस्तकों में से) दो प्रश्नों के उत्तर अपेक्षित -	30 अंक
प्रश्न क्र 3.	वस्तुनिष्ठ प्रश्न	
	अतिलघुत्तरी प्रश्न (तीनों पुस्तकों में से) - 05	05 अंक
	बहुविकल्पीय प्रश्न (तीनों पुस्तकों में से) - 05	05 अंक
	कुल योग	60 अंक

♦ पेपर क्रमांक :- 13,

प्रश्न क्र 1.	संदर्भ सहित व्याख्या (दोनों पुस्तकों से आंतरिक विकल्प सहित)	10 अंक
प्रश्न क्र 2.	दीर्घोत्तरी प्रश्न (दोनों पुस्तकों में से आंतरिक विकल्प सहित प्रश्न)	20 अंक
प्रश्न क्र 3.	दीर्घोत्तरी प्रश्न (दोनों पुस्तकों में से पूछे गए दो प्रश्नों में से एक का उत्तर अपेक्षित)	20 अंक
प्रश्न क्र 4.	वस्तुनिष्ठ प्रश्न	
	अतिलघुत्तरीय प्रश्न -05	05 अंक
	बहुविकल्पीय प्रश्न - 05	05 अंक
	कुल योग	60 अंक



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL
(AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.A.

**Revised Syllabus of F.Y.B. A. Geography
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2022-23**

Details of the course:

Sr. No.	Heading	Particulars
1	Title of Course	Geography
2	Eligibility for Admission	12 th Arts/ Commerce/ Science of all recognised Board
3	Passing marks	35%
4	Ordinances/Regulations (if any)	---
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-2023

Preamble of the Syllabus:

Bachelor of Arts (B.A.) in Geography is a under graduate course of Department of Geography, Changu Kana Thakur Arts, Commerce & Science college, New Panvel (Autonomous). The Choice Based Credit and Grading System to be implemented through this curriculum, would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. This syllabus is prepared to give the sound knowledge and understanding of Geography to undergraduate students at first year of the B.A. degree course. The syllabus is prepared to determine and analyse knowledge of the facts, processes, and methods of Human and Environmental Geography. The content of syllabus will expose the students to various emerging new areas of Geography and acquaint them with their prevalent in their future studies and their applications in society. Through this course students will acquire analytical skills that can be applied to a variety of research and professional tasks where the analysis of spatial information is required.

Objectives of the course:

1. To determine and analyse knowledge of the facts, processes, and methods of Human and Environmental Geography
2. To expose the students to various emerging new areas of Geography and acquaint them with their prevalent in their future studies and their applications in society.
3. To develop basic skills in practical Geography and its applications in society.
4. To cultivate a sense of awareness among students and the public on the need to conserve our environment and to contribute in the efforts to make the environment clean, greener and a better place to live in.

Outcome of the course:

Semester: - I - F.Y.B.A. Geography (Paper No. I)

Subject: Geography	Course: Human Geography Course Code: (UAR1GE1)	
After completing the course, student will be able to:		Bloom Taxonomy Level
CO 1	Understand comprehensibly the nature, scope, approaches, branches and concepts in Human Geography.	II- Understanding
CO 2	Understand and analyse the trends and patterns of world population change, density, distribution and growth. Evaluate the problems of population	II- Understanding III- Applying V- Evaluating
CO 3	Understanding the concept, types and patterns of rural and urban settlements.	II- Understanding
CO 4	Understand and analyse the concept, causes, types, trends and consequences of migration.	II- Understanding II- Understanding
CO 5	Able to create/ construct and interpret of graphs, maps and population pyramid	VI- Creating

Semester: - II - F.Y.B.A. Geography (Paper No. I)

Subject: Geography	Course: Geography of Environment Course Code: (UAR2GE1)	
After completing the course, student will be able to:		
CO 1	Understand the nature, scope, importance and man-environment relationship in Environmental Geography.	II- Understanding
CO 2	Understand the Structure, functions and types of ecosystem.	II- Understanding
CO 3	Understand environmental pollution and major environmental issues and evaluate the causes, effects and solutions.	II- Understanding V- Evaluating
CO 4	Understand the importance of natural resources and propose the methods conservation	II- Understanding VI- Creating
CO 5	Able to fill the map and interpret of thematic maps.	VI- Creating

Title of the Papers:

F. Y. B. A. Geography (Paper No. I)

For the subject of Geography there shall be two papers for 60 lectures each comprising of five units of 12 lectures each.

Semester-I

Paper-I: Human Geography

COURSE CODE: UAR1GE1 (2022-23), Credit - 4

Semester-II

Paper-I: Geography of Environment

COURSE CODE: UAR2GE1 (2022-23), Credit – 4

Scheme of Examination for Each Semester:

❖ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies / Test based on tutorials 4. Book Review /Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Question Paper Pattern
(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/	20
True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	Marks

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
1. There shall be five questions each of 12 marks (24 marks with internal options). 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Question Paper Pattern

University of Mumbai

Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)

Revised Syllabus w.e.f. Academic Year, 2022-23 (CBCS)

F.Y.B.A. Geography, Semester- I and II

Duration: 2 hours		Marks: 60
N.B. 1. All questions are compulsory and carry equal marks. 2. Use of Map Stencils and simple Calculator is allowed. 3. Attach appendix along with answer paper.		
Q. 1	Unit-I	12 Marks
<i>OR</i>		
Q.1	Unit-I (Question may be divided in to A and B)	12 Marks
Q. 2	Unit-II	12 Marks
<i>OR</i>		
Q. 2	Unit-II (Question may be divided in to A and B)	12 Marks
Q. 3	Unit-III	12 Marks
<i>OR</i>		
Q. 3	Unit-III (Question may be divided in to A and B)	12 Marks
Q. 4	Unit-IV	12 Marks
<i>OR</i>		
Q. 4	Unit-IV (Question may be divided in to A and B)	12 Marks
Q. 5	Unit – V Practical Component (Any Two) A) B) C) D)	12 marks

Syllabus for Semester I :

University of Mumbai
Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)
Revised Syllabus w.e.f. Academic Year, 2022-23 (CBCS)
F.Y.B.A. Geography, Semester- I (Human Geography-I)
COURSE CODE: UAR1GE1, Credit- 4

Unit No	Title of the Unit		Periods
UNIT-I	Human Geography: An Introduction		12
	1.1	Human Geography - Meaning, Definition, Nature, Scope	
	1.2	Branches of Human Geography	
	1.3	Different Approaches of Human Geography	
	1.4	Man Environment relation, Determinism Possibilism , Probabilism and Stop and Go Determinism	
UNIT-II	Population		12
	2.1	Trends and Patterns of World Population change	
	2.2	Demographic Transition Model	
	2.3	Population Density: Distribution and Growth	
	2.4	Concept of Under-population, over-population and optimum population	
UNIT-III	Settlement		12
	3.1	Concept of Urban and Rural Settlements	
	3.2	Types and Pattern of settlement	
	3.3	Site and Situation	
	3.4	Functional classification of Urban settlement	
UNIT-IV	Migration		12
	4.1	Concept and Types of Migration	
	4.2	Causes of migration – pull and push: Consequences of migration	
	4.3	Patterns and processes of migration	
	4.4	Emerging trends of migrations, Issues of legal and illegal international, migration Migrant refugee crisis	
UNIT-V	Practical : Map and Interpretation of Data		12
	5.1	Map - Definition, Components, Types and Importance	
	5.2	Map scale - Definition, Types of Scale	
	5.3	Analysis and Interpretation of Population Data.	
	5.4	Construction of Population Pyramid	

Reference Books:

1. Johnson R. J. & Others (1983) : The Disctionary of Human Geography, Blackwell England
2. Singh, L. R. (2009): “Fundamentals of Human Geography”, Sharda Pustak Bhavan, Allahabad
3. Hussain, M. (2011): “Human Geography”, Rawat Publications, Jaipur
4. Dikshit, R. D. (1997): “Geographical Thought: A Contextual History of Ideas”, PHI Learning Private Limited, Delhi
5. Singh, R. Y. (2002): “Geography of Settlements”, Rawat Publications, Jaipur
6. Siddhartha, K. and Mukherjee, S. (2016): “Cities, Urbanisation and Urban Systems”, Kitab Mahal, Delhi
7. Chandna, R. C. (2016): “Geography of Population: Concepts, Determinants and Patterns”, Kalyani Publishers, Ludhiana
8. Bhende, A. and Kanitkat, T. (2015): “Principles of Population Studies”, Himalaya Publishing House, Mumbai
9. Koser, K. (2007): “International Migration: A Very Short Introduction”, Oxford University Press, UK
10. Castles, S., Haas, H., and Miller, M. (2013): “The Age of Migration: International Movements in the Modern World”, Guilford Pr.
11. Leong, G. C. and Morgan, G. C. (1982): “Human and Economic Geography”, Oxford University Press, Delhi
12. Knowles, R. and Wareing, J. (2012): “Economic and Social Geography”, Rupa and CO., Kolkata
13. Waugh, D. (2009): “The New Wider World”, Oxford University World, Oxford
14. Mahmood, A. (2008): Statistical Methods in Geographical Studies”, Rajesh Publications, New Delhi
15. Singh, L. R. (2009): “Fundamentals of Practical Geography”, Sharda Pustak Bhavna, Allahabad
16. Mishra, R. P. and Ramesh, A. (2002): “Fundamentals of Cartography”, Concept Publishing Company, New Delhi
17. पेडणेकर, परमार व इतर (२०१६) “मानवी भूगोल” शेठ पब्लिशर्स प्रायवेट लिमिटेड, मुंबई
18. घारपुरे विठ्ठल (२०००): “मानवी भूगोल” पिंपळापुरे आणि पब्लिशर्स, नागपूर
19. पेडणेकर, नारखेडे व इतर (२०१७) “भूरूपशास्त्र व मानवी भूगोल” शेठ पब्लिशर्स प्रायवेट लिमिटेड, मुंबई
20. परमार, वानखडे व इतर (२०२१) “मानवी भूगोल” हिमालय पब्लिशिंग हाऊस, मुंबई.
२१. पाटील व्ही.जे. व इतर (२०१८) “मानवी भूगोल” प्रशांत प्रकाशन, जळगाव

Syllabus for Semester II :

University of Mumbai
Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)
Revised Syllabus w.e.f. Academic Year, 2022-23 (CBCS)
F.Y.B.A. Geography, Semester- I (Geography of Environmental -I)
COURSE CODE: UAR2GE1, Credit- 4

Unit No	Title of the Unit		Periods
UNIT-I	Fundamentals of Environmental Geography		12
	1.1	Definition, Meaning of Environmental Geography	
	1.2	Nature, Scope and Importance	
	1.3	Man's Interaction with environment	
	1.4	Interdisciplinary Approach of Environmental Geography	
UNIT-II	Ecosystem		12
	2.1	Ecosystem: Meaning, definition and its Structure	
	2.2	Functions: Energy Flow, Food Chain, Food Web, Tropic Level and Food Pyramid	
	2.3	Classification of Ecosystem: Terrestrial and Aquatic	
	2.4	Bio-geochemical Cycles: Hydrological, Carbon and Nitrogen	
UNIT-III	Contemporary Environmental Issues		12
	3.1	Pollution: Air and Water- Causes, effects and Solutions	
	3.2	Pollution: Land and Noise- Causes, effects and Solutions	
	3.3	Major Environmental Issues: Global Warming, Ozone Depletion and Acid Rain	
	3.4	Major Environmental Movements: Local, National and International	
UNIT-IV	Natural Resources and Biodiversity		12
	4.1	Natural Resources: Meaning, Definition and Importance	
	4.2	Types of Natural Resources	
	4.3	Depletion and Measures of Conservation of Natural Resources	
	4.4	Biodiversity in India and its Conservation	
UNIT-V	Practical: Map Filling and Interpretation of Cartographs		12
	5.1	Map Filling- World	
	5.2	Interpretation of Thematic Maps: Choropleth, Isopleth, Dot Map and Flow Maps	

References:

1. Bharucha, E. (2004): “A Textbook for Environmental Studies”, University Grants Commission, New Delhi,
2. Cunningham, W, and Cunnigham, M. (2017): “Principles of Environmental Science: Inquiry and Applications”, McGraw Hill Education, Delhi
3. Gautam, A. (2010): “Environmental Geography”, Sharda Pustak Bhavan, Allahabad
4. Gharpure Vithhal
5. Karlekar, S. and Borges, J. (2008): “Diamond Bhugol- Paryavaran Shatra Kosh”, (Marathi), Diamond Publications, Pune
6. Rajagopalan, R. (2016): “Environmental Studies: From Crisis to Core”, Oxford University Press, New Delhi
7. Sangle, S. (2017): “Paryavaran Bhugol”, (Marathi), Diamond Publications, Pune
8. Saxena, H. (2017): “Environmental Geography”, Rawat Publishers, Jaipur.
9. Singh, S. (2017): “Environmental Geography”, Prayag Pustak Bhawan, Allahabad
10. परमार व इतर (२०१३) “पर्यावरण भूगोल” हिमालय पुब्लिशिंग हाऊस, मुंबई
11. परमार, बोरसे व इतर (२०२२) “पर्यावरण भूगोल” हिमालय पब्लिशिंग हाऊस, मुंबई.
12. पाटील व्ही.जे. व इतर (२०१८) “पर्यावरण भूगोल” प्रशांत प्रकाशन, जळगाव
13. धारपुरे विठ्ठल (२००२): “पर्यावरण भूगोल” पिंपळापुरे आणि पब्लिशर्स, नागपूर
14. ठाकूर व इतर (२०१७) “पर्यावरण भूगोल”कोकण जोग्राफर पब्लिकेशन



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'Best College Award' by University of Mumbai**

Program: B.Com.

**Revised Syllabus of F.Y.B. Com. - Environmental Studies
Choice Based Credit System (60:40)
w.e.f. Academic Year 2022-23**

Details of the course:

Sr. No.	Heading	Particulars
1	Title of Course	Environmental Studies
2	Eligibility for Admission	12 th Commerce/ Science of all recognised Board
3	Passing marks	35%
4	Ordinances/Regulations (if any)	---
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-23

Preamble of the Syllabus:

Environmental Studies is a course at F.Y. B.Com. at under graduation level program of the B.Com. This course is designed to procure awareness among the learners about the environment as a whole and its related problems. The syllabus is prepared to give the sound knowledge and understanding of environment to undergraduate students at first year of the B.Com degree course. The content of syllabus is prepared to make the students capable to understand the relation between the environment and the commercial activities. Also to create an insight into various environmental issues at global, national and regional level and measures for environmental conservation. This course will cultivate a sense of awareness among learners on the need to conserve our environment

Objectives of the course:

1. To demonstrate and analyse knowledge of the facts and processes of environment.
2. To make aware students about various environmental factors and its relation to the field of Commerce.
3. To highlight functional and spatial links between environment, economy and society.
4. To create an environmental awareness among the commerce students.
5. To create an insight into various environmental issues at global, national and regional level and measures for environmental conservation.

Outcome of the course:

Semester: - I - F.Y.B.Com. Environmental Studies

Revised Syllabus w.e.f. Academic Year, 2022-23 (CBCS)

Subject: Environmental Studies	Course: Environmental Studies Course Code: (UCM1EVS)	
After completing the course, student will be able to:		Bloom Taxonomy Level
CO 1	Understand comprehensibly the concept of environment and ecosystem.	II- Understanding
CO 2	Understand and analyse the natural resources and need and measures for sustainable development.	II- Understanding III- Applying
CO 3	Analyse the data of population and evaluate the emerging issues of development.	III- Applying IV- Analyzing
CO 4	Understand the process of urbanization and analyses the environmental issues.	II- Understanding IV- Analyzing
CO 5	Read the thematic maps and interpret the map.	I- Remembering V- Evaluating

Semester: - II - F.Y.B.Com. Environmental Studies

Revised Syllabus w.e.f. Academic Year, 2022-23 (CBCS)

Subject: Environmental Studies	Course: Environmental Studies Course Code: (UCM2EVS)	
After completing the course, student will be able to:		Bloom Taxonomy Level
CO 1	Understand the solid waste management and evaluate the environmental impact and role of society in solid waste management.	II- Understanding V- Evaluating
CO 2	Understand the environmental problems associated with agriculture and the sustainable agricultural practices.	II- Understanding
CO 3	Understand the Tourism potentials and evaluate the challenges before India.	II- Understanding V- Evaluating
CO 4	Understand the environmental movements and environmental management in India.	II- Understanding
CO 5	Remember the environmentally significant features and to mark in Mumbai and Konkan region map.	I- Remembering V- Evaluating

Title of the Papers:

F. Y. B. Com. Environmental Studies

For the subject of Environmental Studies there shall be two papers for 60 lectures each comprising of five units of 12 lectures each.

Semester-I

Paper-I: Environmental Studies

COURSE CODE: UCM1EVS (2022-23), Credit - 4

Semester-II

Paper-I: Environmental Studies

COURSE CODE: UCM1EVS (2022-23), Credit – 4

Scheme of Examination for Semester I and II:

Choice Based Credit System (CBCS)

❖ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Project 2. Presentation and write up on the selected topics of the subjects. 3. Case studies /Test based on Tutorials 4. Open Book Test/Book Review 5. Quiz	20 Marks

Question Paper Pattern
(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

- ❖ Maximum Marks: 20
- ❖ Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

B) Semester End Examination: 60 % **60 Marks**

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
<ol style="list-style-type: none">1. There shall be five questions each of 12 marks (24 marks with internal options).2. All questions shall be compulsory with internal options.3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit/module.

Question Paper Pattern

University of Mumbai

Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)

Revised Syllabus w.e.f. Academic Year, 2022-23 (CBCS)

F.Y.B.Com. Environmental Studies, Semester- I and II

Duration: 2 hours		Marks: 60
N.B. 1. All questions are compulsory and carry equal marks. 2. Use of Map Stencils and simple calculator is allowed. 3. Attach appendix along with answer paper.		
Q. 1	Unit-I	12 Marks
<i>OR</i>		
Q.1	Unit-I (Question may be divided in to A and B)	12 Marks
Q. 2	Unit-II	12 Marks
<i>OR</i>		
Q. 2	Unit-II (Question may be divided in to A and B)	12 Marks
Q. 3	Unit-III	12 Marks
<i>OR</i>		
Q. 3	Unit-III (Question may be divided in to A and B)	12 Marks
Q. 4	Unit-IV	12 Marks
<i>OR</i>		
Q. 4	Unit-IV (Question may be divided in to A and B)	12 Marks
Q. 5	Unit – V Practical Component A) B)	12 marks (06 Marks) (06 Marks)

Syllabus for Semester I:

University of Mumbai

Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)

Revised Syllabus w.e.f. Academic Year, 2022-23 (CBCS)

F.Y.B.Com. Environmental Studies, Semester- I

COURSE CODE: UCM1EVS, Credit- 4

Unit No	Title of the Unit		Periods
UNIT-I	Environment and Ecosystem		12
	1.1	Environment: Definition, Factors and types of Environment	
	1.2	Ecosystem: Elements and types,	
	1.3	Functioning and structure: Food chain and food web, ecological pyramid, hydrological cycle, carbon cycle and nitrogen cycle	
	1.4	Significance of Environmental Studies.	
UNIT-II	Natural Resources and Sustainable Development		12
	2.1	Natural resources: concept, classification and types	
	2.2	Factors influencing on resource utilization	
	2.3	Issues related to water, forest and energy resources	
	2.4	Conservation and measures for sustainable development of resources	
UNIT-III	Growth of Population and Emerging Issues of Development		12
	3.1	Pattern of population growth: world and India	
	3.2	Population explosion: world and India	
	3.3	Population policies of India	
	3.4	Environment and human health indicators: Human development index and World happiness index	
UNIT-IV	Urbanization and Environment		12
	4.1	Urbanization: Trends of urbanization in World and India	
	4.2	Urbanization and related issues	
	4.3	Environmental issues in urban area: Air, water, land pollution and loss of biodiversity	
	4.4	Smart Cities: Concept and policies	
UNIT-V	Reading of Thematic Maps and Map Filling (Practical Component)		12
	5.1	Interpretation of Thematic Maps: Located bars, Circles, Pie charts, Isopleth, Choropleth and Flow map, Pictograms	
	5.2	World Map filling: Environmental features	

Reference Books:

1. Asolekar S, Gopichandran R. 2005, '*Preventive Environmental Management - an Indian perspective*', CEE, Ahmedabad, Foundation Books Pvt Ltd, Daryaganj
2. Chambers N., Simons C., Wackernagel M., 2006, '*Sharing Nature's Interest - Ecological footprints as an indicator of sustainability*'.
3. Doniwal H. K., '*Urban Geography*', GNOSIS, Delhi, 2009.
4. Dresner S., 2005, '*The principles of sustainability*', Earthscan publication Ltd, London.
5. Gandotra V., Patel S., 2008, '*Environmental problems and strategies*', Serials Publication, New Delhi
6. Hulse J. H., 2007, '*Sustainable Development at risk - Ignoring the past*', Cambridge University Press India Pvt Ltd., New Delhi.
7. Mohanta R., Sen A., Singh M.P., 2009, '*Environmental Education - Vol. 1*', APH publishing Corporation New Delhi.
8. Perumal M., Veerasekaran R., Suresh M., Asaithambi M., 2008, '*Environmental and Ecological issues in India*', Abhijeet Publication, Delhi
9. Pednekar H.M., Parmar R.O. and Others.. 2016, '*Environmental Studies*' Sheth Publishers Private Ltd, Mumbai
10. Prabu P.C., Udayasooriyam C., Balasubramanian G, 2009, '*An introduction to Ecology and Environmental Science*', Avinash Paperbacks, New Delhi.
11. Purvis M. and Grainger A., 2005, '*Exploring Sustainable Development - Geographical perspectives*', Earthscan Publication, UK.
12. Rajgopalan R., 2005, '*Environmental Studies - from crisis to cure*', Oxford University press, New Delhi.
13. Reddy K. P., Reddy D. N., 2003, '*Environmental Education*', Neelkanth Publication, Hyderabad.
14. Santra S.C., 2004, '*Environmental Science*', New Central Book agency Pvt Ltd, Kolkata.
15. Saxena H.M., 2000, '*Environmental Management*', Rawat Publication, New Delhi, pp.
16. Sinha S. P., Falguni R., Prasad M., Nanghia H.R., 1993, '*Instant Encyclopaedia of Geography*', Mittal Publication, New Delhi.
17. Sudhir M.A., Alankara M. M., 2003, '*Environmental issues*', Reliance publishing house, New Delhi.
18. Swarup R.S., Mishra S.N., Juahari V.P, 1992, '*Encyclopaedia of Ecology, environment and pollution control - 20*', Mittal publication, New Delhi
19. Tiwari V., 2009, '*A textbook of Environmental studies*', Himalaya Publications House, New Delhi
20. Tomar A., 2007, '*Environmental Education*', Kalpaz publication, New Delhi
21. Uberoi N.K., 2007, '*Environmental Management*', Excel Books, New Delhi
22. William M., Grossa J., 2002, '*Environmental Geography - Science, Land use and Earth Systems*', John Wiley and Sons Inc USA.
23. Wright R., 2008, '*Environmental Science - Towards sustainable future*', Eastern Economy Edition, Prentice hall Inc, New Jersey, U.S.A

Syllabus for Semester II:

University of Mumbai

Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)

Revised Syllabus w.e.f. Academic Year, 2022-23 (CBCS)

F.Y.B.Com. Environmental Studies, Semester- II

COURSE CODE: UCM2EVS, Credit- 4

Unit No	Title of the Unit		Periods
UNIT-I	Solid Waste Management for Sustainable Society		12
	1.1	Waste: concept and types	
	1.2	Waste management: concept and methods	
	1.3	Solid waste: sources and classification	
	1.4	Solid waste management: Initiatives at global, national and local level	
UNIT-II	Agricultural Practices and Environmental Degradation		12
	2.1	Environmental problems associated with agriculture	
	2.2	Sustainable agricultural practices: Initiatives at global level and in India	
	2.3	Environmental problems associated with industries	
	2.4	Sustainable industrial practices: Initiatives at global level and in India	
UNIT-III	Tourism and Environment		12
	3.1	Tourism: Meaning, importance and types	
	3.2	Tourism potentials and challenges in India	
	3.3	Consequences of tourism: economic, cultural and environmental	
	3.4	Sustainable tourism practices	
UNIT-IV	Environmental Movements and Management		12
	4.1	Environmental movements in India: Save Ganga, Save tiger, Save Western Ghats	
	4.2	Environmental Management: Concept, need and relevance; concept of ISO 14000 and ISO 16000	
	4.3	Concept of Carbon Bank and Carbon Credit ,	
	4.4	Environmental Impact Assessment and Ecological footprint	
UNIT-V	Map Filling (Practical Component)		12
	5.1	Konkan Region: (Environmentally significant features)	
	5.2	Mumbai: (Environmentally significant features)	

Reference Books:

1. Asolekar S, Gopichandran R. 2005, '*Preventive Environmental Management - an Indian perspective*', CEE, Ahmedabad, Foundation Books Pvt Ltd, Daryaganj
2. Chambers N., Simons C., Wackernagel M., 2006, '*Sharing Nature's Interest - Ecological footprints as an indicator of sustainability*'.
3. Doniwal H. K., '*Urban Geography*', GNOSIS, Delhi, 2009.
4. Dresner S., 2005, '*The principles of sustainability*', Earthscan publication Ltd, London.
5. Gandotra V., Patel S., 2008, '*Environmental problems and strategies*', Serials Publication, New Delhi
6. Hulse J. H., 2007, '*Sustainable Development at risk - Ignoring the past*', Cambridge University Press India Pvt Ltd., New Delhi.
7. Mohanta R., Sen A., Singh M.P., 2009, '*Environmental Education - Vol. 1*', APH publishing Corporation New Delhi.
8. Perumal M., Veerasekaran R., Suresh M., Asaithambi M., 2008, '*Environmental and Ecological issues in India*', Abhijeet Publication, Delhi
9. Pednekar H.M., Narkhede D.S. and Others.. 2016, '*Environmental Studies*' Sheth Publishers Private Ltd, Mumbai
10. Prabu P.C., Udayasooriyan C., Balasubramanian G, 2009, '*An introduction to Ecology and Environmental Science*', Avinash Paperbacks, New Delhi.
11. Purvis M. and Grainger A., 2005, '*Exploring Sustainable Development - Geographical perspectives*', Earthscan Publication, UK.
12. Rajgopalan R., 2005, '*Environmental Studies - from crisis to cure*', Oxford University press, New Delhi.
13. Reddy K. P., Reddy D. N., 2003, '*Environmental Education*', Neelkanth Publication, Hyderabad.
14. Santra S.C., 2004, '*Environmental Science*', New Central Book agency Pvt Ltd, Kolkata.
15. Saxena H.M., 2000, '*Environmental Management*', Rawat Publication, New Delhi, pp.
16. Sinha S. P., Falguni R., Prasad M., Nanghia H.R., 1993, '*Instant Encyclopaedia of Geography*', Mittal Publication, New Delhi.
17. Sudhir M.A., Alankara M. M., 2003, '*Environmental issues*', Reliance publishing house, New Delhi.
18. Swarup R.S., Mishra S.N., Juahari V.P, 1992, '*Encyclopaedia of Ecology, environment and pollution control - 20*', Mittal publication, New Delhi
19. Tiwari V., 2009, '*A textbook of Environmental studies*', Himalaya Publications House, New Delhi
20. Tomar A., 2007, '*Environmental Education*', Kalpaz publication, New Delhi
21. Uberoi N.K., 2007, '*Environmental Management*', Excel Books, New Delhi
22. William M., Grossa J., 2002, '*Environmental Geography - Science, Land use and Earth Systems*', John Wiley and Sons Inc USA.
23. Wright R., 2008, '*Environmental Science - Towards sustainable future*', Eastern Economy Edition, Prentice hall Inc, New Jersey, U.S.A



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL
(AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: B.A.

Revised Syllabus of S.Y.B. A. Geography
Paper No. II and III
for
Semester III and IV
Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2020-21

Details of the course:

Sr. No.	Heading	Particulars
1	Title of Course	Geography
2	Eligibility for Admission	F.Y.B.A. of all recognised Universities
3	Passing marks	40%
4	Ordinances/Regulations (if any)	---
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble of the Syllabus:

Bachelor of Arts (B.A.) in Geography is a under graduation course of Department of Geography, Changu Kana Thakur Arts, Commerce & Science college, New Panvel (Autonomous) The Choice Based Credit and Grading System to be implemented through this curriculum would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. This syllabus is prepared to give the sound knowledge and understanding of Geography to undergraduate students at second year of the B.A. degree course. The syllabus is prepared to determine and analyse knowledge of the facts, processes, and methods of Geography. The content of syllabus will expose the students to various emerging new areas of Geography and acquaint them with their prevalent in their future studies and their applications in society. Through this course Students will acquire geographic analytical skills that can be applied to a variety of research and professional tasks where the analysis of spatial information is required.

TITLE OF THE PAPERS:

S. Y. B. A. Geography (Paper No. II & III)

For the subject of Geography there shall be two papers for 45 lectures each comprising of five units of 9 lectures each.

Semester-III:

Paper-II: An Introduction to Climatology
Course Code: UAR3GE2, Credit – 3

Paper-III: Physical Geography of India
Course Code: UAR3GE3, Credit - 3

Semester-IV:

Paper-II: Introduction to Oceanography
Course Code: UAR4GE2, Credit - 3

Paper-III: Agriculture Geography of India
Course Code: UAR4GE3, Credit – 3

COURSE OBJECTIVES AND OUCOMES:

Semester: - III - S.Y.B.A. Geography **Revised Syllabus w.e.f. Academic Year, 2020-21 (CBSGS)**

PAPER NO. II - AN INTRODUCTION TO CLIMATOLOGY (UAR3GE2)

Course Objectives:

1. To determine and analyse knowledge of the facts, processes, and branches of Climatology
2. To study the components of air pressure and atmospheric circulation.
3. To learn the concept and process of humidity and precipitation.
4. To understand the concept of climate and changing weather phenomena.
5. To develop basic skills in practical Geography and its applications in climatological study.

Course Outcomes:

By the end of the course, a student should develop the ability to:

1. Understand the introduction to Climatology considering weather & climate, nature, scope, and some other sub division of the course.
2. Understand weather phenomena winds, humidity, precipitation and winds.
3. Understand the process, methods of weather forecasting and climatic changes.
4. Learn the climatic changes, its causes, effects and its measures.
4. Able to read and interpret the weather map and to construct the various graphs related to climatology.

PAPER NO. III – PHYSICAL GEOGRAPHY OF INDIA (UAR3GE3)

Course Objectives:

1. To understand the extent and significance of India's location.
2. To study the physiography and the drainage pattern of India.
3. To expose the students to various facts and processes about climate, soil and natural vegetation of India.
4. To cultivate a sense of awareness among students and the public on the need to conserve our environment.
5. To acquaint the students about the mineral and power resources in India.
6. To develop basic skills in practical Geography and its applications.

Course Outcomes:

By the end of the course, a student should develop the ability to:

1. Understand importance of the location and the geographical personality of India.
2. Understand the variability of drainage pattern and climate in India.
3. Study the soil and forest resources, problems related to its depletion and conservation methods.
4. Study the minerals and energy resources in India.
5. Show the geographical features in the map of India.
6. Read, convert and prepare the map scale.

Semester: - IV - S.Y.B.A. Geography
Revised Syllabus w.e.f. Academic Year, 2020-21 (CBSGS)

PAPER NO. II - AN INTRODUCTION TO OCEANOGRAPHY (UAR4GE2)

Course Objectives:

1. To study the origin development and branches of oceanography.
2. To understand the structure and composition of ocean water and bottom relief of ocean floor.
3. To learn the formation, types and effects of tides and ocean currents.
4. To understand and learn the relationship of man and ocean.
5. To develop basic skills in practical Geography and its applications in oceanographic study.

Course Outcomes:

By the end of the course, a student should develop the ability to:

1. Understand the origin, development and branches of oceanography.
2. To learn the importance and physical structure and composition of ocean water and relief.
3. Knowledge about the formation, types and effect of tides and ocean currents.
4. Understand the relationship between man and ocean.
5. Read and interpret the bathymetrical maps.

PAPER NO. III – AGRICULTURE GEOGRAPHY OF INDIA (UAR4GE3)

Course Objectives:

1. To study the definitions, nature scope and approaches of agriculture geography.
2. To understand the salient features of Indian agriculture and its importance in Indian economy.
3. To study types of farming, major crops, agro climatic zones and problems of agriculture in India.
4. To learn the concept, components and impacts of green revolution in India.
5. To study the sustainable agriculture and watershed management in India.
6. To understand the recent trends and use of technology in agriculture.
7. To learn the reading and interpretation the thematic maps and draw the statistical diagrams and graphs.

Course Outcomes:

By the end of the course, a student should develop the ability to:

1. Understand the introduction to agriculture, nature, scope, significance and approaches of agriculture geography.
2. Understand features, determinants, major crops and problems of Indian agriculture
3. Understand the history, components and impacts of green revolution in India.
4. Understand the development of recent trends and technology used in agriculture in India.
5. Interpret the thematic maps and draw the statistical diagrams and graphs.

SCHEME OF EXAMINATION FOR EACH SEMESTER:***Internal Evaluation: 25 Marks**

(20 marks for internal test and 05 marks for overall performance)

Duration: 40 Minutes		Marks: 20
N.B. 1. All questions are compulsory and carry equal marks.		
Q. 1	A) Fill in the blanks /Choose the correct alternatives/ Match the pairs	05 Marks
	B) Define the terms/ Answer in one sentence	05 Marks
Q.2	Answer the following (Any Two out of three)	10 Marks

****Semester End Examination: 75 Marks****Question Paper Pattern****University of Mumbai****Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)****Revised Syllabus w.e.f. Academic Year, 2019-20 (CBSGS)****S.Y.B.A. Geography, Semester- III and IV**

Duration: 2½ hours		Marks: 75
N.B. 1. All questions are compulsory and carry equal marks. 2. Use of Map Stencils and simple Calculator is allowed. 3. Attach appendix along with answer paper.		
Q. 1	Unit-I	15 Marks
	<i>OR</i>	
Q.1	Unit-I (Question may be divided in to A and B)	15 Marks
Q. 2	Unit-II	15 Marks
	<i>OR</i>	
Q. 2	Unit-II (Question may be divided in to A and B)	15 Marks
Q. 3	Unit-III	15 Marks
	<i>OR</i>	
Q. 3	Unit-III (Question may be divided in to A and B)	15 Marks
Q. 4	Unit-IV	15 Marks
	<i>OR</i>	
Q. 4	Unit-IV (Question may be divided in to A and B)	15 Marks
Q. 5	Unit – V Practical Component (Any Two) A) B)	15 marks

SYLLABUS FOR SEMESTER III:**Paper: II**

University of Mumbai
Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)
Revised Syllabus w.e.f. Academic Year, 2020-21 (CBSGS)
S.Y.B.A. Geography, Semester- III
Paper-II: An Introduction to
Climatology
COURSE CODE: UAR3GE2, Credit - 3

Unit-I: Introduction to Climatology		09 (lectures)
1.1	Definition, nature, scope and branches of climatology	
1.2	Concept and elements of weather and climate	
1.3	Composition and structure of atmosphere	
1.4	Insolation: Vertical and horizontal distribution of temperature	
Unit-II : Air Pressure and Atmospheric Circulation		09 (lectures)
2.1	Air pressure: Concept, types and influencing factors	
2.2	Horizontal distribution of air pressure	
2.3	Wind: Types of winds: Global, regional and local	
2.4	Upper air circulation (Jet stream): Concept, origin and effects	
Unit-III: Humidity and Precipitation		09 (lectures)
3.1	Humidity: Types - absolute, relative and specific	
3.2	Condensation and its forms	
3.3	Precipitation and its types	
3.4	Spatial distribution of rainfall	
Unit-IV: Climate and Weather Phenomena		09 (lectures)
4.1	Cyclones: tropical and temperate	
4.2	Anti-cyclones and tornados	
4.3	El Nino and Indian monsoon	
4.4	Climate change: Global warming, causes effects and measures	
Unit-V: Practical Component		09 (lectures)
5.1	IMD: Weather signs and symbols, Reading and interpretation of IMD weather maps	
5.2	Construction of Wind rose, Climograph and Hythergraph	

Reference Books:-

1. Ahrens, C.D. (2012): Essentials of Meteorology: An Invitation to the Atmosphere; Cengage Learning, Boston
2. Ahrens, C.D., Jackson, P.L., Jackson, C.E.J. and Jackson, C.E.O. (2012): Meteorology Today: An Introduction to Weather, Climate and the Environment; Cengage Learning; Boston
3. Barry, R.G. and Chorley, R.J. (2003): Atmosphere, Weather and Climate; Psychology Press, Hove; East Sussex.
4. Chawan S.V. (ed) (2015): Physical Geography, Paper I, Published by Director (I/C), Institute of Distance and Open Learning, University of Mumbai.
5. Critchfield, H.J., (1975): general Climatology, Prentice Hall, New Jersey.
6. Lal D.S. (1997): Climatology; Sharda Pustak Bhavan; Allahabad
7. Lydolph, P.E.(1985): The Climate of the Earth, Rowman Nad Allanheld, Totowa, New Jersey.
8. Mather,J.R.(1974): Climatology: Fundamentals and Applications; Mc Craw Hill Book Co., U.S.A.
9. Matthews, W. H., Kellogg, W., Robinson, G.D. (1971): Man's Impact on Climate; M.I.T. Press Design Dept. U.S.A.
10. Oliver, J.E. (1993): Climatology: An Atmospheric Science, Pearson Education India, New Delhi
11. Rosenberg, N.J., Blad, B.L., Verma, S.B.(1983): Micro-climate Biological Environment; John Wiley & Sons, U.S.A.
12. Rumney, G.R. (1968): Climatology and the World Climates, Macmillan, London.
13. Shinde P. ; Pednekar H. et.al. (2010): Introduction to Geography, Sheth Publishers Pvt.Ltd., Mumbai.
14. Subrahmanyam, V.P. (ed) (1983): Contributions to Indian Geography a) Vol III- General Climatology, b) Volume IV- Applied Climatology. Heritage Publishers, New Delhi.
15. Trewartha, G.T. (1980): An Introduction to Climate; McGraw Hill, New York, 5th edition, (International Student Edition)

Paper: III

University of Mumbai
Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)
Revised Syllabus w.e.f. Academic Year, 2020-21 (CBSGS)
S.Y.B.A. Geography - Semester- III
Paper-III: Physical Geography of
India
COURSE CODE: UAR3GE3, Credit - 3

Unit-I: Introduction of India		09 (lectures)
1.1	India: Location , extent and significance India: Major physiographic divisions	
1.2	Mountainous region of India	
1.3	North Indian plains	
1.4	Peninsular plateau of India	
1.5	Coastal plains and islands of India	
Unit-II: Drainage System		09 (lectures)
2.1	Drainage System: Concept and types	
2.2	Himalayan rivers of India	
2.3	Peninsular Rivers of India	
2.4	Lakes of India	
Unit-III: Climate, Soils and Natural Vegetation		09 (lectures)
3.1	Seasons in India	
3.2	Soils of India: Importance, types and formation	
3.3	Forest in India: Importance and classification	
3.4	Conservation of soil and forest in India	
Unit-IV: Mineral and Energy Resources		09 (lectures)
4.1	Ferrous minerals in India: Types and distribution (Iron ore, manganese, bauxite and other important minerals)	
4.2	Nonferrous minerals in India: Types and distribution (Mica, limestone, gypsum, clay and other important minerals)	
4.3	Energy resources in India: Types and distribution (Coal, mineral oil and natural gas and other important resources)	
4.4	Power Resources in India: Types and distribution (Hydro, wind, solar, tidal and other important resources)	
Unit-V: Practical Component		09 (lectures)
5.1	Map filling: Showing geographical features in the Map of India (Related to above units)	
5.2	Map Scale – Types, Conversion and drawing	

Reference books:-

1. Deshpande C.D. (1992): India: A Regional Interpretation, Northern Book Centre, New Delhi.
2. Bharucha, F.R. (1983): A text book of the plant geography of India, Oxford University Press, Bombay.
3. Dikshit, K.R.(1991): Environment, Forest Ecology and man in the Western Ghats- The Case of Mahabaleshwar Plateau, Rawat Publications, New Delhi.
4. Forest Survey of India: State Forests Reports, Dehradun.
5. Khullar, D.R. (2014): India: A Comprehensive Geography; Kalyani Publishers
6. Miller, R.W. et al. (1995): Soil in Our Environment, Prentice hall, U.S.A.
7. Raychudhari, S.P.(1958): Soils of India, ICAR, New Delhi
8. Robinson, F (ed.) (1989): The Cambridge Encyclopedia of India, Pakistan, Bangladesh and Sri Lanka, Cambridge University Press.
9. Savindra Singh (2006) : Physical Geography of India ; Pravalika Publications, Allahabad.
10. Sharma T.C. (2013) Economic Geography of India; Rawat Publications, New Delhi.
11. 15. परमार राजेंद्र (२०१६): “भारताचा प्राकृतिक भूगोल” हिमाचल प्रदेश पब्लिशिंग हाउस, मॉंबई
12. 16. घाणसे वल्लभ (२०१४): भूगोल लापर आणि पलरलिसस नागप
“भारताचा भूगोल”
13. 17. पेंडसेकर, नारखेडे व इतर (२०१७) “भारताचा प्राकृतिक भूगोल” केंठ पब्लिशिंगस प्रायलेट शरशमटेडे, मॉंबई

SYLLABUS FOR SEMESTER IV :**Paper: II**

University of Mumbai
Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)
Revised Syllabus w.e.f. Academic Year, 2020-21 (CBSGS)
S.Y.B.A. Geography, Semester- IV
Paper-II: Introduction to
Oceanography
COURSE CODE: UAR4GE2, Credit - 3

Unit-I: Nature of Oceanography		09 (lectures)
1.1	Origin and Development of Oceanography	
1.2	Oceanography : Concept, nature and scope	
1.3	Branches of oceanography	
1.4	Oceans and its characteristic	
Unit-II: Bottom Relief and Ocean		09 (lectures)
2.1	Structure of bottom relief of ocean floor	
2.2	Composition of ocean water	
2.3	Ocean water temperature: Factors and distribution	
2.4	Salinity of ocean water: Factors and distribution	
Unit-III: Movements of Ocean Water		09 (lectures)
3.1	Waves- Formation and types	
3.2	Tsunami and their effects on coast	
3.3	Concept and types of Tides	
3.4	Ocean Currents – types, distribution and effects of ocean currents	
Unit-IV: Man and Ocean		09 (lectures)
4.1	El- Niño and La-Niña phenomenon	
4.2	Coral reefs and their importance	
4.3	Marine Ecosystem: Types and characteristics	
4.4	Marine pollution: Causes, effects and measures	
Unit-V: Practical Component		09 (lectures)
5.1	Map filling : Related to Oceanography	
5.2	Reading and Interpretation of navigation charts and bathymetric maps	

Reference books:-

1. Bhatt, J.J. (1978): Exploring the Planet Ocean, D.Von Nostrand Co.New York.
2. Birla Economic Research Foundation, economic Research Division (1992):
The Oceans, Allied Publishers Ltd. New Delhi.
3. Chandra, S. and Others (eds).(1993): The Indian Ocean and its islands:
Strategic Scientific and Historical perspectives, sage Publications,
New Delhi.
4. Chawan S.V. (ed) (2015): Physical Geography, Paper I, Published by Director
(I/C), Institute of Distance and Open Learning, University of
Mumbai.
5. Fairbridge, R.W.ed) Encycloepadia of Oceanography, Reinholt, New York.
6. Sharma, R.C. (ed)(1985): The Oceans: realities and Prospects, Rajesh Publications,
New Delhi.
7. Sengupta,R. and Desa E,(eds) (2001): The Indian Ocean: A Perspective Vol.,I and II
Oxford and IBH Publishing Company Private Limited, New Delhi.
8. Paul, P.R.(1998): Invitation to Oceanography, Jones and Bartlett Publishing,
Sudbury, Massachusetts.
9. Rajgopalan, R (ed) (1996): Voices for Oceans, A Report to the Independent
World Commission on the Oceans, International Ocean Institute,
Operational centre, Madras, India.
10. Qasim, S.Z(1998): Glimpses of Indian Ocean, Universities Press(India) Limited,
Hyderabad.

Paper: III

University of Mumbai
Changu Kana Thakur A.C.S. College, New Panvel (Autonomous)
Revised Syllabus w.e.f. Academic Year, 2020-21 (CBSGS)
S.Y.B.A. Geography, Semester- IV
Paper-III: Agriculture Geography of India
COURSE CODE: UAR4GE3, Credit - 3

Unit-I: Introduction to Agricultural Geography		09 (lectures)
1.1	Definition, nature and scope of Agricultural Geography	
1.2	Approaches of Agriculture Geography	
1.3	Salient features of Indian agriculture	
1.4	Importance of agriculture in Indian economy	
Unit-II: Introduction to Indian Agriculture		09 (lectures)
2.1	Factors influencing agriculture in India	
2.2	Types of farming in India	
2.3	Major crops of India	
2.4	Agro- climatic regions of India	
2.5	Problems associated with Indian agriculture (Natural, Socio-Economic and Political)	
Unit-III: Green Revolution in India		09 (lectures)
3.1	Green Revolution in India: Introduction and components	
3.2	Impacts of Green Revolution	
3.3	Sustainable agriculture in India	
3.4	Watershed management in India	
Unit-IV: Recent Trends in Agriculture		09 (lectures)
4.1	Livestock resources and white revolution	
4.2	Genetic engineering and tissue culture	
4.3	Horticulture and poly house agriculture	
4.4	Agro processing and agro exports in India	
4.5	Agro-tourism and Agro forestry	
Unit- V: Practical Component		09 (lectures)
5.1	Interpretation/ question- answer on thematic maps related to agriculture of India (NATMO and other)	
5.2	Drawing of Statistical Diagrams and Graphs: Bar graphs, line graphs, and pie charts	

Reference books:-

1. Bansil, B. C. (1975): „Agricultural Problems of India“, Delhi.
2. Bayliss Smith, T.P. (1987) : The Ecology of Agricultural Systems. Cambridge University Press, London .
3. Berry, B.J.L. et. al.(1976) : The Geography of Economic Systems. Prentice Hall, New York.
4. Gregor, H.P.: Geography of Agriculture. Prentice Hall, New York, 1970.
5. Grigg, D. (1984): „An Introduction to Agricultural Geography“, Hutchinson Publication, London
6. Grigg, D.B.(1974) : The Agricultural Systems of the World. Cambridge University Press, New York.
7. Hartshorn, T.N. and Alexander, J.W. (1988): Economic Geography. Prentice Hall, New Delhi.
8. Morgan W.B. and Norton, R.J.C. (1971): Agricultural Geography. Mathuen, London,
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10. Morgan, W.B.(1978): Agriculture in the Third World - A Spatial Analysis. Westview Press, Boulde.
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12. Sauer, C.O.(1969): Agricultural Origins and Dispersals. M.I.T. Press, Mass, U.S.A.
13. Singh J.(1997): Agricultural Development in South Asia: A Comparative A Study in the Green Revolution Experiences, national Books Organization, New Delhi.
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15. Singh, J. and Dhillon, S.S. (1988), “Agricultural Geography”, 2nd edition, Tata McGraw-Hill, NewDelhi
16. Symons, L. (1972): „Agricultural Geography“, Bell and Sons, London
17. Tarrant, J.R.(1974): Agricultural Geography, Problems in Modern Geography Series, John Wiley and Sons.
18. The Hindu (2006): Survey of Indian Agriculture 2006. New Delhi.
19. Wigley, G.(1981), Tropical Agriculture: The Development of Production, 4th edition, Arnold, London



II विद्या विनयेन शोभते II

Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai
Program: B.A.

Revised Syllabus of T.Y.B. A. Geography
Paper No. IV to IX
for
Semester V and VI
Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2021-22

Details of the course:

Sr. No.	Heading	Particulars
1	Title of Course	Geography
2	Eligibility for Admission	Second Year B.A
3	Passing marks	40%
4	Ordinances/Regulations (if any)	---
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Preamble of the Syllabus:

Bachelor of Arts (B.A.) in Geography is a under graduation course of Department of Geography, Changu Kana Thakur Arts, Commerce & Science college, new Panvel (Autonomous) The Choice Based Credit and Grading System to be implemented through this curriculum would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. This syllabus is prepared to give the sound knowledge and understanding of Geography to undergraduate students at first year of the B.A. degree course. The goal of the syllabus is to make the study of Geography as stimulating, interesting and relevant as possible. The syllabus is prepared by keeping in mind the aim to make students capable of studying Geography in academic and industrial courses. Also to expose the students and to develop interest in them in various fields of Geography. The new and updated syllabus is based on disciplinary approach with vigour and depth taking care of the syllabus is not heavy at the same time it is comparable to the syllabi of other universities at the same level. The students pursuing this course would have to develop understanding of various aspects of the Geography. The conceptual understanding, development of experimental skills, developing the aptitude for academic and professional skills, obtaining basic ideas and understanding of hyphenated techniques, understanding the fundamental Geographic processes and rationale towards application of Geographical knowledge are among such important aspects.

Objectives of the course:

1. To promote understanding of basic facts and concepts in Geography while retaining the excitement of Geography.
2. To make students capable of studying Geography in academic and Industrial courses.
3. To expose the students to various emerging new areas of Geography and apprise them with their prevalent in their future studies and their applications in various spheres of chemical sciences.
4. To develop problem solving skills in students.

Outcome of the course:

By the end of the course, a student should develop the ability:

- To understand, coherently and effectively about various genres of Geography.
- To develop the understanding and interest in the field of Geography
- To develop basic skills in practical Geography and its industrial applications.

Title of the Papers:**T. Y. B. A. Geography**

For the subject of Geography at third year level, there shall be six papers in each semester (Semester VI and IX). Out of which for four papers are theory papers (Paper no. IV, V, VI and VIII) of 60 lectures each comprising of five units of 12 lectures. Paper No. VI and IX are Practical Component with 45 lectures each comprising of five units of 09 lectures.

Title of Papers with Course Code and Credit:**V-Semester**

Paper No.	Course Code	Title of the Paper	Credits
Iv	UAR5GE4	Geography of Settlements	04
V	UAR5GE5	Geography of Maharashtra	04
Vi	UAR5GE6	Tools and Techniques in Geography For Spatial Analysis-I (Practical)	3.5
Vii	UAR5GE7	Regional Planning and Development	04
Viii	UAR5GE8	Geography of Resources	04
Ix	UAR5GE9	Geospatial Technology	3.5

Semester–VI

Paper No.	Course Code	Title of the Paper	Credits
IV	UAR6GE4	Environmental Geography	04
V	UAR6GE5	Geography of Tourism and Recreation	04
VI	UAR6GE6	Tools and Techniques in Geography For Spatial Analysis-II (Practical)	3.5
VII	UAR6GE7	Economic Geography	04
VIII	UAR6GE8	Social Geography	04
IX	UAR6GE9	Research Methodology in Geography	3.5

Scheme of Examination for Each Semester:**Internal Evaluation: 25 Marks**

(20 marks for internal test and 05 marks for overall Performance)

Duration: 40 Minutes		Marks: 20
N.B. 1. All questions are compulsory and carry equal marks.		
Q. 1	A) Fill in the blanks /Choose the correct alternatives/ Match the pairs	05 Marks
	B) Define the terms/ Answer in one sentence	05 Marks
Q.2	Answer the following (Any Two out of three)	10 Marks

Semester End Examination: 75 Marks

Question Paper Pattern
For Revised Syllabus w.e.f. Academic Year, 2021-22 (CBSGS)
T.Y.B.A. Geography, Semester- V and VI

Duration: 2½ hours		Marks: 75
N.B. 1. All questions are compulsory and carry equal marks. 2. Use of Map Stencils and simple Calculator is allowed. 3. Attach appendix along with answer paper.		
Q. 1	Unit-I	15 Marks
<i>OR</i>		
Q.1	Unit-I (Question may be divided in to A and B)	15 Marks
Q. 2	Unit-II	15 Marks
<i>OR</i>		
Q. 2	Unit-II (Question may be divided in to A and B)	15 Marks
Q. 3	Unit-III	15 Marks
<i>OR</i>		
Q. 3	Unit-III (Question may be divided in to A and B)	15 Marks
Q. 4	Unit-IV	15 Marks
<i>OR</i>		
Q. 4	Unit-IV (Question may be divided in to A and B)	15 Marks
Q. 5	Unit-V (Question may be divided in to A and B)	15 marks

Semester- V

Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)

T.Y.B.A. Geography (Semester - V)

Paper: IV: GEOGRAPHY OF SETTLEMENT

COURSE CODE: UAR5GE4

Credit: 04

UNIT – I: Introduction of Settlement Geography		No. of Lectures
1.1	Settlement geography: definitions, nature and scope	12
1.2	Importance of settlement studies in Geography	
1.3	Factors influencing growth and distribution of settlements	
1.4	Settlement types, their characteristics and differences	
UNIT – II: Geography of Rural Settlements		12
2.1	Origin and growth of settlements - evolution of rural settlements	
2.2	Site and situation of rural settlements	
2.3	Classification of rural settlements on the basis of population and patterns	
2.4	Classification of rural settlements on the basis of spacing and functions	
UNIT – III: Rural Settlements in India		12
3.1	Spatial distribution and density of rural settlements in India	
3.2	Structure of house and building materials in India	
3.3	Regional variations in rural settlement patterns in India	
3.4	Morphology of rural settlement in India	
UNIT – IV: Urban Settlements		12
4.1	Origin and growth of urban settlements	
4.2	Classification of urban settlements on the basis of culture and functions	
4.3	Hierarchy of Urban Settlement: Rank Size Rule and Primate city	
4.4	Christaller's Central Place Theory and Mark Jefferson's Theory	
UNIT – V: Urban Settlements in India		12
5.1	Urbanization in India: Trends, patterns and types of towns based on Census	
5.2	Morphology of urban settlements in India (With reference to a port and inland city)	
5.3	Impact of urbanization on Indian cities	
5.4	Smart city: Concept, need and implementation in India	

References:

- Deshpande, C. D. (2005): "Cities: A Geographical Study", Translated by V. G. Amrite, Manan Prakashan, Mumbai
- Gharpure, V. (2013): "Nagari Bhugol", (Marathi) Pimpalpure and Company Publishers, Nagpur
- Gharpure, V. (2013): "Vasti Bhugol", (Marathi) Pimpalpure and Company Publishers, Nagpur
- Gharpure, V. (2017): "Manavi Bhugol", (Marathi) Pimpalpure and Company Publishers, Nagpur
- Ghosh. S. (2015): "Introduction to Settlement Geography", Orient Blackswan Private Limited, Hyderabad
- Jyptirmoy Sen (2007): "A Text Book of Social and Cultural Geography," Kalyani Publsiher, New Delhi.
- Knowles, R and Wareing, J. (1996): "Economic and Social Geography", the Made Simple Series, Rupa & Co., Calcutta
- Leong, Goh-Cheng and Morgan, G. (1994): "Human and Economic Geography", Oxford University Press, Oxford
- Noble, A. (1998): "Using Descriptive Models to Understand South Asian Cities", *Education About Asia*, Vol. 3, No. 3, Downloaded from <http://aas2.asian-studies.org/EAA/EAA-Archives/3/3/205.pdf>
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- Singh, L. R. (2009): "Fundamentals of Human Geography", Sharda Pustak Bhawan, Allahabad
- Singh, R. Y. (2012): "Geography of Settlements", Rawat Publications, Jaipur
- Tiwari, R. C. (2016): "Geography of India", Pravalika Publications, Allahabad
- Thakur S. A. and others – "Settlement Geography"/ *Vasti Bhugol*- Konkan Geographers, Publication (2012)
- घारपुरे वळूर (१९९९)ळस्ती भोर, वपपलापुरे अड किं., नागप
- साळिंत प्रकाळ (१९९८) नागरी भूगोर, फडके प्रकाळन, कोल्हाप
- सळदी ए.बी. (२०१०) नागरी भोर, मनरारी प्रकाळन, पुणे

Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)

T.Y.B.A. Geography (Semester - V)

Paper: V-A: GEOGRAPHY OF MAHARASHTRA

COURSE CODE: UAR5GE5

Credit: 04

Unit-I: Maharashtra: Geographical Setting		No. of Lectures
1.1	Location, extent and boundaries	12
1.2	Administrative setup and divisions	
1.3	Physiography and climate	
1.4	Drainage system	
Unit-II: Natural Resources		12
2.1	Soils	
2.2	Natural vegetation	
2.3	Minerals	
2.4	Energy resources	
Unit-III: Human Resources		12
3.1	Population growth	
3.2	Distribution –urban-rural and population density	
3.3	Structure of population : Age-sex, literacy and dependency Ratio	
3.4	Occupational structure of population	
Unit-IV: Agriculture, Fishing and Livestock Resources		12
4.1	Salient features of agriculture	
4.2	Agricultural regions, recent issues and policies	
4.3	Fisheries, recent issues and policies	
4.4	Livestock resources recent issues and policies	
Unit-V: Industries, Trade and Transport		12
5.1	Role of transport in industrial development	
5.2	Major industrial regions	
5.3	Industrial issues and policies	
5.4	Transport and trade	

References:

- Jaymala Diddee, S.R. Jog, V.S. Kale Geography of Maharashtra
- Johns: Economic Geography -
- Khullar: Geography of India
- Majid Hussein: Geography of India
- Oxford: Oxford School atlas-
- Savinder Singh Environmental Geography
- Sharma: India's economic and commercial geography
- प्रा.सवदी: महाराष्ट्राचा भूगोल
- देशपांडे एस.एस: महाराष्ट्राचे अर्थशास्त्र
- महाराष्ट्राचा भूगोल - प्रा.सी.डी देशपांडे
- महाराष्ट्र- सवदी आणण के चे
- महाराष्ट्राचा भूगोल - बी.अरूणाचरम
- महाराष्ट्र 2006 – सांतोष दास्ताने
- जनगणना अँटर्स – महाराष्ट्र सरकार
- महाराष्ट्राचनकाशे – डॉ.के.आर.दत्त
- महाराष्ट्रातील जलसांपदा- प्रा. डॉ.एस.व्ही.ढमढेरे
- महाराष्ट्रातील नद्या – श्रीकांत तापीकर
- महाराष्ट्राचा भूगोल – डॉ.स.शे.फु.रु.

Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester - V)****Paper: V-B : POPULATION GEOGRAPHY****COURSE CODE: UAR5GE5****Credit: 04**

UNIT- I: Introduction to Population Geography		No. of Lectures
1.1	Concept, definition, nature, scope, importance	12
1.2	Evolution and recent trends	
1.3	Basic sources of population data and their important elements	
1.4	Population Geography and other Social Sciences	
UNIT- II: Population Dynamics		12
2.1	Population growth in the world (continent wise and level of development)	
2.2	Population growth in India	
2.3	World : Population density and its determinants	
2.4	Structure of population in developed and developing world (Age and Sex, Rural and Urban)	
UNIT- III: Theories of Population Growth		12
3.1	Demographic Transition Model	
3.2	Malthu's Population Theory	
3.3	Leibenstein's motivational theory of population growth	
3.4	Theory of optimum population	
UNIT- IV: Migration		12
4.1	Definition and Classification of Migration	
4.2	Causes and Consequences of Migration	
4.3	Recent trend of migration in India	
4.4	Issues of infiltration and its impacts in India	
UNIT- V: Contemporary Issues		12
5.1	Ageing population	
5.2	Gender issues -declining sex ratio, literacy gap,	
5.3	Poverty and unemployment in India	
5.4	Rapid urbanization in India	

Reference:

- Bhende A. and Kanitkar T.,(2000):*Principles of Population Studies*, Himalaya Publishing House
- Chandna R.C. and Sidhu M.S., 1980: *An Introduction to Population Geography*, Kalyani Publishers
- Chandna, R C (2006), *Jansankhya Bhugol*, Kalyani Publishers, Delhi
- Chandna, R C (2014),: *Geography of Population: Concepts, Determinants and Patterns*, Kalyani Publishers, Delhi
- Tiwari Ram Kumar (2015) *Jansankhya Bhugol Pravalika* Publication, Allahabad
- Thakur, Patil, Datta, Pednekar, Roy, and Kamble (2016): *Population Geography*, Konkan Geographers Association in India
- Roy. D. (2015) *Population Geography*, Books & Allied Publication, Kolkata

Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)

T.Y.B.A. Geography (Semester - V)

Paper No: VI: TOOLS AND TECHNIQUES IN GEOGRAPHY FOR
SPATIAL ANALYSIS-I (Practical)

COURSE CODE: UAR5GE6

Credit: 3.5

Unit –I: Map Projections		No. of Lectures
1.1	Basic Concepts – Definition, scale, direction, azimuth, graticule, great circle, true meridian, types of projections, choice of projections	09
1.2	Zenithal Polar Projections – Equal Area, Equidistant	
1.3	Cylindrical Projections - Equal Area, Equidistant	
1.4	Conical Projections - One standard parallel, two standard parallel	
Unit-II: Elements of Map		
2.1	Basic elements of map and identification of relief, bearing and distance	09
2.2	Area calculation with square method, strip method and triangulation method	
2.3	Delineation of watershed on topo sheet and preparation of drainage map	
2.4	Longitudinal profile of river	
Unit-III: Survey of India Toposheets		
3.1	Introduction and indexing of SOI Topo sheets, Signs and symbols and marginal information	09
3.2	Study of physiography, drainage and vegetation (one full topo sheet of hilly and plateau region each)	
3.3	Study of settlements – size, pattern, utilities (one full topo sheet of plains and urban region each)	
3.4	Study of transport and communication network and economic activities (one full topo sheet of plains and urban area each)	
Unit IV: Preparation of Thematic maps (Conventional method)		
4.1	Preparation of thematic maps with actual data- Dot and Pictogram	09
4.2	Preparation of thematic maps with actual data- Choropleth and Isopleth	
4.3	Preparation of thematic maps with actual data- Located bar, located circle and pie chart	
Unit-V: Use of computers in geographical data representation		
5.1	Use of MS Word and MS Power Point in Geography	09
5.2	Construction of line graphs & simple, multiple bar graphs, divided bar graphs, and pie charts using MS-excel	
5.3	Preparation of datasheet in SPSS	
5.4	Calculation of central tendency and standard deviation using SPSS	

References -

- Ahirrao ani Karanjkehe – प्रात्यक्षक भूगोल, पब्लिशर्स
- Karlekar Shrikant- प्रात्यक्षक भूगोल, पब्लिशर्स
डायमंड
- Karlekar Shrikant- Bhoogol shastratil Sanshodhan Paddhati, डायमंड पब्लिशर्स
- Monkhouse F.J. - Maps & Diagrams, Methuen and Co., London, 1971 (3rd Edition, Revised).
- NCERT - Textbook for Class-12, Practical Work in Geography Part II
- Peter A. Rogerson - Statistical Methods for Geography, Sege Publishers -2001
- Robinson A.H. - Elements of Cartography, Wiley
- Sarkar Ashis - Practical Geography, Orient Black Swan – 2015
- Sarkar Ashis –Quantitative Geography, Orient Black Swan – 2013
- Singh R.L. & Singh P. B. - Elements of Practical Geography, Kalyani Publishers 2005
- Stoddard Robert – Field techniques and research methods in geography, Geography faculty publication <http://digitalcommons.unl.edu/geographyfacpub/26>
- Thakur S. A. - प्रात्यक्षक भूगोल, Konkan Geographer's publication (2016)

Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester - V)****Paper: VII: REGIONAL PLANNING AND DEVELOPMENT****COURSE CODE: UAR5GE7****Credit: 04**

UNIT – I: Understanding Regional Planning		No. of Lectures
1.1	Planning: Concept, types and need	12
1.2	Regional planning: Concept, nature, relation with Geography	
1.3	Role of surveys and geospatial technology in regional planning	
1.4	Problems associated with regional planning	
UNIT – II: Concept of Region in Planning		12
2.1	Region: Concept, types and delineation	
2.2	Planning Regions: Need, characteristics and hierarchy	
2.3	Demarcation of planning regions: Principles, criteria and methods	
2.4	Perroux's Growth Pole Theory and regional planning	
UNIT – III: Understanding Regional Development		12
3.1	Development: Concept and indicators	
3.2	Regional disparities in development: Concept and measurements	
3.3	Spatial and Non-Spatial Models of Development with Special Reference to Rostow's Model and Myrdal's Model	
3.4	Strategies for regional development	
UNIT – IV: Regional Planning in India – I		12
4.1	Five-Year Plans: Features, achievements and failure	
4.2	Multi-level planning in India	
4.3	Planning regions of India	
4.4	Changing planning mechanism of India: NITI Ayog	
UNIT – V: Regional Planning in India – II		12
5.1	Micro level planning in rural area	
5.2	Backward area development programme	
5.3	Urban fringe of Indian cities: Problems and planning	
5.4	Metropolitan Planning: A Case of Mumbai Metropolitan Region	

References:

- Chand, Mahesh (2000): “Regional Planning In India”, Allied Publishers Ltd., Mumbai
- Chandana, R. C. (2016): “Regional Planning and Development”, Kalyani Publishers, New Delhi
- Dhamdhere, S. et al (2015): “Arthik Vikas Ani Niyojan”, (Marathi), Diamond Publications, Pune
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- Jhingan, M. L. (2017): “The Economics of Development and Planning”, Vrinda Publications (P) Limited, Delhi
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- NITI Ayog (2017): “Three Year Action Plan (2017-18 to 2019-20)”, NITI Ayog, New Delhi
- Tiwari, R. C. (2016): “Geography of India”, Pravalika Publications, Allahabad

Books for further reading:

- Bhargava, G. (2001): “Development of India’s Urban, Rural, and Regional Planning in 21st Century: Policy Perspective”, Gyan Publishing House, Delhi
- Datt, G. And Mahajan, A. (2016): “Datt and Sundaram’s Indian Economy”, S. Chand Publishing, New Delhi
- Devi, Laxmi (2000): “Planning Development and Regional Disparities”, (ed.) Anmol Publications, New Delhi
- Dhamdhere, S. and Shinde, S. (2010): “Bhartiya Ani Jagtik Arthik Vikas” (Marathi), Diamond Publications, Pune
- Hall, P. (2016): “Urban and Regional Planning” Routledge, London
- Knowles, R and Wareing, J. (1996): “Economic and Social Geography”, the Made Simple Series, Rupa& Co., Calcutta
- Sundaram, K. V. (1985): “Geography and Planning: Essays in Honour of Prof. V. L. S. PrakasaRao”, Concept Publishing Co., New Delhi
- Sundaram, K. V. (1989): “Regional Planning and Development: Essays on Space, Society, and Development in Honour of Professor R. P. Misra”, Heritage Publishers, New Delhi
- Vidyarthi, A. et al (2017): “Understanding India’s New Approach to Spatial Planning and Development: A Spatial Shift?”, Oxford University Press, New Delhi
- Yojana, Monthly Journal Published in English and Marathi by Government of Maharashtra

IMPORTANT WEBSITES / WEB LINKS:

mmrda.maharashtra.gov.in

niti.gov.in

planningcommission.gov.in

yojana.gov.in

Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester - V)****Paper: VIII - A: GEOGRAPHY OF RESOURCES****COURSE CODE: UAR5GE8****Credit: 04**

UNIT – I: Introduction to the Resources		No. of Lectures
1.1	Meaning and importance of the natural resources	12
1.2	Factors influencing resource utilization	
1.3	Classification of resources	
1.4	Issues with renewable and non-renewable resources	
UNIT – II: Need for Sustainable use of Natural resources		12
2.1	Over exploitation and depletion of natural resources	
2.2	Resource consumption pattern in the developed, developing and less developed countries	
2.3	Need and measures for resource conservation	
2.4	Sustainable use of natural resources	
UNIT – III: Natural Resources, Part –I		12
3.1	Distribution of water resources on the Earth	
3.2	Water consumption pattern, water pollution and water conservation	
3.3	Distribution of forest resources in the world	
3.4	Depletion of forest and forest conservation	
UNIT – IV: Natural Resources Part –II		12
4.1	Soil composition and factor affecting pedogenesis processes	
4.2	Soil degradation and its conservation	
4.3	Minerals and their classification	
4.4	Utilization of energy minerals, issues and need conservation	
UNIT – V: Human Resources		12
5.1	Concept of human resource: skilled and unskilled workers	
5.2	Distribution of population in the world	
5.3	Concept of over, under and optimum population	
5.4	Population Resource regions	

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Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester - V)****Paper: VIII-B : GEOGRAPHY OF HEALTH****COURSE CODE: UAR5GE8****Credit: 04**

Unit I - Introduction to Geography of Health		No. of Lectures
1.1	Nature, scope and evolution Geography of health	12
1.2	Conceptual background and components Geography of health	
1.3	Significance and approaches Geography of health	
1.4	Relation of Geography of health with other branches of social science	
Unit- II -The Pollution Syndrome		12
2.1	Air Pollution: Causes, Effects and remedial measures	
2.2	Water Pollution: Causes, Effects and remedial measures	
2.3	Radioactive Pollution: Causes, Effects and remedial measures	
2.4	Plastic Pollution: Causes, Effects and remedial measures	
Unit III - Geography of Diseases		12
3.1	Weather-related diseases and climate change and Global health	
3.2	Types of diseases and their regional pattern	
3.3	Case studies of communicable diseases - malaria and HIV Aids	
3.4	Case studies of non-communicable diseases - cancer and malnutrition	
Unit IV -Health and Environment		12
4.1	Linkages of health with environment	
4.2	Relation between development and health	
4.3	Population dynamics, urbanization, poverty and inequality	
4.4	Migration and related health issues	
Unit V - Health Care Facilities		12
5.1	Health care facilities in India	
5.2	Spatial Distribution of health care facilities in Maharashtra	
5.3	Health care policies in India	
5.4	Health Organisations: WHO, UNISEF, Red Cross Society and NGOs	

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Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)

T.Y.B.A. Geography (Semester - V)

**Paper: VIII-C: GEOGRAPHY OF DISASTER MITIGATION
AND MANAGEMENT**

COURSE CODE: UAR5GE8

Credit: 04

UNIT – I, Meaning & Concept of Disaster & Hazard		No. of Lectures
1.1	Concepts of Disaster, Hazard, Vulnerability and Risks	12
1.2	Typology of hazards & Disasters- Natural Disasters & Man-made Disasters	
1.3.	Impacts of Disasters – Socio–economic and political	
1.4.	Need of Disaster Management in India	
UNIT – II, Elements of Disaster Management		12
2.1.	Disaster Management : Meaning & Concept	
2.2.	Role of International Organizations for Disaster Management – UNISDR, INSARAG, Red Cross	
2.3	Role of National Organizations for Disaster Management	
2.4	Role of NGOs & Community in Disaster Management	
UNIT – III, Disaster Management : Methods & Approaches		12
3.1	Disaster Management : Historical Perspective	
3.2	Disaster Management : Methods & Approaches	
3.3	Pre- Disaster Stage of Management	
3.4	Post- Disaster Stage of Management	
UNIT- IV, Natural Disaster and its Management in India		12
4.1	Earthquake & Tsunami –Causes, Effects, Management	
4.2	Flood – Distribution, Causes, Effects , Management	
4.3	Cyclone – Distribution, Causes, Effects , Management	
4.4	Famine – Distribution, Causes, Effects , Management	
UNIT –V, Anthropogenic Disaster and its Management in India		12
5.1	Industrial Hazards – Causes, effects and management with reference to Bhopal Gas Tragedy	
5.2	Terrorism – Causes, effects and management with reference to 26/11 Mumbai attack	
5.3	Wild Fire – Types, Causes, effects and management with reference to Uttarakhand forest fire 2016	
5.4	Accidents - Causes, effects and management with reference to Savitri river bridge collapse accident August 2016	

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T.Y.B.A. Geography (Semester - V)

Paper – IX: GEOSPATIAL TECHNOLOGY

Course Code: UAR5GE9

Credit- 3.5

UNIT - I	Remote Sensing – I	No. of Lectures
1.1	Geospatial Technology: Concept, Components and Importance	09
1.2	Remote Sensing: Concept, Types, Process and Geographical Applications	
1.3	Electromagnetic Energy, EMR and EMS – Effects of Atmosphere on EMR, Spectral Reflectance and Spectral Signature or Curve - Platforms, Sensors and Resolution	
1.4	Elements of Visual Image Interpretation - Mapping of Thematic Layers and Visual Image Interpretation of Physical and Manmade Features	
UNIT - II	Remote Sensing – II	09
2.1	Concept of DEM, Digital image analysis: landuse and landform classification, 3D view of DEM	
2.2	Aerial Photographs: Concept, Process and Types	
2.3	Interpretation of Aerial Photographs	
2.4	Advanced Remote Sensing Technology - Use of Bhuvan website	
UNIT - III	Global Positioning System	09
3.1	GPS : Concept, Segments, Applications	
3.2	Types of GPS – GPS Data Accuracy and Errors	
3.3	Factors Affecting GPS Data - Global Navigation System	
3.4	Ground Survey and Demarcation of Point, Line and Polygon Features with GPS Device – Transfer GPS Data to Computer with Software's like Easy GPS	
UNIT - IV	Geographic Information System – I	09
4.1	GIS : Concept, Components and Applications - Map Projection and Coordinate System	
4.2	GIS Data Sources and Types	
4.3	Use of Image/map into GIS Software and Geo-referencing	
4.4	Creating Layers by Digitization of Point, Line and Polygon Features	
UNIT V	Geographic Information System – II	09
5.1	Functions of Database Creation – Input, Editing and Linking	
5.2	Spatial Database Analysis: Overlay, Merge, Query	
5.3	Map compositions for Map Layout and Design	
5.4	Preparation of Thematic Maps	

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Semester- VI

Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)

T.Y.B.A. Geography (Semester - VI)

Paper: IV: ENVIRONMENTAL GEOGRAPHY

COURSE CODE: UAR6GE4

Credit: 04

UNIT -I	Introduction to Environmental Geography		No. of Lectures
	1.1	Environmental Geography: Definition, Nature, Scope and Importance	12
	1.2	Environment: Meaning, Components and Types	
	1.3	Approaches to the Study of Man – Environment Relationship (Determinism, Possibilism, Probabilism, Stop and Go determinism)	
	1.4	Changing Man - Environment Relationship in a Historical Perspective	
UNIT-II	Ecosystem		12
	2.1	Meaning and Structure of Ecosystem	
	2.2	Ecological Pyramids and Productivity of Ecosystem	
	2.3	Functions of Ecosystem: Food Chain & Web, Energy Transfer, Biogeochemical Cycles	
	2.4	Types of Ecosystems: Aquatic, Terrestrial, and Aqua-Terrestrial Ecosystems	
UNIT-III	Biodiversity		12
	3.1	Biodiversity: Concept, Types and Distribution	
	3.2	Biodiversity Hotspots: Concept, and Distribution in India with Special Reference to Western Ghats	
	3.3	Threat to Biodiversity: Causes and consequences	
	3.4	Conservation of Biodiversity and Policies of Indian Government	
UNIT-IV	Environmental Challenges in India		12
	4.1	Air pollution and Water Pollution: Causes, consequences and measures	
	4.2	Land and Noise Pollution: Causes consequences and measures	
	4.3	Environmental Issues Related to Big Dams	
	4.4	Major environmental Movements in India	
UNIT-V	Sustainable Development and Environmental Management		12
	5.1	Environmental Management and Environmental Impact Assessment	
	5.2	Concepts and Need of Sustainable Development and goals for Environmental Management	
	5.3	Need of Environmental Education and Eco-friendly Lifestyle	
	5.4	Biosphere Reserves and Wildlife Management in India	

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Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester - VI)****Paper No: V-A : GEOGRAPHY OF TOURISM and RECREATION COURSE****CODE: UAR6GE5****Credit: 04**

Unit-I -Introduction to Tourism Geography		No of Lectures
1.1	Definition , Nature and Scope	12
1.2	Types of Tourism	
1.3	Components of Tourism - Geographical and economical components	
1.4	Components of Tourism - Socio-cultural and political components	
Unit-II Types & Impact of Tourism		
2.1	New Trends in Tourism (World, India and Maharashtra)	12
2.2	Trends of Tourism Development in World	
2.3	Impact of Tourism on Environment- Environmental and economical	
2.4	Impact of Tourism on Socio-cultural and political components	
Unit-III – Role of Infrastructure and Technology in Tourism Development		
3.1	Accommodation and food services	12
3.2	Transportation	
3.3	Travel Agencies and Tour Guide	
3.4	Documentation and Ticketing	
Unit-IV - Planning of Tourism and Tourism Organizations		
4.1	Need of Planning and Elements of Planning	12
4.2	Levels of Planning	
4.3	Tourism Organizations - IATA, PATA, I.T.D.C. and M.T.D.C	
4.4	Incredible India campaign	
Unit-V Tourism Potential and Tourism Policy in Maharashtra		
5.1	Coastal tourism in Maharashtra	12
5.2	Adventure tourism in Sahyadri	
5.3	Heritage tourism in Maharashtra	
5.4	Tourism Policy of Maharashtra State	

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Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester - VI)****Paper No.: V –B: POLITICAL GEOGRAPHY****COURSE CODE: UAR6GE5****Credit: 04**

Unit – 1. : Introduction of Political Geography		No of Lectures
1.1	Definition, Nature and Scope of Political Geography	12
1.2	Historical Development and Recent Trends in Political Geography	
1.3	Concept of state and factors	
1.4	Concept of Nation, Nation-State, and Nationalism	
Unit – 2. : Approaches and Concepts in Political Geography		12
2.1	Hartshorne’s Fundamental Approach: Centrifugal and Centripetal Forces	
2.2	Unified Field Theory	
2.3	Core Areas: Concept, Characteristics, and Distribution	
2.4	Capitals: Concept, Functions, and Classification	
Unit – 3. : Frontiers and Boundaries		12
3.1	Frontiers and Boundaries: Concepts and Distinction	
3.2	Functions of Frontiers and Boundaries	
3.3	Classification of Boundaries	
3.4	India’s Boundaries: Characteristics and Disputes	
Unit – 4. : Geostrategic and Geopolitical Views		12
4.1	Mackinder’s Heartland and Spykman’s Rimland Theory	
4.2	Geopolitics of Indian Ocean	
4.3	Geopolitics of International Water Disputes with Special Reference to India	
4.4	Changing Political Map of India	
Unit – 5. : Electoral Geography		12
5.1	Concept, Nature and Approaches of Electoral Geography	
5.2	Geography of Voting: Geographical Factors Affecting Elections	
5.3	Spatial Organization of Electoral Areas and Geography of Representation	
5.4	Challenges to Election System in India	

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T.Y.B.A. Geography (Semester - VI)

Paper No: VI: TOOLS AND TECHNIQUES IN GEOGRAPHY FOR SPATIAL
ANALYSIS-II (Practical)

COURSE CODE: UAR6GE6 Credit: 3.5

Unit – I: Nature of data and Measures Central Tendency		No. of Lectures
1.1	Meaning and types of data, variable, observation, observation value, (simple, discrete data and continuous data)	09
1.2	Frequency Distribution, Histogram, Frequency Polygon and Ogive curve	
1.3	Measures of Central Tendency- mean, median and mode	
Unit –II: Measures of Dispersion and Deviation		
2.1	Mean Deviation and Quartile Deviation	09
2.2	Standard Deviation and Variance	
2.3	Time Series Analysis Moving Averages (3 years and 5 years)	
Unit –III: Correlation, Regression & Hypothesis Testing		
3.1	Calculation of correlation coefficient - Pearson's and Spearman's methods	09
3.2	Regression analysis	
3.3	Chi square test	
Unit-IV: Sampling Techniques		
4.1	Sample design in Geography	09
4.2	Point sampling –Linear, random and stratified	
4.3	Line sampling – Stratified and random	
4.4	Area sampling –Quadrant and random	
Unit-V: Field work in Geography of any Rural and Urban one place/village		
5.1	Collection of physiographic data – Field observation, field sketching, collection of soil and rock samples, identification of vegetation etc.	09
5.2	Collection of socio-economic data – interviews, questionnaire survey, visit to local governing office, NGO's etc	
5.3	Collection of geospatial data – Topo sheets, aerial photographs, Google images/maps, Bhuvan images etc.	
5.4	To prepare a geographical report of a place using the base of available 5.1, 5.2, and 5.3 aspects	
	Field Trip	

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Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester - VI)****Paper – VII: ECONOMIC GEOGRAPHY****COURSE CODE: UAR6GE7****Credit: 04**

Units	Name of the Unit/Subunit	No of Lectures
Unit – 1: Introduction of Economic Geography		
1.1	Definition, Nature and Scope	12
1.2	Branches of Economic Geography	
1.3	Approaches to study Economic Geography and Relation with other social sciences	
1.4	Resources: Concept, Classification and Importance in Economy	
Unit – 2: Economic Activities		
2.1	Economic Activities: Type and Characteristics	12
2.2	Factors Affecting Economic Activities	
2.3	Agriculture and Lumbering: Types and Distribution	
2.4	Fishing and Animal Husbandry: Types and Distribution	
Unit – 3: Minerals and Industries		
3.1	Minerals: Importance, Characteristics and Distribution of Iron Ore, Manganese, Coal and Mineral Oil and other important minerals	12
3.2	Factors Affecting Industrial Locations	
3.3	Weber's Industrial Location Theory	
3.4	Major Industrial Regions of the World	
Unit – 4: Transport and International Trade		
4.1	Transportation: Importance and influencing factors	12
4.2	Major Transport Patterns in the World	
4.3	Patterns of International Trade: Composition and Direction	
4.4	Major International Trade Organizations: WTO, OPEC, SAARC, G-20 and BRICS	
Unit – 5 : Economic Development of India		
5.1	Regionalization of India based on Levels of Economic Development	12
5.2	Globalization and its impact on Indian economy	
5.3	Special Economic Zones	
5.4	Issues related to Environment Economic Development in India	

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13. अलिंरिरा, धापटे, पाटील, प्द (१९९७): आर्थप भूगोल, लिनराली प्ान, पे
14. एक. ए. ठार, आर. बी. पाटील, पेडेर, धेरी (२०१२): आर्थप भूगोल, जोग्रफकु अकोलिकएन
15. खतीब (२००७): आर्थप भूगोल, मेिता पलिकलपग िाउक, ोपनिापूर
16. फे ले, प्द, प्ार, अडकूळ, पाटील (१९९८): आर्थप भूगोल, कपेमपान, ोपनिापूर
17. लिल घारपेरे (२०१३): आर्थप भूगोल, पपपळापेरे अल पलिकलकु, नागपूर.
18. प्द, ेंगारे, मेख (१९९९): आर्थप भूगोल, फड्े प्ान, ोपनिापूर
माने द्
19. क्दी, ोळेर् (२०१०): अलिभन् भूगोल : , लिनराली प्ान, पे

Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester - VI)****Paper: VIII -A : BIOGEOGRAPHY****COURSE CODE: UAR6GE8****Credit: 04**

Unit-I: Introduction to Biogeography		No, of Lectures
1.1	Biogeography-Concept, definition, nature and scope	12
1.2.	Historical development and branches of Biogeography	
1.3.	Approaches in Biogeography	
1.4.	Importance of Biogeographic studies	
Unit-II: Ecosystem and Biosphere		12
2.1.	Ecosystem: Concept, meaning and types	
2.2.	Components of ecosystem and ecosystem productivity	
2.3.	Biosphere: Concept, meaning and components	
2.4.	Biogeographic processes	
Unit -III: Plant Community		12
3.1.	Concept of plant community and classification of plants	
3.2.	Biotic succession and climax vegetation	
3.3.	Major plant formation and biomes- Tropical	
3.4.	Major plant formation and biomes- Temperate	
Unit –IV: Marine Biogeography		12
4.1.	Marine Biogeography meaning and concept	
4.2.	Types of ocean habitats	
4.3.	Biogeography of estuaries	
4.4.	Island biogeography	
Unit-V: Biodiversity		12
5.1.	Meaning and types of Biodiversity	
5.2.	Importance of Biodiversity	
5.3.	Causes of Biodiversity loss	
5.4	Biodiversity conservation	

References:

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Revised Syllabus w.e.f. Academic Year 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester – VI)****Paper VIII-B: SOCIAL GEOGRAPHY****COURSE CODE: UAR6GE8****Credit: 04**

UNIT – I: Introduction to Social Geography		TOTAL LECTURES
1.1	Definitions, Nature, Scope and importance	12
1.2	Branches and Approaches in Social Geography	
1.3	Concept of Social Space and Socio-cultural Regions	
1.4	Globalization: The Process of Social and Spatial Change	
UNIT – II: Elements of Social Geography -World		12
2.1	Race: Concept and Basis of Classification and distribution	
2.2	Religion: Characteristics, Distribution of Major Religions in the World	
2.3	Language: Characteristics and Distribution of Major Linguistic Families in the World	
2.4	Tribes: Concept, Characteristics and Distribution of Major Tribes in the World	
UNIT – III: : Elements of Social Geography –India		12
3.1	Race: Major races and its distribution in India	
3.2	Religion: Major Religions and its distribution and its distribution in India	
3.3	Language: Major Linguistic Families in India	
3.4	Tribes: Distribution of Scheduled Tribes in India	
UNIT – IV Contemporary Issues in India		12
4.1	Religion related social issues	
4.2	Language related social issues	
4.3	Patterns of gender issues in India	
4.4	Socio-economic problems of indigenous communities in India	
UNIT – V: Contemporary Social welfare policies of Government of India		12
5.1	Religion related Policy	
5.2	Language related Policy	
5.3	Gender related Policy	
5.4	Policy related to indigenous communities in India	

References:

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- www.nptel.ac.in/courses/109103022/40

Revised Syllabus w.e.f. Academic Year, 2021-22 (CBSGS)**T.Y.B.A. Geography (Semester – VI)****Paper: VIII-C: GEOGRAPHY OF TRANSPORT****COURSE CODE: UAR6GE8****Credit: 04**

Unit-I : Introduction to Transport Geography		No. of Lectures
1.1	Concept and Definition of Geography of Transport	12
1.2	Nature and Scope Geography of Transport	
1.3	Definition of Distance and its types, Factors affecting on Transportation	
1.4	Significance of the study of Geography of Transport	
Unit-II – Transport network system		12
2.1	Transport network system – structure and properties	
2.2	Application of graph theory measures	
2.3	Location of routes and efficiency of network	
2.4	Conflicting aspects of decision making	
Unit-III : Evolution of Modes of Transport		12
3.1	Evolution of transport network and their environment	
3.2	Phases of growth and development of different modes of transport	
3.3	Factors influencing comparative cost structures and locational responses	
3.4	Global patterns of land, water and air transports	
Unit-IV : Theoretical Framework of Transport		12
4.1	Connectivity and its Measurement	
4.2	Accessibility and its Measurement	
4.3	Taffe's model	
4.4	Gravity model	
Unit-V: Transportation Issues in India		12
5.1	Issues associated with roadways transport network	
5.2	Issues associated with railways transport network	
5.3	Issues associated with water transport development	
5.4	Issues associated with air transport development	

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Revised Syllabus w.e.f. Academic Year, 2021-22 (CBSGS)

T.Y.B.A. Geography (Semester – VI)

Paper: IX: RESEARCH METHODOLOGY IN GEOGRAPHY

COURSE CODE: UAR6GE9

Credit: 3.5

Paper – IX	RESEARCH METHODOLOGY IN GEOGRAPHY	No. of Lectures
UNIT I	Research Methodology in Geography	09
1.1	Research in Geography: Concept, Classification, Steps and Significance Review of Literature	
1.2	Research Methodology: Meaning and Types (Qualitative and Quantitative)	
1.3	Defining the Research Problem: Meaning, Need and Techniques	
1.4	Research Designs: Concept, Need and Objectives	
UNIT II	Data Collection and Processing	09
2.1	Sample Design, Measurement and Scaling	
2.2	Data Collection in Geography: Types (Primary and Secondary) and Methods (Observation, Questionnaire, Schedule, Interview, etc.)	
2.3	Role of Internet in Research: Online Research Referencing (Shodhganga, INFLIBNET, Research Gate, Academia, Mendeley, etc.)	
2.4	Data Processing: Editing, Coding, Classification and Tabulation	
UNIT III	Data Analysis	09
3.1	Data Analysis: Meaning, Significance and Types	
3.2	Using MS-Excel and SPSS for Data Analysis: Graphical, Descriptive and Inferential Statistical Representation	
3.3	Hypothesis: Meaning, Types, Levels of Significance, Degrees of Freedom and Errors	
3.4	Statistical Techniques for Hypothesis Testing	
UNIT IV: Digital Data Analysis and Research Report Writing		09
4.1	Techniques of Spatial and Non-spatial data Analysis in GIS Software's (Q- GIS/Gramm ++)	
4.2	Techniques of Data Analysis in Satellite Image Processing Software's(SAGA)	
4.3	Basics of Research Report Writing: Layout, Structure, Language, Bibliography, References and Footnotes	
4.4	Ethics in Research	
UNIT V	Preparation of Research Report	09
5.1	Research Report on any One Theme in Physical Geography or Human Geography by following the all steps of Research	

References:

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Choice Based Credit System (CBCS)
F.Y.B. A. History Syllabus
To be implemented from the Academic year 2022-23
SEMESTER I
HISTORY OF MODERN INDIA (1857 C.E-1947C.E)
Course Code: BAUGHIS-I (Credit- 03)

Module I: Growth of Political Awareness (15 Lectures)

A. Revolt of 1857: Causes and Consequences

B. Emergence of the Provincial Associations

C. Foundation of the Indian National Congress

Module II: Trends in Indian Nationalism (15 lectures)

A. Moderates

B. Extremists

C. Revolutionary Nationalist

Module III: Gandhian Movement (15 Lectures)

A. Gandhian Ideology of Satyagraha, Non- Violence and Non Co-operation Movement

B. Civil Disobedience Movement

C. Quit India Movement

Module IV: Towards Independence and Partition (15 Lectures)

A. Constitutional Development (1909-1935)

B. Indian National Army and Naval Mutiny (1942-1947)

C. Towards Independence

Choice Based Credit System (CBCS)
F.Y.B. A. History Syllabus
To be implemented from the Academic year 2022-23
SEMESTER II

HISTORY OF MODERN INDIA
(1857 C.E- 1947 C.E)
Course Code: BAUGHIS-I (Credit- 03)

Module I: Socio-Religious Reform Movement (15 Lectures)

A. Brahmo Samaj, Arya Samaj and Ramakrishana Mission

B. Satyashodhak Samaj, Aligarh Movement and Singh Sabha Movement.

C. Impact of Reform Movements

Module II: Education, Press & Communication (15 Lectures)

A. Promotion of Western Education and Impact on Indian Society

B. Development of Press

C. Modern Transport and Communication

Module III: Impact of British Rule on Indian Economy (15 Lectures)

A. Agricultural Policy during British period Special reference Revenue System

B. Growth of Trade, Commerce and Industries

C. Drain Theory

Module IV: Subaltern Movement (15 Lectures)

A. Peasants and Tribes

B. Dalit's and Labours

C. Women

Choice Based Credit Grading and Semester System (CBCGS)

**S.Y.B. A. History Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER III**

Landmarks in World History, 1300 A.D.-1945 A.D.

SYBA – History Paper-II

Module I: The Modern Age (11 Lectures)

- (a) Renaissance
- (b) Geographical Discoveries
- (c) Reformation**

Module II: Age of Revolutions (11 Lectures)

- (a) American Revolution**
- (b) French Revolution**
- (c) Industrial Revolution

Module III: Nationalism and Imperialism (11 Lectures)

- (a) Formation of Nation-States in Europe
- (b) Nationalist Movements in Italy and Germany
- (c) Imperialist Expansion in Asia**

Module IV: World in Transition (1914-1919) (12 Lectures)

- (a) World War I**
- (b) Russian Revolution**
- (c) League of Nations**

Choice Based Credit Grading and Semester System (CBCGS)

**S.Y.B. A. History Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER IV**

Landmarks in World History, 1300 A.D.-1945 A.D.

SYBA – History Paper-II

Module I: Inter War Period (11 Lectures)

- (a) Kemal Pasha and Modernization of Turkey
- (b) Reza Shah and Reforms in Iran
- (c) Birth of Israel

Module II: Rise of Dictatorships (11 Lectures)

- (a) Fascism
- (b) Nazism
- (c) Militarism in Japan

Module III: World War II and Efforts for Peace (12 Lectures)

- (a) World War II
- (b) The Atlantic Charter
- (c) United Nations Organization.

Module IV: Nationalist Movements in Asia (11 Lectures)

- (a) Dr. Sun-Yat-Sen and China
- (b) Mahatma Gandhi and India
- (c) Dr. Sukarno and Indonesia

Choice Based Credit Grading and Semester System (CBCGS)
S.Y.B. A. History Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER III

SYBA History – Paper- III

Ancient India Earliest Times to 1000 A.D.

Module I: Sources of Ancient India and their Importance (11 Lectures)

(a) Archaeological Sources

(b) Literary Sources

(c) Foreign Travellers Accounts

Module II: Indus Valley Civilization (11 Lectures)

(a) Discovery and Extent, Town Planning

(b) Social and Economic, Religious Life

(c) Decline of the Civilization

Module III: Vedic Age (11 Lectures)

(a) Origin of the Aryans

(b) Social and Economic Life

(c) Education and Religion

Module IV: India after 6th Century B.C. (12 Lectures)

(a) Janapada, Administration of Mahajanpadas

(b) Jainism and Buddhism

(c) Persian and Greek Invasions

Choice Based Credit Grading and Semester System (CBCGS)
S.Y.B. A. History Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER IV

SYBA History – Paper- III

Ancient India Earliest Times to 1000 A.D.

Module I: Mauryan and Post-Mauryan Period (322 B.C.to 320 A.D.)

(11 Lectures)

(a) Chandragupta and Ashoka

(b) Mauryan Administration

(c) Post Mauryan Dynasties- Sungas, Kushanas and Sstsvahanas

Module II: Gupta Age (320 A.D. to 600 A.D.)

(11 Lectures)

(a) Imperial Expansion: Chandragupta I, Samudragupta and Chandragupta II

(b) Administration

(c) Classical Age

Module III: Post Gupta Period (600 A.D. to 1000 A.D.)

(11 Lectures)

(a) The Age of Harshavardhan

(b) The Rise of Rajputs

(c) Arab Invasion of Sind

Module IV: Major Dynasties of Deccan and South India

(12 Lectures)

(a) Chalukyas of Badami and Rashtrakutas

(b) Pallavas and Cholas

(c) Spread of Indian Culture in South-East Asia

T.Y.B.A. History
UAR5HS4
SEMESTER -V

Core Course IV- History of Medieval India (1000 CE-1526CE)

Objectives:

1. To acquaint the students with the history of early Medieval India that laid the foundation of the Sultanate in India.
2. To study the contribution of Vijayanagar and Bahamani kingdoms to Medieval Indian History.
3. To examine the administrative, socio-economic and cultural aspects of Medieval India.

Module I: Foundation, Expansion and Decline of Delhi Sultanate

- (a) Socio-economic and political conditions on the eve of the Turkish Invasion
- (b) Rise and Decline of Slave dynasty, Khilji Dynasty
- (c) Tughlaq, Sayyid and Lodi Dynasty

Module II: Administrative Structure of the Sultanate

- (a) Central Administration and Iqta system
- (b) Administrative and Military Reforms of Ala-ud-din Khilji
- (c) Reforms of Firozshah Tughlaq and Mohammed bin Tughlaq

Module III: Emergence of Vijaynagar and Bahamani Kingdoms

- (a) Rise, Growth and Decline of Vijaynagar and Bahamani Kingdoms
- (b) Administration, Socio-Economic and Cultural conditions of Vijayanagar Empire
- (c) Administration, Socio-Economic and Cultural conditions of Bahamani Kingdom

Module IV: Society, Economy, Religion and Culture of Delhi Sultanate

- (a) Socio-economic and religious life
- (b) Education and Literature
- (c) Art and Architecture

T.Y.B.A. History
UAR6HS4
SEMESTER -VI

Core Course: IV- History of Medieval India (1526 CE-1707CE)

Objectives:

1. To acquaint the students with the history of India since the emergence of the Mughal rule.
2. To understand administration of the Mughal Empire.
3. To study the rise of the Maratha Power.

Module I: Foundation, Expansion and Decline of the Mughal Rule

- (a) India on the eve of Mughal Rule; Invasion of Babur
- (b) Humayun, Shershah and Akbar
- (c) Jahangir, Shahjahan and Aurangzeb

Module II: Administrative Structure of the Mughals

- (a) Central and Provincial Administration
- (b) Mansabdari System
- (c) Revenue and Judicial system

Module III: Rise of the Maratha Power

- (a) Chhatrapati Shivaji and Foundation of Swarajya
- (b) Administration of Chhatrapati Shivaji
- (c) Chhatrapati Sambhaji, Chhatrapati Rajaram and Maharani Tarabai

Module IV: Society and Economy, Religion and Culture of the Mughal Rule

- (a) Society and Economy
- (b) Religion, Education and Literature
- (c) Art and Architecture

T.Y.B.A. History
UAR5HS5
SEMESTER -V

Core Course V- History of Modern Maharashtra (1818 CE-1960 CE)

Objectives:

1. To acquaint students with regional history.
2. To understand political and socio-economic developments during the 19th and 20th centuries.
3. To create understanding of the movement that led to the formation of Maharashtra.

Module I: Beginning of the British Rule

- (a) Socio-Economic conditions of Maharashtra in 19th Century
- (b) Administration and Judiciary
- (c) Tribal and Peasant Uprisings

Module II: Socio- Economic Awakening

- (a) Mahatma Jotirao Phule - Satya Shodhak Samaj and Universal Humanism
- (b) Prarthana Samaj
- (c) Contribution of thinkers of Maharashtra to Economic Nationalism

Module III: Political Developments in Maharashtra (1885-1960)

- (a) Moderates, Extremists and Revolutionaries in Maharashtra
- (b) Response to Gandhian Movements in Maharashtra
- (c) Samyukta Maharashtra Movement

Module IV: Emergence of New Forces

- (a) Contribution of Reformers in Education
- (b) Contribution of Reformers towards Emancipation of Women
- (c) Contribution of Reformers towards Upliftment of Depressed Classes: V. R. Shinde, Rajarshi Shahu Maharaj and Dr. B.R. Ambedkar

T.Y.B.A. History
UAR6HIS5
SEMESTER -VI

Core Course V – History of Contemporary India (1947 CE- 2000 CE)

Objectives:

1. To understand the process of making the Constitution and the Integration and Reorganization of Indian States.
2. To acquaint the students with the political developments in India after Independence.
3. To comprehend the socio-economic changes and progress in science and technology in India.

Module I: The Nehru Era (1947 CE – 1964 CE)

- (a) Features of Indian Constitution
- (b) Integration and Reorganization of Indian States
- (c) Socio- Economic Reforms and Foreign Policy

Module II: Political, Social and Economic Developments (1964 CE – 1984 CE)

- (a) Political Developments after Nehru Era; Green Revolution.
- (b) Abolition of Privy Purses and Titles; Nationalization of Banks; The Emergency
- (c) Janata Government; Return of Congress to power ; Foreign Policy

Module III: Political, Social and Economic Developments (1984 CE – 2000 CE)

- (a) Political Developments
- (b) Relations with Neighboring Countries
- (c) Science, Technology and Education

Module IV: Emerging Trends

- (a) Communalism and Separatist Movements
- (b) Empowerment of Women Policy of Reservation
- (c) Policy of Reservation

T.Y.B.A. History
UAR5HS6
SEMESTER -V

Core Course VI – Introduction to Archaeology

Objectives:

1. To understand the basic facets of Archaeology.
2. To evaluate the importance of Epigraphy.
3. To study the importance of Numismatics as an important source of history.

Module I: Aims and Methods of Archaeology

- (a) Definition, Aims and Development of Archaeology in India
- (b) Archaeology and History; Archaeology and Other Sciences
- (c) Field Archaeology: Methods of Exploration, Excavation and Dating Antiquities; Significance of Archaeology

Module II: Pre-Historic, Proto-Historic and Early Historical Periods

- (a) Palaeolithic and Mesolithic Periods
- (b) Neolithic and Chalcolithic Periods
- (c) Megalithic and Early Historical Periods

Module III: Epigraphy

- (a) Definition and History of Indian Epigraphy
- (b) Types of Inscriptions and their significance
- (c) Evolution of Brahmi and Kharosthi Scripts; Edicts of Ashoka

Module IV: Numismatics

- (a) Definition and History of Indian Numismatics
- (b) Ancient Indian Coinage: Punch-Marked, Satavahana, Western Kshatrapas, Kushana and Gupta Coins
- (c) Contribution of Numismatics to Indian History

T.Y.B.A. History
UAR6HS6
SEMESTER -VI

Elective Course VI - Introduction to Museology and Archival Science

Objectives:

1. To inform the students about the role of Museums in the preservation of Heritage.
2. To understand the importance of Archival Science in the study of History.
3. To encourage students to pursue careers in various Museums and Archives in India and abroad.

Module I: Museology

- (a) Definition of Museology, Museum Movement in India
- (b) Role of the Curator
- (c) Types of Museums

Module II: Museums

- (a) Methods of Collection and Conservation of Objects in Museums
- (b) Preservation Techniques and Types of Exhibitions
- (c) Changing Role of Museums: In-house and Out-reach activities of Museums

Module III: Archival Science

- (a) Meaning, Scope, Objectives and Classes of Archives
- (b) Importance of Archives: Value of Records as Sources of History
- (c) Classification of Records

Module IV: Management of Archives

- (a) Appraisal and Retention of Records
- (b) Conservation and Preservation of Records
- (c) Digital Archives

T.Y.B.A. History
UAR5HS7
SEMESTER -V

Core Course VII- History of the Marathas (1630 CE – 1707CE)

Objectives:

1. To introduce the students to the regional history of Maharashtra.
2. To familiarize students with the literary sources of the history of the Marathas.
3. To help students to understand the forces leading to the establishment of Maratha power under Chhatrapati Shivaji Maharaj.

Module I: Introduction to Maratha History

- (a) Marathi, Persian and European Sources
- (b) Deccan in the 17th century – Geo-Political and Economic conditions
- (c) Socio-Cultural conditions; Maharashtra Dharma

Module II: Establishment of Swarajya

- (a) Chhatrapati Shivaji's relations with Bijapur
- (b) Chhatrapati Shivaji's relations with the Mughals
- (c) Chhatrapati Shivaji's relations with the Europeans

Module III: Period of Consolidation and Crisis

- (a) Coronation and its significance; Chhatrapati Shivaji's Karnatak Campaign
- (b) Chhatrapati Sambhaji, Chhatrapati Rajaram and Maharani Tarabai
- (c) Civil War : Maharani Tarabai and Chhatrapati Shahu

Module IV: Administration during the Royal Period

- (a) Civil Administration
- (b) Revenue and Judicial Administration
- (c) Military Administration

Core Course VII: History of the Marathas (1707 CE – 1818 CE)

Objectives:

1. To enable the students to understand the processes that led to the expansion of the Maratha Power.
2. To appreciate the contribution of the Marathas in the national politics of the 18th century.
3. To develop an understanding of the society and culture in Maharashtra in the 18th century.

Module I: Expansion of the Maratha Power

- (a) Rise of the Peshwas: Balaji Vishwanath
- (b) Peshwa Bajirao I
- (c) Maratha Confederacy

Module II: Consolidation of the Maratha Power

- (a) Peshwa Balaji Bajirao (Nanasaheb)
- (b) Third Battle of Panipat: causes and consequences
- (c) Defeat of the Marathas and significance of the Third Battle of Panipat

Module III: Post Panipat Revival and Downfall

- (a) Peshwa Madhavrao I
- (b) Barbhai Council
- (c) Decline of the Maratha Power

Module IV: Administrative and Socio-Cultural Developments

- (a) Peshwa Administration: Civil, Revenue and Military
- (b) Society under the Peshwas – Religion, Caste and Position of Women
- (c) Cultural Developments: Literature, Art and Architecture

T.Y.B.A. History
UAR5HS8
SEMESTER -V

Core Course VIII: History of Contemporary World (1945 CE – 2000 CE)

Objectives:

1. To trace some of the major events of post-World War II period.
2. To understand the significance of these events.
3. To comprehend the ways in which events of the latter half of the twentieth century have influenced the present.

Module I: Cold War (1945-1985)

- (a) Meaning, Causes of Cold War and Security Pacts
- (b) Conflicts in Cold War: Germany, Korea and Cuba
- (c) Economic Revival of Western Europe; Soviet Union's Relations with Eastern Europe

Module II: Europe, U.S.S.R and U.S.A. (1985-2000)

- (a) Disintegration of U.S.S.R
- (b) Re-drawing of political borders of Germany, Yugoslavia and Czechoslovakia; Emergence of the European Union (EU) in Western Europe
- (c) U.S.A as the dominant world power

Module III: Movements for Equal Rights and Challenging the Bipolar World (1945-2000)

- (a) Campaigns within and outside South Africa against Apartheid
- (b) Civil Rights Movement in U.S.A
- (c) Non-Aligned Movement

Module IV: Major Trends

- (a) Globalisation
- (b) Sustainable Development
- (c) Women's Liberation Movement

T.Y.B.A. History
UAR6HS8
SEMESTER -VI

Core Course VIII - History of Asia (1945 CE-2000 CE)

Objectives:

- 1.To acquaint the students with some of the major changes that occurred in Asia after World War II.
- 2.To understand the ways in which Asian nations resisted and defied the control of the West.
- 3.To comprehend some of the trends that emerged in Asia.

Module I: Transformation of China

- (a) Domestic Policy in People's Republic of China under Mao Zedong
- (b) Economic Progress in China under Deng Xiaoping
- (c) Foreign Policy of China with USSR

Module II: Reconstruction of Japan

- (a) American Occupation of Japan
- (b) Economic Miracle in Japan
- (c) Foreign Policy of Japan with USA

Module III: South East Asia

- (a) Cold War and Vietnam
- (b) Guided Democracy in Indonesia
- (c) Association of South East Asian Nations (ASEAN)

Module IV: Conflicts in West Asia

- (a) Arab- Israel Conflict (1948-2000)
- (b) Iranian Revolution of 1979
- (c) Oil Politics and OPEC

T.Y.B.A. History
UAR5HS9
SEMESTER -V

Elective Course IX - Research Methodology and Sources of History

Objectives:

1. To teach students basics of research methodology in history with a view to promote historical research.
2. To understand the various kinds of sources of history and its interpretation.
3. To acquaint students with the new trends and approaches in history writing.

Module I: History: Definition and Scope

- (a) History: Meaning, Scope and Nature
- (b) Importance of History
- (c) History and Auxiliary Sciences

Module II: Sources of History

- (a) Sources: Nature and Types
- (b) Authenticity and Credibility of Sources
- (c) Importance of Archival Sources

Module III: Research Methods in History

- (a) Meaning of Historical Research: Methods of Data Collection
- (b) Interpretation and Generalisation of Sources
- (c) Footnotes and Bibliography

Module IV: Sources for Writing Indian History

- (a) Sources for Ancient Indian History
- (b) Sources for Medieval Indian and Maratha History
- (c) Sources for Modern Indian History

T.Y.B.A. History
UAR6HS9
SEMESTER -VI

Elective Course IX - Research Methodology and Sources of History

Objectives:

1. To teach students basics of research methodology in history with a view to promote historical research.
2. To understand the various kinds of sources of history and its interpretation.
3. To acquaint students with the new trends and approaches in history writing.

Module I: Historical Research: Methods and Presentation

- (a) Steps in Historical Research
- (b) Methods of Critical Enquiry
- (c) Presentation of Historical Research

Module II: New Trends in History

- (a) Local History
- (b) Oral History
- (c) Digital and E-Sources

Module III: Approaches to History

- (a) Subaltern
- (b) Feminist
- (c) Post-Modern

Module IV: Indian Historiography

- (a) Imperialist
- (b) Nationalist
- (c) Marxist

F.Y.B.A. Compulsory Marathi



Janardan Bhagat ShikshanPrasarak Sanstha's

CHANGU KANA THAKUR

**ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

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Revised Syllabus of F.Y.B.A. Compulsory Marathi

F.Y.B.A. Optional Marathi

Choice Based Credit & Grading System (60:40)

w.e.f. Academic Year 2022-23

मराठी विभाग
प्रथम वर्ष कला
अनिवार्य मराठी (Compulsory Marathi)
अभ्यासक्रम

प्रथम वर्ष बी.ए. मराठी अनिवार्य या विषयासाठी २०२२-२०२३

या शैक्षणिक वर्षापासून नेमलेला अभ्यासक्रमात वैचारिक गद्य आणि निवडक मराठी कथा तसेच व्यावहारिक मराठीच्या काही घटकांचा समावेश करण्यात आला आहे. .या अभ्यासक्रमाची श्रेयांकन पद्धतीनुसार रचना करण्यात आली आहे. .वरील अभ्यासक्रम दोन सत्रांत विभागलेला असून, नेमलेल्या विशिष्ट तासिकांमध्ये तो शिकविला जाणे तसेच त्याच्या चाचणी परीक्षा घेणे आवश्यक आहे.

सत्र पहिले -

एकूणव्याख्याने - ४०, श्रेयांकने -०२ गुण

मराठी वैचारिक गद्य

घटक - १. (५० मिनिटांच्या २० तासिका) श्रेयांकन -१

- १.सरकार आणि प्रजासत्ताक - लोकहितवादी
- २.गुलामगिरीची प्रस्तावना - जोतिरावगोविंदराव फुले
३. हिंदु व मुसलमान यांचे ऐक्य कशाने होईल? - गोपाळ गणेश आगरकर
- ४.मराठी भाषेची सांप्रतची स्थिती - विष्णुशास्त्री चिपळूणकर
५. स्त्रीपुरुषतुलना- ताराबाई शिंदे
६. शिक्षण: स्वराज्यासाठी ! - राजर्षी छत्रपती शाहू
- ७.समाजसुधारणा यशस्वी का होत नाही? - विठ्ठल रामजी शिंदे
८. अस्पृश्योन्नतीचा आर्थिक पाया - डॉ. भीमराव रामजी आंबेडकर
९. देवळांचा धर्म आणि धर्माचीदेवळे - केशव सीताराम ठाकरे
- १० अंधश्रद्धा निर्मूलनाची व्यापक वैचारिक भूमिका - डॉ. नरेंद्र दाभोळकर

घटक - २ व्यावहारिक मराठी (५० मिनिटांच्या २० तासिका) श्रेयांकन - १

व्यावहारिक मराठी या विषयासाठी घटक विषय -

१. मराठी लेखनाचे नियम व विराम चिन्हे
 २. वर्तमानपत्रासाठी वृत्त आणि वृत्तांत लेखन
 ३. अर्ज लेखन
 ४. भाषांतर (इंग्रजीतून मराठीत)
- * समाज माध्यमांसाठी लेखन - ब्लॉगलेखन

अंतर्गत परीक्षा - एकूण गुण- ४०

श्रेयांकन पद्धतीतील एक आवश्यक भाग म्हणून अंतर्गत चाचणी परीक्षा वर्गात होणे आवश्यक आहे. या पहिल्या सत्रातील चाचणी परीक्षांचा तपशील व गुणविभागणीपुढीलप्रमाणे -

क्रमांक	परीक्षा	विषय	गुण
प्रश्न१	चाचणी परीक्षा (बहुपर्यायी किंवा वस्तुनिष्ठ स्वरूपाची)	व्यावहारिक मराठी १) मराठी लेखनाचे नियम व विरामचिन्हे २) वैचारिक गद्य	२०
प्रश्न२	गृहपाठ परीक्षण	विषयाला अनुसरून	१०
प्रश्न३	विषयाला ब्लॉग लेखन	विषयाला अनुसरून	१०

प्रथम सत्रान्त परीक्षा - गुण ६०

वरील अभ्यासपत्रिकेचे सत्रान्त स्नपत्रिकेचे स्वरूप पुढील प्रमाणे ठरविण्यात आले आहे.

' वैचारिक गद्य ' या भागावर १० - १० गुणांचे (अंतर्गत पर्याय असलेले) दोन प्रश्न विचारावेत. तसेच ०५ गुणांसाठी दोन अंतर्गत पर्याय असलेले टिपा विचारावेत.

व्यावहारिक मराठीच्या घटकांविषयीची गुणांनुसार विभागणी करून १५ - १५ गुणांचे दोन प्रश्न विचारावेत. ही गुण विभागणी पुढील प्रमाणे -

प्रश्न क्रमांक	विषय	गुण
प्रश्न १	मराठी लेखनाचे नियम व विराम चिन्हे	०८
प्रश्न २	वर्तमानपत्रासाठी वृत्त आणि वृत्तांत	०७
प्रश्न ३	अर्ज लेखन	०८

प्रश्न ४	भाषांतर (इंग्रजीतून मराठीत)	०७
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सत्र दुसरे -

एकूण व्याख्याने - ४० , श्रेयांकने - ०२

घटक - १. निवडक मराठी कथा (५० मिनिटांच्या २० तासिका) श्रेयांकन - ०१

१. शंकर पाटील - चकवा
२. द.मा. मिरासदार - व्यंकूची शिकवणी
३. मुकुंदटाकसाळे - वाचन संस्कृती
४. मंगला गोडबोले - डाग
५. वामन ओव्हाळ - येळकोट
६. रमेश मंत्री - परोपकार
७. चिं वि जोशी - वरसंशोधन
८. विद्याधर पुंडलिक - आजी शरण येते
९. श्रीनिवास भणगे - कापूसकोंड्याची गोष्ट
१०. वि. आ. बुवा - सुवर्ण कमळाचा शोध

घटक - २. व्यावहारिक मराठी - (५० मिनिटांच्या २० तासिका) श्रेयांकन - ०१

व्यावहारिक मराठी या विषयासाठी घटकविषय -

१. इतिवृत्त लेखन
२. वर्तमानपत्रासाठी जाहिरात लेखन
३. उताऱ्यावरील प्रश्न
४. सारांश लेखन

अंतर्गत परीक्षा - एकूण गुण - ४०

श्रेयांकन पद्धतीतील एक आवश्यक भाग म्हणून अंतर्गत चाचणी परीक्षा वर्गात होणे आवश्यक आहे. या दुसऱ्या सत्रातील चाचणी परीक्षांचा तपशील व गुण विभागणी पुढील प्रमाणे-

क्रमांक	परीक्षा	विषय	गुण
प्रश्न १	चाचणी परीक्षा (बहुपर्यायी किंवा वस्तुनिष्ठ स्वरूपाची)	व्यावहारिक मराठी - १) वर्तमानपत्रासाठी जाहिरात लेखन २) अभ्यासक्रमाला नेमलेल्या कथेवर	२०
प्रश्न २	गृहपाठ पुस्तक परीक्षण	विषयाला अनुसरून	१०
प्रश्न ३	मुलाखत तयार करणे	विषयाला अनुसरून	१०

द्वितीय सत्रान्त परीक्षा - गुण - ६०

वरील अभ्यासपत्रिकेचे सत्रान्त प्रश्नपत्रिकेचे स्वरूप पुढील प्रमाणे ठरविण्यात आले आहे. 'निवडक मराठी कथा' यातील कथेवर १०-१० गुणांचे (अंतर्गत पर्याय असलेले) दोन प्रश्न विचारावेत तसेच ०५ गुणांसाठी दोन अंतर्गत पर्याय असलेले टिपा विचारावेत. तसेच व्यावहारिक मराठीच्या घटकविषयांची गुणांनुसार विभागणी करून १५ - १५ गुणांचे दोन प्रश्न विचारावेत ही गुणविभागणी पुढील प्रमाणे -

१ इतिवृत्त लेखन (अंतर्गत पर्याय) ०८

२ वर्तमानपत्रासाठी जाहिरात लेखन (अंतर्गत पर्याय) ०७

एकूण गुण १५

३ उताऱ्यावरील प्रश्न ०८

४ सारांश लेखन ०७

एकूण गुण १५

विभाग प्रमुख, मराठी विभाग

चांगू काना ठाकूर कला, वाणिज्य आणि विज्ञान
महाविद्यालय, नवीन पनवेल

प्राचार्य

चांगू काना ठाकूर कला, वाणिज्य आणि विज्ञान
महाविद्यालय, नवीन पनवेल

प्रथम वर्ष कला
विषय - मराठी ऐच्छिक

प्रथम वर्ष बी. ए. मराठी ऐच्छिक या विषयासाठी- २०२२-२३ या शैक्षणिक
वर्षापासून नेमलेला अभ्यासक्रम --

प्रथम वर्ष बी.ए .मराठी ऐच्छिक या अभ्यासक्रमात प्रथम सत्रात दोन नाट्यकृती व दुसऱ्या
सत्रात निवडक कविता यांचा समावेश करण्यात आलेला आहे. या अभ्यासक्रमांची श्रेयांकन
पद्धतीनुसार रचना करण्यात आली आहे. वरील अभ्यासक्रम दोन सत्रांत विभागलेला असून,
नेमलेल्या विशिष्ट तासिकांमध्ये तो शिकविला जाणे तसेच त्याच्या चाचणी परीक्षा घेणे आवश्यक
आहे.

सत्र पहिले

एकूण व्याख्याने - ४५, श्रेयांकने - ०३

घटक-१.

'नाटक' या साहित्य प्रकाराचा सिद्धान्तिक परिचय

नाटक या साहित्य प्रकाराची संकल्पना, नाटक या साहित्य प्रकाराचे घटक, नाटकाचे महत्त्वाचे दोन
प्रकार

(शौकात्मिका व सुखात्मिका) नाटक एक संमिश्र कला, मराठी नाटकाच्या इतिहासातील महत्त्वाचे टप्पे.

(५० मिनिटांच्या -१५ तासिका) श्रेयांकन - ०१

घटक - २.

'अशी पाखरे येती' - विजय तेंडुलकर (५० मिनिटांच्या १५ तासिका) श्रेयांकन -०१

घटक - ३.

'किरवंत' - प्रेमानंद गज्वी(५० मिनिटांच्या १५ तासिका) श्रेयांकन - ०१

अंतर्गत परीक्षा - एकूण गुण - ४०

श्रेयांकन पद्धतीतील एक आवश्यक भाग म्हणून अंतर्गत चाचणी परीक्षा वर्गात होणे आवश्यक आहे. या पहिल्या सत्रातील चाचणी परीक्षांचा तपशील व गुण विभागणी पुढील प्रमाणे -

क्रमांक	परीक्षा	विषय	गुण
१	चाचणी परीक्षा (बहुपर्यायी किंवा वस्तुनिष्ठ स्वरूपाची)	नाटक या साहित्य प्रकारच्या सैद्धांतिक भागावर व शिकवलेल्या नाटकावर	२०
२	नाटकाचे पुस्तक परीक्षण	विषयाला अनुसरून	१०
३	वर्गात घेतली जाणारी परीक्षा	अभ्यासक्रमातील पर्यायी स्वरूपाचे प्रश्न	१०

प्रथम सत्रान्त परीक्षा - गुण - ६०

वरील अभ्यासपत्रिकेचे सत्रान्त प्रश्नपत्रिकेचे स्वरूप पुढील प्रमाणे ठरविण्यात आले आहे.

प्रथम वर्ष बी.ए. मराठी (ऐच्छिक)

प्रश्न क्रमांक	विषय	गुण
प्रश्न १	नाटक या साहित्यप्रकाराचा सैद्धान्तिक परिचय यावर पर्याय देऊन एक प्रश्न	१५
प्रश्न २	'अशी पाखरे येती' या नाटकावर पर्याय देऊन एक प्रश्न	१५
प्रश्न ३	'किरवंत' या नाटकावर पर्याय देऊन एक प्रश्न	१५
प्रश्न ४	प्रत्येक गटातील एकेक टीप लिहा (अंतर्गत पर्यायांसह) १) नाटकाचा सैद्धान्तिक परिचय २) 'अशी पाखरे येती' ३) 'किरवंत'	१५

सत्र दुसरे

एकूण व्याख्याने - ४५, श्रेयांकने - ०३

घटक - १. (५० मिनिटांच्या १५ तासिका)

'कविता' या साहित्य प्रकाराचा सैद्धान्तिक परिचय -

(कविता या साहित्य प्रकाराची संकल्पना, भाव काव्य आणि गीत फरक, कवितेची भाषा, मराठी कवितेच्या इतिहासातील महत्त्वाचे टप्पे) श्रेयांकन - १

घटक -२. (५० मिनिटांच्या १५ तासिका) श्रेयांकन - १

१. नारायण सुर्वे :-

१. माफ करा
२. दोन दिवस
३. माझे शब्द
४. तुमचंच नाव लिवा

२. नामदेव ढसाळ

१. ज्ञानोबा
२. आत्ता
३. माणसाने
४. अंधाराने सूर्य पाहिलं तेंव्हा

३. अरुण कोलटकर

१. तक्ता
२. वामांगी
३. ज्ञानेश्वर समाधी वर्णन
४. इराणी

४. भुजंग मेश्राम -

१. बिरसा मुंडा
२. गावबांधणी
३. शोधयात्रा
४. ग्रँड फादर

५. वीरा राठोड-

१. आसेवर चालतात तांडे
२. तुझ्या स्वप्नांची हमी भरता येणार नाही मला
३. किती भयाण अंधारातून आलंय बघ!
४. मी भाकरीचा शोध घेतो तू गाणे विणत रहा

६. संध्या रंगारी

१. निश्चय
२. पोरी
३. बाई
४. वास्तव

घटक -३. (५० मिनिटांच्या १५ तासिका) श्रेयांकन - १

१. कल्पना दुधाळ

१. संपत कसं नाहीस
२. नखनख जीव
३. उकीर
४. घालमेल

२. नीरजा

१. माणूस होण्याचा इतिहास
२. जमिनीवर उतरायलाच हवं आता
३. बाबासाहेब
४. मेणबत्या घेऊन निघालेल्या मुली

३. वर्जेससोळंकी

१. हत्या : एक
२. बाबासाहेब
३. शाळा
४. तुमची त्वचा चाटू शकतं कुणीही लपलप

४. संतोष पवार

१. सोन्या बापू
२. नाला साठी घोडा
३. खेळ
४. भ्रमिस्टाचा जाहीरना

५. अजीम नवाज राही

१. एक नदी
२. पूर ओसरल्यानंतरची नासधूस
३. शून्याच्या तावडीतूनसटकताना
४. मुसलमानांच्या मुसक्या बांधताना

६. सौमित्र (किशोर कदम)

१. घर
२. मोर्चा
३. शहर
४. पुस्तक

अंतर्गत परीक्षा - एकूण गुण - ४०

श्रेयांकन पद्धतीतील एक आवश्यक भाग म्हणून अंतर्गत चाचणी परीक्षा वर्गात होणे आवश्यक आहे. या दुसऱ्या सत्रातील चाचणी परीक्षांचा तपशील व गुण विभागणी पुढील प्रमाणे -

क्रमांक	परीक्षा	विषय	गुण
१	चाचणी परीक्षा (बहुपर्यायी किंवा वस्तुनिष्ठ स्वरूपाची)	कविता या साहित्य प्रकारच्या सैद्धांतिक भागावर व शिकवलेल्या कवितेवर	२०
२	कवितेचे रसग्रहण	अभ्यासाच्या बाहेरील कवितेचे	१०
३	वर्गात घेतली जाणारी परीक्षा	अभ्यासक्रमातील पर्यायी स्वरूपाचे प्रश्न	१०

द्वितीय सत्रान्त परीक्षा - गुण - ६०

वरील अभ्यास पत्रिकेचे सत्रान्त प्रश्नपत्रिकेचे स्वरूप पुढील प्रमाणे ठरविण्यात आले आहे.

प्रश्न क्रमांक	विषय	गुण
प्रश्न १	कवितेचा सिद्धान्तिक परिचय यावर पर्याय देऊन एक प्रश्न	१५
प्रश्न २	घटक दोन मधील कवितेवर पर्याय देऊन एक प्रश्न	१५
प्रश्न ३	घटक तीन मधील कवितेवर पर्याय देऊन एक प्रश्न	१५
प्रश्न ४	प्रत्येक गटातील एकेक टीप लिहा (अंतर्गत पर्यायासह) १) कवितेचा सिद्धान्तिक परिचय २) घटक दोन मधील कवितेवर ३) घटक तीन मधील कवितेवर	१५

विभाग प्रमुख, मराठी विभाग

चांगू काना ठाकूर कला, वाणिज्य आणि विज्ञान
महाविद्यालय, नवीन पनवेल

प्राचार्य

चांगू काना ठाकूर कला, वाणिज्य आणि विज्ञान
महाविद्यालय, नवीन पनवेल

Choice Based Credit Grading and Semester System (CBCGS)
F.Y.B. A. Rural Development Syllabus
To be implemented from the Academic year 2022-2023
SEMESTER I

Course Code	Unit	Topics	Credits	L / Week
UAR1RD1	I	Rural Development	3	4
	II	Rural Society		
	III	Rural Social Transformation		
	IV	Key Issues		

SEMESTER II

Course Code	Unit	Topics	Credits	L / Week
UAR2RD2	I	Rural Governance in Maharashtra	3	4
	II	Rural Economy		
	III	Rural Infrastructure		
	IV	Rural Sustainable development		

Syllabus

SEMESTER I

I RURAL DEVELOPMENT

- Introduction and definition of Rural Development
- Concept of Rural Development
- Nature and Scope of Rural Development
- Importance of Rural Development
- Various areas for Rural Development programs
- **Overview of changes in Rural Development**

II RURAL SOCIETY

- Concept & Nature of Rural Society
- Characteristics of Rural Society
- Family & Caste
- Rural Urbanisation

III RURAL SOCIAL TRANSFORMATION

- Concept of Social Transformation
- Factors of Social Transformation
- Obstacles in the process of Social Transformation
- Role of NGOs and CBOs in Social Transformation.
- Need of people's participation in Rural Social Transformation.

IV KEY ISSUES OF RURAL COMMUNITIES

- Poverty
- Education
- Health
- Indebtedness
- Agrarian crisis

SEMESTER II

ISSUES RELATED TO RURAL DEVELOPMENT

I RURAL GOVERNANCE IN MAHARASHTRA

- Historical background of Panchayat Raj System in India.
- Concept of Panchayat Raj
- Structures and Functions of Panchayat Raj institutions in Maharashtra
- Introduction to Revenue Administration, Scope of Revenue Administration
- Structures and Functions of District Revenue Administration in Maharashtra

II RURAL ECONOMY

- Rural Economy in India: Nature and Changing patterns
- Role of Agriculture in Rural Development.
- Pattern of land holdings
- Types of Agricultural Labours and their problems
- Agricultural Allied Activities in Rural
- **Introduction of Agro processing Industries**

III RURAL INFRASTRUCTURE

- Concept of Rural Infrastructure
- Role of Rural Infrastructure in Rural Development
- Transport and Communication
- Drinking Water and Sanitation
- Electrification
- Marketing
- Finance.

IV Rural Sustainable Development

- **Introduction & Characteristics of Sustainable Development**
- **Existing Natural Recourses**
- **Status of Biodiversity**
- **Sustainable agriculture –Organic Farming**

Choice Based Credit Grading and Semester System (CBCGS)
S.Y.B.A. Rural Development Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER III

Paper No III

Course Code	Unit	Topics	Credits	L / Week
UAR1RD-III	I	Indian Rural Society	3	3
	II	Rural Institutional System		
	III	Social Change		
	IV	Concept Related to Social Change		

Paper No IV

Course Code	Unit	Topics	Credits	L/Week
UAR1RD-IV	I	District Administration	3	3
	II	Revenue Administration		
	III	Law & Order Administration and Judicial Machinery		
	IV	Planning for Rural Development		

Semester – IV

Paper No V

Course Code	Unit	Topics	Credits	L/Week
UAR1RD-V	I	Study of Agricultural Development	3	3
	II	Sources of Rural Employment		
	III	Tourism Development		
	IV	Areas of Rural Upliftments		

Paper NO VI

Course Code	Unit	Topics	Credits	L/Week
UAR1RD-VI	I	Law Related to Panchayat Raj in Maharashtra	3	3
	II	Land Reforms Legislations		
	III	Law related to Rural Area		
	IV	Law related to Tribal Area		

S.Y.B.A – RURAL DEVELOPMENT

SEMESTER III PAPER NO. II

RURAL SOCIETY

Code BARD - 03

1. Indian Rural Society

a. Components of Indian Rural Society

- Tribal Community : Definition and Characteristics
- Rural Community : Definition and Characteristics
- Urban Community : Definition and Characteristics

b. Rural Urban Continuum

- Concept, Examples, Impact of Rural Community on Urban Community

c. Problems of Weaker Section

- Scheduled Caste: Problems, Remedial Measures and Constitutional Provisions
- Scheduled Tribes: Problems, Remedial Measures
- Problems of Women: Responsible Factor, Remedial Measures

2. Rural Institutional System

a. Religion: Concept, Features, Functions , Importance , Elements of Religion

b. Education: Concept, Objectives, Function and Importance in Rural Development

c. Co-operation: Concept, Features, Merits and Demerits, Importance in Rural Development

3. Social Change

a. Concept Of Social Change

b. Reasons Of Social Change

c. Types Of Social Change

d. Barriers in Social Change

e. Change in Society

4. Concept Related to Social Change

a. Sanskritization: Concept, Features, Factors Responsible For Sanskritization Limitation of Sanskritization

b. Westernization

Concept, Features, Nature, Impact of Westernization on Indian Society

c. Modernization

Concept, Nature, causes, Impact of Modernization on Rural Society

SEMESTER – IV Paper-II
DEVELOPMENT STRATEGIES

1. Agricultural Development

- a. National Agricultural Policy 2007 and Food Security
 - Concept
 - Objectives
 - Features
 - Provision and Drawbacks
- b. Irrigation and Water Management
 - Importance Of Irrigation In Agriculture
 - Sources Of Irrigation
 - Methods Of Irrigation - Modern And Conventional
- c. Agricultural Universities and KVK
 - Establishment
 - Importance And Need
 - Function

2. Sources of Rural Employment

- a. Self Help Group
 - Concept
 - Features
 - Importance in Rural
- b. Agro Based Industries
 - Concept, Types, Function, Importance in employment Generation
 - Problems Of Agro Based Industries
- d. Commerce and Trade
 - Rural Marketing and Finance
 - APMC

3. Tourism Development

- Concept, Factors
 - Merits and Demerits In Tourism
- a. Rural Tourism
 - Concept, Nature, Importance, Limitation
 - b. Agro Tourism
 - Concept, Nature, Importance, Merits and Demerits
 - c. Environmental Tourism
 - Concept, Nature, Need and Importance

4. Areas of Rural Upliftment

- Agriculture Development
- Rural Housing
- Rural Education
- Rural Health
- Tribal Development

S Y B A - RURAL DEVELOPMENT

SEMESTER – III PAER NO. III

Code B.A.R.D - 04

Rural Administration

Ch- No. 1 **District Administration**

- a) Basic concept of District Administration.
- b) Objectives and Principles of District Administration
- c) Post independence developments of District Administration
- d) Components of District Administration.

Ch- No. 2 **Revenue Administration**

- a) Historical Background
- b) Scope of Revenue Administration.
- c) Components of Revenue Administration.
- d) Functions & Functionaries of Revenue Administration

Ch- No. 3 **Law & Order Administration & Judicial Machinery.**

- a) Law and order in District and Taluka level
- b) Judicial Machinery in district
- c) Civil and Criminal Judicial
- d) Lok Nyayalaya

Ch- No. 4 **Planning for Rural Development.**

- a) Concept, types and importance of planning.
- b) District planning Machinery.
- c) Need of people participation in rural planning.
- d) Role of NGOs in Rural Planning

SY B A - RURAL DEVELOPMENT

SEMESTER – IV PAER NO. III

Code B.A.R.D - 06

LAWS RELATED TO RURAL DEVELOPMENT

Ch- No. 1 **Law related to Panchayat Raj in Maharashtra.**

- a) Historical Background.
- b) Mumbai Grampanchayat Act. 1958.
- c) Maharashtra Zilla parishad and Panchayat Samiti Act 1961.
- d) 73rd Constitutional Amendment.

Ch- No. 2 **Land Reform Legislations.**

- a) Land holding and Land Reforms.
- b) Tenancy Act.
- c) Land Ceiling Act.
- d) Consolidation of land holding Act.

Ch-No. 3 **Law related to Rural Area.**

- a) MANEREGA
- b) RTI
- c) Co-operative Act
- d) Biodiversity Act. Natural conservation 2002

Ch- No. 4 **Law related to Tribal area.**

- a) Law related to Tribal Community land.
- b) PESA- (Panchayat Extension to Schedule Area Act 1996)
- c) Laws related to Forest land - Forest right Act.



॥ विद्या विनयेन शोभते ॥

**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.A.

**Revised Syllabus of F.Y.B.A. Political Science
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2022-23**

F.Y.B.A. Political Science Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	Political science
2	Course Code	UAR1POL1 & UAR2POL1
3	Eligibility for Admission	12 th of all recognised Board
4	Passing marks	40%
5	Ordinances/Regulations (if any)	-
6	No. of Semesters	Two
7	Level	U.G.
8	Pattern	Semester (60:40)
9	Status	Revised
10	To be implemented from Academic year	2022-2023

• **Preamble of the Syllabus**

Bachelor of Arts (F.Y.B.A.) in Political Science is a U.G. course of Department of Political Science, of Changu Kana Thakur Arts, Commerce & Science College, New Panvel (Autonomous). The Choice Based Credit and Grading System to be implemented through this curriculum would allow students to develop the disciplines of his/her liking and abilities. This syllabus is prepared to get a knowledge and understanding of Political Science. The goal of syllabus is to study Political Science by learners for getting idea about the Indian Political System. The fresh learners of Political Science will be introduced to the Constitution of India and its basic structure, parts, provisions, working of the Indian Parliament, Contemporary Issues, Developments in the Electoral Politics, Election Machinery and Electoral Reforms to build a strong foundation for their further study in the subject. This syllabus would help to cultivate critical understanding of issues such as coalition politics, political parties and their working, challenges to the internal security which remain extremely necessary and things that are pertinent for any learner in Political Science. The present syllabus therefore focuses on providing this insight to the students while making them aware of the selected issues and themes in Indian politics as they emerge with specific focus on citizenship, Fundamental Rights and Directive Principles of State Policy. These units will cover with laws and amendments to focus on the deep study of Union and State: Legislature and Executive and Judiciary of India, Election Commission of India their composition, powers and functions and contemporary developments, discussions and debates, study tour, will also be covered in the First and Second Semester.

• **OBJECTIVES:**

1. To introduce the Constitution of India.
2. To understand the philosophy of Indian constitution.
3. To sensitize and create awareness among students about their Rights as a Citizen.
4. Assessing the nature of Indian Federalism by keeping focus on Union-State Relations.
5. Critically analysing the important institutions of the Indian Union: The Executive: President, Prime Minister, Council of Ministers, Governor, Chief Minister and Council of Minister, The legislature: Rajya Sabha, Lok Sabha, Speaker, Committee System, State Legislature, The Judiciary: Supreme Court, High Courts: composition and functions- Judicial Activism, Judicial Review
6. Examining the role of Political parties in Indian Democracy.
7. Evaluating the Electoral Process in India with focus on the Election Commission: Composition, Functions and Role and Electoral Reforms

• **F. Y. B. A. Political Science**

For the subject of political Science there shall be two papers for 45 lectures each comprising of four units of 11 Lectures each tentatively.

Semester-I

1. Paper- I Unit-I will be on Introduction to Indian constitution.
2. Paper- I Unit-II will be on citizens and the constitution
3. Paper- I Unit-III will be on The Union and Judiciary
4. Paper- I Unit-IV Will be on The State and Local Self Government

Semester-II

1. Paper-I Unit-I will be on Federal system in India
2. Paper-I Unit-II will be on Political Dynamics
3. Paper-I Unit-III will be on Social Dynamics
4. Paper-I Unit-III will be on Challenges to National security

COURSE OUTCOMES

F.Y.B.A.- SEMESTER I

Name of the Programme: B.A.	Programme Coordinator: Prof. Dr. B.S.Patil	Head of the Department: Mr. A.V.Patil
Subject: Political Science	Course: Indian Political System Sub Title:- Constitutional Framework Course Code: UAR1POL1	Course Coordinator: Mr. A.V.Patil
	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the history of making of Indian Constitution, its preamble and basic features	Level2 Understanding
CO2	Identify various provisions for citizenship, fundamental rights, directive principles of state policy and Relationship between fundamental rights and directive principles of state policy	Level 3 Apply
CO3	Examine Union Legislature, Executive and Judicial System in India	Level 4 Analyze
CO4	Discuss The Concept of Centralization-Decentralization, The State, Local Self Government & it's Implementation	Level 6 Create

F.Y.B.A. Political Science Syllabus

F.Y.B.A.- SEMESTER II

Name of the Programme: B.A.	Programme Coordinator: Prof. Dr. B.S.Patil	Head of the Department: Mr. A.V.Patil
Subject: Political Science	Course: Indian Political System Course Code: UAR1POL1	Course Coordinator: Mr. A.V.Patil
	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Illustrate Indian Federal System, changing dynamics in centre-state relations and demand for greater autonomy	Level 2 Understanding
CO2	Analyse the political parties, elections, election machinery, and electoral reforms	Level 4 Analysing
CO3	Perceive caste, religion and regionalism in politics	Level 5 Evaluate
CO4	Elaborate challenges to national security i.e., criminalization of politics, global terrorism, naxalism	Level 6 Create

Revised Scheme of Examination Faculty of Arts (Under-graduate Programmes)

Choice Based Credit System (CBCS)

❖ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies / Test based on tutorials 4. Book Review /Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Question Paper Pattern

(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

Maximum Marks: 20, Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern	
1.	There shall be five questions each of 12 marks (24 marks with internal options).
2.	All questions shall be compulsory with internal options.
3.	Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Theory:			
I	All questions are compulsory and will have internal options.		
	Q-1	From Unit – I (having internal options.)	12 M
	Q-2	From Unit – II (having internal options.)	12 M
	Q-3	From Unit – III (having internal options.)	12 M
	Q-4	From Unit – IV (having internal options.)	12 M
	Q-5	Short Notes; Questions from all the FOUR Units with equal weightage of marks Allotted to each Unit.	12 M

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: 1) It is noted that the concerned regulation of the College is amended and implemented to all Semesters i.e., Semester I to Semester VI to all undergraduate programmes, under faculty of Arts, Commerce and Science with effect from the academic year 2022 - 2023.

2) This revised scheme of evaluation is discussed in detail, finalised and accepted.

Choice Based Credit Grading and Semester System (CBCGS)

F.Y.B.A. Political Science Syllabus

To be implemented from the Academic year 2022-23

SEMESTER I

POLITICS PAPER I

TITLE: INDIAN POLITICAL SYSTEM

SUB-TITLE: THE CONSTITUTIONAL FRAMEWORK

COURSE CODE: UAR1POL1 (2022-2023) Credits- 04

UNIT- I

1. INTRODUCTION TO THE CONSTITUTION (11 LECTUERS)

1.1 BRIEF HISTORY OF THE MAKING OF CONSTITUTION

1.2 PREMABLE

1.3 BASIC FEATURES

1.4 CONSTITUTIONAL AMENDMENT PROCEDURE & IMPORTANT AMENDMENT'S

UNIT-II

2.CITIZENS AND THE CONSTITUTION (12 LECTUERS)

2.1 CITIZENSHIP- MEANING AND CONSTITUTIONAL PROVISION'S

2.2 FUNDAMENTAL RIGHTS – ARTS 12 TO 35

2.3 DIRECTIVE PRINCIPLES OF STATE POLICY

2.4 RELATIONSHIP BETWEEN FUNDAMENTAL RIGHTS & DIRECTIVE PRINCIPLES OF STATE POLICY

UNIT-III

3. THE UNION AND JUDICIARY

(12 LECTUERS)

3.1 UNION LEGISLATURE- PARLIAMENT

3.2 UNION EXECUTIVE - THE PRESIDENT, PRIME MINISTER AND COUNCIL OF MINISTERS

3.3 JUDICIAL SYSTEM – SUPREME COURT, HIGH COURT, JUDICIAL REVIEW AND JUDICIAL ACTIVISM, PUBLIC INTREST LITIGATION

UNIT-IV

4. THE STATE AND LOCAL SELF GOVERNMENT

(10 LECTUERS)

4.1 THE CONCEPT OF DECENTRALIZATION

4.2 STATE LEGISLATURE

4.3 STATE EXECUTIVE- THE GOVERNOR, CHIF MINISTER AND COUNCIL OF

MINISTERS

4.4 LOCAL SELF-GOVERNMENT – 73rd, 74th, AMENDMENTS AND THEIR IMPLEMENTATION

• SUGGESTED READINGS:

1. Basu, Durga Das, Introduction to the Constitution of India, Lexis Nexis, 2012.
2. Laxmikant, M, Indian Polity, TMH, 2015.
3. Laxmikant, M., Governance in India, TMH, 2015.
4. Pylee, M. V., An Introduction to the Constitution of India, Vikas Publishing, 2008.
5. Sharma, Brij Kishore, Introduction to the Constitution of India, PHI Learning, 2009.
6. प्रा.चिं.ग.घांगरेकर आणि डॉ.अनिरुद्ध, शासन आणि राजकारण: तुलनात्मक शासन भारताच्या संदर्भात, के.क्षीरसागर प्रकाशन, २०१९
7. डॉ. भास्कर लक्षण भोळे, भारतीय गणराज्याचे शासन आणि राजकारण, पिंपळापुरे प्रकाशन, २०१५.
8. तुकाराम जाधव आणि महेश शिरापूरकर, भारतीय संविधान आणि भारतीय राजकारण, द युनिक अकादमी प्रकाशन, २०२१

Syllabus Academic Year, 2022-23 (CBCS)

F.Y.B.A. Semester- II

PAPER – I

TITLE: INDIAN POLITICAL SYSTEM

SUB-TITLE: INDIAN POLITICAL PROCESS

COURSE CODE: UAR2POL1 (2022-2023) CREDIT: 04

UNIT-I

1. FEDERAL SYSTEM IN INDIA (12 LECTURES)

1.1 INDIAN FEDERAL SYSTEM

1.2 CONCEPT OF CENTRALIZATION

1.2 CHANGING DYNAMICS OF CENTRE-STATE RELATIONS

1.3 DEMAND FOR GREATER AUTONOMY

UNIT-II

2. POLITICAL DYNAMICS (12 LECTURES)

2.1 POLITICAL PARTY- NATIONAL PARTY, REGIONAL PARTY

2.2 ELECTIONS-ELECTORAL SYSTEM, ELECTION MACHINERY, ELECTION PROCESS

2.3 ELECTORAL REFORMS-VARIOUS COMMITTEE, REFORMS BEFORE 1996, REFORMS OF 1996, REFORMS AFTER 1996, REFORMS SINCE 2010, ANTI DEFECTION LAW

UNIT-III

3. SOCIAL DYNAMICS (11 LECTURES)

3.1 CASTE, RELIGION, REGIONALISM IN POLITICS

3.2 GENDER (WITH REFERENCE TO POLITICAL PARTICIPATION)

3.3 SOCIAL MEDIA AND NEW SOCIAL MOVEMENT

UNIT IV

4. CHALLENGES TO NATIONAL SECURITY

(10 LECTURES)

4.1 CRIMINALISATION OF POLITICS

4.2 INTERNAL THREATS TO SECURITY (WITH REFERENCE TO NAXALISM AND NORTH EAST INSURGENCY)

4.3 GLOBAL TERRORISM

• **SUGGESTED READINGS:**

1. Abbas, H., Kumar, Ranjay, and Alam, Mohammad Aftab, Indian Government and Politics, Pearson, 2011.
2. Chakravarty, Bidyut, and Pande, Rajendra Kumar, Indian Government and Politics, Sage Publications, 2008.
3. Chandoke, Neera, and Priyadarshi, Praveen, Contemporary India, Pearson, 2009.
4. Ghosh, Peu, Indian Government and Politics, PHI, 2012.
5. Jayal, Nirja G., and Mehta, BhanuPratap, The Oxford Companion to Politics in India, OUP, 2011.
6. Jha, Pravin Kumar, Indian Politics in Comparative Perspective, Pearson, 2012.
7. Paranjpe, Shrikant, India's Internal Security: Issues and Perspectives, Kalinga Publications, 2009.
8. Singh, M. P., and Saxena, Rekha, Indian Politics, PHI, 2011.
9. Baxi, Upendra and Parekh, Bhiku (Eds.), Crisis and Change in Contemporary India
10. Shah, Ghanshyam, Social Movements and the State
11. Kaviraj, S., Politics in India
12. Tiwari, R.K., Political Parties, Party Manifestos and Election in India, 1909-2014, Taylor and Francis Publication, 2018
13. प्रा.चिं.ग.घांगरेकर आणि डॉ.अनिरुद्ध, शासन आणि राजकारण: तुलनात्मक शासन भारताच्या संदर्भात, के.क्षीरसागर प्रकाशन, २०१९
14. डॉ. भास्कर लक्षण भोळे, भारतीय गणराज्याचे शासन आणि राजकारण, पिंपळापुरे प्रकाशन, २०१५.
15. तुकाराम जाधव आणि महेश शिरापूरकर, भारतीय संविधान आणि भारतीय राजकारण, द युनिक अकादमी प्रकाशन, २०२१



॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Program: B.A.

**Revised Syllabus of S.Y.B.A. Political Science
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2022-23**

S.Y.B.A. Political Science Syllabus

1	Title of Course	Political science
2	Course Code	UAR3POL2 UAR3POL3 & UAR4POL2 UAR4POL3
3	Eligibility for Admission	12 th of all recognised Board
4	Passing marks	40%
5	Ordinances/Regulations (if any)	-
6	No. of Semesters	Two
7	Level	U.G.
8	Pattern	Semester (60:40)
9	Status	Revised
10	To be implemented from Academic year	2022-2023

Revised Scheme of Examination Faculty of Arts (Under-graduate Programmes)

Choice Based Credit System (CBCS)

❖ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Survey Project 2. Presentation and write up on the selected topics of the subjects 3. Case studies / Test based on tutorials 4. Book Review /Poetry Appreciation/ Open Book Test 5. Quiz	20 Marks

Question Paper Pattern

(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

Maximum Marks: 20, Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be five questions each of 12 marks (24 marks with internal options).
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

I	Theory:		
	All questions are compulsory and will have internal options.		
	Q-1	From Module – I (having internal options.)	12 M
	Q-2	From Module – II (having internal options.)	12 M
	Q-3	From Module – III (having internal options.)	12 M
	Q-4	From Module – IV (having internal options.)	12 M
Q-5	Short Notes; Questions from all the FOUR Modules with equal weightage of marks Allotted to each Unit.	12 M	

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

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2) This revised scheme of evaluation is discussed in detail, finalised and accepted.

**Choice Based Credit Grading and Semester System (CBCGS)
S.Y.B.A. Political Science Syllabus**

**To be implemented from the Academic year 2020-21
SEMESTER III**

POLITICS PAPER II

TITLE: POLITICAL THEORY

SUB-TITLE: PRINCIPLES AND CONCEPTS OF POLITICAL THEORY

COURSE CODE: UAR3POL2 CREDITS- 04 LECTURE- 45

Preamble of the Syllabus

Bachelor of Arts (S.Y.B.A.) in Political Science is a under UG course of Department of Political Science, Changu Kana Thakur Arts, Commerce & Science college, New Panvel (Autonomous) The Choice Based Credit and Grading System to be implemented through this curriculum would allow students to develop the disciplines of his/her liking and abilities. This syllabus is prepared to get knowledge and understanding of Political Science. The Second year Politics paper study into the concepts and principles of Political Theory and Political Values and ideology over semester Third and Fourth. This Course is essential since learners are acquainted with the working of political system in general over their First year and this course provides conceptual grounding to the same.

OBJECTIVES:

- 1) Learners understand to the political theory is the part of political science.
- 2) Learners understand to the theoretical understanding of the theories, concept, principles and values.

COURSE OUTCOMES

SEMESTER III

Name of the Programme: B.A.	Programme Coordinator: Prof. Dr. B.S.Patil	Head of the Department: Mr. A.V. Patil
Subject: Political Science	Course: Political Theory Course Code: UAR3POL2	Course Coordinator: Mr. A.V. Patil
	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Define Political Theory and its Traditional-Contemporary approaches	Level 01 Remember
CO2	Describe Concept of State and its various theories and meaning of Civil Society and Market	Level 02 Understanding
CO3	Inspect internal relationships between Power, Authority and Legitimacy.	Level 04 Analyze
CO4	Estimate the concept of law, political obligation and resistance against social evils.	Level 05 Evaluate

Syllabus

Module 1 - Introduction to Political Theory [11 Lectures]

1.1 Definition and Scope of Political Theory

1.2 Approaches to the Study of Political Theory: Traditional

1.3 Approaches to the Study of Political Theory: Contemporary

Module 2 – State, Civil Society & Market [12 Lectures]

2.1 State: Concept and Perspectives

2.2 Nation - State: Meaning and Changing Perceptions

2.3 State, Civil Society and Market

Module 3 – Power, Authority and Legitimacy [10 Lectures]

3.1 Power

3.2 Authority

3.3 Legitimacy

Module 4 : Concept of Law and Political Obligation [12 Lectures]

4.1 Concept of Law

4.2 Political Obligation

4.3 Right to Resist

SEMESTER IV

PAPER II - POLITICAL VALUES AND IDEOLOGIES
COURSE CODE: UAR4POL2, CREDIT: 04

• Objectives:

- 1) To understand meaning, nature and scope of Rights. Discuss on different Rights.
- 2) To understand the basic political values.
- 3) To understand the concept of Democracy.

COURSE OUTCOMES

SEMESTER IV

Name of the Programme: B.A.	Programme Coordinator: Prof. Dr. B.S.Patil	Head of the Department: Mr. A.V. Patil
Subject: Political Science	Course: Political Values & Ideologies Course Code: UAR1POL2	Course Coordinator: Mr. A.V. Patil
	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Outline Nature, Theory and Classification of Rights	Level 02 Understanding
CO2	Explain Basic Political Values i.e., Liberty, Equality and Justice	Level 02 Understanding
CO3	Examine Theory and Principles of Democracy and its effective implementation in the lives of people.	Level 04 Analyze
CO4	Construct their Political Opinion by studying philosophical perspectives of Marxism, Fascism and Feminism	Level 06 Create

**SEMESTER IV
SYLLABUS**

Module 1 – Rights

[10 Lectures]

1.1 Meaning and Nature of Rights

1.2 Theories of Rights

1.3 Classification of Rights

Module 2 – Basic Political Values

[12 Lectures]

2.1 Liberty

2.2 Equality

2.3 Justice

Module 3 – Democracy

[11 Lectures]

3.1 Theories of Democracy

3.2 Principles of Liberal Democracy

3.3 Conditions for the Successful Working of Democracy

Module 4 – Political Ideologies

[12 Lectures]

4.1 Marxism

4.2 Fascism

4.3 Feminism

REFERENCES:

Abbas, Hoveyda and Ranjay Kumar, *Political Theory*, Pearson, 2012

Bhargava, Rajeev and Ashok Acharya (eds), *Political Theory: An Introduction*, Pearson Longman, 2008

Bhargava, Rajeev and Helmut Reifeld (eds), *Civil Society, Public Sphere, and Citizenship: Dialogues and Perception*, Sage Publications, New Delhi, 2005

Chandhoke, Neera, *State and Civil Society: Explanations in Political Theory*, Sage Publications, New Delhi, 1995

Gauba, O.P., *An Introduction to Political Theory*, Macmillan Publishers India Ltd., 2011

Heywood, Andrew, *Politics*, Palgrave Foundations, New York, 2002

Hoffman, John and Paul Graham, *Introduction to Political Ideology*, Pearson, 2006

Marsh David and Gerry Stoker (ed), *Theory and Methods in Political Science*, Macmillan Press Ltd, 1995

Mckinnon, Catriona (ed), *Issues in Political Theory*, New York Oxford University Press, 2008

Verma, S.P., *Modern Political Theory*, MacMillan, New Delhi, 2003.

Reference Books in Marathi

1. Translation of O.P. Gauba's Book, An introduction to Political Theory in Marathi by Jadhav T, *Rajaneetishastra Parichay*, K. Sagar Publications, Pune, 2015.
2. Bhargav Rajeev and Acharya Ashok (eds), *Rajakiya Siddhanth Parichay*, Pearson, New Delhi, 2008.
3. Tijare, Peshwe, *Adhunik Rajakiya Siddhanth*, Shri Mangesh Prakashan, Nagpur, 1998.
4. Phad, S.B., *Uchhatar Adhunik Rajakiya Siddhanth*, Vidya Books Publishers, Aurangabad, 2014.
5. Deshpande, Shrikant., *Rajakiya Siddhanth*, Shri Mangesh Prakashan, Nagpur, 2003.
6. Chopade, K., *Rajakiya Siddhanthachi Tatve*, Vidya Books Publishers, Aurangabad, 2002.

SYBA

SEMESTER III

PAPER III - PUBLIC ADMINISTRATION

COURSE CODE- UAR3POL3 CREDITS 04 LECTURE 45

Preamble:

The Second Year Politics Paper III course acquaints learners with a field of study in Politics which deals with administration. It works on the theories of administration and how governance can be shaped better with the understanding of administration and management. Experiences of administration across the world towards leadership, administration and motivation are studied in this course. This course is inherently useful for better personnel management and for a clear understanding of the process of governance, development and policy making.

Course Objectives:

- 1) Learner understands to the public administration.
- 2) Developing the knowledge of administrative studies with special reference to Indian administrative structures and practices.
- 3) Analyzing the various dimensions of the working of the Indian Administrative system.

COURSE OUTCOMES

SEMESTER III

Name of the Programme: B.A.	Programme Coordinator: Prof. Dr. B.S.Patil	Head of the Department: Mr. A.V. Patil
Subject: Political Science	Course: Public Administration Course Code: UAR3POL3	Course Coordinator: Mr. A.V. Patil
	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Recall Meaning, Nature, Scope and Evolution of Public Administration	Level 01 Remember
CO2	Explain Various Theories of Administration i.e., Scientific Management, Bureaucratic, Human Relations Theory	Level 02 Understanding
CO3	Analyse Basic Principles and Theories of Public/ Private Organization	Level 04 Analyse
CO4	Discuss Contemporary Techniques and Practices in Administration	Level 06 Create

Syllabus:

Module 1: Introduction to Public Administration [Lectures 12]

1.1. Meaning, Scope and Significance

1.2. Evolution of Public Administration as a Discipline

1.3. Public Administration in the Age of Liberalisation, Privatisation and Globalisation

Module 2. Theories of Administration [Lectures 10]

2.1. Scientific Management Theory- F.W. Taylor

2.2. Bureaucratic Theory- Max Weber

2.3. Human Relations Theory- Elton Mayo

Module 3. Basic Principles and Theories of Organisation [Lectures 12]

3.1. Hierarchy, Delegation, Centralisation-Decentralisation

3.2. Motivation Theories- McGregor, McClelland

3.3. Leadership Theories- Trait theory, Contingency theory

Module 4. Contemporary Techniques and Practices in Administration [Lectures 11]

4.1. Good Governance

4.2. E-Governance

4.3. Public-Private Partnership (PPP)

S.Y.B.A

SEMESTER IV

PAPER III- INDIAN ADMINISTRATION

Course Objectives:

- 1) Learners understand to the Indian administration.
- 2) Developing knowledge of administrative studies with special reference to Indian administrative structures and practices.
- 3) To get acquainted with the budgetary and financial processes.

COURSE OUTCOMES

SEMESTER IV

Name of the Programme: B.A.	Programme Coordinator: Prof. Dr. B.S.Patil	Head of the Department: Mr. A.V. Patil
Subject: Political Science	Course: Indian Administration Course Code: UARIPOL3	Course Coordinator: Mr. A.V. Patil
	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Illustrate Evolution of Indian Administration, its Salient Features and Role of District Collector in effective implementation of Government Policies, Schemes for Community Transformation	Level 02 Understanding
CO2	Explain various tools designed for Personnel Administration	Level 02 Understanding
CO3	Analyse Budgetary Process, Parliamentary Committees and Functioning of Comptroller and Auditor General of India.	Level 04 Analyze
CO4	Discuss Contemporary Issues in Indian Administration and its Redressal Mechanism	Level 06 Create

Syllabus:

Module 1. Introduction to Indian Administration [Lectures 11]

1.1 Evolution and Constitutional Context

1.2 Salient features

1.3 District Administration since Independence: Changing role of District Collector

Module 2. Personnel Administration [Lectures 11]

2.1. Recruitment: All India Services, Central Services, State Services

2.2. Public Service Commission: Union Public Service

Commission and Maharashtra Public Service Commission

2.3. Training: All- India Services, Central Services, State Services (Maharashtra)

Module 3. Financial Administration [Lectures 12]

3.1. Budgetary Process

3.2. Parliamentary Committees: Public Accounts Committee, Estimates Committee, Committee on Public Undertakings

3.3. Comptroller and Auditor General

Module 4. Contemporary Issues in Indian Administration [Lectures 11]

4.1. Integrity in Administration: Lokpal, Lokyukta, CVC

4.2. Citizen and Administration

4.3. Citizens' Charte

• **REFERENCES**

- Bava, Noorjahan. *Public Administration in the 21st Century*, Kanishka Publishers New Delhi, 2010.
- Avasthi, Maheshwari, *Public Administration*, Laxmi Narayan Agarwal Publications, Agra, 2006.
- Bhattacharya, Mohit, *New Horizons of Public Administration*, Jawahar Publications, New Delhi, 2008.
- Chakrabarty, Bidyut, and Bhattacharya Mohit (ed.), *Public Administration a Reader*, Oxford University Press, New Delhi, 2005
- Fadia, B. L. & Dr. Kuldeep Fadia, *Public Administration: Administrative Theories and Concepts*, Sahitya Bhawan, Agra, 2015
- K.S. Padhay, **Indian Political Thought**, New Delhi: PHI Learning Pvt. Ltd., 2011
- Laxmikant M., *Public Administration*, Tata McGraw Hill, New Delhi, 2011.
- Laxmikanth M., *Governance in India*, Tata McGraw Hill, New Delhi, 2011.
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- Sharma, M. P., and Sadana, B. L., *Public Administration in Theory and Practice*, Kitab Mahal, New Delhi, 2014
- Vishnoo Bhagwan and Vidya Bhusan, *Public Administrative*, S. Chand., New Delhi, 2010.
- The Indian Journal of Public Administration, Special Issue on Controlling Corruption in India:
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2. Bora, Shirsat, *Lokprashasanshastra*, Vidya Books Publishers, Aurangabad, 2013
3. Bang, R.K., *Lokprashasan Tatveani Siddhanth*, Vidya Books Publishers, Aurangabad, 2015.
4. Patil, V. B., *Lokprashasan*, Shri Mangesh Prakashan, Nagpur.
5. Patil, V. B., *Samagra Lokprashasan*, K Sagar, Pune.
6. Bhogale, Shantaram, *Lokprashasanache Siddhantaani Kaaryapadhati*, Kailas Prakashan, Aurangabad

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www.library.lieden.edu/public-administration/digital-library-public-administration

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Commerce I

Sr. No.	Modules / Units
1	Business and Business Environment
	<p>Introduction: Concept, Functions, challenges of business. Traditional and Modern Concept of business. Steps in setting business objectives, classification of business objectives.</p> <p>Business Environment: Concept and Importance of business environment, Inter-relationship between Business and Environment, Constituents of Business Environment, PESTEL Analysis.</p> <p>International Environment –Introduction to International Business and significance of International Business, WTO and Trading Blocs and their impact on Indian Business.</p>
2	Project Planning
	<p>Introduction: Business Planning Process; Concept and importance of Project Planning; Project Report; feasibility Study types and its importance</p> <p>Business Unit Promotion: Concept and Stages of Business Unit Promotion, Location – Factors determining location, and Role of Government in Promotion.</p> <p>Statutory Requirements in Promoting Business Unit: Licensing and Registration procedure, Filing returns and other documents, Other important legal provisions.</p>
3	Entrepreneurship
	<p>Introduction: Concept and importance of entrepreneurship, factors Contributing to Growth of Entrepreneurship, Entrepreneur and Manager, Entrepreneur and Intrapreneur</p> <p>The Entrepreneurs: Types of Entrepreneurs, Competencies of an Entrepreneur, Entrepreneurship Training and Development centers in India. Incentives to Entrepreneurs in India.</p> <p>Women Entrepreneurs: Problems and Promotion.</p>
4	New Trends in Business and Strategy alternative in changing scenario
	<p>New Trends in Business: Impact of Liberalization, Privatization and Globalization, Strategy alternatives in the changing scenario, Restructuring and turnaround strategies</p> <p>Strategies for going Global: MNC, TNC, FDI</p> <p>Contemporary Aspects in Business: concept and scope of CSR, Corporate Governance and its' impact.</p>

Commerce II

Sr. No.	Modules / Units
1	Concept of Services
	<p>Introduction: Meaning, Characteristics, Scope and Classification of Services – Importance and Challenges of service sector in the Indian</p> <p>Marketing Mix Services: Consumer expectations, Services Mix, - Product, Place, Price, Promotion, Process of Services delivery, Physical evidence and people</p> <p>Service Marketing : Concept, Service Marketing Triangle, Role of Service in Modern Economy, Goods v/s Service Marketing.</p>
2	Retailing
	<p>Introduction: Concept of organized and unorganized retailing , Trends in retailing, growth of organized retailing in India, Survival strategies for unorganized Retailers.</p> <p>Retail Format: Store format, Non – Store format, Store Planning, design and layout</p> <p>Retail Scenario: Retail Scenario in India and Global context – Prospects and Challenges in India. Mall Management – Retail Franchising. FDI in Retailing, Careers in Retailing</p>
3	Recent Trends in Service Sector
	<p>ITES Sector: Concept and scope of BPO, KPO, LPO and ERP.</p> <p>Banking Sector: Methods of E-Payment (Debit & Credit Cards, Smart Cards, E-Wallets ,NEFT ,RTGS) Payment Gateways , online banking and M- Banking (Importance and risk involved), FDI and its impact on Banking in India, Insurance- Features, Principles, Types, Opportunities and Challenges. IRDA</p> <p>Logistics: Net working – Importance – Challenges-Trends in Logistics</p>
4	E-Commerce
	<p>Introduction: Meaning, Features, Functions and Scope of E-Commerce- Importance and Limitations of E-Commerce</p> <p>Types of E-Commerce: Basic ideas and Major activities of B2C,B2B, C2C.</p> <p>Present status of E-Commerce in India: Transition to E-Commerce in India, E-Transition Challenges for Indian Corporates , Government E-Market place, World Wide Web- Concept of Web Server, Web Site, Web page, Principles of Website Design.</p>

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Commerce III

Sr. No.	Modules
1	Introduction To Management (11)
	<ul style="list-style-type: none">● Management- Concept, Nature, Functions, Managerial Skills & Competencies● Evolution of Management Thoughts Classical Approach: Scientific Management – F.W. Taylor’s Contribution Classical Organisation Theory: Henri Fayol’s Principles Neo Classical: Human Relations Approach – Elton Mayo’s Hawthorne experiments● Modern Management Approach- Peter Drucker’s Dimensions of Management, Indian Management Thoughts: Origin & Significance of Indian Ethos to Management.
2	Planning & Decision Making (10)
	<ul style="list-style-type: none">● Planning – Steps, Importance, Components, Problems in Planning● M.B.O –Process, Advantages, Management By Exception- Advantages; Management Information System- Concept, Components● Decision Making – Techniques, Essentials of a Sound Decision Making, Impact of Technology on Decision Making.
3	Organising (12)
	<ul style="list-style-type: none">● Organising-Steps, Organisation Structures – Features of Line & Staff Organisation, Matrix Organisation , Virtual Organisation, Formalv/s Informal Organisation.

	<ul style="list-style-type: none"> ● Departmentation –Meaning –Bases, Span of Management- Factors Influencing Span of Management, Tall and Flat Organisation. ● Delegation of Authority- Process, Barriers to Delegation, Principles of Effective Delegation. <i>Decentralisation</i>: Factors Influencing Decentralisation, Centralization v/s Decentralisation
4	Coordination and Controlling (12)
	<ul style="list-style-type: none"> ● Motivation – Concept, Importance, Influencing factors. Importance of Communication, Barriers to effective Communication ● Leadership and Coordination- Concept, Functions, Styles, Qualities of a good leader. Importance of Coordination, Principles of Coordination ● Controlling – Concept, Steps, Techniques of Controlling –PERT, CPM, Budgetary Control, Management Audit.

Commerce IV

Sr. No.	Modules
1	Production & Inventory Management
	<ul style="list-style-type: none"> ● Production Management: Objectives, Scope Production Planning & Control : Steps, Importance ● Production Systems: Concept, Types - Continuous and Intermittent. Productivity: Concept, Factors Influencing Productivity, Measures for improving Productivity. ● Inventory Management- Objectives, Inventory Control- Techniques. Scientific Inventory Control System – Importance
2	Quality Management
	<ul style="list-style-type: none"> ● Introduction to Quality: Dimensions of Quality, Cost of Quality: Types – Internal Failure Cost, External Failure Cost, Appraisal Cost, Prevention Cost, Quality Circle: Features. ● Quality Management Tools: TQM – Importance, Six Sigma – Process, ISO 9000 – Certification Procedure, Kaizen – Process ● Service Quality Management: Importance, SERVQUAL Model, Measures to improve service quality.
3	Indian Financial System

	<ul style="list-style-type: none"> ● Indian Financial Market: Structure, Primary Market – IPO Procedure Dematerialisation: Process, Role of Depositories : NSDL and CDSL ● SEBI: Functions of SEBI, Investors protection measures of SEBI. Stock Exchange – Functions, Speculators. ● Credit Rating: Advantages, Credit Rating Agencies in India - CRISIL, CARE, and ICRA.
4	Recent Trends In Finance
	<ul style="list-style-type: none"> ● Mutual Funds- Advantages and Limitations, Types, Factors responsible for growth of mutual funds – Systematic Investment Plan. ● Commodity Market: Categories, Derivatives Market: Types, Participants, Types of Derivative Instruments. ● Start-up Ventures –Concept, Sources of Funding, Micro Finance – Importance, Role of Self Help Groups. Managing Personal finance during Pandemic

Advertising I

Sr. No.	Modules
1	Introduction to Advertising
	<ul style="list-style-type: none"> ● Integrated Marketing Communications (IMC)- Concept, Features, Elements, Role of advertising in IMC ● Advertising: Concept, Features, Evolution of Advertising, Active Participants, Benefits of advertising to Business firms and consumers. Functions of Advertising. ● Classification of advertising: Geographic, Media, Target audience and Functions.
2	Advertising Agency
	<ul style="list-style-type: none"> ● Ad Agency: Features, Structure and services offered, Types of advertising agencies , Agency selection criteria ● Agency and Client: Maintaining Agency–Client relationship, Reasons and ways of avoiding Client Turnover, Creative Pitch, Agency compensation

	<ul style="list-style-type: none"> ● Careers in advertising: Skills required for a career in advertising, Various Career Options, Freelancing Career Options – Graphics, Animation, Modeling, Dubbing.
3	Economic & Social Aspects of Advertising
	<ul style="list-style-type: none"> ● Economic Aspects: Effect of advertising on consumer demand, monopoly and competition, Price. ● Social aspects: Ethical and social issues in advertising, positive and negative influence of advertising on Indian values and culture. ● Pro Bono/Social advertising: Pro Bono Advertising, Social Advertising by Indian Government through Directorate of Advertising and Visual Publicity (DAVP), Self-Regulatory body- Role of ASCI (Advertising Standard Council of India)
4	Brand Building and Special Purpose Advertising
	<ul style="list-style-type: none"> ● Brand Building: The Communication Process, AIDA Model, Role of advertising in developing Brand Image and Brand Equity, and managing Brand Crises. ● Special purpose advertising: Rural advertising, Political advertising-, Advocacy advertising, Corporate Image advertising, Green Advertising – Features of all the above special purpose advertising. ● Trends in Advertising: Media, Ad-spends, Advertising during a Pandemic.

Advertising II

Sr. No.	Modules
1	Media in Advertising
	<ul style="list-style-type: none"> ● Traditional Media: Print, Broadcasting, Out-Of-Home advertising and films - advantages and limitations of all the above traditional media ● New Age Media: Digital Media / Internet Advertising – Forms, Significance and Limitations. Features of New Age Media. ● Media Research: Concept, Importance, Tool for regulation - ABC and Doordarshan Code
2	Planning Advertising Campaigns
	<ul style="list-style-type: none"> ● Advertising Campaign: Concept, Advertising Campaign Planning -Steps Determining advertising objectives - DAGMAR model

	<ul style="list-style-type: none"> ● Advertising Budgets: Factors determining advertising budgets, methods of setting advertising budgets, Media Objectives - Reach, Frequency and GRPs ● Media Planning: Concept, Process, Factors considered while selecting media, Media Scheduling Strategies
3	Fundamentals of Creativity in Advertising
	<ul style="list-style-type: none"> ● Creativity: Concept and Importance, Creative Process, Concept of Creative Brief, Techniques of Visualization ● Creative aspects: Buying Motives - Types, Selling Points- Features, Appeals – Types, Concept of Unique Selling Proposition (USP) ● Creativity through Endorsements: Endorsers – Types, Celebrity Endorsements – Advantages and Limitations, High Involvement and Low Involvement Products
4	Execution and Evaluation of Advertising
	<ul style="list-style-type: none"> ● Preparing print ads: Essentials of Copywriting, Copy – Elements, Types, Layout- Principles, Types, Illustration – Importance, Types. ● Creating broadcast ads: Execution Styles, Jingles and Music – Importance, Concept of Storyboard ● Evaluation: Advertising copy, Pre-testing and Post-testing of Advertisements – Methods and Importance of Research in advertising

Business Law I

Sr. No.	Modules
1	Indian Contract Act – 1872 Part –I
	<ul style="list-style-type: none"> ● Contract – Definition of Contract and Agreement, Essentials of Valid Contract, Classification of Contracts.

	<ul style="list-style-type: none"> ● Offer and Acceptance – Rules of valid offer and acceptance, Counter offer, standing or open offer, distinguish between offer and invitation to offer. Concept of Communication and Revocation of offer and acceptance (sec. 3,5) ● Capacity to Contract (S. 10-12) – Minor, Unsound Mind, Disqualified Persons. ● Consideration (S. 2 & 25) – Concept and Importance of consideration, Legal rules of Consideration, Exceptions to the Rule, 'No Consideration No Contract' (Ss. 25) Unlawful Consideration (S 23)
2	Indian Contract Act – 1872 Part –II
	<ul style="list-style-type: none"> ● Consent (Ss.13, 14-18, 39.53, 55, 66)-Agreements in which consent is not free – Coercion, Undue Influence, Misrepresentation Fraud, Mistake. ● Void Agreements (S. 24-30) – Concept, Void Agreements under Indian Contract Act. ● Contingent Contract (S. 31), Quasi Contract (S.68-72), Concept of E- Contract & Legal Issues in formation and discharge of E- Contract. Concept of Performance of Contract (S 37) ● Modes of Discharge of Contract, Remedies on breach of Contract.(73-75)
3	Special Contracts
	<ul style="list-style-type: none"> ● Law of Indemnity & Guarantee (Ss. 124-125, Ss. 126-129, 132-147) – Concept, Essentials elements of Indemnity and Guarantee, Contract of Indemnity vs. Guarantee, Modes of Discharge of Surety. ● Law of Bailment (S. 148, 152-154, 162, 172, 178, 178A, 179) – Concept, Essentials of Bailment, Kinds of Bailment, Rights and Duties of Bailor and Bailee ● Law of Pledge – Concept, Essentials of valid Pledge, Lien – concept, Difference between Pledge and Lien, Rights of Pawnor & Pawnee.(Ss.173, 174, 177) ● Law of Agency (Ss. 182-185, 201-209) – Concept, Modes of creation of Agency, Modes of termination of Agency, Rights & Duties of Principal and Agent.
4	The Sale Of Goods Act – 1930
	<ul style="list-style-type: none"> ● Contract of Sale (S.2) – Concept, Essentials elements of contract of sale, Distinction between Sale and Agreement to sell (S.4) Distinguish between Sale and Hire Purchase Agreement, Types of Goods. Effects of destruction of Goods (Ss. 6,7,8),

	<ul style="list-style-type: none"> ● Conditions & Warranties (Ss. 11-25 & 62, 63) – Concept, Distinguish between Conditions and Warranties, Implied Conditions & Warranties, Concept of Doctrine of Caveat Emptor –Exceptions. ● Property – Concept , Rules of transfer of property (Ss. 18-26) ● Unpaid Seller (Ss. 45-54, 55 & 56)- Concept, Rights of an unpaid seller, Remedies for Breach of contract of Sale (Ss. 55-61), Auction sale – Concept, Legal Provisions. (S. 64)
5	<p>The Negotiable Instruments (Amended) Act 2015 and Information Technology Act 2000</p>
	<ul style="list-style-type: none"> ● Negotiable Instruments – Concept (S13), Characteristics, Classification of Negotiable Instruments (Ss. 11, 12, 17-20, 42, 43, 104,134,135) Maturity of Instruments. ● Promissory Note and Bill of Exchange (Ss. 4,5, 108-116)- Concept, Essentials of Promissory Note, Bill of Exchange (Ss. 4,5), Essential features of promissory note and Bill of exchange, Kinds Promissory note and Bill of exchange, Cheque (S.6)– Concept, Types & Crossing of Cheque, Distinguish between Bill of Exchange & Cheque, Dishonour of Cheque – Concept & Penalties (Ss. 138, 139,142) ● Introduction of Information Technology act in India- Objectives & Features. ● Cyber Law, Cyber Crime and Cyber Security – Introduction, Types of Cyber Crime. Measures to overcome cyber Crime

Business Law II

Sr. No.	Modules
1	Indian Companies Act – 2013 Par T –I
	<ul style="list-style-type: none"> ● Company –Concept, Features, Role of Promoters (S. 2(69) S. 92), Duties and liabilities of the Promoter Effects of Pre-Incorporation contracts, Consequences of non-registration, and Lifting of Corporate Veil. ● Classification of Companies Distinction between Private Company and Public Company, Advantages and disadvantages of Private company and Public Company. –Common Procedure for Incorporation of Company, ● Memorandum of Association (MOA) & Article of Association(AOA) – Concept , Cluses of MOA, AOA- Contents, Doctrine of constructive notice, Doctrine of Ultra Vires, Doctrine of Indoor Management. ● Prospectus – Concept, Kinds, Contents, Private Placement
2	Indian Companies Act – 2013, Par T –II
	<ul style="list-style-type: none"> ● Member of a Company –Concept, Who can become a member, Modes of acquiring membership, Cessation of membership, Right & Liabilities of Members. ● Director – Qualifications& Disqualification, Classification, Director Identification Number (DIN), Legal Position of Directors. ● Meetings – Types, Legal Provisions of Statutory Meeting, Annual General Meeting, Extra-Ordinary Meeting, Board Meeting.
3	Indian Partnership Act – 1932 & Competition Act 2002
	<ul style="list-style-type: none"> ● Partnership – Concept, Essentials, True Test of Partnership, Partnership Deed, Types of Partnership, Rights and Duties of Partners, Distinguish between Partnership & Hindu Undivided Family (HUF). ● Dissolution – Concept, Modes of Dissolution, Consequences of Dissolution. ● Limited Liability Partnership (LLP) 2008 – Concept, Characteristics, Advantages & Disadvantages, Procedure for Incorporation. ● Extent of L.L.P.- Conversion of LLP, Mutual rights & duties of partners, Winding up of LLP, Distinction between LLP and Partnership. ● Competition Act 2002 – Concept, Salient Features, Objectives & Advantages. ● Abuse of Dominant Position, Competition Commission of India, Anti-Competition Agreements,

4	Consumer Protection Act, 1986 & Competition Act 2002
	<ul style="list-style-type: none"> ● Consumer Protection Act – Concept , Objects, Reasons for enacting the Consumer Protection Act, Definition of Consumer, Consumer Dispute, Complaint, Complainant, Defect, Deficiency, Consumer Dispute, Unfair Trade Practices, Goods and Services. ● Consumer Protection Councils & Redressal Agencies – District, State & National. ● Competition Act 2002 – Concept, Salient Features, Objectives & Advantages. ● Abuse of Dominant Position, Competition Commission of India, Anti-Competition Agreements,
5	INTELLECTUAL PROPERTY RIGHTS
	<ul style="list-style-type: none"> ● Intellectual Property Right (IPR) – Concept, Nature, Introduction & background of IPR in India. ● IPR relating to Patents – Concepts of Invention and discovery, Comparison (S2 (j)), Concept of Patents, General principles applicable to working of patented inventions, Term of Patent. Infringement of Patent Rights & Remedies. (Ss. 104-115) ● IPR relating to Copyrights- Concept of Copyright (Ss. 14, 16, 54,) Concept of author and authorized acts, (S.2) Ownership of Copy right (S.17) Duration or term of Copy right. (S. 22-27), Original work and fair use, Rights of Copyright holder, Infringement of Copyrights & Remedies. (Ss. 51, 52) ● IPR relating to Trademarks –Concept, Functions of Trade Mark, types, trademarks that cannot be registered, Registration of Trade Marks and rights of the proprietor of Trade Marks. Procedure for registration of Trade Marks., Infringement of Trademarks & Remedies.

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Export Marketing- I

Sr. No.	Modules / Units
1	Introduction to Export Marketing
	a) Concept and features of Export Marketing; Importance of Exports for a Nation and a Firm; Distinction between Domestic Marketing and Export Marketing b) Factors influencing Export Marketing ; Risks involved in Export Marketing; Problems of India's Export Sector c) Major merchandise/commodities exports of India (since 2015); Services exports of India (since 2015); Region-wise India's Export Trade (since 2015)
2	Global Framework for Export Marketing
	a) Trade barriers; Types of Tariff Barriers and Non-Tariff barriers; Distinction between Tariff and Non-Tariff barriers b) Major Economic Groupings of the World (EU (European Union), ASEAN (The Association of Southeast Asian Nations), SAARC (The South Asian Association of Regional Cooperation), NAFTA (The North American Free Trade Agreement) BRICS (Brazil, Russia, India, China, South Africa) APEC (Asia -Pacific Economic Cooperation)); Positive and Negative Impact of Regional Economic Groupings; Agreements of World Trade Organization (WTO) c) Need for Overseas Market Research; Market Selection Process , Determinants of Foreign Market Selection E- Exporting
3	India's Foreign Trade Policy

	<p>a) Foreign Trade Policy (FTP) 2015-20 - Highlights and Implications, Export Trade facilitations and ease of doing business as per the new FTP</p> <p>b) Role of Directorate General of Foreign Trade (DGFT), Negative list of Exports, Deemed Exports</p> <p>c) Benefits to Status Holders & Towns of Excellence; Common benefits for EHTP, BTP and STP; Benefits enjoyed by (IIAs) Integrated Industrial Areas(SEZ), EOU, AEZ Production Link Incentive Scheme (PLI)</p>
4	Export Incentives and Assistance
	<p>a. Financial Incentives available to Indian Exporters - Marketing Development Assistance (MDA), Market Access Initiative (MAI), Assistance to States for Infrastructure Development for Exports (ASIDE), Industrial Raw Material Assistance Centre(IRMAC),</p> <p>b. Institutional Assistance to Indian Exporters - Federation of Indian Export Organisations (FIEO), India Trade Promotion Organisation (ITPO), The Federation of Indian Chambers of Commerce and Industry (FICCI), Export Promotion Councils (EPCs) & Commodity Boards (CBs), Indian Institute of Foreign Trade (IIFT), Indian Institute of Packaging (IIP)</p> <p>c. Schemes - Export Promotion Capital Goods (EPCG) Scheme, Duty Exemption and Remission Schemes, Export Advance Authorisation Scheme; Duty Drawback (DBK); IGST Refund for Exporters</p>

Export Marketing- II

Sr. No.	Modules / Units
1	Product Planning and Pricing Decisions for Export Marketing
	a) Planning for Export Marketing with regards to Product, Branding, Packaging ROHS (Restriction of Hazardous Substances, Recycling) b) Need for Labelling and Marking in Exports, Factors determining Export Price; Objectives of Export Pricing c) International Commercial (INCO) Terms; Export Pricing Quotations – Free on Board (FOB), Cost Insurance and Freight (CIF) and Cost and Freight (C&F); Problems on FOB quotation
2	Export Distribution and Promotion
	a) Factors influencing Distribution Channels; Direct and Indirect Exporting Channels; Distinction between Direct and Indirect Exporting Channels b) Components of Logistics in Export marketing ; Selection criteria of Modes of Transport; Need for Insurance in Export Marketing, Warehousing c) Sales Promotion Techniques used in Export Marketing; Importance of Trade Fairs and Exhibitions; Benefits of Personal Selling; Essentials of Advertising in Export Marketing ; Grey Marketing
3	Export Finance
	a) Methods of Payment In export marketing; Procedure to open Letter of Credit, Types and Benefits of Countertrade b) Features of Pre-shipment and Post-shipment finance ; Procedure to obtain Export Finance ; Distinction between Pre-shipment Finance and Post Shipment Finance. c) Role of Commercial Banks, EXIM Bank , SIDBI in financing exporters; Role of ECGC
4	Export Procedure and Documentation

	<p>a. Registration with different authorities; Pre-shipment Procedure involved in Exports; Procedure of Quality Control and Pre-shipment Inspection; (HSN Harmonized System of Nomenclature)</p> <p>b. Shipping and Custom Stage Formalities; Role of Clearing & Forwarding Agent; Post-shipment Procedure for Realization of Export Proceeds; Procedure of Export under Bond and Letter of Undertaking. (LUT)</p> <p>c. Importance of - Commercial Invoice cum Packing list, Bill of Lading/ Airway Bill, Shipping Bill/Bill of Export, Consular Invoice, Certificate of Origin. Performa of Bills</p>
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Commerce V (Marketing)

Sr. No.	Modules / Units
1	Introduction to Marketing
	<ul style="list-style-type: none"> ● Marketing, Concept, Features, Importance, Functions, Evolution, Strategic v/s Traditional Marketing ● Marketing Research - Concept, Features, Process Marketing Information System-Concept, Components Data Mining- Concept, Importance ● Consumer Behaviour- Concept, ,Factors influencing Consumer Behaviour Market Segmentation- Concept, Benefits, Bases of market segmentation Customer Relationship Management-Concept, Techniques, Customer engagement- Tools Market Targeting- Concept, Five patterns of Target market Selection
2	Marketing Decisions I
	<ul style="list-style-type: none"> ● Marketing Mix- Concept, Product- Product Decision Areas Product Life Cycle- Concept, Managing stages of PLC Branding- Concept , Components Brand Equity- Concept , Factors influencing Brand Equity ● Packaging- Concept , Essentials of a good package Product Positioning- Concept, Strategies of Product Positioning Service Positioning- Importance & Challenges ● Pricing- Concept, Objectives, Factors influencing Pricing, Pricing Strategies
3	Marketing Decisions

	<ul style="list-style-type: none"> ● Physical Distribution- Concept, Factors influencing Physical Distribution, Marketing Channels (Traditional & Contemporary Channels) Supply Chain Management-Concept, Components of SCM ● Promotion- Concept, Importance, Elements of Promotion mix Integrated Marketing Communication (IMC)- Concept, Scope ,Importance ● Sales Management- Concept, Components, Emerging trends in selling Personal Selling- Concept , Process of personal selling, Skill Sets required for Effective Selling
4	Key Marketing Dimensions
	<ul style="list-style-type: none"> ● Marketing Ethics: Concept, Unethical practices in marketing, Marketing Myths Competitive Strategies for Market Leader, Market Challenger, Market Follower, and Market Nicher. ● Rural Marketing- Concept, Features of Indian Rural Market, Strategies for Effective Rural Marketing Digital Marketing-Concept, trends in Digital Marketing Green Marketing- concept, importance ● Challenges faced by Marketing Managers in 21st Century Careers in Marketing – Skill sets required for effective marketing Factors contributing to Success of brands in India with suitable examples, Marketing During a Pandemic

Commerce VI (Human Resource Management)

Sr. No.	Modules / Units
1	Human Resource Management

	<ul style="list-style-type: none"> ● Human Resource Management – Concept, Functions, Importance, Traditional v/s Strategic Human Resource Management ● Human Resource Planning- Concept Steps in Human Resource Planning Job Analysis-Concept, Components, Job design- Concept, Techniques ● Recruitment- Concept, Sources of Recruitment Selection - Concept , process , Techniques of E-selection
2	Human Resource Development
	<ul style="list-style-type: none"> ● Human Resource Development- Concept, functions Training- Concept, Process of identifying training and development needs, Methods of Training & Development (Apprenticeship, understudy, job rotation, vestibule training, case study, role playing, sensitivity training, In-basket, management games, E- Training) Evaluating training effectiveness- Concept, Methods ● Performance Appraisal- Concept, Benefits, Limitations, Methods Potential Appraisal-Concept, Importance ● Career Planning- Concept, Importance Succession Planning- Concept, Need Mentoring- Concept, Importance Counselling- Concept, Techniques.
3	Human Relations
	<ul style="list-style-type: none"> ● Human Relations- Concept, Significance Leadership –Concept, Transactional & Transformational Leadership Motivation- Concept, Theories of Motivation,(Maslow’s Need Hierarchy Theory, Vroom’s Expectancy Theory, McGregor’s Theory X and Theory Y, Pink’s Theory of Motivation) ● Employees Morale- Concept, Factors affecting Morale, Measurement of Employees Morale Emotional Quotient and Spiritual Quotient- Concept, Factors affecting EQ & SQ ● Employee Grievance- Causes, Procedure for Grievance redressal Employee welfare measures and Healthy & Safety Measures.
4	Trends In Human Resource Management
	<ul style="list-style-type: none"> ● HR in changing environment: Competencies- concept, classification Learning organizations- Concept, Creating an innovative organization, Innovation culture- Concept, Need, Managerial role.

<ul style="list-style-type: none"> ● Trends in Human Resource Management,: Employee Engagement- Concept, Types Human resource Information System (HRIS) – Concept, Importance, Changing patterns of employment. ● Challenges in Human Resource Management: Employee Empowerment, Workforce Diversity. Inclusion in the workplace, Attrition, Downsizing, Employee Absenteeism, Work life Balance, Sexual Harassment at work place, Domestic and International HR Practices, Millennial (Gen Y), Competency Mapping, Human Resource Management during a Pandemic.

Marketing Research Paper – I

Sr. No.	Modules / Units
1	Introduction to Marketing Research
	<ul style="list-style-type: none"> a. Marketing Research- Definition, features, functions, significance of Marketing Research in marketing decision making, limitations of Marketing Research b. Steps in Marketing Research, Ethics in Marketing Research, Career options in Marketing Research, Qualities of a good Marketing Research professional c. Marketing Information System- Definition, components, essentials of a good MIS, Key Performance Indicator (KPI) Dashboards- concept and examples, Concept of Decision Support System- Components , importance Data Mining- concept, importance
2	Planning Research
	<ul style="list-style-type: none"> a. Research Design- concept, importance, types Hypothesis- concept, types, importance

	<p>b. Questionnaire- concept, types of questions, steps in the preparation of questionnaire, essentials of a good questionnaire</p> <p>c. Sampling- concept, terms in sampling, techniques of sampling, essentials of good sampling</p>
3	Data Collection
	<p>a. Primary data-concept, merits, demerits, methods</p> <p>b. Secondary data- concept, merits, demerits, sources</p> <p>c. Qualitative and Quantitative research- concept, features, Qualitative v/s Quantitative research</p> <p>Integrating technology in data collection, methods- (online surveys, hand held devices, text messages, social networking), importance</p>
4	Data Processing, Analysis, Reporting
	<p>a. Stages in Data processing</p> <p>Editing- meaning, objectives, types</p> <p>Coding- meaning, guidelines</p> <p>Classification- meaning, methods</p> <p>Tabulation- meaning, methods</p> <p>b. Data Analysis & Interpretation</p> <p>Data Analysis- meaning, steps, use of statistical tools (SPSS, SAS, MS EXCEL, MINITAB)</p> <p>Data Interpretation- meaning, importance, stages</p> <p>c. Report Writing- concept, types, contents, essentials, use of visual aids in research report</p>

Marketing Research Paper – II

Sr. No.	Modules / Units
1	Applications of Marketing Research-I
	<p>a. Product Research- concept, areas, steps in new product development Product Testing & Test Marketing- concept, methods</p> <p>b. Brand Research- concept, components of a Brand, importance of brand research Packaging Research- concept, importance</p> <p>c. Price Research- concept, factors influencing pricing, importance of price research, methods of price research</p>
2	Applications of Marketing Research-II

	<p>a. Physical Distribution research- concept, types of distribution channels, Supply Chain Management- concept, components of supply chain management, importance of physical distribution research</p> <p>b. Promotion Research- concept, elements of promotion, importance of promotion research Advertising Research- concept, scope, pre & post testing methods of advertising effectiveness</p> <p>c. Consumer Research- concept, objectives, methods. Customer experience management- Importance. Motivation Research- concept, importance</p>
3	Applications of Marketing Research-III
	<p>a. Sales Research- concept, significance, scope/areas</p> <p>b. Rural Marketing Research-concept, features of Indian rural market, sources of data, research tools, do's and don'ts in rural Marketing Research</p> <p>c. Global Marketing Research- concept, factors affecting Global Marketing , need and scope of Global Marketing Research</p>
4	Managing Marketing Research
	<p>a. Organizing Marketing Research activity- factors involved in organizing Marketing Research activity, methods of organizing Marketing Research activity, In house marketing department,--structure, merits , demerits</p> <p>b. Professional Marketing Research agencies- structure, merits, demerits, professional standards</p> <p>c. Prominent Marketing Research agencies- HTA, ORG, IMRB, NCAER, Nielson, Marketing Research during a Pandemic.</p>

Mcom I Business Ethics and CSR

SN	Modules/ Units
1	Introduction to Business Ethics
	<ul style="list-style-type: none"> ● Business Ethics – Concept, Characteristics, Importance and Need for business ethics. Indian Ethos, Ethics and Values, Work Ethos. ● Sources of Ethics, Concept of Corporate Ethics, code of Ethics-Guidelines for developing code of ethics, Ethics Management Programme, Ethics Committee. ● Various approaches to Business Ethics - Theories of Ethics- Friedman's Economic theory, Kant's Deontological theory, Mill & Bentham's Utilitarianism theory

	<ul style="list-style-type: none"> ● Gandhian Approach in Management and Trusteeship, Importance and relevance of trusteeship principle in Modern Business, Gandhi's Doctrine of Satya and Ahimsa, Emergence of new values in Indian Industries after economic reforms of 1991
2	Indian Ethical Practices and Corporate Governance
	<ul style="list-style-type: none"> ● Ethics in Marketing and Advertising, Human Resources Management, Finance and Accounting, Production, Information Technology, Copyrights and Patents ● Corporate Governance: Concept, Importance, Evolution of Corporate Governance, Principles of Corporate Governance, Elements of Good Corporate Governance, Failure of Corporate Governance and its consequences ● Regulatory Framework of Corporate Governance in India, SEBI Guidelines and clause 49, Changing roles of corporate Boards. ● Ethical Decision Making- Concept, Simon Decision Making Model, Characteristics of good decision making.
3	Introduction to Corporate Social Responsibility
	<ul style="list-style-type: none"> ● Corporate Social Responsibility: Concept, Scope & Relevance and Importance of CSR in Contemporary Society. ● Corporate philanthropy, Models for Implementation of CSR, Drivers of CSR, Prestigious awards for CSR in India. ● CSR and Indian Corporations- Legal Provisions and Specification on CSR, Future of CSR in India. ● Role of NGO's and International Agencies in CSR, Integrating CSR into Business
4	Environmental CSR and CSR Policy
	<ul style="list-style-type: none"> ● CSR and environmental concerns, CSR and Sustainable Development, CSR through Triple Bottom Line in Business ● Environmental CSR- Concept, Role of Business Firm in Environmental CSR ● Designing CSR Policy- Factors influencing CSR Policy, Role of HR Professionals in CSR ● Global Recognitions of CSR- ISO- 14000-SA 8000 – AA 1000, ISO 45000, Codes formulated by UN Global Compact – UNDP, Global Reporting Initiative; major codes on CSR.

SN	Modules/ Units
1	Introduction to Electronic Commerce –Evolution and Models
	<ul style="list-style-type: none"> ● Evolution of E-Commerce-Introduction, History/Evolution of Electronic Commerce, Roadmap of E-Commerce in India, Main activities, Functions and Scope of E-Commerce. ● Benefits and Challenges of E-Commerce, Reverse logistics , E-Commerce Business Strategies for Marketing, Sales and Promotions. ● Business Models of E-Commerce- Characteristics of Business to Business(B2B), Business to Consumers (B2C), Business to Government (B2G) ● Concepts of other models of E-commerce. Business to Consumer E-Commerce process, Business to Business E-Commerce- Need and Importance, alternative models of B2B E-Commerce, E-Commerce Sales Product Life Cycle (ESLC) Model
2	World Wide Web and Electronic Payment System
	<ul style="list-style-type: none"> ● World Wide Web-Reasons for building own website, Benefits of Website, Registering a Domain Name, Role of web site in B2C E-commerce; push and pull approaches; Web site design principles. ● EDI and paperless trading; Pros & Cons of EDI; Related new technologies use in E-commerce, Applications of E-commerce and E-enterprise - Applications to Customer Relationship Management- Types of E-CRM, Functional Components of E-CRM, Comparison between Conventional and E-organisation. ● Electronic Payment System-Characteristics of E-payment system, SET Protocol for credit card payment, prepaid e-payment service, post-paid E-payment system, Types of payment systems. ● Operational, credit and legal risks of E-payment system, Risk management options for E-payment systems, Set standards / principles for E-payment
3	E-marketing and E-Services
	<ul style="list-style-type: none"> ● E-Marketing- Scope and Techniques of E-Marketing, Traditional web promotion; Web counters; Web advertisements, Role of Social media. ● E-Commerce Customer Strategies for Purchasing and support activities, Planning for Electronic Commerce and its initiatives, Justify an Internet business. ● E-Services in Banking, Hospitality, Healthcare, Education, Insurance, Tourism. ● E-Government Services, Government E-Market Place.

SN	Modules/ Units
4	Legal and Regulatory Environment and Security issues of E-commerce
	<ul style="list-style-type: none"> ● Introduction to Cyber Laws-World Scenario, Cyber-crime& Laws in India and their limitations, Hacking, Web Vandals, E-mail Abuse, Software Piracy and Patents. ● Taxation Issues, Protection of Cyber Consumers in India and CPA 1986, Importance of Electronic Records as Evidence. ● Security Issues in E-Commerce- Risk management approach to Ecommerce Security - Types and sources of threats, Protecting electronic commerce assets and intellectual property. ● Security Tools, Client server network security, Electronic signature, Encryption and concepts of public and private key infrastructure

Research Methodology for Business

SN	Modules/ Units
1	Introduction to Research & its Process
	<ul style="list-style-type: none"> ● Features and Importance of research in business, Objectives and Types of research- Basic, Applied, Descriptive, Analytical and Empirical Research. Stages in Research Process. ● Formulation of research problem, Research Design, significance of Review of Literature ● Hypothesis: Formulation, Sources, Importance and Types ● Sampling: Significance, Methods, Factors determining sample size
2	Data Collection & Data Processing
	<ul style="list-style-type: none"> ● Data Collection: Primary data: Observation, Experimentation, Interview, Schedules, Survey, Limitations of Primary data, Secondary data: Sources and Limitations, ● Factors affecting the choice of method of data collection. ● Questionnaire: Types, Steps in Questionnaire Designing, Essentials of a good questionnaire ● Data Processing: Significance in Research, Stages in Data Processing: Editing, Coding, Classification, Tabulation, Graphic Presentation
3	Statistical Analysis & Research Reporting
	<ul style="list-style-type: none"> ● Statistical Analysis: Tools and Techniques, Measures of Central Tendency, Measures of Dispersion, Correlation Analysis and Regression Analysis. ● Testing of Hypothesis – <ul style="list-style-type: none"> ▪ Parametric Test-t test, f test, z test ▪ Non-Parametric Test -Chi square test, ANOVA, Factor Analysis ● Interpretation of data: significance and Precautions in data interpretation ● Research Report Writing: Importance, Essentials, Structure/ layout, Types., Footnotes & Bibliography ● References and Citation Methods: <ul style="list-style-type: none"> ▪ APA (American Psychological Association)

	<ul style="list-style-type: none"> ▪ CMS (Chicago Manual Style) ▪ MLA (Modern Language Association)
4	Modern Practices & Applications of research in functional areas of Business
	<ul style="list-style-type: none"> ● Modern Practices: Ethical Norms in Research, Plagiarism, Role of Computers in Research ● SPSS, MS Excel: Data Collection, Data Processing (Editing), Data Analysis: Graphs ● Applications of research in various functional areas of business: <ol style="list-style-type: none"> 1. Operations research- Definition, Characteristics of Operations research, Operations research techniques, Areas of application, Limitations of Operations research 2. Marketing Research- Definition, Objective of Marketing research, Significance of Marketing research, Areas of application, Types of MR: Product research, Sales research, Promotion research, Consumer research, MIS 3. Finance- Significance of research financial management, Applications of research in various areas like Cash Management, Asset Management, Budgeting 4. HR Research- Features, Objectives & Techniques, Process of HR Research, Need of HR Research

Strategic Management

SN	Modules/ Units
1	Introduction to Strategic Management
	<ul style="list-style-type: none"> ● Concept of Strategic Management, Strategic Management Process, Vision, Mission and Goals, Benefits and Risks of Strategic Management. ● Levels of Strategies: Corporate, Business and Operational Level Strategy

	<ul style="list-style-type: none"> ● Functional Strategies: Human Resource Strategy, Marketing Strategy, Financial Strategy, Operational Strategy ● Business Environment: Components of Environment- Micro and Macro and Environmental Scanning, ETOP-Environmental Threat and Opportunity Profile.
2	Strategy Formulation, Implementation and Evaluation
	<ul style="list-style-type: none"> ● Strategic Formulation: Stages and Importance, Formulation of Alternative Strategies: Mergers, Acquisitions, Takeovers, Joint Ventures, Diversification, Turnaround, Divestment and Liquidation. ● Strategic Analysis and Choice: Issues and Structures, Corporate Portfolio Analysis- BCG Matrix, GE Nine Cell Matrix, Hofer's Matrix, Porters five force model, McKinsey 7S model. ● Strategic Implementation: Steps, Importance and Problems, Resource Allocation- Importance & Challenges ● Strategic Evaluation and Control: Importance, Limitations and Techniques, Budgetary Control: Advantages & Limitations
3	Business and Corporate Strategies
	<ul style="list-style-type: none"> ● Business Process Outsourcing and Knowledge Process Outsourcing in India: Concept and Strategies. Reasons for growing BPO and KPO businesses in India. ● Reengineering Business Processes- Business Reengineering, Process Reengineering and Operational Reengineering ● Disaster Management: Concept, Problems and Consequences of Disasters, Strategies for Managing and Preventing disasters and Cope up Strategies. ● Corporate Restructuring Strategies: Concept, Need and Forms, Corporate Renewal Strategies: Concept, Internal and External factors and Causes. Digitalization & Corporate Strategy- The evolving Business Strategy: Importance & Limitations
4	Designing Global & Local Strategies
	<ul style="list-style-type: none"> ● Start-up Business Strategies: Make in India and its Challenges, Government initiatives in Make in India Model with reference to National manufacturing, Contribution of Make in India Policy in overcoming industrial sickness ● Strategic Alliance: Concept, Types, Importance, Problems of Indian Strategic Alliances and International Businesses, Public Private Participation: Importance, Problems and Governing Strategies of PPP Model. ● Globalisation Strategy: Concept, factors that push for globalization, benefits of Globalisation, framework for global strategy with suitable examples (Sony, Philips)

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|--|--|
| | <ul style="list-style-type: none">● Localisation Strategy: Meaning, Importance of localization strategy in business, factors that push for localization, benefits of localization. |
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J.B.S.P.Sanstha's

**Changu Kana Thakur Arts, Commerce and Science
College,
New Panvel
(Autonomous)**

**Bachelor of Commerce (B.Com)
Programme
F.Y.B.Com.
Two Semesters
*Course Structure***

Under Choice Based Credit System

To be implemented from Academic Year- 2022-2023

Department of Accountancy

Batchler of Commerce (B.Com) Programme
Under Choice Based Credit, Grading and Semester System

Course Structure

FYBCOM

(To be implemented from Academic Year- 2022-2023)

No. of Courses	Semester I	Credits	No. of Courses	Semester II	Credits
1	Core Courses (CC)		1	Core Courses (CC)	
1	Accountancy and Financial Management - 1	03	1	Accountancy and Financial Management - 2	03
Total Credits		03	Total Credits		03

**Revised Syllabus of F.Y. B.Com Courses of B.Com. Programme at
Semester I
with effect from the Academic Year 2022-2023**

**Elective Courses (EC)
Discipline Specific Elective (DSE) Courses**

1. Accountancy and Financial Management - I

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Ind AS 16 – i.e. Property, Plant and Equipment Depreciation – Straight Line and Written Down Value Method	15
2	Final Accounts of Limited Liability Partnership [LLP]	15
3	Departmental Accounts	15
4	Bank Reconciliation Statement (BRS)	15
Total		60

**UG - Course Outcomes (Cos)
Semester – I**

Name of the Programme B.Com	Programme Coordinator	Head of the Department
	Dr.S.B.Yadav	Dr. S.B. Yadav
Subject: Accountancy and Financial Management – I	Course: Accountancy and Financial Management – I Course code - UCM1AF1	Course Coordinator – Dr.S.B. Yadav
	After completing the course, students will be able to;	Bloom Taxonomy Level (BTL)
CO1	Define the accounting standards.	I. Remembering
CO2	Solve LLP concern final account.	III. Applying
CO3	Solve departmental final account.	VI. Creating
CO4	Compare Bank Balance and Cash Balance	V. Evaluating

Sr. No.	Modules / Units
1	Ind AS 16 - i.e. Property, Plant and Equipment
	<ul style="list-style-type: none"> ● Ind AS 16 – i.e. Property, Plant and Equipment ● Depreciation – Problems based on Straight Line and Written Down Value Method
2	Final Accounts of Limited Liability Partnership [LLP]
	<ul style="list-style-type: none"> ● Statutory provisions ● Final accounts of LLP with all standard adjustments.
3	Departmental Accounts
	<ul style="list-style-type: none"> ● Meaning of Departmental Accounts ● Basis of Allocation of Expenses and Incomes/Receipts ● Inter Departmental Transfer : at Cost Price and Invoice Price ● Stock Reserve ● Departmental Trading and Profit & Loss Account and Balance Sheet
4	Bank Reconciliation Statement (BRS)
	<ul style="list-style-type: none"> ● Meaning and use of BRS ● Practical problem based on BRS

**Revised Syllabus of F.Y.B.COM Courses of
B.Com. Programme
At Semester II
With Effect from the Academic Year 2022-2023**

**Elective Courses (EC)- Discipline Specific Elective(DSE) Courses
2. Accountancy and Financial Management II**

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Accounting from Incomplete Records	15
2	Consignment Accounts	15
3	Branch Accounts	15
4	Inventory Valuation	10
5	Accounting In Computerized Environment	05
Total		60

**UG - Course Outcomes (Cos)
Semester – II**

Name of the Programme B.Com	Programme Coordinator – Dr.S.B.Yadav	Head of the Department Dr.S.B. Yadav
Subject: Accountancy and Financial Management – I	Course: Accountancy and Financial Management – I Course code – UCM2AF2	Course Coordinator – Dr.S.B. Yadav
	After completing the course, students will be able to;	Bloom Taxonomy Level (BTL)
CO1	Define the conversion method in incomplete records of accounting.	I. Remembering
CO2	Find del-credet commission in consignment accounts.	I. Remembering
CO3	Construct the Branch Profit or Loss	VI. Creating
CO4	Build new company in tally ERP 9.	VI. Creating

Sr. No.	Modules / Units
1	Accounting from Incomplete Records
	<ul style="list-style-type: none"> ● Introduction ● Problems on preparation of final accounts of Proprietary Trading Concern (conversion method)
2	Consignment Accounts
	<ul style="list-style-type: none"> ● Meaning of Consignment ● Accounting for consignment transactions ● Valuation of stock ● Invoicing of goods at higher price(excluding overriding commission, normal/abnormal losses)
3	Branch Accounts
	<ul style="list-style-type: none"> ● Meaning/ Classification of branch ● Accounting for Dependent Branch not maintaining full books. ● Debtors method Stock and debtors method.
4	Inventory Valuation
	<ul style="list-style-type: none"> ● Meaning of inventories Cost for inventory valuation ● Inventory systems : Periodic Inventory system and Perpetual Inventory System Valuation: Meaning and importance ● Methods of Stock Valuation as per Ind AS – 2 : ● FIFO and Weighted Average Method Computation of valuation of inventory as on balance sheet date: If inventory is taken on a date after the balance sheet or before the balance sheet
5	Accounting In Computerized Environment
	<ul style="list-style-type: none"> ● Manual vs Computerized Accounting System ● Tally ERP 9 ● Creation of company ● Group ● Ledger

Reference Books

Reference Books

Accountancy and Financial Management

- Introduction to Accountancy by T. S. Grewal, S. Chand and Company (P) Ltd., New Delhi Advance Accounts by Shukla & Grewal, S. Chand and Company (P) Ltd., New Delhi
- Advanced Accountancy by R. L Gupta and M Radhaswamy, S. Chand and Company (P) Ltd., New Delhi
- Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial Accounting by LesileChandwichk, Pentice Hall of India Adin Bakley (P) Ltd.
- Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishing Co. Ltd., Mumbai.
- Financial Accounting by P. C. Tulsian, Pearson Publications, New Delhi Accounting Principles by Anthony, R.N. and Reece J.S., Richard Irwin Inc.
- Financial Accounting by Monga, J.R. Ahuja, GirishAhujaandShehgal Ashok, Mayur Paper Back
- Compendium of Statement & Standard of Accounting, ICAI.
- Indian Accounting Standards, Ashish Bhattacharya, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial Accounting by Williams , Tata Mc. Grow Hill & Co. Ltd., Mumbai
- Company Accounting Standards by ShrinivasanAnand, Taxman. Financial Accounting by V. Rajasekaran, Pearson Publications, New Delhi. Introduction to Financial Accounting by Horngren, Pearson Publications.
- Financial Accounting by M. Mukherjee.M. Hanif. Tata McGraw Hill Education Private Ltd; New Delhi



J.B.S.P.Sanstha's

**Changu Kana Thakur Arts, Commerce and Science College,
New Panvel (Autonomous)
Question Paper Pattern
(Internal Assessment- 40 Marks)**

1. 20 Marks Class Test
2. 10 Marks Assignment (Internal Tool)
3. 10 Marks Quiz (Internal Tool)

1. Maximum Marks: 20 marks [Class Test]

Questions to be set: 20

Duration: 20 Minutes

Question No	Particular	Marks
Q-1	Objective Questions Students to answer all 20 questions (<i>*Multiple choice/ True or False/ Match the columns/ Fill in the blanks</i>)	20 Marks

2. 10 Marks Case Study (Internal Tool)

Case Study for 10 Marks Time Limit 30 Minutes

3. 10 Marks Quiz (Internal Tool)

Quiz of 10 Marks on Google Form 10 quiz questions of 1 mark each to be asked based on the course work. Time limit 10 Minutes.

Question Paper Pattern (Practical Courses)

Maximum Marks: 60

Questions to be set: 04

Duration: 2 Hrs.

All Questions are Compulsory Carrying 15 Marks each.

Question No	Particular	Marks
Q-1	Practical Question	15 Marks
	OR	
Q-1	Practical Question	15 Marks
Q-2	Practical Question	15 Marks
	OR	
Q-2	Practical Question	15 Marks
Q-3	Practical Question	15 Marks
	OR	
Q-3	Practical Question	15 Marks
Q-4	(a) Theory Question	7 Marks
	(b) Theory Question	8 Marks
	OR	
Q-4	Short Notes (Any three out of five)	15 Marks

Note:

Full length question of 15 marks may be divided into two sub questions of 08 and 07 marks.



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'Best College Award' by University of Mumbai

Program: B.Com.

Revised Syllabus of S.Y.B.Com. – Semester IIIrd and IVth
Accountancy and Financial Management
Paper III and IV
Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2020-21

**Choice Based Credit Grading and Semester System (CBCGS)
S.Y.B. Com. Accountancy and Financial Management Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER III**

Course Code	Unit	Topics	Credits	L / Week
UCM3FA3	I	Partnership Final Accounts based on Adjustment of Admission or Retirement/Death of a Partner during the year	4	15
	II	Piecemeal Distribution of Cash		15
	III	Amalgamation of Firms		15
	IV	Accounting for Hire Purchase		15

**Choice Based Credit Grading and Semester System (CBCGS)
S.Y.B. Com. Accountancy and Financial Management Syllabus
To be implemented from the Academic year 2020-2021
SEMESTER IV**

Course Code	Unit	Topics	Credits	L / Week
UCM4FA4	I	Introduction to Company Accounts	4	15
	II	Redemption of Preference Shares		15
	III	Ascertainment and Treatment of Profit Prior to Incorporation		15
	IV	Accounting with the use of Accounting Software		15

Semester - III– Accountancy and Financial Management - III

Sr. No.	Modules / Units
1	Partnership Final Accounts based on Adjustment of Admission or Retirement/Death of a Partner during the year
	<p>i) Simple final accounts questions to demonstrate the effect on final Accounts when a partner is admitted during the year or when partner Retires / dies during the year.</p> <p>ii) Allocation of gross profit prior to and after admission / retirement / death when stock on the date of admission / retirement is not given and apportionment of other expenses based on time / Sales/other given basis.</p> <p>iii) Ascertainment of gross profit prior to and after admission/retirement/death when stock on the date of admission/retirement is given and apportionment of other expenses based on time / Sales / other given basis Excluding Questions where admission / retirement / death takes place in the same year.</p>
2	Piecemeal Distribution of Cash
	<p>i) Excess Capital Method only</p> <p>ii) Asset taken over by a partner</p> <p>iii) Treatment of past profits or past losses in the Balance sheet</p> <p>iv) Contingent liabilities / Realization expenses / amount kept aside for expenses and adjustment of actual</p> <p>v) Treatment of secured liabilities</p> <p>vi) Treatment of preferential liabilities like Govt. dues / labour dues etc. Excluding : Insolvency of partner and Maximum Loss Method</p>
3	Amalgamation of Firms
	<p>i) Realization method only</p> <p>ii) Calculation of purchase consideration</p> <p>iii) Journal / ledger accounts of old firms</p> <p>iv) Preparing Balance sheet of new firm</p> <p>v) Adjustment of goodwill in the new firm</p> <p>vi) Realignment of capitals in the new firm by current accounts / cash or a combination thereof Excluding Common transactions between the amalgamating firms</p>
4	Accounting for Hire Purchase
	<p>Meaning</p> <p>Calculation of interest Accounting for hire purchase transactions by asset purchase method based on full cash price</p> <p>Journal entries, ledger accounts and disclosure in balance sheet for hirer and vendor (excluding default, repossession and calculation of cash price)</p>

Semester – IV – Accountancy and Financial Management - IV

Sr. No.	Modules / Units
1	Introduction to Company Accounts
	<p>Introduction of basic terms: Types of companies, nature and formation of companies, Shares, Debentures, Share Capital, Reserves and surplus, types of assets and liabilities, dividend, format of Balance Sheet</p> <p>Issue of shares: Different modes IPO, Private Placements, Preferential, Rights, ESO, SWEAT and ESCROW account, Issue of shares at par, premium and discount, Under subscription and Over subscription of shares, forfeiture and reissue of forfeited shares, issue of shares for consideration other than cash. (Practical problem)</p> <p>Issue of Debenture and Redemption ; At par, Premium, discount types of Debentures (no practical problems on redemption of debentures)</p>
2	Redemption of Preference Shares
	<p>Redemption of Preference: Provision of the Companies Act for redemption of Preference Shares (Sec 55 of the Companies Act, 2013), Companies (Share and Debentures) Rules. Methods of Redemption of fully paid up Preference Shares as per Companies Act, 2013: The proceed of a fresh issue of shares, the capitalisation of undistributed profits and a combination of both, calculation of minimum fresh issue to provide the fund for redemption, (Question on journal entries and/or Balance Sheet) Note: Companies governed by Section 133 of the Companies Act, 2013 and comply with the accounting standards prescribed for them. Hence, the balance in security premium account not to be utilised for premium payable on redemption of preference shares.</p>
3	Ascertainment and Treatment of Profit Prior to Incorporation
	<p>(i) Principles for ascertainment Preparation of separate combined, columnar Profit and Loss A/c including different basis of allocation of expenses and income and Balance sheet</p>
4	Accounting with the use of Accounting Software
	<p>Advance accounting & Inventory Voucher: Purchase and Sales order, reorder , delivery notes , Budgeting Control, Invoice product invoice and service invoice Shortcut keys : special combination, special functional key combination. Management Information System (MIS)</p>



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'College with Potential for Excellence' Status Awarded by UGC
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Program: B.Com.

Revised Syllabus of
S.Y.B.Com.

Accountancy and Financial Management
Financial Accounting and Auditing
Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2020-21

Semester – III

**Revised Syllabus of Courses of B.Com. Programme at Semester III
with Effect from the Academic Year 2020-2021**

Elective Courses (EC)

Discipline Specific Elective (DSE) Courses

**Financial Accounting and Auditing – Introduction to
Management Accounting
Modules at a Glance**

Modules at a Glance Sr. No.	Modules	No. of Lectures
1	Introduction to Management Accounting	10
2	Ratio Analysis and Interpretation	15
3	Cash Flow Statement	10
4	Capital Budgeting	10
Total		45

Sr. No.	Modules / Units
1	Introduction to Management Accounting
	<p>A. Introduction to Management Accounting – Meaning, Nature, Scope, Functions, Decision Making Process, Financial Accounting V/s Management Accounting</p> <p>B. Analysis and Interpretation of Financial Statements</p> <p>i) Study of Balance sheet and Income statement / Revenue statements in vertical form suitable for analysis</p> <p>ii) Relationship between items in Balance Sheet and Revenue statement</p> <p>iii) Tools of analysis of Financial Statements (i) Trend analysis (ii) Comparative Statement (iii) Common Size Statement</p> <p>Note : (i) Problems based on trend analysis (ii) Short Problems on Comparative and Common sized statements</p>
2	Ratio Analysis and Interpretation
	<p>(Based on Vertical Form of Financial statements) – Meaning, classification, Du Point Chart, advantages and Limitations)</p> <p>A. Balance Sheet Ratios :</p> <p>i) Current Ratio</p> <p>ii) Liquid Ratio</p> <p>iii) Stock Working Capital Ratio</p> <p>iv) Proprietary Ratio</p> <p>v) Debt Equity Ratio</p> <p>vi) Capital Gearing Ratio</p> <p>B. Revenue Statement Ratio:</p> <p>i) Gross Profit Ratio</p> <p>ii) Expenses Ratio</p> <p>iii) Operating Ratio</p> <p>iv) Net Profit Ratio</p> <p>v) Net Operating Profit Ratio</p> <p>vi) Stock Turnover Ratio</p> <p>A. Combined Ratio :</p> <p>i) Return on capital employed (Including Long Term Borrowings)</p> <p>ii) Return on proprietor's Fund (Shareholders Fund and Preference Capital)</p> <p>iii) Return on Equity Capital</p> <p>iv) Dividend Pay-out Ratio</p> <p>v) Debt Service Ratio</p> <p>vi) Debtors Turnover</p> <p>vii) Creditors Turnover</p> <p>(Practical Question on Ratio Analysis)</p>
3	Cash Flow Statement
	Preparation of Cash Flow Statement with reference to Ind AS-7 (Indirect method only)
4	Capital Budgeting
	<p>A. Introduction:</p> <p>B. The classification of capital budgeting projects</p> <p>C. Capital budgeting process</p> <p>D. Capital budgeting techniques - Payback Period, Accounting Rate of Return, Net Present Value, The Profitability Index, Discounted Payback. (Excluding calculation of cash flow)</p>

Reference Text :

1. Cost and Management Accounting - Colinn Dury 7th Edition
2. Cost and Management Accounting- Dbarshi Bhattacharyya pearson Publications 2013 edition
3. Management Accounting - M.Y.Khan
4. Management Accounting - I.M.pandey

**Revised Syllabus of Courses of B.Com. Programme at Semester IV
with Effect from the Academic Year 2020-2021**

Elective Courses (EC)

Discipline Specific Elective (DSE) Courses

**Financial Accounting and Auditing – Introduction to
Auditing**

Modules at a Glance Sr. No.	Modules	No. of Lectures
1	Introduction to Auditing	10
2	Audit Planning, Procedures and Documentation	10
3	Auditing Techniques and Internal Audit Introduction	15
4	Auditing Techniques : Vouching & Verification	10
Total		45

Sr. No.	Modules /Units
1	Introduction to Auditing
	<p>A. Basics – Financial Statements, Users of Information, Definition of Auditing, Objectives of Auditing, Inherent limitations of Audit, Difference between Accounting and Auditing, Investigation and Auditing.</p> <p>B. Errors & Frauds – Definitions, Reasons and Circumstances, Types of Error, Types of frauds, Risk of fraud and Error in Audit, Auditors Duties and Responsibilities in case of fraud.</p> <p>C. Principles of Audit, Materiality, True and Fair view</p> <p>D. Types of Audit – Meaning, Advantages, Disadvantages of Balance sheet Audit, Interim Audit, Continuous Audit, Concurrent Audit and Annual Audit, Statutory Audit</p> <p>E. Audit Of ledger – General Consideration , Scrutiny of ledger of Assets, personal , revenue accountants</p>
2	Audit Planning, Procedures and Documentation
	<p>A. Audit Planning – Meaning, Objectives, Factors to be considered, Sources of obtaining information, Discussion with Client, Overall Audit Approach</p> <p>B. Audit Program – Meaning, Factors, Advantages and Disadvantages, Overcoming Disadvantages, Methods of Work, Instruction before commencing Work, Overall Audit Approach.</p> <p>C. Audit Working Papers – Meaning, importance, Factors determining Form and Contents, Main Functions / Importance, Features, Contents of Permanent Audit File, Temporary Audit File, Ownership, Custody, Access of Other Parties to Audit Working Papers, Auditors Lien on Working Papers, Auditors Lien on Client’s Books.</p>
3	Auditing Techniques and Internal Audit Introduction
	<p>A. Test Check – Test Checking Vs Routing Checking, test Check meaning, features, factors to be considered, when Test Checks can be used, advantages, disadvantages, precautions.</p> <p>B. Audit Sampling – Audit Sampling, meaning, purpose, factors in determining sample size – Sampling Risk, Tolerable Error and expected error, methods of selecting Sample Items Evaluation of Sample Results auditors Liability in conducting audit based on Sample</p> <p>C. Internal Control – Meaning and purpose, review of internal control, advantages, auditors duties, review of internal control, Inherent Limitations of Internal control, internal control samples for sales and debtors, purchases and creditors, wages and salaries. Internal Checks Vs Internal Control, Internal Checks Vs Test Checks.</p> <p>D. Internal Audit : Meaning, basic principles of establishing Internal audit, objectives, evaluation of internal Audit by statutory auditor, usefulness of Internal Audit, Internal Audit Vs External Audit, Internal Checks Vs Internal Audit</p>
4	Auditing Techniques : Vouching & Verification
	<p>A. Audit of Income : Cash Sales, Sales on Approval, Consignment Sales, Sales Returns Recovery of Bad Debts written off, Rental Receipts, Interest and Dividends Received Royalties Received</p> <p>B. Audit of Expenditure : Purchases, Purchase Returns, Salaries and Wages, Rent, Insurance Premium, Telephone expense Postage and Courier, Petty Cash Expenses, Travelling Commission Advertisement, Interest Expense</p> <p>C. Audit of Assets Book Debts / Debtors, Stocks – Auditors General Duties; Patterns, Dies and Loose Tools, Spare Parts, Empties and Containers Quoted Investments and Unquoted Investment Trade Marks / Copyrights Patents Know-How Plant and Machinery Land and Buildings Furniture and Fixtures</p> <p>D. Audit of Liabilities : Outstanding Expenses, Bills Payable Secured loans Unsecured Loans, Contingent Liabilities</p>

Reference Text :

1. B.N. Tondan, A Hand book on Practical Auditing,
2. Ravinder Kumar and Virendra Sharma, Auditing: Principles and Practices
3. Varsha Ainapure and Mukund Ainapure, Auditing and Assurance
4. T. J. Rana, Auditing -1

Scheme of Examination:

The performance of the learners will be evaluated in two components. One component will be the Internal Assessment component carrying 25% marks and the second component will be the Semester End Examination component carrying 75% marks.

Internal Assessment:

The Internal Assessment will consist of one class test of 20 marks for each course and 5 Marks for active participation and overall conduct. The question paper pattern will be shown as below:

**Question Paper Pattern
(Internal Assessment)**

1. Class Test:-

Maximum Marks: 20 marks

Questions to be set: 02

Duration: 40 Minutes

Question No	Particular	Marks
Q-1	Objective Questions Students to answer 10 sub questions out of 15 sub questions. <i>(*Multiple choice/ True or False/ Match the columns/ Fill in the blanks)</i> OR Objective Questions A) Sub Questions to be asked 08 and to be answered any 05 B) Sub Questions to be asked 08 and to be answered any 05 <i>(*Multiple choice/ True or False/ Match the columns/ Fill in the blanks)</i>	10 Marks
Q-2	Concept based short questions Students to answer 5 sub questions out of 8 sub questions.	10 Marks

2. Active participation and overall conduct..... 5 Marks

Question Paper Pattern (External Assessment)

Maximum Marks: 75

Questions to be set: 05

Duration: 02.30 Hrs.

Question No	Particular	Marks
Q-1	Full Length Practical Question OR	15 Marks
Q-1	Full Length Practical Question	15 Marks
Q-2	Full Length Practical Question OR	15 Marks
Q-2	Full Length Practical Question	15 Marks
Q-3	Full Length Practical Question OR	15 Marks
Q-3	Full Length Practical Question	15 Marks
Q-4	Full Length Practical Question OR	15 Marks
Q-4	Full Length Practical Question	15 Marks
Q-5	A) Theory questions B) Theory questions OR	07 Marks 08 Marks
Q-5	Short Notes To be asked 05 To be answered 03	15 Marks

Note:

Practical question of 15 marks may be divided into two sub questions of 7/8 and 10/5 Marks.



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'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.Com.

**Revised Syllabus of T.Y.B.Com. – Semester V and VI
FINANCIAL ACCOUNTING AND AUDITING
(COST ACCOUNTING)**

Choice Based Credit & Grading System (75:25)

w.e.f. Academic Year 2021-22

**TYBCOM/SEM-V & VI/ FINANCIAL ACCOUNTING AND AUDITING PAPER – VIII AND X/SYLLABUS/QP
PATTERN/FROM-2021-22**

Sr. No.	Heading	Particulars
1	Title of Course	Financial accounting and auditing (cost accounting)
2	Eligibility for Admission	S.Y.BCOM PASSED
3	Passing marks	40%
4	Ordinances/Regulations (if any)	--
5	No. of Semesters	V AND VI
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Preamble

In new era our accounting statements preparation also changed and need to be improved. New methods of accounting have been emerging. So to make the students more train in the modern accounting environment this syllabus revision is must.

Objectives

SN	Objectives
1	To enhance the abilities of learners to develop the concept of Basic Terms of cost accounting
2	To enable the learners to understand classification of Cost and cost Sheet
3	To enable the learners to understanding Budgetary control and standard costing

Outcomes

SN	Outcomes
1	Learners will enhance or gain knowledge and understanding of the concept of Basic Terms of cost accounting
2	Learners will enhance or gain knowledge and understanding of the classification of Cost and cost Sheet
3	Learners will able to prepare various types of budget and application of standard costing.

For the subject of Financial accounting and Auditing (Cost Accounting) there shall be two papers for 60 lectures each comprising of six units of 10 Lectures each.

Semester-V

1. Paper-VIII Module-I will be for 10 Lectures
2. Paper-VIII Module-II will be for 10 Lectures
3. Paper-VIII Module-III will be for 10 Lectures
4. Paper-VIII Module-IV will be for 10 Lectures
- 5 Paper-VIII Module –V will be for 10 Lectures
- 6 Paper-VIII Module –VI will be for 10 Lectures

Semester-VI

1. Paper-X Module-I will be for 10 Lectures
2. Paper-X Module-II will be for 10 Lectures
- 3, Paper-X Module-III will be for 10 Lectures
4. Paper-X Module-IV will be for 10 Lectures
5. Paper-X Module –V will be for 10 Lectures
- 6, Paper-X Module –VI will be for 10 Lectures

Scheme of Examination for Each Semester:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

Each paper shall be of two and half hour duration.	
All questions are compulsory and will have internal options.	
Q-1	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
Q-2	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
Q-3	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
Q-4	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
Q-5	Two questions of theory Questions from all Module 15 M OR Short Notes out of 5 any 3 15 M

Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. FINANCIAL ACCOUNTING AND AUDITING
(COST ACCOUNTING)
Syllabus To be implemented from the Academic year 2021-2022
SEMESTER V

Course Code	Unit	Topics	Credits	L / Week
UCM5FA8	1	Introduction to Cost Accounting	4	10
	2	Material Cost		10
	3	Labour Cost		10
	4	Overheads		10
	5	Classification of Costs and Cost Sheet		10
	6	Reconciliation of cost and financial accounts		10

Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. FINANCIAL ACCOUNTING AND AUDITING
(COST ACCOUNTING)
Syllabus To be implemented from the Academic year 2021-2022
SEMESTER VI

Course Code	Unit	Topics	Credits	L / Week
UCM6FA10	1	Budgetary Control	4	10
	2	Contract Costing		10
	3	Process Costing		10
	4	Introduction to Marginal Costing		10
	5	Introduction to Standard Costing		10
	6	Some Emerging concepts of Cost accounting		10

T.Y.B.COM – FINANCIAL ACCOUNTING AND AUDITING
(COST ACCOUNTING – VIII)

Sr. No.	Modules / Units
1	Introduction to Cost Accounting
	(a) Objectives and scope of Cost Accounting (b) Cost centres and Cost units (c) Cost classification for stock valuation, Profit measurement, Decision making and control (d) Coding systems (e) Elements of Cost (f) Cost behaviour pattern, Separating the components of semi- variable costs
2	Material Cost
	(i) Procurement procedures—Store procedures and documentation in respect of receipts and issue of stock, Stock verification (ii) Inventory control —Techniques of fixing of minimum, maximum and reorder levels, Economic Order Quantity, ABC classification; Stocktaking and perpetual inventory (iii) Inventory accounting Note- Simple practical problems based on Calculation of EOQ, Raw Material Turnover ratio, Preparation of stock ledger and Valuation of Inventories, based on FIFO and Weighted average cost.
3	Labour Cost
	(i) Attendance and payroll procedures, Overview of statutory requirements, Overtime, Idle time and Incentives (ii) Labour turnover (iii) Utilisation of labour, Direct and indirect labour, Charging of labour cost, Identifying labour hours with work orders or batches or capital jobs (iv) Efficiency rating procedures (v) Remuneration systems and incentive schemes. Note- Simple practical problems based on Preparation of labour cost statement Remuneration and incentive systems based on Piece work plan, Haley Premium Plan, Rowan system, Gantt's Task
4	Overheads

**TYBCOM/SEM-V & VI/ FINANCIAL ACCOUNTING AND AUDITING PAPER – VIII AND X/SYLLABUS/QP
PATTERN/FROM-2021-22**

	<p>Functional analysis — Factory, Administration, Selling and Distribution Behavioural analysis — Fixed, Variable, Semi-variable cost</p> <p>Note-Simple practical problems on</p> <p>Departmentalization and apportionment of primary overheads, Computation of overhead rates including Machine overhead rates</p> <p>Basic concepts of treatment of over/under absorption of overheads- Direct Labour method and Prime Cost method</p>
5	Classification of Costs and Cost Sheet
	<p>Classification of costs, Cost of Sales, Cost Centre, Cost Unit, Profit Centre and Investment Centre</p> <p>Cost Sheet, Total Costs and Unit Costs, Different Costs for different purpose</p> <p>Note- Simple practical problems on preparation of cost sheet</p>
6	Reconciliation of cost and financial accounts
	Practical problems based on Reconciliation of cost and Financial accounts.

T.Y.B.COM – FINANCIAL ACCOUNTING AND AUDITING
(COST ACCOUNTING – X)

Sr. No.	Modules / Units
1	Budgetary Control
	<p>Concept, Types of Budget (Flexible, fixed, production, sales, cash and zero budget)</p> <p>Practical Problems only on Cash Budget</p>
2	Contract Costing
	<p>Progress payments, Retention money, Contract accounts, Accounting for material, Accounting for Tax deducted at source by the contractee, Accounting for plant used in a contract, treatment of profit on incomplete contracts, Contract profit and Balance sheet entries.</p> <p>Excluding Escalation clause</p> <p>Note- Simple practical problems</p>
3	Process Costing
	<p>Process loss, Abnormal Gains and Losses, Joint products and by-products. Excluding Equivalent units, Inter-process profit</p> <p>Note- Simple Practical problems Process Costing and joint and by-products</p>
4	Introduction to Marginal Costing
	<p>Marginal costing meaning, applications, advantages, limitations Contribution, Breakeven analysis, Margin of safety and profit volume graph. Note-Simple Practical problems based on Marginal Costing excluding decision making</p>
5	Introduction to Standard Costing
	<p>Various types of standards, Setting of standards, Basic concepts of Material and Labour variance analysis.</p> <p>Note-Simple Practical problems based on Material and labour variances excluding sub-variances</p>
6	Some Emerging concepts of Cost accounting
	<p>Target Costing Life cycle Costing Benchmarking ABC Costing</p> <p>Note- No practical problems</p>

Reference Books

Financial Accounting and Auditing

- *Cost Accounting- A managerial emphasis by Horngren, Charles, Foster and Datar, Prentice Hall*
- *Management Accounting by Khan and Jain, Tata McGraw Hill*
- *Practical Costing by P C Tulsian, Vikas New Delhi*
- *Advanced problems and solutions in cost Accounting by S N Maheshwari, Sultan Chand New Delhi*
- *Cost Accounting (For B. Com 4th Sem, Delhi Univ) by Arora M N, Vikas Publishing House Pvt. Ltd.*
- *A Textbook of Cost And Management Accounting - 10th Edn by Arora M N, Vikas Publishing House Pvt. Ltd.*
- *Cost Accounting: Principles & Practice - 12 Edn by Arora M N, Vikas Publishing House Pvt. Ltd.*
- *Essentials of Cost Accounting by Arora M N, Vikas Publishing House Pvt. Ltd.*
- *Students Guide to Cost Accounting & Financial Management (Set of 2 Volumes) (CA-IPCC) (Group I) by Bhavesh N. Chandarana, Taxmann*
- *Lectures on Costing by Swaminathan: S. Chand and Company (P) Ltd., New Delhi*
- *Cost Accounting by C.S. Rayudu, Tata Mc. Grow Hill and Co. Ltd., Mumbai*
- *Cost Accounting by Jawahar Lal and Seema Srivastava, Tata Mc. Grow Hill and Co. Ltd., Mumbai*
- *Cost Accounting by Ravi M. Kishore, Taxmann Ltd., New Delhi*
- *Principles and Practices of Cost Accounting by N.K. Prasad, Book Syndicate Pvt. Ltd., Calcutta*
- *Cost Accounting Theory and Practice by B.K. Bhar, Tata Mc. Grow Hill and Co. Ltd., Mumbai*
- *Cost Accounting Principles and Practice by M.N. Arora, Vikas Publishing House Pvt. Ltd., New Delhi*
- *Advanced Cost and Management Accounting: Problems and Solutions by V.K. Saxena and C.D. Vashist, S. Chand and Company (P) Ltd., New Delhi*
- *Cost Accounting by S.P. Jain and K.L. Narang, Kalyani Publishers, Ludhiana*
- *Modern Cost and Management Accounting by M. Hanif, Tata McGraw Hill Education Pvt. Ltd., New Delhi*
- *Fundamentals of Cost Accounting by Jhamb. H. V., Ane Books Pvt. Ltd.*
- *Cost Accounting by Gupta Nirmal, Ane Books Pvt. Ltd.*



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Revised Syllabus of T.Y.B.Com. – Semester Vth and VIth
Direct and Indirect Tax
Paper I and II

Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2021-22

**TYBCOM/SEM-V & VI/ DIRECT AND INDIRECT TAX PAPER –I AND II/SYLLABUS/QP PATTERN/FROM-
2021-22**

Sr. No.	Heading	Particulars
1	Title of Course	Direct and Indirect Tax
2	Eligibility for Admission	S.Y.BCOM PASSED
3	Passing marks	40%
4	Ordinances/Regulations (if any)	--
5	No. of Semesters	V th and VI th
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Preamble

In new era our taxation statements preparation also changed and need to be improved. New methods of taxation have been emerging. So to make the students more train in the modern taxation environment this syllabus revision is must.

Objectives

SN	Objectives
1	To enhance the abilities of learners to develop the concept of Basic Terms of Direct Tax
2	To enable the learners to understand Scope of Total Income & Residential Status
3	To enable the learners to understanding of Heads of Income (S: 14) and Deduction from Total Income
4	To enable the learners to understanding Computation of Total Income for Individual and filling ITR-1 Form Sahaj

Outcomes

SN	Outcomes
1	Learners will enhance or gain knowledge and understanding of the provision of the direct tax Law
2	It will enable the learners to understand the basic principles of Residential Status
3	It will enable the learners in understanding, of Heads of Income (S: 14) and Deduction from Total Income

4	Learner will enhance or gain knowledge and understanding Computation of Total Income for Individual and filling ITR-1 Form Sahaj
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Objectives

SN	Objectives
1	To enhance the abilities of learners to develop the concept of Basic Terms of Indirect Tax Goods and Service Tax Act
2	To enable the learners to understand Levy and Collection of Tax
3	To enable the learners to understanding of Time, Place and Value of Supply and Input Tax Credit & Payment of Tax
4	To enable the learners to understanding Registration under GST Law

Outcomes

SN	Outcomes
1	Learners will enhance or gain knowledge and understanding of the provision of the Indirect tax Law
2	It will enable the learners to understand the Scope of Supply ,Non taxable Supplies, Composite and Mixed Supplies, Composition Levy , Levy and Collection of tax and Exemption from tax
3	It will enable the learners in understanding, concept of Supply and Payment of tax
4	Learner will enhance or gain knowledge and understanding Procedure for registration, Cancellation of registration, Persons not liable registration

T. Y. B. Com. DIRECT AND INDIRECT TAX

For the subject of Direct and Indirect Tax there shall be two papers for 45 lectures each comprising of five units

Semester-V

1. Paper-I Module-I will be for 04 Lectures
2. Paper-I Module-II will be for 04 Lectures
3. Paper-I Module-III will be for 24 Lectures
4. Paper-I Module-IV will be for 04 Lectures
5. Paper-I Module –V will be for 09 Lectures

Semester-VI

1. Paper-II Module-I will be for 09 Lectures
2. Paper-II Module-II will be for 09 Lectures
3. Paper-II Module-III will be for 09 Lectures
4. Paper-II Module-IV will be for 09 Lectures
5. Paper-II Module –V will be for 09 Lectures

Scheme of Examination for Each Semester:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

I	Each paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options.	
	Q-1	Practical Problem from any Module15 M OR Practical Problem from any Module15 M
	Q-2	Practical Problem from any Module15 M OR Practical Problem from any Module15 M
	Q-3	Practical Problem from any Module15 M OR Practical Problem from any Module15 M
	Q-4	Practical Problem from any Module15 M OR Practical Problem from any Module15 M
	Q-5	Two questions of theory Questions from all Module15 M

	OR
	Short Notes out of 5 any 315 M

Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. Direct and Indirect Tax Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER V

Course Code	Unit	Topics	Credits	L / Week
UCM5TX1	I	Basic Terms	3	04
	II	Scope of Total Income & Residential Status		04
	III	Heads of Income		24
	IV	Deduction from Total Income		04
	V	Computation of Total Income for Individual and filling ITR-1 Form		09

Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. Direct and Indirect Tax- Goods and Service Tax Act
Syllabus to be implemented from the Academic year 2021-2022
SEMESTER VI

Course Code	Unit	Topics	Credits	L / Week
UCM6DX2	I	Introduction	3	09
	II	Levy and Collection of Tax		09
	III	Time, Place and Value of Supply		09
	IV	Input Tax Credit & Payment of Tax		09
	V	Registration under GST Law		09

Semester - V– Direct and Indirect Tax - I

Sr. No.	Modules / Units
1	Basic Terms
	Assessee, Assessment, Assessment Year, Annual value, Business, Capital Assets, Income, Person, Previous Year, Transfer
2	Scope of Total Income & Residential Status
	Scope of Total Income (S: 5) Residential Status (S: 6) for Individual assessee
3	Heads of Income (S: 14)
	<ul style="list-style-type: none"> • Salary (S: 15 to 17) • Income from House Properties (S: 22 to 27) • Profit and Gain From Business (S:28, 30, 31, 32, 35, 35D, 36, 37, 40, 40A 43B. • Capital Gains (S: 45, 48, 49, 50, 54, 54 EC) restricted to computation of Capital gain on transfer of residential house property only • Income from Other Sources (S: 56 to S: 59) • Exclusions From Total Income (S: 10) Exclusion related to specified heads to be covered with relevant head.eg. Salary, Business Income, Capital Gain, Income from Other Sources
4	Deduction from Total Income
	S 80 A, S 80C, 80CCC, 80D, 80DD, 80E, 80 U, 80 TTA (revised deduction)
5	Computation of Total Income for Individual and filling ITR-1 Form Sahaj

Semester –VI- Direct and Indirect Tax - II Goods and Service Tax Act

Sr. No.	Modules / Units
1	Introduction
	<ul style="list-style-type: none"> • What is GST • Need for GST • Dual GST Model • Definitions <ul style="list-style-type: none"> Section 2(17) Business Section 2(13) Consideration Section 2(45) Electronic Commerce Operator Section 2(52) Goods Section 2(56) India Section 2(78) Non taxable Supply Section 2(84) Person Section 2(90) Principal Supply Section 2(93) Recipient Section 2(98) Reverse charge Section 2(102) Services Section 2(105) Supplier Section 2(107) Taxable Person Section 2(108) Taxable Supply • Goods & Services Tax Network (GSTN)
2	Levy and Collection of Tax
	<ul style="list-style-type: none"> • Scope of Supply • Non taxable Supplies • Composite and Mixed Supplies • Composition Levy • Levy and Collection of tax • Exemption from tax
3	Time, Place and Value of Supply
	<ul style="list-style-type: none"> • Time of Supply • Place of Supply • Value of Supply
4	Input Tax Credit & Payment of Tax
	<ul style="list-style-type: none"> • Eligibility for taking Input Tax Credit • Input Tax Credit in Special Circumstances • Computation of Tax Liability and payment of tax (Recent tax Rate)
5	Registration under GST Law
	<ul style="list-style-type: none"> • Persons not liable registration • Compulsory registration • Procedure for registration • Deemed registration • Cancellation of registration

Reference Books

Reference Books

Direct and Indirect Tax

- Taxmann's Direct Taxes Ready Reckoner – Covering Illustrative Commentary on all Provisions of the Income-tax Act with Focused Analysis | 45th Edition | March 2021 | A.Y. 2021-22 & 2022-23 Paperback – 25 by Vinod K. Singhania
- Taxmann's Students' Guide to Income Tax Including GST | Updated till 1st December 2020 64th Edition | A.Y 2021-22 Paperback – 7 January 2021 by [Dr. Vinod K Singhania](#) , [Dr. Monica Singhania](#)
- Taxation (**Direct & Indirect Tax**) Students' **Guide** to Income Tax Including GST [Problems and Solutions]. Author(s): Dr. Vinod K. Singhania,
- **Besley, T. J., & Persson, T. (2013).** Taxation and development. *Handbook of Economic Development*.
- Handbook For Start-Ups A Tax And Regulatory Guide by Radhika Jain, Bloomsbury India
- Taxation of Capital Gains as Amended by the Finance Act 2021 by Girish Ahuja and Ravi Gupta, Commercial Law Publishers India Pvt Ltd
- Customs & Gst Budget 2021-2022 by R K Jain, Centax Publication Pvt Ltd



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Program: B.Com.

Revised Syllabus of T.Y.B.Com. – Semester Vth and VIth

FINANCIAL ACCOUNTING AND AUDITING

Paper VII and IX

Choice Based Credit & Grading System (75:25)

w.e.f. Academic Year 2021-22

Sr. No.	Heading	Particulars
1	Title of Course	Financial Accounting and Auditing
2	Eligibility for Admission	S.Y.BCOM PASSED
3	Passing marks	40%
4	Ordinances/Regulations (if any)	--
5	No. of Semesters	V th and VI th
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Preamble

In today's world maintaining account transactions are more complex. Preparation of various reports for compliances of companies act and other statutory requirement from various agencies. Computerized accounting becomes an integral part of an accounting system. So to make the students more train in the modern accounting environment this syllabus revision is must.

Objectives

SN	Objectives
1	To enhance the abilities of learners to develop the concept of partnership Final account and how to maintain it.
2	To enable the learners to understand, develop and apply the techniques of personal investment accounting.
3	To enable the learners in understanding, preparing and presenting the advanced excel in business accounting.

Outcomes

SN	Objectives
1	Learners will enhance the abilities of learners to develop the concept company Final account and how to maintain it.
2	It will enable the learners to understand, develop and apply the techniques of personal investment accounting.
3	It will enable the learners in understanding, preparing and presenting the advanced excel in business accounting..

T. Y. B. Com. FINANCIAL ACCOUNTING AND AUDITING

For the subject of Financial Accounting and Auditing there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-III

1. Paper-VII Module-I will be for 15 Lectures
2. Paper- VII Module-II will be for 15Lectures
3. Paper- VII Module-III will be for 10 Lectures
4. Paper- VII Module-IV will be for 12 Lectures
5. Paper- VII Module-V will be for 8 Lectures

Semester-IV

1. Paper- IX Module-I will be for 15 Lectures
2. Paper- IX Module-II will be for 15Lectures
3. Paper- IX Module-III will be for 10 Lectures
4. Paper- IX Module-IV will be for 10 Lectures
5. Paper- IX Module-V will be for 10 Lectures

Scheme of Examination for Each Semester:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

I		
	Each paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options.	
	Q-1	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-2	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-3	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-4	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-5	Two theory Questions from all Module 15 M OR Short Notes out of 5 any 3 15 M

Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. Financial Accounting and Auditing-VII
Syllabus To be implemented from the Academic year 2021-2022
SEMESTER V

Course Code	Unit	Topics	Credits	L / Week
UCM5FA7	I	Preparation of Final Accounts of Companies	4	15
	II	Internal Reconstruction		15
	III	Buy Back of Shares		10
	IV	Investment Accounting (w.r.t. Accounting Standard- 13)		12
	V	Implications for Accounting with Application of Excel in Business for Accounting		8

Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. Financial Accounting and Auditing-IX Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER VI

Course Code	Unit	Topics	Credits	L / Week
UCM6FA9	I	AS – 14 - Amalgamation, Absorption & External Reconstruction	4	15
	II	Accounting of Transactions of Foreign Currency		15
	III	Underwriting of Shares & Debentures		10
	IV	Accounting for Limited Liability Partnership		10
	V	Recent Trends in Accounting with ERP SAP R3.		10

Financial Accounting and Auditing-VII

Sr. No.	Modules / Units
1	Preparation of Final Accounts of Companies
	<p>Relevant provisions of Companies Act related to preparation of Final Account(excluding cash flow statement)</p> <p>Preparation of financial statements as per Companies Act. (excluding cash flowstatement)</p> <p>AS 1 in relation to final accounts of companies (disclosure of accountingpolicies)</p> <p>Adjustment for –</p> <ol style="list-style-type: none"> 1. Closing Stock 2. Depreciation 3. Outstanding expenses and income 4. Prepaid expenses and Pre received income 5. Proposed Dividend and Unclaimed Dividend 6. Provision for Tax and Advance Tax 7. Bill of exchange (Endorsement, Honour, Dishonour) 8. Capital Expenditure included in Revenue expenditure and vice versaeg- purchase of furniture included in purchases 9. Unrecorded Sales and Purchases 10. Good sold on sale or return basis 11. Managerial remuneration on Net Profit before tax 12. Transfer to Reserves 13. Bad debt and Provision for bad debts 14. Calls in Arrears 15. Loss by fire (Partly and fully insured goods) 16. Goods distributed as free samples. 17. Any other adjustments as per the prevailing accounting standard.
2	Internal Reconstruction
	<p>Need for reconstruction and company law provisions</p> <p>Distinction between internal and external reconstructions.</p> <p>Methods including alteration of share capital, variation of shareholder rights, sub division, consolidation, surrender and reissue / cancellation, reduction of share capital with relevant legal provisions and accounting treatment forsame.</p>
3	Buy Back of Shares
	<p>Company Law / Legal provisions (including related restrictions, power, transfer to capital redemption reserve account and prohibitions)</p> <p>Compliance of conditions including sources, maximum limits and debt equity ratio. Cancellation of Shares Bought back(Excluding Buy Back of minority shareholding)</p>

Sr. No.	Modules / Units
4	Investment Accounting (w.r.t. Accounting Standard- 13)
	For shares (variable income bearing securities) For debentures/Preference. shares (fixed income bearing securities) Accounting for transactions of purchase and sale of investments with ex and cum interest prices and finding cost of investment sold and carrying cost as perweighted average method (Excl. brokerage). Columnar format for investment account.
5	Implications for Accounting with Application of Excel in Business for Accounting
	Practical use of the following excel formulas for Business for Accounting AGGREGATE, ROUND, EOMONTH, EDATE, WORKDAY, TRIM , 3DFORMULAS, VLOOKUP,HLOOKUP,IF,SUMIFS.

Financial Accounting and Auditing-IX

Sr. No.	Modules / Units
1	AS – 14 - Amalgamation, Absorption & External Reconstruction (excluding inter-company holdings)
	In the nature of merger and purchase with corresponding accounting treatments of pooling of interests and purchase method respectively. Meaning and Computation of purchase consideration. Problems based on purchase method only.
2	Accounting of Transactions of Foreign Currency
	In relation to purchase and sale of goods, services and assets and loan and credit transactions. Computation and treatment of exchange rate differences
3	Underwriting of Shares & Debentures
	Introduction, Underwriting, Underwriting Commission Provision of Companies Act with respect to Payment of underwriting commission Underwriters, Sub-Underwriters, Brokers and Manager to issues Types of underwriting, Abatement Clause Marked, Unmarked and Firm-underwriting applications, Liability of the underwriters in respect of underwriting contract Practical problems

4	Accounting for Limited Liability Partnership
	Statutory Provisions Conversion of partnership firm into LLP Final Accounts
5	Recent Trends in Accounting with ERP SAP R/3.
	Practical implications of ERP SAP R3 (Real Time Data Processing 3 Tire) What is SAP R/3? Structure of SAP R/3

Reference Books

- Introduction to Accountancy by T. S. Grewal, S. Chand and Company (P) Ltd., New Delhi
Advance
- Accounts by Shukla & Grewal, S. Chand and Company (P) Ltd., New Delhi
- Advanced Accountancy by R. L Gupta and M Radhaswamy, S. Chand and Company (P) Ltd., New
Delhi
- Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial
Accounting by LesileChandwichk, Pentice Hall of India Adin Bakley (P) Ltd.
- Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishing Co. Ltd.,
Mumbai.
- Financial Accounting by P. C. Tulsian, Pearson Publications, New Delhi Accounting Principles by
Anthony, R.N. and Reece J.S., Richard Irwin Inc.
- Financial Accounting by Monga, J.R. Ahuja, GirishAhujaandShehgal Ashok, Mayur Paper Back
- Compendium of Statement & Standard of Accounting, ICAI.
- Indian Accounting Standards, Ashish Bhattacharya, Tata Mc. Grow Hill & Co. Ltd., Mumbai
Financial
Accounting by Williams , Tata Mc. Grow Hill & Co. Ltd., Mumbai
- Company Accounting Standards by ShrinivasanAnand, Taxman. Financial Accounting by V.
Rajasekaran, Pearson Publications, New Delhi. Introduction to Financial Accounting by Horngren,
Pearson Publications.
- Financial Accounting by M. Mukherjee.M. Hanif. Tata McGraw Hill Education Private Ltd; New
Delhi



J.B.S.P.Sanstha's

**Changu Kana Thakur Arts, Commerce and Science
College,**

New Panvel (Autonomous)

**Masters of Commerce (M.Com)
Programme
M.Com. Part - I
Two Semesters
*Course Structure***

Under Choice Based Credit System

To be implemented from Academic Year- 2022-2023

Department of Accountancy

Master of Commerce (M.Com) Programme
Under Choice Based Credit, Grading and Semester System

Course Structure

M.Com I

(To be implemented from Academic Year- 2022-2023)

No. of Courses	Semester I	Credits	No. of Courses	Semester II	Credits
1	Core Courses (CC)		1	Core Courses (CC)	
1	Cost and Management Accounting	06	1	Corporate Finance	06
Total Credits		06	Total Credits		06

Revised Syllabus and Question Paper Pattern of Courses of
*Revised Syllabus of Courses of
Master of Commerce (M.Com) Programme at Semester I
(To be implemented from Academic Year- 2022-2023)*

Core Courses (CC)

Cost and Management Accounting

Modules at a Glance

SN	Modules	No. of Lectures
1	Cost Accounting Standard [CAS -1, 16, 17 and 22]	15
2	Marginal Costing, Absorption Costing and Management Decisions	15
3	Standard Costing	15
4	Budgetary Control	15
Total		60

Course Outcomes [CO's]

Name of the Programme: M.COM-Part-I	Programme Coordinator: Dr. S.B.Yadav	Head of the Department: Dr. S.B.Yadav
	Course: Cost and Management Accounting Course Code: PCM1AC	Course Coordinator: Dr. S.B.Yadav
	After Completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Solve the problems based on Cost Accounting Standard	III. Applying
CO2	Calculating the profitability of business using marginal costing techniques	IV Analyzing
CO3	Assessing the decision to be made under different alternatives under marginal costing	V Evaluating
CO4	Gathering importance of costing techniques and methodology	II understanding

SN	Modules/ Units
1	Cost Accounting Standard [CAS -1 , 16 , 17 and 22]
	<ul style="list-style-type: none"> • CAS-1- Classification of Cost • CAS- 16 - Depreciation and amortization • CAS-17 - Interest and Financial Charges • CAS-22- Manufacturing Cost
2	Standard Costing
	<ul style="list-style-type: none"> • Standard Costing as an Instrument of Cost Control and Cost Reduction - Fixation of Standards - Theory and Problems based on Analysis of Variances of Materials, Labour Overheads and sales including Sub-variances
3	Budgetary Control
	<ul style="list-style-type: none"> • Budget and Budgetary Control Zero Based Budget Performance Budgets - Functional Budgets Leading to the Preparation of Master Budgets Capital Expenditure Budget - Fixed and Flexible Budgets - Preparation of Different Types of Budgets
4	Marginal Costing, Absorption Costing and Management Decisions
	<ul style="list-style-type: none"> • Meaning of Absorption Costing - Distinction between Absorption Costing and Marginal Costing - Problems on Breakeven Analysis - Cost Volume Profit Analysis - Breakeven Charts - Contribution Margin and Various Decision Making Problems • Managerial Decisions through Cost Accounting such as Pricing Accepting Special Offer - Profit Planning - Make or Buy Decisions - Determining Key Factors - Determining Sales Mix - Determining Optimum Activity Level - Performance Evaluation - Alternative Methods of Production, Cost Reduction & Cost Control

**Revised Syllabus of Courses of
Master of Commerce (M.Com) Programme at Semester II
(To be implemented from Academic Year- 2022-2023)**

Core Courses (CC)

2. Corporate Finance

Modules at a Glance

SN	Modules	No. of Lectures
1	Scope and Objectives of Financial Management	15
2	Time Value of Money	15
3	Capital Budget – include time value of money	15
4	Financial Decisions	15
Total		60

Course Outcomes [CO's]

Semester - II

Name of the Programme: M.COM-Part-I	Programme Coordinator: Dr. S.B.Yadav	Head of the Department: Dr. S.B.Yadav
Subject : Corporate Finance	Course: Corporate Finance Course Code: PCM2CF	Course Coordinator: Dr.S.B.Yadav
	After Completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain the Scope and objectives of Financial Management.	II. Understanding
CO2	Calculating the Present Value, Annuity, Techniques of Discounting, Techniques of Compounding, Bond Valuation and YTM	IV Applying
CO3	Examine Application of Capital Budgeting.	IV Analyzing
CO4	Solving the problems on Cost of Capital, Capital Structure Decisions and Business Risk and Financial Risk	VI Creating

SN	Modules/ Units
1	Scope and Objectives of Financial Management
	<ul style="list-style-type: none"> • Introduction, Meaning, Importance, Scope, Objectives, Profit v/s Value Maximization
2	Time Value of Money
	<ul style="list-style-type: none"> • Concept, Present Value, Annuity, Techniques of Discounting, Techniques of Compounding, Bond Valuation and YTM
3	Capital Budget – include time value of money
	<ul style="list-style-type: none"> • Payback period • Discounted payback period • Net present value • Accounting rate of return • Internal rate of return • Profitability index
4	Financial Decisions
	<ul style="list-style-type: none"> • Cost of Capital - Introduction, Definition of Cost of Capital, Measurement of Cost of Capital, WACC, Marginal Cost of Capital • Capital Structure Decisions Meaning, Choice of Capital Structure, Importance, Optimal Capital Structure, EBIT-EPS Analysis, Cost of Capital, Capital Structure and Market Price of Share, Capital Structure Theories, Dividend Policy - Pay Out Ratio • Business Risk and Financial Risk Introduction, Debt v/s Equity Financing, Types of Leverage, Investment Objective/Criteria for Individuals/Non-business Purpose

***Revised Syllabus of Courses of
Master of Commerce (M.Com) Programme at Semester I
(To be implemented from Academic Year- 2022-2023)***

Reference Books

Cost and Management Accounting and Corporate Finance

- Advanced Cost & Management Accounting by Saxena
- Cost & Management Accounting by **Satish Inamdar**
- Cost & Management Accounting by **Kishore R. M.**
- Text Book Of Management Accounting by **Sanjay Patankar**
- Management Accounting: Text, Problems & Cases by **Khan & Jain**
- Management Accounting **Reference Book by Rao**
- Introduction to Management Accounting – Horngreen and Sundlem
- Principles of Management Accounting – Manmohan & Goyal
- Management Accounting – Dr. E.B. Khedkar, Dr. D.B. Bharati and Dr. A. B. Kharapas.
- Cost and Management Accounting – S.M.Inamdar
- Management Accounting – Dr. Mahesh Kulkarni
- Double Entry Book Keeping – T.S.Grewal
- Principles and Practice of Cost Accounting – Ashish K. Bhattacharya
- Management Accounting 3rd Ed. – Khan & Jain
- Theory & Problems in Management & Cost Accounting – Khan & Jain
- Cost Accounting – Jawaharlal

Question Paper Pattern **(Internal Assessment- 40 Marks)**

1. 20 Marks Class Test
2. 10 Marks Assignment (Internal Tool)
3. 10 Marks Quiz (Internal Tool)

1. Maximum Marks: 20 marks [Class Test]

Questions to be set: 20

Duration: 20 Minutes

Question No	Particular	Marks
Q-1	Objective Questions Students to answer all 20 questions (<i>*Multiple choice/ True or False/ Match the columns/ Fill in the blanks</i>)	20 arks

2. 10 Marks Case Study (Internal Tool)

Case Study for 10 Marks Time Limit 30 Minutes

3. 10 Marks Quiz (Internal Tool)

Quiz of 10 Marks on Google Form 10 quiz questions of 1 marks each to be asked based on the course work. Time limit 10 Minutes.

Question Paper Pattern (Practical Courses)

Maximum Marks: 60

Questions to be set: 04

Duration: 2 Hrs.

All Questions are Compulsory Carrying 15 Marks each.

Question No	Particular	Marks
Q-1	Practical Question	15 Marks
	OR	
Q-1	Practical Question	15 Marks
Q-2	Practical Question	15 Marks
	OR	
Q-2	Practical Question	15 Marks
Q-3	Practical Question	15 Marks
	OR	
Q-3	Practical Question	15 Marks
Q-4	Objective Question <i>(Multiple Choice/ True or False/ Fill in the Blanks/ Match the Columns/ Short Questions.)</i>	15 Marks
	OR	
Q-4	Short Notes <i>(Any three out of five)</i>	15 Marks

Note:

Full length question of 15 marks may be divided into two sub questions of 08 and 07 marks.



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Revised Syllabus of M.Com. Part – II Semester- IIIrd and IVth

1. Advanced Cost Accountancy
2. Financial Management

Choice Based Credit Grading and Semester System (CBCGS)**M. Com. Advanced Cost Accountancy Syllabus****To be implemented from the Academic year 2020-2021****SEMESTER III**

Course Code	Unit	Topics	Credits	L / Week
PCM3ACA	I	Process Costing	6	15
	II	Cost Allocation and Activity Based Costing Systems		15
	III	Responsibility Accounting		15
	IV	Strategic Cost Management		15

Choice Based Credit Grading and Semester System (CBCGS)**M. Com. Financial Management Syllabus****To be implemented from the Academic year 2020-2021****SEMESTER IV**

Course Code	Unit	Topics	Credits	L / Week
PCM4FIM	I	Types of Financing	6	15
	II	Investment Decisions : Capital Budgeting		15
	III	Management of Working Capital		15
	IV	Financial Planning		15

Semester – III Advanced Cost Accountancy

SN	Modules/ Units
1	Process Costing
	<p>A) Introduction - Features of process, Concept of Process Loss, Abnormal Loss, Normal Loss, Abnormal Gain.</p> <p>B) Computation of Inter Process Profit – Advantages and Disadvantages</p> <p>C) Computation of Equivalent Production – Weighted Average and FIFO.</p>
2	Cost Allocation and Activity Based Costing Systems
	<p>A) Cost Allocation – Meaning and its Types, Relationship between resources, activities, Cost and Cost drivers, Methods of allocating central costs - cost allocation using Direct Method, Step Down Method and Reciprocal Method.</p> <p>B) Activity Based Costing – Introduction, Advantages, Limitations, Identification of cost drivers, Practical Problems on Traditional V/s Activity Based Costing System.</p>
3	Responsibility Accounting
	<p>A) Responsibility Accounting – Meaning, Features, Objective, Assumptions, Problems, Responsibility Centre's – Cost, Profit, Revenue and Investment.</p> <p>B) Concept of Controllability – Introduction, Measuring Managerial Performance (ROI and Residual Income Approach)</p> <p>C) Preparation of Managerial Reports using Segmented Costs and Controllable costs approach.</p>
4	Strategic Cost Management
	<p>A) Transfer Pricing – Introduction, Advantages and Disadvantages, Setting Transfer Pricing – Negotiated transfer pricing, Cost Based transfer pricing.</p> <p>B) Target Costing – Introduction, Concept, Objectives, Comparison between Target Costing and Cost Plus Pricing.</p> <p>C) Inflation Accounting – Meaning, Features, Conversion of Income Statement, Balance Sheet, Stocks and Net Assets Block using Current Purchasing Power Method.</p>

Semester – IV Financial Management

SN	Modules/ Units
1	Types of Financing
	<p>Introduction Needs of Finance and Sources: Long Term, Medium Term, Short Term Long Term Sources of Finance Owners Capital / Equity Capital Preference share capital Retained Earning Debentures or Bonds Loans from Financial Institutions / Banks Short Term Sources of Finance Trade Credit Accrued Expenses and Deferred Income Advances From Customers Commercial Papers Bank Advances:Loans, O/D, Clean O/Ds, Cash Credit, Advances against goods, Bills Purchased, Discounted, Advances against documents of title of goods, Advances against supply of bills, Term Loans Inter Corporate Deposits Certificate of Deposits Public Deposits</p>
2	Investment Decisions : Capital Budgeting
	<ul style="list-style-type: none"> • Introduction • Nature of Capital Budgeting • Purpose of Capital Budgeting • Capital Budgeting Process • Types of Capital Investment • Decisions Project Cash Flows and Net profit Approval • Basic Principle of Measuring Project Cash Flows • Increment principle, Long Term Funds Principle, Exclusion of Financial Cost Principle, Post Tax Principle • Probability technique for measurement of cash flow • Capital Budgeting Techniques : Net Return Value; Internal Rate of Return; Profitability Index Methods • A Comparison; Project Selection Under Capital Rationing • (Note: Problems on computation of cash flow, ranking of projects on various techniques, selection and analysis with / without capital rationing. Comparison of IRR with Required rate of return i.e. cut off rate, IRR and mutually exclusive projects with unequal lives, multiple IRR)

Reference Books

Reference Books

- **Advanced Cost accounting by Vashishta and Saxena**
- **Advanced Financial Management by Prasana Chandra**
- **Advanced Financial Management by Khan and Jain**
- **Cost accounting B.K.Bhar**



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Program: M.Com. Part II

Revised Syllabus of M.Com. – Semester - III

1. Advanced Financial Accountancy
2. Corporate Financial Accountancy

Choice Based Credit & Grading System (60:40)

w.e.f. Academic Year 2020-21

Choice Based Credit Grading and Semester System (CBCGS)**M. Com. Advanced Financial Accountancy Syllabus****To be implemented from the Academic year 2020-2021****SEMESTER III**

Course Code	Unit	Topics	Credits	L / Week
PCM3AFA	I	Foreign Currency Conversion (As per Applicable Accounting Standards)	6	15
	II	Final Accounts & Statutory Requirements for Banking Companies		15
	III	Accounting & Statutory Requirements of Insurance Companies		15
	IV	Accounting & Statutory Requirements of Co-operative Societies		15

Semester – III Advanced Financial Accountancy

Sr. No.	Modules / Units
1	Foreign Currency Conversion (As per Applicable Accounting Standards)
	Requirements as per Accounting Standards Foreign Branches
2	Final Accounts & Statutory Requirements for Banking Companies
	Final Accounts of Banking Companies Provisioning of Non- Performing Assets Form & Requirements of Final Accounts
3	Accounting & Statutory Requirements of Insurance Companies
	<ul style="list-style-type: none"> • Accounting Provision for Insurance Act and Insurance Regulation and Development Authorities for <ol style="list-style-type: none"> 1) Life Insurance Business 2) General Insurance Business • Forms and Requirements of Final Accounts for <ol style="list-style-type: none"> 1) Life Insurance Business 2) General Insurance Business
4	Accounting & Statutory Requirements of Co-operative Societies
	<ul style="list-style-type: none"> • Accounting Provisions of Maharashtra State Co-operative Societies Act and Rules • Forms and Requirements of Final Accounts

M.Com. Part – II - Sem-IV Corporate Financial Accountancy

For the subject of Corporate Financial Accountancy there shall be one paper for 60 lectures each comprising of four units of 15 Lectures each.

Semester-IV

1. Module-I will be for 15 Lectures
2. Module-II will be for 15 Lectures
3. Module-III will be for 15 Lectures
4. Module-IV will be for 15 Lectures

Choice Based Credit Grading and Semester System (CBCGS)

**M. Com. Corporate Financial Accountancy Syllabus
To be implemented from the Academic year 2020-2021**

SEMESTER IV

Course Code	Unit	Topics	Credits	L / Week
PCM4CFA	I	Corporate Financial Reporting	6	15
	II	International Financial Reporting Standards (IFRS) & Ind – AS		15
	III	Valuation of Business for Amalgamation & Merger		15
	IV	Consolidated Financial Statement		15

Semester – IV Corporate Financial Accountancy

SN	Modules/ Units
1	Corporate Financial Reporting
	<ul style="list-style-type: none"> • Introduction of Financial Reporting • Need for reporting • Contents of Financial Report • Recent trends in Financial reporting
2	International Financial Reporting Standards (IFRS) & Ind - AS
	<ul style="list-style-type: none"> • Accounting Standards (AS) – applicability, interpretation, scope and compliance in India • Introduction to I.F.R.S • Ind – AS • Specific Ind AS:

	Borrowing Costs Operating Segments Earning per share Income Taxes Accounting for fixed assets
3	Valuation of Business for Amalgamation & Merger
	Meaning, Need & Approach Methods of valuation
4	Consolidated Financial Statement
	Meaning, Stand Alone Financial Statements Consolidated Financial statements – Applicability, Advantages & Disadvantages Procedure of Consolidation of Balance-sheet & Profit & Loss Account (Excluding cross holding, Chain Holding & Foreign Subsidiary)

Reference Books

Reference Books

- Introduction to Accountancy by T. S. Grewal, S. Chand and Company (P) Ltd., New Delhi Advance
- Accounts by Shukla & Grewal, S. Chand and Company (P) Ltd., New Delhi
- Advanced Accountancy by R. L Gupta and M Radhaswamy, S. Chand and Company (P) Ltd., New Delhi
- Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial Accounting by LesileChandwichk, Pentice Hall of India Adin Bakley (P) Ltd.
- Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishing Co. Ltd., Mumbai.
- Financial Accounting by P. C. Tulsian, Pearson Publications, New Delhi Accounting Principles by Anthony, R.N. and Reece J.S., Richard Irwin Inc.
- Financial Accounting by Monga, J.R. Ahuja, GirishAhujaandShehgal Ashok, Mayur Paper Back
- Compendium of Statement & Standard of Accounting, ICAI.
- Indian Accounting Standards, Ashish Bhattacharya, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial Accounting by Williams , Tata Mc. Grow Hill & Co. Ltd., Mumbai
- Company Accounting Standards by ShrinivasanAnand, Taxman. Financial Accounting by V. Rajasekaran, Pearson Publications, New Delhi. Introduction to Financial Accounting by Horngren, Pearson Publications.
- Financial Accounting by M. Mukherjee.M. Hanif. Tata McGraw Hill Education Private Ltd; New Delhi



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Revised Syllabus of M.Com. Part – II Semester- IIIrd and IVth

- 1. Direct Tax**
- 2. Indirect Tax – Introduction to Goods and Service Tax**

Choice Based Credit Grading and Semester System (CBCGS)

M. Com. Direct Tax Syllabus

To be implemented from the Academic year 2020-2021

SEMESTER III

Course Code	Unit	Topics	Credits	L / Week
PCM3TAX	I	Definitions and Basis of Charge	6	15
	II	Heads of Income		15
	III	Deductions u/s 80 and Exclusions from the Total Income		15
	IV	Computation of Income and Tax of Individual, Firm and Company (Excluding MAT) and Provisions for Filing Return of Income - Sec 139(1) and Sec 139(5)		15

Choice Based Credit Grading and Semester System (CBCGS)

M. Com. Indirect Tax- Introduction of Goods and Service Tax Syllabus

To be implemented from the Academic year 2020-2021

SEMESTER IV

Course Code	Unit	Topics	Credits	L / Week
PCM4TGS	I	Overview of Goods and Service Tax	6	15
	II	Registration under GST		15
	III	Collection of Tax under Integrated Goods and Services Tax Act, 2017		10
	IV	Place of supply of goods or services or both under Integrated Goods and Services Tax Act, 2017		10
	V	Payment of GST		10

Semester – III - Direct Tax

SN	Modules/ Units
1	Definitions and Basis of Charge
	<ul style="list-style-type: none"> • Definitions: Person, Assessee, Income • Basis of Charge: Previous Year, Assessment Year, Residential Status, Scope of Total Income, Deemed Income
2	Heads of Income
	<ul style="list-style-type: none"> • Income from Salary • Income from House Property • Profits and Gains from Business and Profession • Income from Capital Gains • Income from Other Sources
3	Deductions u/s 80 and Exclusions from the Total Income
	<ul style="list-style-type: none"> • Deductions: 80C, 80CCF, 80D, 80DD, 80DDB, 80E, 80U • Exclusions: Exemptions related to Specific Heads of Income to be Covered with Relevant Provisions, Agricultural Income, Sums Received from HUF by a Member, Share of Profit from Firm, Income from Minor Child, Dividend
4	Computation of Income and Tax of Individual, Firm and Company (Excluding MAT) and Provisions for Filing Return of Income - Sec 139(1) and Sec 139(5)
	<ul style="list-style-type: none"> • Computation of Income & Tax of Individual and Partnership Firm

Note:

1. *The Syllabus is restricted to study of particular sections, specifically mentioned rules and notifications only*
2. *All modules/units include computational problems/ Case study*
3. *The Law in force on 1st April immediately preceding the commencement of Academic year will be applicable for ensuing Examinations*

Semester – IV Indirect Tax- Introduction of Goods and Service Tax

SN	Modules/ Units
1	Overview of Goods and Service Tax
	Introduction and Meaning of GST and IGST Scope of GST Present/old Tax Structure v/s GST GST in Other Countries Existing taxes proposed to be subsumed under GST Principles adopted for subsuming the taxes Dual GST Benefits of GST GST Council GST Network (GSTN) and GST regime Integrated Goods and Services Tax Act, 2017: title and definitions, administration.
2	Registration Under GST
	Rules and Procedure of registration Special provisions relating to casual taxable person and non-resident taxable person Amendment of registration Cancellation of registration Revocation of cancellation of registration
3	Collection of Tax under Integrated Goods and Services Tax Act, 2017
	Sec 5 and Sec 6
4	Place of supply of goods or services or both under Integrated Goods and Services Tax Act, 2017
	Sec 10 and Sec 12
5	Payment of GST
	<ul style="list-style-type: none"> • Introduction • Time of GST Payment • How to make payment • Challan Generation & CPIN • TDS & TCS

Reference Books

- Taxmann's Direct Taxes Law & Practice -With special reference to Tax Planning
- Equalisation Levy Commodities Transaction Tax & Securities Transaction...
- [Direct Taxes Manual](#) by Taxman
- Income Tax Act by Taxman
- GST Acts with Rules/Forms & Notifications by Taxman
- Taxation (Direct and Indirect): B.Com – by Monica Singhania and Vinod K Singhania
- II Year- B.com – Taxation-English Medium-Osmania University by Vikram editorial board
- Taxation B.Com 2nd year AP Uni. by Gaur V.P., Yadagiri M., Padmalatha N., Krishna Rao
- Taxation with Lab Work B.Com 2nd year Telangana Uni. by Gaur V.P., Narang D.B., Madmalatha M., Kanduri Sush
- Business Taxation B.Com, BBM, BCA & M.Com by Radhakrishnan P



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Revised Syllabus of M.Com. Part – II Semester- IIIrd and IVth
PROJECT WORK

Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2020-21

Sr. No.	Heading	Particulars
1	Title of Course	Project Work
2	Eligibility for Admission	M.COM. SEM I AND SEM II PASSED OR APPEARED EXAMINATION
3	Passing marks	40%
4	Ordinances/Regulations (if any)	--
5	No. of Semesters	III rd and IV th
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Preamble

After successfully completion of undergraduate courses one should be the master of the accountancy. To get the advanced knowledge of most complex subject like Accountancy, Taxation, Financial Management, Costing and Research methodology we introduced various aspects of all these in the syllabus so the student will be trained to tackle the problems arising in the world of accountancy and Taxation.

Objectives

SN	Objectives
1	To enhance the abilities of learners to develop the research and presentation skill.

Outcomes

SN	Objectives
1	Learners will enhance the abilities to develop the research and presentation skill.

M.Com II Project work for Semester III and IV

Work Load:

Work load for Project Work is 1 hour per batch of 15 students per week for the teacher. The student shall do field work and library work in the remaining 3 hours per week.

Credits:

6 Credit for each semester.

Guidelines:

- The project topic may be undertaken in any area of Elective Courses.
- Each of the students has to undertake a Project individually under the supervision of a teacher-guide.

- The student shall decide the topic in consultation with the teacher-guide concerned.
- University/college should allot P G Teacher for guidance to the students based on her / his specialization.
- There shall be double valuation of project by the teacher- guide concerned and an external examiner appointed by the University/College with equal weightage.
- The teacher-guide along with the external examiner appointed by the University/College for the valuation of project shall conduct viva voce examination with equal weightage.
- The date of viva voce shall be intimated to the students by the Department well in advance.
- **The project report shall be prepared as per the broad guidelines given below:**
 - a. Project Report shall be typed in Times New Roman with one and half line spacing in 12 Font Size and 1.5 spacing.
 - b. The size of the Project Report shall be with a minimum of 25,000 words and a maximum of 40,000 words.
 - c. Project Report shall be printed on both sides of the paper. d. The Project Report shall be bounded.

Evaluation:

The Project Report evaluation is for 60 Marks and the Viva –Voce examination is for 40 Marks (without presentation). No marks will be allotted on the Project Report unless a candidate appears at the Viva-Voce Examination. Similarly, no marks will be allotted on Viva-Voce Examination unless a candidate submits his/her Project Report.

Project Report (60 marks):

Introduction and other areas covered – 20 marks

Presentation, Analysis & Findings -- 30 marks

Conclusion & Recommendations -- 10 marks

Viva-Voce (40 marks):

In course of Viva-Voce Examination, the question may be asked in the following areas: Importance / relevance of the Study, Objective of the Study, Methodology of the Study/ Mode of Enquiry -- 10 marks

Ability to explain the analysis, findings, concluding observations, recommendation, limitations of the Study -- 20 marks

Overall Impression (including Communication Skill) -- 10 marks

Passing:

- Minimum of Grade E in the project component
- In case of failing in the project work, the same project can be revised for ATKT examination.
- Absence of student for viva voce:

If any student fails to appear for the viva voce on the date and time fixed by the department such student shall appear for the viva voce on the date and time fixed by the Department, such student shall appear for the viva voce only along with students of the next batch.

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Department of Business Economics

Mapping of Syllabus

(Activities/ Content with a direct bearing on Employability/ Entrepreneurship/ Skill Development
of Courses during the Year 2021-22)

1. F.Y.B.COM Semester –I

Skill development

Business Economics-Paper- I, Course Code- UCM1BE1

Module-I: - Introduction: 10 L

Scope and importance of business economics- Basic tools, opportunity cost principle- Basic economic relations- functional relations- equations- total, average and marginal relations- use of marginal analysis in decision making.

The basics of market demand, market supply and equilibrium price- shifts in demand and supply curves and equilibrium.

Module-II: - Demand Analysis: 15L

Cross elasticity of demand and promotional elasticity of demand. Indifference curve analysis: Meaning and features- Budget line, Consumer's equilibrium, conditions of consumer's equilibrium.

Demand estimation and forecasting- meaning and significance- methods of demand estimation- survey and statistical methods (numerical illustrations on trend analysis).

Module-III: - Supply and Production Decisions: 10L

Production function- short run analysis with law of variable proportions- production function with two variable inputs-isoquants -ridge lines and least cost combination of inputs- long run production function and laws of returns to scale, Expansion path.

Module-IV: - Cost of production: 15L

Cost concepts: accounting and economic costs, explicit and implicit costs, Social and private costs, fixed and variable costs- total, average and marginal costs- cost-output relationship in short and long run (hypothetical numerical problems to be discussed)

Extension of cost analysis: cost reduction through experience, LAC and learning curve- Break even analysis (with business applications)

**2. F.Y.B.COM - Semester –II,
Entrepreneurship Development**

Business Economics-II - Course Code- UCM2BE2

Module-I: - Market structure: Perfect competition and Monopoly: 10L

Perfect competition and monopoly: Perfect competition and monopoly models are two extreme cases- short run and long run equilibrium of a firm and of industry. Monopoly: sources of monopoly power- short run and long run equilibrium of a firm under monopoly.

Module-II: - Pricing and output decisions under imperfect competition: 15L

Monopolistic competition market: Competitive and monopolistic elements of monopolistic competition- equilibrium of a firm under monopolistic competition- monopolistic completion verses perfect competition- excess capacity and inefficiency- debate over role of advertising (topics to be taught using case studies from real life examples)

Oligopolistic markets: Key attributes of oligopoly- price rigidity, collusive and non- collusive oligopoly market-price leadership models (with practical examples)

Module-III: -Objectives of the firms: 10L

Objectives of the firms- Profit maximization, sales maximization, growth maximization, maximization of satisfaction, maximization of managerial utility or discretion, entry prevention and risk avoidance.

Module-IV: - Evaluating capital projects: 10L

Meaning and importance of capital budgeting, steps in capital budgeting- Techniques of investment appraisal: Payback period method, net present value method, internal rate of return method (with numerical examples)

3. F.Y.B.COM (Accounting and Finance) Semester-I

Business Economics- Paper-I, Course Code-

UAF1BE1,

Entrepreneurship Development

Module I- Introduction: 15L

Scope and Importance of business economics - basic tools- Opportunity cost principle- Basic economic relations – functional relations: equations-Total, average and marginal relations-use of marginal analysis in decision making. Introduction to Survey: Meaning, features- Survey based project.

Module II- Demand Analysis: 15L

Cross and promotional elasticity of demand. The basics of market demand & supply and equilibrium price – shifts in the demand and supply curves and equilibrium. Indifference curve: Meaning, properties. Budget line, consumer's equilibrium.

Demand Estimation and forecasting: Meaning and significance-methods of demand estimation: survey and statistical methods. (Numerical illustrations on trend analysis)

Module III- Production function: 15L

Short run analysis with Law of Variable proportion-isoquants, ridgelines, and least cost combination of inputs-Long run production function and Law of return to Scale-Expansion path

Cost Concepts: Accounting cost and economic cost, implicit and explicit cost, fixed and variable cost- total, average and marginal cost, cost output relationship in the short run and long run (hypothetical numerical problems to be discussed) Break even analysis (with business applications)

Module IV-Market Structure: 15L

Perfect competition and monopoly and pricing and output decisions under imperfect competition :- Short run and long run equilibrium of a competitive firm and of industry-Monopoly- Short run and long run equilibrium of a firm under monopoly.

Monopolistic Competition: Equilibrium of a firm under monopolistic competition.

Oligopolistic markets: Key attributes of oligopoly –price rigidity

4. F Y B M S- Semester-I
Business Economics- Paper-I,
Course Code- UMS1BE1,
Entrepreneurship Development

Module I- Introduction: 15L

Scope and Importance of business economics - basic tools- Opportunity cost principle- Basic economic relations – functional relations: equations-Total, average and marginal relations-use of marginal analysis in decision making. Introduction to Survey: Meaning, features- Survey based project.

Module II- Demand Analysis: 15L

Cross and promotional elasticity of demand. The basics of market demand & supply and equilibrium price – shifts in the demand and supply curves and equilibrium. Indifference curve: Meaning, properties. Budget line, consumer's equilibrium.

Demand Estimation and forecasting: Meaning and significance-methods of demand estimation: survey and statistical methods. (Numerical illustrations on trend analysis)

Module III- Production function: 15L

Short run analysis with Law of Variable proportion-isoquants, ridgelines, and least cost combination of inputs-Long run production function and Law of return to Scale-Expansion path. Cost Concepts: Accounting cost and economic cost, implicit and explicit cost, fixed and variable cost- total, average and marginal cost, cost output relationship in the short run and long run (hypothetical numerical problems to be discussed) Break even analysis (with business applications)

Module IV-Market Structure: 15L

Perfect competition and monopoly and pricing and output decisions under imperfect competition :- Short run and long run equilibrium of a competitive firm and of industry-Monopoly- Short run and long run equilibrium of a firm under monopoly.

Monopolistic Competition: Equilibrium of a firm under monopolistic competition.

Oligopolistic markets: Key attributes of oligopoly –price rigidity

5. .Y.B.COM Semester –III
Business Economics- Paper- III- Course Code- UCM3BE3
Introduction to Macroeconomics,
Entrepreneurship Development

Module-I: Introduction: 10L

- **Macroeconomics:** Meaning, Scope and Importance.
- **Circular flow of aggregate income and expenditure** and its Importance- closed and open economy models
- **Green GNP and NNP concepts-** Importance and Measurement
- **Trade Cycles:** Features and Phases
- **Classical Macro economics: Say’s law of Markets** - Features, Implications and Criticism

Module-II: - Basic Concepts of Keynesian Economics: 15L

- **The Principle of Effective Demand:** Aggregate Demand and Aggregate Supply
- **Consumption Function:** Properties, Assumptions and Implications
- **Investment function and Marginal Efficiency of capital**
- **Investment Multiplier effect on Income and Output:** Assumptions, Working, Leakages, Criticism and Importance - paradox of thrift
- **Relevance of Keynesian theory tools to the developing countries**

Module-III: Post Keynesian Developments In Macro Economics: 10L

- **The IS-LM model** of integration of commodity and money markets
- **Inflation and unemployment:** Philips curve
- **Stagflation:** meaning, causes, and consequences
- **Supply side economics:** Basic propositions and critical appraisal

Module-IV - Money, Prices and Inflation- 10L

- **Money Supply:** Determinants of Money Supply - Factors influencing Velocity of Circulation of Money
- **Demand for Money:** Classical and Keynesian approaches and Keynes’ liquidity preference theory of interest - Friedman’s restatement of Demand for money
- **Inflation:** Demand Pull Inflation and Cost Push Inflation - Effects of Inflation- Nature of inflation in a developing economy - policy measures to curb inflation- monetary policy and inflation targeting

6. S.Y.B.COM, Semester –IV

Business Economics – IV Public Finance Paper,

Course Code- UCM4BE4,

Entrepreneurship Development

Model No. I - The Role of Government in an Economy: 10L

- **Meaning and Scope of Public finance.**
- **Major fiscal functions:** allocation function, distribution function & stabilization function
- **Principle of Maximum Social Advantage:** Dalton and Musgrave Views - the Principle in Practice, Limitations.
- **Relation between Efficiency, Markets and Governments**
- **The concept of Public Goods and the role of Government**

Module-II- Public Revenue: 15

- **Sources of Public Revenue:** tax and non-tax revenues
- **Objectives of taxation - Canons of taxation**
- **Direct taxes- Merits and demerits- Indirect taxes- Merits and demerits**
- **Shifting of tax burden:** Impact and incidence of taxation - Processes- factors influencing incidence of taxation
- **Economic Effects of taxation:** on Income and Wealth, Consumption, Savings, Investments and Production.
- **Redistributive and Anti – Inflationary nature of taxation** and their implications

Module –III- Public Expenditure and Public Debt: 10L

- **Public Expenditure:** Canons - classification - economic effects of public spending - on production, consumption, distribution, employment and stabilization - Theories of Public Expenditure: Wagner's Hypothesis and Wiseman Peacock Hypothesis - Causes for Public Expenditure Growth - Significance of Public Expenditure: Low Income Support and Social Insurance Programmes.
- **Public Debt:** Classification - Burden of Debt Finance: Internal and External- Public Debt and Fiscal Solvency

Module- IV- Fiscal Policy and Management: 10L

- **Fiscal Policy:** Meaning, Objectives, constituents and Limitations.
- **Budget-** Meaning objectives and types - Structure of Union budget - Deficit concepts
- **Study of current year budget**
- **Intergovernmental Fiscal Relations:** fiscal federalism and fiscal decentralization - central-state financial relations

7. **S. Y. B. COM. (Accounting and Finance)**

Semester-IV, Paper –II,

Course code- UAF4BE2,

Entrepreneurship Development

1. Introduction to Macroeconomic Data and Theory - 15L

Macroeconomics: Meaning, Scope and Importance.

Circular flow of aggregate income and expenditure: closed and open economy models

The Measurement of national product: Meaning and Importance - conventional and Green GNP and NNP concepts

Short run economic fluctuations : Features and Phases of Trade Cycles

The Keynesian Principle of Effective Demand: Aggregate Demand and Aggregate Supply

- Consumption Function - Investment function - effects of Investment Multiplier on Changes in Income and Output.

Introduction to the Great Depression and Euro Zone Crisis – Brexit

2. Money, Inflation and Monetary Policy - 15L

Money Supply: Determinants of Money Supply - Factors influencing Velocity of Circulation of Money

Demand for Money : Classical and Keynesian approaches and Keynes' liquidity preference theory of interest

Money and prices : Quantity theory of money - Fisher's equation of exchange - Cambridge cash balance approach

Inflation: Demand Pull Inflation and Cost Push Inflation - Effects of Inflation- Nature of inflation in a developing economy.

Monetary policy: Meaning, objectives and instruments, inflation targeting

3. Constituents of Fiscal Policy - 15L

Role of a Government to provide Public goods- Principles of Sound and Functional Finance

Fiscal Policy: Meaning and Objectives

Instruments of Fiscal policy : Canons of taxation - Factors influencing incidence of taxation - Effects of taxation Significance of Public Expenditure - Social security contributions- Low Income Support and Social Insurance Programmes - Public Debt - Types, Public Debt and Fiscal Solvency, Burden of debt finance

Union budget -Structure- Deficit concepts-Fiscal Responsibility and Budget Management Act.

4. Open Economy : Theory and Issues of International Trade - 15L

The basis of international trade : Ricardo's Theory of comparative cost advantage - The Heckscher – Ohlin theory of factor endowments- terms of trade - meaning and types

Factors determining terms of trade - Gains from trade - Free trade versus protection

Foreign Investment : Foreign Portfolio investment- Benefits of Portfolio capital flows- Foreign Direct Investment - Merits of Foreign Direct Investment - Role of Multinational corporations

Balance of Payments: Structure -Types of Disequilibrium - Measures to correct disequilibrium in BOP.

Foreign Exchange and foreign exchange market : Spot and Forward rate of Exchange - Hedging, Speculation and Arbitrage -Fixed and Flexible exchange rates- Managed flexibility

**8. SY B M S Semester-IV, Paper –
II, Course code- UMS4BE2,**

Entrepreneurship Development

1. Introduction to Macroeconomic Data and Theory - 15L

Macroeconomics: Meaning, Scope and Importance.

Circular flow of aggregate income and expenditure: closed and open economy models

The Measurement of national product: Meaning and Importance - conventional and Green GNP and NNP concepts

Short run economic fluctuations : Features and Phases of Trade Cycles

The Keynesian Principle of Effective Demand: Aggregate Demand and Aggregate Supply
- Consumption Function - Investment function - effects of Investment Multiplier on Changes in Income and Output.

Introduction to the Great Depression and Euro Zone Crisis – Brexit

2. Money, Inflation and Monetary Policy - 15L

Money Supply: Determinants of Money Supply - Factors influencing Velocity of Circulation of Money

Demand for Money : Classical and Keynesian approaches and Keynes' liquidity preference theory of interest

Money and prices : Quantity theory of money - Fisher's equation of exchange - Cambridge cash balance approach

Inflation: Demand Pull Inflation and Cost Push Inflation - Effects of Inflation - Nature of inflation in a developing economy.

Monetary policy : Meaning, objectives and instruments, inflation targeting

3. Constituents of Fiscal Policy - 15L

Role of a Government to provide Public goods- Principles of Sound and Functional Finance

Fiscal Policy: Meaning and Objectives

Instruments of Fiscal policy : Canons of taxation - Factors influencing incidence of taxation - Effects of taxation Significance of Public Expenditure - Social security contributions- Low Income Support and Social Insurance Programmes - Public Debt - Types, Public Debt and Fiscal Solvency, Burden of debt finance

Union budget -Structure- Deficit concepts-Fiscal Responsibility and Budget Management Act.

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The basis of international trade : Ricardo's Theory of comparative cost advantage - The Heckscher – Ohlin theory of factor endowments- terms of trade - meaning and types
Factors determining terms of trade - Gains from trade - Free trade versus protection

Foreign Investment : Foreign Portfolio investment- Benefits of Portfolio capital flows- Foreign Direct Investment - Merits of Foreign Direct Investment - Role of Multinational corporations

Balance of Payments: Structure -Types of Disequilibrium - Measures to correct disequilibrium in BOP.

Foreign Exchange and foreign exchange market : Spot and Forward rate of Exchange - Hedging, Speculation and Arbitrage -Fixed and Flexible exchange rates- Managed flexibility

9. T Y B Com Semester -V

Business Economics Paper-V Course Code-UCM5BE5,

Entrepreneurship Development

1. Macro Economic Overview of India

- || **Overview of New Economic Policy 1991:** Role of Social Infrastructure with referenceto Education, Health and Family Welfare.
- || **Sustainable Development Goals and Policy Measures:** Make in India, Invest in India,and Skill Development and Training Programmes.
- || **Foreign Investment Policy Measures in India:** Foreign Investment Promotion Board, FDI, MNCs and their role.

2. Agriculture During Post Reform Period

- || **National Agriculture Policy 2000:** Objectives, Features and Implications.
- || **Agricultural Pricing and Agricultural Finance**
- || **Agricultural Marketing Development:** Agricultural Market Infrastructure – Market Information – Marketing Training – Enabling Environments – Recent Developments.

3. The Industry and Service Sector during Post-reform Period

- || **Policy Measures:** Competition Act, 2003, Disinvestment Policy, Micro, Small and Medium Enterprises [MSME Sector] since 2007.
- || **Industrial Pollution in India:** Meaning, Type, Effects and Control.
- || **Service Sector:** Recent Trends, Role and Growth in Healthcare and Tourism Industry.

4. Banking and Financial Market

- || **Banking Sector:** Recent Trends, Issues and Challenges in Banking and Insurance Industry.
- || **Money Market:** Structure, Limitations and Reforms.
- || **Capital Market:** Structure, Growth and Reforms.

10. T Y B Com Semester- VI
Business Economics Paper-VI, Course Code-UCM6BE6,
Entrepreneurship Development

1. Introduction to International Trade

- || **Theories of International Trade** – Ricardo’s Theory of Comparative Costs and the Heckscher – Ohlin Theory.
- || **Terms of Trade** – Types and Limitations.
- || **Gains from International Trade** – Offer Curves and Reciprocal Demand.

2. Commercial Policy

- || **Commercial Trade Policy** – Free Trade and Protection – Pros and Cons.
- || **Tariff and Non-Tariff Barriers: Meaning, Types and Effects.**
- || **International Economic Integration** – Types and Objectives: EU and Brexit, ASAEN

3. Balance of Payments and International Economic Organization

- || **Balance of Payment:** Meaning, Structure, Types of Disequilibrium.
- || **Causes and Measures to correct the disequilibrium in Balance of Payments.**
- || **WTO – Recent Developments in TRIPS, TRIMS and GATS.**

4. Foreign Exchange Market

- || **Foreign Exchange Market:** Meaning, Functions, Determination of Equilibrium Rate of Exchange.
- || **Purchasing Power Parity Theory, Spot and Forward Rates, Arbitrage.**
- || **Role of Central Bank in Foreign exchange rate management, Managed Flexible exchange rate system of India.**

11. M.Com. Part I Semester I- Business Economics-I , Course Code- PCM1EBD
“Economics for Business Decisions”,
Entrepreneurship Development

1. Basic Principles in Business Economics- 15L

Meaning and Scope of Business Economics – twin principles of scarcity- Meaning and Scope or and efficiency, incremental and Marginal principle; profit maximization principle; market economy and invisible hand; production possibility frontier; Opportunity cost – accounting profit and economic profit; market failure, externality, public goods and economic role of government

2. Demand and Supply Analysis- 15L

Determinants of demand – market demand function – theory of attributes, snob appeal, band wagon and Veblen effect and demand function.

Applications of elasticity of demand and supply to economic issues: Paradox of bumper harvest- tax on price and quantity – minimum floor and maximum ceilings: minimum wages controversy- Effects of elasticity of demand and supply on incidence of tax.

The theory of consumer choice – Consumer preference and budget constraint – equilibrium position of tangency with the help of Indifference analysis – effect of changes in price and Income on consumer – equilibrium

3. Production Decisions and Cost Analysis- 15L

Production function – short run and long run – Law of variable proportion, returns to scale, scale economies, scope economies- least cost factor combination for a given output- Expansion path and Multi product firm cost reduction through experience – learning curve

Economic analysis of Cost: Classification of costs, short run and long run cost functions. Break even analysis.

4. Market Structure Analysis -15L

Difference between perfectly and imperfectly competitive markets- Perfect competition and Monopoly as limiting cases of market imperfections – Sources of market power – profit maximization of simple and discriminating monopolist – methods of measuring monopoly power and discriminating monopolist – Public policy towards monopoly power.

Different forms of imperfect competition – Monopolistic competition and Oligopoly – Strategic decision making in oligopoly markets- collusive and non-collusive oligopoly- collusive oligopoly models of price leadership and cartel – basic concepts of game theory – Using Game theory to analyse strategic decisions – application of model of prisoner’s dilemma in market decisions. Advanced Nash equation.

**12. M.Com. Part I, Semester II, Business Economics-II, Course Code-
PCM2MCA “Macro Economics: Concepts and Applications”**

Entrepreneurship Development

1. Aggregate income and its Dimensions- 15L

Aggregate Income and its dimensions: National income aggregates – and measurement; - GNP, GDP, NDP, Real and nominal income concepts, measures of inflation and price indices – GDP deflator – Nominal and real Interest rates -PPP Income and HDI , National income as a measure of economic welfare.

2. Keynesian Concepts of Aggregate Demand (ADF), Aggregate Supply (ASF)- 15L

Keynesian concepts of Aggregate Demand (ADF), Aggregate Supply (ASF), Interaction of ADF and ASF and determination of real Income. Marginal efficiency of capital, Inflationary gap.

Policy trade – off between Inflation and unemployment - Phillips’ curve – short run and long run.

3. Economic Policy Implications in the IS-LM Framework- 15L

The IS-LM mode: Equilibrium in goods and money market; Monetary and real influences on IS-LM curves, Economic fluctuations and Stabilization policies in IS-LM framework Transmission mechanism and the crowding out effect; composition of output and policy mix, IS-LM in India

4. International Aspects of Macroeconomic Policy- 15L

International aspects of Macroeconomic policy: Balance of payments disequilibrium of an open economy – corrective policy measures – Expenditure changing policies and Expenditure switching policies BOP adjustments through monetary and fiscal policies – The Mundell–Fleming model. Devaluation, revaluation as expenditure switching policies effectiveness of devaluation and J curve effect

13. T Y B Com (Accounting and Finance)	
Economics Paper – III Course Code- UAF6BE3 (Indian Economy)	
Entrepreneurship Development	
Sr. No.	Modules / Units
1	Introduction Agricultural Sector
	Introduction Demographic features- Poverty, Income inequality and Unemployment Urbanization and its effects Agricultural Sector Institutional Structure- Land reforms in India Technological changes in agriculture Agricultural pricing and agricultural finance Agricultural marketing National agricultural policy
2	Industrial Sector
	Growth and pattern of industrialization Industrial Policy of 1991. Public sector enterprises and disinvestment policy Small scale sector- problems and prospects
3	Service Sector and External Sector
	Service Sector Nature and scope of service industry Recent trends in Banking industry, Insurance Industry, Healthcare Industry and Tourism Industry External Sector Structure and directions of foreign trade India's Balance of payments since 1991 FDI, foreign capital and transnational companies in India. Role and impact of SAARC, ASEAN and WTO
4	Money and Banking
	Money market and its features Monetary policy of RBI Progress of commercial banking in India Development of capital markets SEBI and its functions

J.B.S.P.Sanstha's
**Changu Kana Thakur Arts, Commerce and Science College,
New Panvel
(Autonomous)**

**Bachelor of Commerce (B.Com)
Programme
Three Year Integrated Programme-
Six Semesters
*Course Structure***

Under Choice Based Credit System

**To be implemented from Academic Year- 2019-2020
Progressively**

Faculty of Commerce

Revised Syllabus of Courses of B.Com. Programme at Semester I with Effect from the Academic Year 2019-2020

Elective Courses (EC)
Discipline Specific Elective(DSE) Courses

1. Accountancy and Financial Management I

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Accounting standards issued by ICAI and Inventory valuation	15
2	Final Accounts with adjusting and closing entry	15
3	Departmental Accounts	15
4	Bank Reconciliation Statement (BRS)	15
	Total	60

Sr. No.	Modules / Units
1	Accounting standards issued by ICAI and Inventory valuation
	<ul style="list-style-type: none"> • General Accepted Accounting Principles (GAAP) Concepts, benefits, procedures for issue of accounting standards Various Ind AS - 1: Disclosure of Accounting Policies Purpose, Areas of Policies, Disclosure of Policies Disclosure of Change in Policies, Illustrations Ind AS-2:Valuation of Inventories (Stock) Meaning, Definition, Applicability, Measurement of Inventory, Disclosure in Final Account, Explanation with Illustrations. Ind AS - 18: Revenue Recognition Meaning and Scope, Transactions excluded, Sale of Goods, Rendering of Services, Effects of Uncertainties, Disclosure, Illustrations. • Inventory Valuation Meaning of inventories Cost for inventory valuation Inventory systems : Periodic Inventory system and Perpetual Inventory System Valuation: Meaning and importance Methods of Stock Valuation as per Ind AS – 2 : FIFO and Weighted Average Method Computation of valuation of inventory as on balance sheet date: If inventory is taken on a date after the balance sheet or before the balance sheet
2	Final Accounts with adjusting and closing entry
	Expenditure: Capital, Revenue Receipts: Capital, Revenue Adjustment and Closing Entries Final accounts of Manufacturing concerns (Proprietary Firm)
3	Departmental Accounts
	Meaning Basis of Allocation of Expenses and Incomes/Receipts Inter Departmental Transfer : at Cost Price and Invoice Price Stock Reserve Departmental Trading and Profit & Loss Account and Balance Sheet
4	Bank Reconciliation Statement (BRS)
	<ul style="list-style-type: none"> • Meaning and use of BRS • Practical problem based on BRS

**Revised Syllabus of Courses of B.Com. Programme at Semester II
with Effect from the Academic Year 2016-2017**

**Elective Courses (EC)-
Discipline Specific Elective(DSE) Courses**

1. Accountancy and Financial Management II

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Accounting from Incomplete Records	15
2	Consignment Accounts	15
3	Branch Accounts	15
4	Accounting In Computerized Environment	15
Total		60

Sr. No.	Modules / Units
1	Accounting from Incomplete Records
	Introduction Problems on preparation of final accounts of Proprietary Trading Concern (conversion method)
2	Consignment Accounts
	Accounting for consignment transactions Valuation of stock Invoicing of goods at higher price(excluding overriding commission, normal/abnormal losses)
3	Branch Accounts
	Meaning/ Classification of branch Accounting for Dependent Branch not maintaining full books: Debtors method Stock and debtors method
4	Accounting In Computerized Environment
	Manual vs Computerized Accounting System Tally ERP 9 1. Creation of company 2. Group 3. Ledger

Reference Books

Reference Books

Accountancy and Financial Management

- Introduction to Accountancy by T. S. Grewal, S. Chand and Company (P) Ltd., New Delhi Advance Accounts by Shukla & Grewal, S. Chand and Company (P) Ltd., New Delhi
- Advanced Accountancy by R. L Gupta and M Radhaswamy, S. Chand and Company (P) Ltd., New Delhi
- Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial Accounting by LesileChandwichk, Pentice Hall of India Adin Bakley (P) Ltd.
- Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishing Co. Ltd., Mumbai.
- Financial Accounting by P. C. Tulsian, Pearson Publications, New Delhi Accounting Principles by Anthony, R.N. and Reece J.S., Richard Irwin Inc.
- Financial Accounting by Monga, J.R. Ahuja, GirishAhujaandShehgal Ashok, Mayur Paper Back
- Compendium of Statement & Standard of Accounting, ICAI.
- Indian Accounting Standards, Ashish Bhattacharya, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial Accounting by Williams , Tata Mc. Grow Hill & Co. Ltd., Mumbai
- Company Accounting Standards by ShrinivasanAnand, Taxman. Financial Accounting by V. Rajasekaran, Pearson Publications, New Delhi. Introduction to Financial Accounting by Horngren, Pearson Publications.
- Financial Accounting by M. Mukherjee.M. Hanif. Tata McGraw Hill Education Private Ltd; New Delhi



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.Com.

**Revised Syllabus of
S.Y.B.Com.**

**Accountancy and Financial Management
Financial Accounting and Auditing
Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2020-21**

**Revised Syllabus of Courses of B.Com. Programme at Semester III
with Effect from the Academic Year 2020-2021**

Elective Courses (EC)

Discipline Specific Elective (DSE) Courses

Accountancy and Financial Management III

Modules at a Glance Sr. No.	Modules	No. of Lectures
1	Partnership Final Accounts based on Adjustment of Admission or Retirement/Death of a Partner during the year	15
2	Piecemeal Distribution of Cash	15
3	Amalgamation of Firms	15
4	Accounting for Hire Purchase	15
Total		60

Semester - III

Sr. No.	Modules / Units
1	Partnership Final Accounts based on Adjustment of Admission or Retirement/Death of a Partner during the year
	<p>i) Simple final accounts questions to demonstrate the effect on final Accounts when a partner is admitted during the year or when partner Retires / dies during the year.</p> <p>ii) Allocation of gross profit prior to and after admission / retirement / death when stock on the date of admission / retirement is not given and apportionment of other expenses based on time / Sales/other given basis.</p> <p>iii) Ascertainment of gross profit prior to and after admission/retirement/death when stock on the date of admission/retirement is given and apportionment of other expenses based on time / Sales / other given basis Excluding Questions where admission / retirement / death takes place in the same year.</p>
2	Piecemeal Distribution of Cash
	<p>i) Excess Capital Method only</p> <p>ii) Asset taken over by a partner</p> <p>iii) Treatment of past profits or past losses in the Balance sheet</p> <p>iv) Contingent liabilities / Realization expenses / amount kept aside for expenses and adjustment of actual</p> <p>v) Treatment of secured liabilities</p> <p>vi) Treatment of preferential liabilities like Govt. dues / labour dues etc. Excluding : Insolvency of partner and Maximum Loss Method</p>
3	Amalgamation of Firms
	<p>i) Realization method only</p> <p>ii) Calculation of purchase consideration</p> <p>iii) Journal / ledger accounts of old firms</p> <p>iv) Preparing Balance sheet of new firm</p> <p>v) Adjustment of goodwill in the new firm</p> <p>vi) Realignment of capitals in the new firm by current accounts / cash or a combination thereof Excluding Common transactions between the amalgamating firms</p>
4	Accounting for Hire Purchase
	<p>Meaning</p> <p>Calculation of interest Accounting for hire purchase transactions by asset purchase method based on full cash price</p> <p>Journal entries, ledger accounts and disclosure in balance sheet for hirer and vendor (excluding default, repossession and calculation of cash price)</p>

Reference Text :

1. Ashish K. Bhattacharyya – “Financial Accounting for Business Managers”, Prentice Hall of India Pvt. Ltd.
2. Shashi K. Gupta – “Contemporary Issues in Accounting”, Kalyani Publishers.
3. R. Narayanaswamy – “Financial Accounting”, Prentice Hall of India, New Delhi
4. Ashok Sehgal – “Fundamentals of Financial Accounting”, Taxmann’s Publishers

Semester – III

***Revised Syllabus of Courses of B.Com. Programme at Semester III
with Effect from the Academic Year 2020-2021***

Elective Courses (EC)

Discipline Specific Elective (DSE) Courses

**Financial Accounting and Auditing – Introduction to
Management Accounting
*Modules at a Glance***

<i>Modules at a Glance Sr. No.</i>	Modules	No. of Lectures
1	Introduction to Management Accounting	10
2	Ratio Analysis and Interpretation	15
3	Cash Flow Statement	10
4	Capital Budgeting	10
Total		45

Sr. No.	Modules / Units
1	Introduction to Management Accounting
	<p>A. Introduction to Management Accounting – Meaning, Nature, Scope, Functions, Decision Making Process, Financial Accounting V/s Management Accounting</p> <p>B. Analysis and Interpretation of Financial Statements</p> <p>i) Study of Balance sheet and Income statement / Revenue statements in vertical form suitable for analysis</p> <p>ii) Relationship between items in Balance Sheet and Revenue statement</p> <p>iii) Tools of analysis of Financial Statements (i) Trend analysis (ii) Comparative Statement (iii) Common Size Statement</p> <p>Note : (i) Problems based on trend analysis (ii) Short Problems on Comparative and Common sized statements</p>
2	Ratio Analysis and Interpretation
	<p>(Based on Vertical Form of Financial statements) – Meaning, classification, Du Point Chart, advantages and Limitations)</p> <p>A. Balance Sheet Ratios :</p> <p>i) Current Ratio</p> <p>ii) Liquid Ratio</p> <p>iii) Stock Working Capital Ratio</p> <p>iv) Proprietary Ratio</p> <p>v) Debt Equity Ratio</p> <p>vi) Capital Gearing Ratio</p> <p>B. Revenue Statement Ratio:</p> <p>i) Gross Profit Ratio</p> <p>ii) Expenses Ratio</p> <p>iii) Operating Ratio</p> <p>iv) Net Profit Ratio</p> <p>v) Net Operating Profit Ratio</p> <p>vi) Stock Turnover Ratio</p> <p>A. Combined Ratio :</p> <p>i) Return on capital employed (Including Long Term Borrowings)</p> <p>ii) Return on proprietor's Fund (Shareholders Fund and Preference Capital)</p> <p>iii) Return on Equity Capital</p> <p>iv) Dividend Pay-out Ratio</p> <p>v) Debt Service Ratio</p> <p>vi) Debtors Turnover</p> <p>vii) Creditors Turnover</p> <p>(Practical Question on Ratio Analysis)</p>
3	Cash Flow Statement
	Preparation of Cash Flow Statement with reference to Ind AS-7 (Indirect method only)
4	Capital Budgeting
	<p>A. Introduction:</p> <p>B. The classification of capital budgeting projects</p> <p>C. Capital budgeting process</p> <p>D. Capital budgeting techniques - Payback Period, Accounting Rate of Return, Net Present Value, The Profitability Index, Discounted Payback. (Excluding calculation of cash flow)</p>

Reference Text :

1. Cost and Management Accounting - Colinn Dury 7th Edition
2. Cost and Management Accounting- Dbarshi Bhattacharyya pearson Publications 2013 edition
3. Management Accounting - M.Y.Khan
4. Management Accounting - I.M.pandey

**Revised Syllabus of Courses of B.Com. Programme at Semester IV
with Effect from the Academic Year 2020-2021**

Elective Courses (EC)

Discipline Specific Elective (DSE) Courses

Accountancy and Financial Management IV

Modules at a Glance Sr. No.	Modules	No. of Lectures
1	Introduction to Company Accounts	15
2	Redemption of Preference Shares	15
3	Ascertainment and Treatment of Profit Prior to Incorporation	15
4	Accounting with the use of Accounting Software	15
Total		60

Sr. No.	Modules / Units
1	Introduction to Company Accounts
	<p>Introduction of basic terms: Types of companies, nature and formation of companies, Shares, Debentures, Share Capital, Reserves and surplus, types of assets and liabilities, dividen, format of Balance Sheet</p> <p>Issue of shares: Different modes IPO, Private Placements, Preferential, Rights, ESO, SWEAT and ESCROW account, Issue of shares at par, premium and discount, Under subscription and Over subscription of shares, forfeiture and reissue of forfeited shares, issue of shares for consideration other than cash. (Practical problem)</p> <p>Issue of Debenture and Redemption ; At par, Premium, discount types of Debentures (no practical problems on redemption of debentures)</p>
2	Redemption of Preference Shares
	<p>Redemption of Preference: Provision of the Companies Act for redemption of Preference Shares (Sec 55 of the Companies Act, 2013), Companies (Share and Debentures) Rules. Methods of Redemption of fully paid up Preference Shares as per Companies Act, 2013: The proceed of a fresh issue of shares, the capitalisation of undistributed profits and a combination of both, calculation of minimum fresh issue to provide the fund for redemption, (Question on journal entries and/or Balance Sheet) Note: Companies governed by Section 133 of the Companies Act, 2013 and comply with the accounting standards prescribed for them. Hence, the balance in security premium account not to be utilised for premium payable on redemption of preference shares.</p>
3	Ascertainment and Treatment of Profit Prior to Incorporation
	<p>(i) Principles for ascertainment Preparation of separate combined, columnar Profit and Loss A/c including different basis of allocation of expenses and income and Balance sheet</p>
4	Accounting with the use of Accounting Software
	<p>Advance accounting & Inventory Voucher: Purchase and Sales order, reorder , delivery notes , Budgeting Control, Invoice product invoice and service invoice Shortcut keys : special combination, special functional key combination. Management Information System (MIS)</p>

Reference Text :

1. Introduction to Accountancy T.S. Grewal S. Chand and Co. (P) Ltd., New Delhi
2. Advanced Accounts Shukla and Grewal S. Chand and Co. (P) Ltd., New Delhi
3. Advanced accountancy R.L. Gupta and M. Radhaswamy S. Chand and Co. (P) Ltd., New Delhi
4. Modern Accountancy Mukerjee and Hanif Tata Mc. Grow Hill and Co. Ltd., Mumbai
5. Financial Accountancy LesileChandWichkPretice Hall of India AdinBakley (P) Ltd.

**Revised Syllabus of Courses of B.Com. Programme at Semester IV
with Effect from the Academic Year 2020-2021
Elective Courses (EC)
Discipline Specific Elective (DSE) Courses**

Financial Accounting and Auditing – Auditing

Modules at a Glance Sr. No.	Modules	No. of Lectures
1	Introduction to Auditing	10
2	Audit Planning, Procedures and Documentation	10
3	Auditing Techniques and Internal Audit Introduction	15
4	Auditing Techniques : Vouching & Verification	10
Total		45

Sr. No.	Modules /Units
1	Introduction to Auditing
	<p>A. Basics – Financial Statements, Users of Information, Definition of Auditing, Objectives of Auditing, Inherent limitations of Audit, Difference between Accounting and Auditing, Investigation and Auditing.</p> <p>B. Errors & Frauds – Definitions, Reasons and Circumstances, Types of Error, Types of frauds, Risk of fraud and Error in Audit, Auditors Duties and Responsibilities in case of fraud.</p> <p>C. Principles of Audit, Materiality, True and Fair view</p> <p>D. Types of Audit – Meaning, Advantages, Disadvantages of Balance sheet Audit, Interim Audit, Continuous Audit, Concurrent Audit and Annual Audit, Statutory Audit</p> <p>E. Audit Of ledger – General Consideration , Scrutiny of ledger of Assets, personal , revenue accountants</p>
2	Audit Planning, Procedures and Documentation
	<p>A. Audit Planning – Meaning, Objectives, Factors to be considered, Sources of obtaining information, Discussion with Client, Overall Audit Approach</p> <p>B. Audit Program – Meaning, Factors, Advantages and Disadvantages, Overcoming Disadvantages, Methods of Work, Instruction before commencing Work, Overall Audit Approach.</p> <p>C. Audit Working Papers – Meaning, importance, Factors determining Form and Contents, Main Functions / Importance, Features, Contents of Permanent Audit File, Temporary Audit File, Ownership, Custody, Access of Other Parties to Audit Working Papers, Auditors Lien on Working Papers, Auditors Lien on Client’s Books.</p>
3	Auditing Techniques and Internal Audit Introduction
	<p>A. Test Check – Test Checking Vs Routing Checking, test Check meaning, features, factors to be considered, when Test Checks can be used, advantages, disadvantages, precautions.</p> <p>B. Audit Sampling – Audit Sampling, meaning, purpose, factors in determining sample size – Sampling Risk, Tolerable Error and expected error, methods of selecting Sample Items Evaluation of Sample Results auditors Liability in conducting audit based on Sample</p> <p>C. Internal Control – Meaning and purpose, review of internal control, advantages, auditors duties, review of internal control, Inherent Limitations of Internal control, internal control samples for sales and debtors, purchases and creditors, wages and salaries. Internal Checks Vs Internal Control, Internal Checks Vs Test Checks.</p> <p>D. Internal Audit : Meaning, basic principles of establishing Internal audit, objectives, evaluation of internal Audit by statutory auditor, usefulness of Internal Audit, Internal Audit Vs External Audit, Internal Checks Vs Internal Audit</p>
4	Auditing Techniques : Vouching & Verification
	<p>A. Audit of Income : Cash Sales, Sales on Approval, Consignment Sales, Sales Returns Recovery of Bad Debts written off, Rental Receipts, Interest and Dividends Received Royalties Received</p> <p>B. Audit of Expenditure : Purchases, Purchase Returns, Salaries and Wages, Rent, Insurance Premium, Telephone expense Postage and Courier, Petty Cash Expenses, Travelling Commission Advertisement, Interest Expense</p> <p>C. Audit of Assets Book Debts / Debtors, Stocks – Auditors General Duties; Patterns, Dies and Loose Tools, Spare Parts, Empties and Containers Quoted Investments and Unquoted Investment Trade Marks / Copyrights Patents Know-How Plant and Machinery Land and Buildings Furniture and Fixtures</p> <p>D. Audit of Liabilities : Outstanding Expenses, Bills Payable Secured loans Unsecured Loans, Contingent Liabilities</p>

Reference Text :

1. B.N. Tondan, A Hand book on Practical Auditing,
2. Ravinder Kumar and Virendra Sharma, Auditing: Principles and Practices
3. Varsha Ainapure and Mukund Ainapure, Auditing and Assurance
4. T. J. Rana, Auditing -1

Scheme of Examination:

The performance of the learners will be evaluated in two components. One component will be the Internal Assessment component carrying 25% marks and the second component will be the Semester End Examination component carrying 75% marks.

Internal Assessment:

The Internal Assessment will consist of one class test of 20 marks for each course and 5 Marks for active participation and overall conduct. The question paper pattern will be shown as below:

**Question Paper Pattern
(Internal Assessment)**

1. Class Test:-

Maximum Marks: 20 marks

Questions to be set: 02

Duration: 40 Minutes

Question No	Particular	Marks
Q-1	Objective Questions Students to answer 10 sub questions out of 15 sub questions. <i>(*Multiple choice/ True or False/ Match the columns/ Fill in the blanks)</i> OR Objective Questions A) Sub Questions to be asked 08 and to be answered any 05 B) Sub Questions to be asked 08 and to be answered any 05 <i>(*Multiple choice/ True or False/ Match the columns/ Fill in the blanks)</i>	10 Marks
Q-2	Concept based short questions Students to answer 5 sub questions out of 8 sub questions.	10 Marks

2. Active participation and overall conduct..... 5 Marks

Question Paper Pattern (External Assessment)

Maximum Marks: 75

Questions to be set: 05

Duration: 02.30 Hrs.

Question No	Particular	Marks
Q-1	Full Length Practical Question OR	15 Marks
Q-1	Full Length Practical Question	15 Marks
Q-2	Full Length Practical Question OR	15 Marks
Q-2	Full Length Practical Question	15 Marks
Q-3	Full Length Practical Question OR	15 Marks
Q-3	Full Length Practical Question	15 Marks
Q-4	Full Length Practical Question OR	15 Marks
Q-4	Full Length Practical Question	15 Marks
Q-5	A) Theory questions B) Theory questions OR	07 Marks 08 Marks
Q-5	Short Notes To be asked 05 To be answered 03	15 Marks

Note:

Practical question of 15 marks may be divided into two sub questions of 7/8 and 10/5 Marks.



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'Best College Award' by University of Mumbai

Program: B.Com.

Revised Syllabus of T.Y.B.Com. – Semester Vth and VIth
Direct and Indirect Tax
Paper I and II

Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2021-22

**TYBCOM/SEM-V & VI/ DIRECT AND INDIRECT TAX PAPER –I AND II/SYLLABUS/QP PATTERN/FROM-
2021-22**

Sr. No.	Heading	Particulars
1	Title of Course	Direct and Indirect Tax
2	Eligibility for Admission	S.Y.BCOM PASSED
3	Passing marks	40%
4	Ordinances/Regulations (if any)	--
5	No. of Semesters	V th and VI th
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Preamble

In new era our taxation statements preparation also changed and need to be improved. New methods of taxation have been emerging. So to make the students more train in the modern taxation environment this syllabus revision is must.

Objectives

SN	Objectives
1	To enhance the abilities of learners to develop the concept of Basic Terms of Direct Tax
2	To enable the learners to understand Scope of Total Income & Residential Status
3	To enable the learners to understanding of Heads of Income (S: 14) and Deduction from Total Income
4	To enable the learners to understanding Computation of Total Income for Individual and filling ITR-1 Form Sahaj

Outcomes

SN	Outcomes
1	Learners will enhance or gain knowledge and understanding of the provision of the direct tax Law
2	It will enable the learners to understand the basic principles of Residential Status
3	It will enable the learners in understanding, of Heads of Income (S: 14) and Deduction from Total Income

4	Learner will enhance or gain knowledge and understanding Computation of Total Income for Individual and filling ITR-1 Form Sahaj
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Objectives

SN	Objectives
1	To enhance the abilities of learners to develop the concept of Basic Terms of Indirect Tax Goods and Service Tax Act
2	To enable the learners to understand Levy and Collection of Tax
3	To enable the learners to understanding of Time, Place and Value of Supply and Input Tax Credit & Payment of Tax
4	To enable the learners to understanding Registration under GST Law

Outcomes

SN	Outcomes
1	Learners will enhance or gain knowledge and understanding of the provision of the Indirect tax Law
2	It will enable the learners to understand the Scope of Supply ,Non taxable Supplies, Composite and Mixed Supplies, Composition Levy , Levy and Collection of tax and Exemption from tax
3	It will enable the learners in understanding, concept of Supply and Payment of tax
4	Learner will enhance or gain knowledge and understanding Procedure for registration, Cancellation of registration, Persons not liable registration

T. Y. B. Com. DIRECT AND INDIRECT TAX

For the subject of Direct and Indirect Tax there shall be two papers for 45 lectures each comprising of five units

Semester-V

1. Paper-I Module-I will be for 04 Lectures
2. Paper-I Module-II will be for 04 Lectures
3. Paper-I Module-III will be for 24 Lectures
4. Paper-I Module-IV will be for 04 Lectures
5. Paper-I Module –V will be for 09 Lectures

Semester-VI

1. Paper-II Module-I will be for 09 Lectures
2. Paper-II Module-II will be for 09 Lectures
3. Paper-II Module-III will be for 09 Lectures
4. Paper-II Module-IV will be for 09 Lectures
5. Paper-II Module –V will be for 09 Lectures

Scheme of Examination for Each Semester:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

I	Each paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options.	
	Q-1	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-2	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-3	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-4	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-5	Two questions of theory Questions from all Module 15 M

		OR Short Notes out of 5 any 315 M
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Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. Direct and Indirect Tax Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER V

Course Code	Unit	Topics	Credits	L / Week
UCM5TX1	I	Basic Terms	3	04
	II	Scope of Total Income & Residential Status		04
	III	Heads of Income		24
	IV	Deduction from Total Income		04
	V	Computation of Total Income for Individual and filling ITR-1 Form		09

Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. Direct and Indirect Tax- Goods and Service Tax Act
Syllabus to be implemented from the Academic year 2021-2022
SEMESTER VI

Course Code	Unit	Topics	Credits	L / Week
UCM6DX2	I	Introduction	3	09
	II	Levy and Collection of Tax		09
	III	Time, Place and Value of Supply		09
	IV	Input Tax Credit & Payment of Tax		09
	V	Registration under GST Law		09

Semester - V– Direct and Indirect Tax - I

Sr. No.	Modules / Units
1	Basic Terms
	Assessee, Assessment, Assessment Year, Annual value, Business, Capital Assets, Income, Person, Previous Year, Transfer
2	Scope of Total Income & Residential Status
	Scope of Total Income (S: 5) Residential Status (S: 6) for Individual assessee
3	Heads of Income (S: 14)
	<ul style="list-style-type: none"> • Salary (S: 15 to 17) • Income from House Properties (S: 22 to 27) • Profit and Gain From Business (S:28, 30, 31, 32, 35, 35D, 36, 37, 40, 40A 43B. • Capital Gains (S: 45, 48, 49, 50, 54, 54 EC) restricted to computation of Capital gain on transfer of residential house property only • Income from Other Sources (S: 56 to S: 59) • Exclusions From Total Income (S: 10) Exclusion related to specified heads to be covered with relevant head.eg. Salary, Business Income, Capital Gain, Income from Other Sources
4	Deduction from Total Income
	S 80 A, S 80C, 80CCC, 80D, 80DD, 80E, 80 U, 80 TTA (revised deduction)
5	Computation of Total Income for Individual and filling ITR-1 Form Sahaj

Semester –VI- Direct and Indirect Tax - II Goods and Service Tax Act

Sr. No.	Modules / Units
1	Introduction
	<ul style="list-style-type: none"> • What is GST • Need for GST • Dual GST Model • Definitions <ul style="list-style-type: none"> Section 2(17) Business Section 2(13) Consideration Section 2(45) Electronic Commerce Operator Section 2(52) Goods Section 2(56) India Section 2 (78) Non taxable Supply Section 2(84) Person Section 2(90) Principal Supply Section 2(93) Recipient Section 2(98) Reverse charge Section 2(102) Services Section 2(105) Supplier Section 2(107) Taxable Person Section 2(108) Taxable Supply • Goods & Services Tax Network (GSTN)
2	Levy and Collection of Tax
	<ul style="list-style-type: none"> • Scope of Supply • Non taxable Supplies • Composite and Mixed Supplies • Composition Levy • Levy and Collection of tax • Exemption from tax
3	Time, Place and Value of Supply
	<ul style="list-style-type: none"> • Time of Supply • Place of Supply • Value of Supply
4	Input Tax Credit & Payment of Tax
	<ul style="list-style-type: none"> • Eligibility for taking Input Tax Credit • Input Tax Credit in Special Circumstances • Computation of Tax Liability and payment of tax (Recent tax Rate)
5	Registration under GST Law
	<ul style="list-style-type: none"> • Persons not liable registration • Compulsory registration • Procedure for registration • Deemed registration • Cancellation of registration

Reference Books

Reference Books

Direct and Indirect Tax

- Taxmann's Direct Taxes Ready Reckoner – Covering Illustrative Commentary on all Provisions of the Income-tax Act with Focused Analysis | 45th Edition | March 2021 | A.Y. 2021-22 & 2022-23 Paperback – 25 by Vinod K. Singhania
- Taxmann's Students' Guide to Income Tax Including GST | Updated till 1st December 2020 64th Edition | A.Y 2021-22 Paperback – 7 January 2021 by [Dr. Vinod K Singhania](#) , [Dr. Monica Singhania](#)
- Taxation (**Direct & Indirect Tax**) Students' **Guide** to Income Tax Including GST [Problems and Solutions]. Author(s): Dr. Vinod K. Singhania,
- **Besley, T. J., & Persson, T. (2013).** Taxation and development. *Handbook of Economic Development.*
- Handbook For Start-Ups A Tax And Regulatory Guide by Radhika Jain, Bloomsbury India
- Taxation of Capital Gains as Amended by the Finance Act 2021 by Girish Ahuja and Ravi Gupta, Commercial Law Publishers India Pvt Ltd
- Customs & Gst Budget 2021-2022 by R K Jain, Centax Publication Pvt Ltd



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Program: B.Com.

Revised Syllabus of T.Y.B.Com. – Semester Vth and VIth
FINANCIAL ACCOUNTING AND AUDITING
Paper VII and IX
Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2021-22

Sr. No.	Heading	Particulars
1	Title of Course	Financial Accounting and Auditing
2	Eligibility for Admission	S.Y.BCOM PASSED
3	Passing marks	40%
4	Ordinances/Regulations (if any)	--
5	No. of Semesters	V th and VI th
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Preamble

In today's world maintaining account transactions are more complex. Preparation of various reports for compliances of companies act and other statutory requirement from various agencies. Computerized accounting becomes an integral part of an accounting system. So to make the students more train in the modern accounting environment this syllabus revision is must.

Objectives

SN	Objectives
1	To enhance the abilities of learners to develop the concept of partnership Final account and how to maintain it.
2	To enable the learners to understand, develop and apply the techniques of personal investment accounting.
3	To enable the learners in understanding, preparing and presenting the advanced excel in business accounting.

Outcomes

SN	Objectives
1	Learners will enhance the abilities of learners to develop the concept company Final account and how to maintain it.
2	It will enable the learners to understand, develop and apply the techniques of personal investment accounting.
3	It will enable the learners in understanding, preparing and presenting the advanced excel in business accounting..

T. Y. B. Com. FINANCIAL ACCOUNTING AND AUDITING

For the subject of Financial Accounting and Auditing there shall be two papers for 60 lectures each comprising of four units of 15 Lectures each.

Semester-III

1. Paper-VII Module-I will be for 15 Lectures
2. Paper- VII Module-II will be for 15Lectures
3. Paper- VII Module-III will be for 10 Lectures
4. Paper- VII Module-IV will be for 12 Lectures
5. Paper- VII Module-V will be for 8 Lectures

Semester-IV

1. Paper- IX Module-I will be for 15 Lectures
2. Paper- IX Module-II will be for 15Lectures
3. Paper- IX Module-III will be for 10 Lectures
4. Paper- IX Module-IV will be for 10 Lectures
5. Paper- IX Module-V will be for 10 Lectures

Scheme of Examination for Each Semester:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

I		
	Each paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options.	
	Q-1	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-2	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-3	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-4	Practical Problem from any Module 15 M OR Practical Problem from any Module 15 M
	Q-5	Two theory Questions from all Module 15 M OR Short Notes out of 5 any 3 15 M

Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. Financial Accounting and Auditing-VII
Syllabus To be implemented from the Academic year 2021-2022
SEMESTER V

Course Code	Unit	Topics	Credits	L / Week
UCM5FA7	I	Preparation of Final Accounts of Companies	4	15
	II	Internal Reconstruction		15
	III	Buy Back of Shares		10
	IV	Investment Accounting (w.r.t. Accounting Standard- 13)		12
	V	Implications for Accounting with Application of Excel in Business for Accounting		8

Choice Based Credit Grading and Semester System (CBCGS)
T.Y.B. Com. Financial Accounting and Auditing-IX Syllabus
To be implemented from the Academic year 2021-2022
SEMESTER VI

Course Code	Unit	Topics	Credits	L / Week
UCM6FA9	I	AS – 14 - Amalgamation, Absorption & External Reconstruction	4	15
	II	Accounting of Transactions of Foreign Currency		15
	III	Underwriting of Shares & Debentures		10
	IV	Accounting for Limited Liability Partnership		10
	V	Recent Trends in Accounting with ERP SAP R3.		10

Financial Accounting and Auditing-VII

Sr. No.	Modules / Units
1	Preparation of Final Accounts of Companies
	<p>Relevant provisions of Companies Act related to preparation of Final Account(excluding cash flow statement) Preparation of financial statements as per Companies Act. (excluding cash flowstatement) AS 1 in relation to final accounts of companies (disclosure of accountingpolicies)</p> <p>Adjustment for –</p> <ol style="list-style-type: none"> 1. Closing Stock 2. Depreciation 3. Outstanding expenses and income 4. Prepaid expenses and Pre received income 5. Proposed Dividend and Unclaimed Dividend 6. Provision for Tax and Advance Tax 7. Bill of exchange (Endorsement, Honour, Dishonour) 8. Capital Expenditure included in Revenue expenditure and vice versaeg- purchase of furniture included in purchases 9. Unrecorded Sales and Purchases 10. Good sold on sale or return basis 11. Managerial remuneration on Net Profit before tax 12. Transfer to Reserves 13. Bad debt and Provision for bad debts 14. Calls in Arrears 15. Loss by fire (Partly and fully insured goods) 16. Goods distributed as free samples. 17. Any other adjustments as per the prevailing accounting standard.
2	Internal Reconstruction
	<p>Need for reconstruction and company law provisions Distinction between internal and external reconstructions.</p> <p>Methods including alteration of share capital, variation of shareholder rights, sub division, consolidation, surrender and reissue / cancellation, reduction of share capital with relevant legal provisions and accounting treatment forsame.</p>
3	Buy Back of Shares
	<p>Company Law / Legal provisions (including related restrictions, power, transfer to capital redemption reserve account and prohibitions) Compliance of conditions including sources, maximum limits and debt equity ratio. Cancellation of Shares Bought back(Excluding Buy Back of minority shareholding)</p>

Sr. No.	Modules / Units
4	Investment Accounting (w.r.t. Accounting Standard- 13)
	For shares (variable income bearing securities) For debentures/Preference. shares (fixed income bearing securities) Accounting for transactions of purchase and sale of investments with ex and cum interest prices and finding cost of investment sold and carrying cost as perweighted average method (Excl. brokerage). Columnar format for investment account.
5	Implications for Accounting with Application of Excel in Business for Accounting
	Practical use of the following excel formulas for Business for Accounting AGGREGATE, ROUND, EOMONTH, EDATE, WORKDAY, TRIM , 3DFORMULAS, VLOOKUP,HLOOKUP,IF,SUMIFS.

Financial Accounting and Auditing-IX

Sr. No.	Modules / Units
1	AS – 14 - Amalgamation, Absorption & External Reconstruction (excluding inter-company holdings)
	In the nature of merger and purchase with corresponding accounting treatments of pooling of interests and purchase method respectively. Meaning and Computation of purchase consideration. Problems based on purchase method only.
2	Accounting of Transactions of Foreign Currency
	In relation to purchase and sale of goods, services and assets and loan and credit transactions. Computation and treatment of exchange rate differences
3	Underwriting of Shares & Debentures
	Introduction, Underwriting, Underwriting Commission Provision of Companies Act with respect to Payment of underwriting commission Underwriters, Sub-Underwriters, Brokers and Manager to issues Types of underwriting, Abatement Clause Marked, Unmarked and Firm-underwriting applications, Liability of the underwriters in respect of underwriting contract Practical problems

4	Accounting for Limited Liability Partnership
	Statutory Provisions Conversion of partnership firm into LLP Final Accounts
5	Recent Trends in Accounting with ERP SAP R/3.
	Practical implications of ERP SAP R3 (Real Time Data Processing 3 Tire) What is SAP R/3? Structure of SAP R/3

Reference Books

- Introduction to Accountancy by T. S. Grewal, S. Chand and Company (P) Ltd., New Delhi
Advance
- Accounts by Shukla & Grewal, S. Chand and Company (P) Ltd., New Delhi
- Advanced Accountancy by R. L Gupta and M Radhaswamy, S. Chand and Company (P) Ltd., New
Delhi
- Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill & Co. Ltd., Mumbai Financial
Accounting by LesileChandwichk, Pentice Hall of India Adin Bakley (P) Ltd.
- Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishing Co. Ltd.,
Mumbai.
- Financial Accounting by P. C. Tulsian, Pearson Publications, New Delhi Accounting Principles by
Anthony, R.N. and Reece J.S., Richard Irwin Inc.
- Financial Accounting by Monga, J.R. Ahuja, GirishAhujaandShehgal Ashok, Mayur Paper Back
- Compendium of Statement & Standard of Accounting, ICAI.
- Indian Accounting Standards, Ashish Bhattacharya, Tata Mc. Grow Hill & Co. Ltd., Mumbai
Financial
Accounting by Williams , Tata Mc. Grow Hill & Co. Ltd., Mumbai
- Company Accounting Standards by ShrinivasanAnand, Taxman. Financial Accounting by V.
Rajasekaran, Pearson Publications, New Delhi. Introduction to Financial Accounting by Horngren,
Pearson Publications.
- Financial Accounting by M. Mukherjee.M. Hanif. Tata McGraw Hill Education Private Ltd; New
Delhi



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: BMS

**Revised Syllabus of F.Y.BMS Management Studies
Choice Based Credit System (CBCS) (60:40)
w. e. f. Academic Year 2022-23**

Sr. No.	Heading	Particulars
1	Title of Course	Management Studies
2	Eligibility for Admission	12 th Commerce, Science and Arts recognised Board
3	Passing marks criteria	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-2023

Title Name of the Programme: Bachelor of Management Studies
(B.M.S.)

Nature of the Programme: BMS is three year full time graduate degree programme

Preamble of the Programme: This course is being introduced by University of Mumbai .With the growing demand for professionally qualified management executives, the course has been especially designed to create operational cadre management personnel. It is a UGC approved three-year degree course under the faculty of Management, with six semesters. This is a specialty program with three specializations offered to learners i.e. Finance, Human Resource and Marketing.

The course is design to give basic understanding about management education which will develop the lateral thinking, communication skills and social responsibilities and strengthen the analytical, interpersonal organization and decision making skills through presentations and seminars. This will also provide an adequate exposure to operational environment in the field of management.

The course is designed to encourage and inculcate the use of modern technology to solve the practical problems in the real world and to prepare learners for future career success by encouraging them to develop necessary tools and skills, including written and oral communication skills, an ability to work with others, leadership qualities, and a capability to creatively solve problems.

<i>*List of Skill Enhancement Courses (SEC) for Semester I (Any One)</i>		<i>**List of Skill Enhancement Courses (SEC) for Semester II (Any One)</i>	
UMS1FC1	Foundation Course – I	UMS2FC2	Foundation Course - II
UMS1NS1	Foundation Course in NSS – I	UMS2NS2	Foundation Course in NSS - II
UMS1NC1	Foundation Course in NCC – I	UMS2NC2	Foundation Course in NCC - II
UMS1PE1	Foundation Course in Physical Education – I	UMS2PE2	Foundation Course in Physical Education - II
Note: Course selected in Semester I will continue in Semester II			

Bachelor of Management Studies (BMS) Programme

Under Choice Based Credit System

Course

FYBMS

(To be implemented from Academic Year- 2022-2023)

No. of Courses	Semester I	Credits	No. of Courses	Semester II	Credits
	<i>Elective Courses (EC)</i>			<i>Elective Courses (EC)</i>	
UMS1IFA	Introduction to Financial Accounts	03	UMS2ICA	Introduction to Cost Accounting	03
UMS1BLW	Business Law	03	UMS2ILW	Industrial Law	03
UMS1BST	Business Statistics	03	UMS2BMA	Business Mathematics	03
	<i>Ability Enhancement Courses (AEC)</i>			<i>Ability Enhancement Courses (AEC)</i>	
	<i>Ability Enhancement Compulsory Course (AECC)</i>			<i>Ability Enhancement Compulsory Course (AECC)</i>	
UMS1BC1	Business Communication - I	03	UMS2BC2	Business Communication -II	03
	<i>*Skill Enhancement Courses (SEC)</i>			<i>**Skill Enhancement Courses (SEC)</i>	
	Any one course from the following list of courses	02		Any one course from the following list of the courses	02
UMS1PD1	Personality Development I	02	UMS2PD2	Personality Development II	02

<i>Core Courses (CC)</i>			<i>Core Courses (CC)</i>		
UMS1FHS	Foundation of Human Skills	03	UMS2PMK	Principles of Marketing	03
UMS1BE1	Business Economics-I	03	UMS2PMG	Principles of Management	03
Total Credits		22	Total Credits		22

Bachelor of Management Studies (BMS)
Programme
Under Choice Based Credit System
Course Structure

(To be implemented from Academic Year- 2022-2023)

Semester I

<i>*List of Skill Enhancement Courses (SEC) for Semester I (Any One)</i>	
UMS1FC1	Foundation Course – I
UMS1NS1	Foundation Course in NSS – I
UMS1NC1	Foundation Course in NCC – I
UMS1PE1	Foundation Course in Physical Education - I

***Revised Syllabus of Courses of Bachelor of Management Studies
(BMS) Programme at Semester I
with Effect from the Academic Year 2022-2023***

Elective Courses (EC)

**Introduction to Financial Accounts
Course Code: UMS1IFA**

Objectives

Sr. No	Objectives
01	To develop an understanding of the basic concept and principles of accounting and acquire the ability to apply the same in preparation of Financial Statement.

Modules at a Glance

Sr. No.	Module	No. of Lectures
1	Introduction	15
2	Accounting Transactions	15
3	Depreciation Accounting & Trial Balance	15
4	Final Accounts	15

Total	60
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Sr. No.	Modules / Units
1	Introduction
	<ul style="list-style-type: none"> ● Meaning and Scope of Accounting: Need and development, definition: Book-Keeping and accounting, Persons interested in accounting, Branches of accounting, Objectives of accounting ● Accounting principles: Introductions to Concepts and conventions ● International Financial Reporting Standards (IFRS): Introduction to IFRS <ul style="list-style-type: none"> ▪ IAS-1: Presentation of Financial Statements (Introductory Knowledge) ▪ IAS-2: Inventories (Introductory Knowledge) ▪ IAS-7: Statement of Cash Flows ▪ IAS-16: Property Plant & Equipment ▪ IAS-115: Revenue Recognition ▪ IAS-116: Leases
2	Accounting Transactions
	<ul style="list-style-type: none"> ● Accounting transactions: Accounting cycle, Journal, Journal proper, Opening and closing entries, Relationship between journal & ledger: Rules regarding posting: Trial balance: Subsidiary books (Purchase, Purchase Returns, Sales, Sales Returns & cash book –Triple Column), Bank Reconciliation Statement. ● Expenditure: Classification of Expenditure- Capital, revenue and Deferred Revenue expenditure Unusual expenses: Effects of error: Criteria test ● Receipts: Capital receipt, Revenue receipt, distinction between capital receipts and revenue receipts. ● Profit or Loss: Revenue profit or loss, capital profit or loss
3	Depreciation Accounting & Trial Balance
	<ul style="list-style-type: none"> — Depreciation accounting: Practical problem based on depreciation using SLM and RBM methods. (Where Provision for depreciation Account not maintained). Preparation of Trial Balance: Introduction and Preparation of Trial Balance
4	Final Accounts

	<ul style="list-style-type: none"> ● Introduction to Final Accounts of a Sole proprietor ● Manufacturing Account, Trading Account, Profit and Loss Account and Balance Sheet. ● Preparation and presentation of Final Accounts in horizontal format
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Course Outcome

Sr.No	Course Outcome
01	Demonstrate basic knowledge of concepts, theories, principles and standards used in financial accounting.
02	Apply accounting concepts for transaction recording
03	Develop ability to prepare financial statement of the company
04	Interpret information in the financial statement of the organisation

**Revised Syllabus of Courses of Bachelor of Management Studies
(BMS) Programme at Semester I
with Effect from the Academic Year 2022-2023
Elective Courses (EC)**

**Business Law
Course Code: UMS1BLW**

OBJECTIVES

Sr. No	Objectives
01	To provide students with practical legal knowledge of legal issues.
02	To provide knowledge of basic concept, ideas, techniques and process in the field of law.

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Contract Act, 1872 & Sale of Goods Act, 1930	15
2	Negotiable Instrument Act, 1981 & Consumer Protection Act, 1986	12
3	Company Law	15
4	Intellectual Property Rights(IPR) & Indian Partnership Act, 1932	18
Total		60

1	Contract Act, 1872 & Sale of Goods Act, 1930
	<ul style="list-style-type: none"> ● Contract Act, 1872: Essential elements of Contract; Agreement and Contract – Capacity to Contract, free consent, consideration, lawful objects/ consideration, Breach of contract. Remedies for breach of Contract. ● Sale of Goods Act, 1930: Scope of Act, Sale and Agreement sell, essential of a valid Sale Contract – Conditions and warranties – Implied Condition and warranties, Rights of an unpaid seller.
2	Negotiable Instrument Act, 1981 & Consumer Protection Act, 1986
	<ul style="list-style-type: none"> ● Negotiable Instrument Act, 1981: Introduction of Negotiable Instruments – Characteristics of negotiable instruments, Promissory note, Bills of exchange, Cheque, Dishonour of Cheque. ● Consumer Protection Act, 1986: Objects of Consumer Protection- Introduction of Consumers, who is consumer? Meaning of the words “Goods and services” – Meaning of the words “Defects and Deficiencies of goods and services” Consumer disputes and Complaints.
3	Company Law
	<ul style="list-style-type: none"> ● Company Law: What is company?–Incorporation of company–MOA, AOA, Prospectus, Meetings, Meaning of transfer and transmission of shares.
4	Intellectual Property Rights(IPR) & Indian Partnership Act, 1932
	<ul style="list-style-type: none"> ● Intellectual Property Rights(IPR) <ul style="list-style-type: none"> ▪ IPR definition/ objectives ▪ Patent definition. What is patentable? What is not patentable? Invention And its Attributes, Inventors and Applications ▪ Trademarks, definition, types of trademarks, infringement and passing off. ▪ Copy right definition and subject in which copy right exists, Originality, Meaning and Content, Authors and Owners, Rights and Restrictions. ▪ Geographical indications (only short notes) ● Indian Partnership Act, 1932: Nature of partnership, Relation of Partners to One Another, Relation of Partner to Third Parties, Incoming & Outgoing Partners, Dissolution of Firms, Registration of Firms.

Course Outcome

Sr.No	Course Outcome
01	Learners will be able to apply basic legal knowledge to business transactions in their future and identify the fundamental legal principles behind contractual agreements.
02	Learners will be able to classify the negotiable instrument and legal environment of the business.
03	Learners will be able to determine the legal and fiscal structure of different forms of business organisations and their responsibility as an employer.
04	Learners will be able to interpret the various provisions related to Intellectual Property Rights, its applicability, duration & registration procedures also acquaint the incorporation and dissolution procedures of partnership firms.

*Revised Syllabus of Courses of Bachelor of Management Studies
(BMS) Programme at Semester I
with Effect from the Academic Year 2022-2023*

Elective Courses (EC)

Business Statistics
Course Code: UMS1BST

OBJECTIVES

Sr.No	Objectives
01	To familiarize learners with basic Statistical tools like central tendency, measures of dispersions, correlation and regression and time – series and their application.

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to Statistics	15
2	Measures of Central Tendency and Dispersion	15
3	Forecasting Techniques: Co-Relation and Linear Regression, Time Series and Index Number	15
4	Elementary Probability and Testing of Hypothesis	15
Total		60

Sr. No.	Modules / Units
1	Introduction to Statistics
	<ul style="list-style-type: none"> ● Introduction: Functions/Scope, Importance, Limitations ● Data: Relevance of Data(Current Scenario), Type of data(Primary & Secondary), Primary (Census vs Samples, Method of Collection (In Brief), Secondary(Merits, Limitations, Sources) (In Brief) ● Presentation Of Data: Classification – Frequency Distribution – Discrete & Continuous, Tabulation, Graph(Frequency, Bar Diagram, Pie Chart, Histogram, Ogives)
2	Measures of Central Tendency and Dispersion
	<ul style="list-style-type: none"> ● Measures Of Dispersion: Range with C.R(Co-Efficient Of Range), Quartiles & Quartile deviation with CQ (Co-Efficient Of Quartile), Mean Deviation from mean with CMD (Co-Efficient Of Mean Deviation), Standard deviation with CV(Co-Efficient Of Variance). ● Measures Of Central Tendency: Mean(A.M, Weighted, Combined), Median(Calculation and graphical using Ogives), Mode(Calculation and Graphical using Histogram),Comparative analysis of all measures of Central Tendency
3	Forecasting Techniques
	<ul style="list-style-type: none"> ● Co-Relation and Linear Regression <ul style="list-style-type: none"> - Co-Relation: Karl Pearson, Rank Co-Relation - Linear Regression: Least Square Method ● Time Series and Index Number <ul style="list-style-type: none"> - Time Series: Least Square Method, Moving Average Method, Determination of Season - Index Number: Simple(un weighted) Aggregate Method, Weighted Aggregate Method, Simple Average of Price Relatives, Weighted Average of Price Relatives, Chain Base Index Numbers, Base Shifting, Splicing and Deflating, Cost of Living Index Number
4	Elementary Probability and Testing of Hypothesis
	<ul style="list-style-type: none"> ● Elementary Probability: Concept of Sample space, Concept of Event, Definition of Probability, Addition & Multiplication laws of Probability, Conditional Probability ● Introduction to Testing of Hypothesis: <ul style="list-style-type: none"> - Sampling Distribution : Sample Mean and sample proportion, Determination of sample size, Central limit theorem (statement only) - Hypothesis : Simple and Composite, null and alternatives, Two types of errors, level of significance (concepts only), Large sample test.

Course Outcomes

Sr.No	Course Outcome
01	Explain fundamentals of statistics and different types of data
02	Analyse information using numerical data and graphical charts
03	Interpret statistical analysis tools to make business decisions
04	Evaluate performance of the business or company and identify trends

*Revised Syllabus of Courses of Bachelor of Management Studies
(BMS) Programme at Semester I
with Effect from the Academic Year 2022-2023*

Ability Enhancement Courses (AEC)

Business Communication-I
Course Code: UMS1BC1

OBJECTIVES

Sr. No.	Objectives
01	To familiarize the students with process of communication and its applications
02	To acquaint the students with different types of communication
03	To demonstrate effective use of technology in communication
04	To inform the students about barriers to effective communication
05	To introduce the students with business correspondence
06	To develop effective listening skills amongst the students
07	To cultivate effective oral skills those can enable students to speak confidently, interpersonally as well as in business organization

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Theory of Communication	15
2	Obstacles to Communication in Business World	15
3	Business Correspondence	15
4	Language and Writing Skills	15
Total		60

Sr. No.	Modules / Units
1	<p>Theory of Communication</p> <p>Concept of Communication: Meaning, Definition, Process, Need, Feedback Emergence of Communication as a key concept in the Corporate and Global world Impact of technological advancements on Communication</p> <p>Channels and Objectives of Communication: Channels- Formal and Informal- Vertical, Horizontal, Diagonal, Grapevine</p> <p>Objectives of Communication: Information, Advice, Order and Instruction, Persuasion, Motivation, Education, Warning, and Boosting the Morale of Employees(A brief introduction to these objectives to be given)</p> <p>Methods and Modes of Communication: Methods: Verbal and Nonverbal, Characteristics of Verbal Communication Characteristics of Non-verbal Communication, Business Etiquette Modes: Telephone and SMS Communication 3 (General introduction to Telegram to be given) Facsimile Communication [Fax] Computers and E- communication Video and Satellite Conferencing</p>
2	<p>Obstacles to Communication in Business World</p> <p>Problems in Communication /Barriers to Communication: Physical/ Semantic/Language / Socio-Cultural / Psychological / Barriers, Ways to Overcome these Barriers</p> <p>Listening: Importance of Listening Skills, Cultivating good Listening Skills – 4</p> <p>Introduction to Business Ethics</p> <ul style="list-style-type: none"> ● Concept and Interpretation, Importance of Business Ethics, Personal Integrity at the workplace, Business Ethics and media, Computer Ethics, Corporate Social Responsibility. ● Teachers can adopt a case study approach and address issues such as the following so as to orient and sensitize the student community to actual business practices: ● Surrogate Advertising, Patents and Intellectual Property Rights, Dumping of Medical/E-waste, ● Human Rights Violations and Discrimination on the basis of gender, race, caste, religion, appearance and sexual orientation at the workplace ● Piracy, Insurance, Child Labour.
3	<p>Business Correspondence</p> <p>Theory of Business Letter Writing: Parts, Structure, Layouts—Full Block, Modified Block, Semi - Block Principles of Effective Letter Writing, Principles of effective Email Writing,</p> <p>Personnel Correspondence: Statement of Purpose, Job Application Letter and Resume, Letter of Acceptance of Job Offer, Letter of Resignation Letter of Appointment, Promotion and Termination, Letter of Recommendation</p>

Sr. No.	Modules / Units
4	Language and Writing Skills
	<ul style="list-style-type: none"> • Commercial Terms used in Business Communication • Articles writing • Meaning, objective and steps involved in articles writing • Paragraph Writing:- Paragraph Writing: Preparation of the first draft, Revision and Self – Editing, Rules of spelling. • Notes Making & Paraphrasing • Time & Stress Management Skills

Course Outcome

Sr.No	Course Outcome
01	Demonstrate the outline of theory of Business Communication
02	Apply formal and informal communication present in business organization
03	Examine the method of communication and identify different barriers to successful communication
04	Formulate various type of commercial letters effectively

*Revised Syllabus of Courses of Bachelor of Management Studies
(BMS) Programme at Semester I
with Effect from the Academic Year 2022-2023*

Skill Enhancement Courses (SEC)

**Foundation Course –I
Course Code: UMS1FC1**

OBJECTIVES

Sr. No	Objectives
01	To acquaint the students with concepts of the Social awareness.
02	To appreciate the Unity in Diversity of Indian society.
03	To acquaint the student with concepts of Globalization, Ecology and Environment
04	To create awareness about human right , and Managing Stress and Conflict in Contemporary Society

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Overview of Indian Society	15
2	Concept of Disparity	15
3	The Indian Constitution	08
4	Significant Aspects of Political Processes	07
Total		45

Sr. No.	Modules / Units
1	Overview of Indian Society
	Understand the multi-cultural diversity of Indian society through its demographic composition: population distribution according to religion, caste, and gender; Appreciate the concept of linguistic diversity in relation to the Indian situation; Understand regional variations according to rural, urban and tribal characteristics; Understanding the concept of diversity as difference
2	Concept of Disparity
	Understand the concept of disparity as arising out of stratification and inequality; Explore the disparities arising out of gender with special reference to violence against women, female foeticide (declining sex ratio), and portrayal of women in media; Appreciate the inequalities faced by people with disabilities and understand the issues of people with physical and mental disabilities Examine inequalities manifested due to the caste system and inter-group conflicts arising thereof; Understand inter-group conflicts arising out of communalism; Examine the causes and effects of conflicts arising out of regionalism and linguistic Differences
3	The Indian Constitution
	Philosophy of the Constitution as set out in the Preamble; The structure of the Constitution-the Preamble, Main Body and Schedules; Fundamental Duties of the Indian Citizen; tolerance, peace and communal harmony as crucial values in strengthening the social fabric of Indian society; Basic features of the Constitution
4	Significant Aspects of Political Processes
	The party system in Indian politics; Local self-government in urban and rural areas; the 73rd and 74th Amendments and their implications for inclusive politics; Role and significance of women in politics

Topics for Project Guidance: Growing Social Problems in India:

- *Substance abuse- impact on youth & challenges for the future*
- *HIV/AIDS- awareness, prevention, treatment and services*
- *Problems of the elderly- causes, implications and response*
- *Issue of child labour- magnitude, causes, effects and response*
- *Child abuse- effects and ways to prevent*
- *Trafficking of women- causes, effects and response*

Course Outcome

Sr.No	Course Outcome
01	To know about duties & responsibilities towards society
02	To aware about the problems and issues of society.
03	To impart knowledge of Globalization and make students aware about the problems in society.

**Revised Syllabus of Courses of Bachelor of Management Studies
(BMS) Programme at Semester I
with Effect from the Academic Year 2022-2023**

**Skill Enhancement Courses (SEC)
Foundation Course in NSS - I
Course Code: UMS1NS1
OBJECTIVES**

Sr. No	Objectives
01	To make students identify the problems and needs of the community and get the students involved in the problem solving process.
02	To develop the civic responsibility amongst the students
03	To develop leadership qualities and democratic attitudes.
04	To nurture accountability regarding their duties in national building
05	To introduce the nature and structure of National Service Scheme.
06	To promote understanding of the community and environment in which they work through GOs and NGOs

Modules at a Glance

Modules	No. of Lectures
Introduction to National Service Scheme(NSS)	10
National Service Scheme regular Activities	15
Contemporary Social Issues in India	10
Indian constitution and social justice	10
Total	45

Sr. No.	Modules / Units
1	Introduction to National Service Scheme(NSS)
	<p>Unit I: Emergence of NSS in India (Historical Background) and its development.</p> <ul style="list-style-type: none"> ● Organizational Structure of National Service Scheme from National level to College level. ● Objectives of National Service Scheme(NSS) ● National Service Scheme (NSS) –Symbol and its meaning. <p>Unit II: Symbol of NSS and its meaning</p> <ul style="list-style-type: none"> ● Motto of National Service Scheme ● Various prayers, inspirational songs to be used in NSS programme
2	National Service Scheme regular Activities
	<p>Unit I: Guidelines of Distributor of working hours or academic year.</p> <p>Classification of regular activities in the society</p> <ul style="list-style-type: none"> ● Rural ● Urban ● Campus <p>Unit II: Theme Based Activities</p> <ul style="list-style-type: none"> ● Water Conservation ● Rain Water Harvesting: Issues and Policies ● Health Services provided by GOs and NGOs: Role of NSS Volunteers ● Social Media and Cyber Security: Definition, types, and its impact. ● Need for Cyber Security in contemporary scenario (Indian Cyber Act 2005, Role of NSS volunteers)
3	Contemporary Social Issues in India
	<p>Unit I: Gender based issues</p> <ul style="list-style-type: none"> ● Decline of Sex Ratio, #MeToo, Pinjara Todd, Right to bleed, Child Abuse ● Digital Media and Gender Issues <p>Unit II: Contemporary Beneficiaries Schemes</p> <ul style="list-style-type: none"> ● Sanitation,Housing, Health (Role of students in implementation and taking the schemes to the society)
4	Indian constitution and social justice
	<p>Unit I:Indian Constitution</p> <ul style="list-style-type: none"> ● Preamble ● Structure ● Features ● Fundamental Rights and Duties ● Review of Constitution Amendments towards community development. <p>Unit II:Social Justice</p> <ul style="list-style-type: none"> ● Social Justice – the Concept and its Features ● Contributions for Social Justice-ChhatrapatiShivajiMaharaj, Mahatma Jyotirao Phule, Shahu Maharaj, Dr. Babasaheb Ambedkar

Course Outcome

Sr. No.	Course Outcome
01	To make students to understand the Unity in diversity.
02	To make the students responsible in eradicating the social evils like class and caste conflicts, superstitions and gender inequality.
03	To promote students in bringing national integrity and communal harmony under the philosophical path of Phule, Shahu and Ambedkar.
04	To cultivate value system of Indian society.
05	To understand the different roles of students in national building.
06	To motivate the students in enhancing their standard of living with dignity.
07	To promote students in utilizing their knowledge in finding practical solution to individual and community problems.

***Revised Syllabus of Courses of Bachelor of Management Studies
(BMS) Programme at Semester I***

with Effect from the Academic Year 2022-2023

Skill Enhancement Courses

(SEC) 5.Foundation Course in

NCC - I

Course Code: UMS1NC1

OBJECTIVES

Sr. No	Objectives
01	To create evolved youth, who will be equipped to contribute in the development of the nation
02	To train students so as to achieve their physical, mental, psychological and emotional development.
03	To make student aware of the protection and conservation of the environment.
04	To understand and develop life skills and soft skills and cultivate leadership qualities among the youth.
05	To impart basic military training, to develop awareness about the defence forces and expose learners to military ethos / values
06	To make the students apply the knowledge in specialised military subject/ social topics/ Cultural endeavours.

Modules at a Glance

Sr. No.	Modules	No. of Lectures
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1	Introduction to NCC, National Integration & Awareness	12
2	Drill: Foot Drill	08
3	Environment Awareness and Conservation	05
4	Personality Development and Leadership	08
5	Specialized Subject: Army/ Navy/ Air	12
6	Project	15
Total		60

Sr. No.	Modules / Units
1	Introduction to NCC, National Integration & Awareness

	<p>Desired outcome: The students will display sense of patriotism, secular values and shall be transformed into motivated youth who will contribute towards nation building through national unity and social cohesion.</p> <ul style="list-style-type: none"> ● Historical development of Military history in India ● Present scenario of NCC and its advantages in career building ● Genesis, Aims, Objectives of NCC & NCC Song ● Organization & Training ● Incentives & Benefits ● Religions, Culture, Traditions and Customs of India ● National integration, necessity
2	Drill: Foot Drill
	<p>Desired outcome: The students will demonstrate the sense of discipline, improve bearing, smartness, turnout, develop the quality of immediate and implicit obedience of orders, with good reflexes.</p> <ul style="list-style-type: none"> ● General and Words of Command ● Attention, Stand at Ease and Stand Easy, Turning and Inclining at the Halt ● Sizing, Forming Up in Three Ranks and Numbering, Open and Close Order March and Dressing ● Saluting at the Halt, Getting On Parade, Dismissing and Falling Out ● Marching, Length of Pace and Time of Marching in Quick Time and Halt, Slow March and Halt ● Turning on the March and Wheeling. ● Saluting on the March. ● Formation of squad and Squad Drill.
3	Environment Awareness and Conservation
	<p>Desired outcome: The student will be aware of the conservation of natural resources and protection of environment.</p> <ul style="list-style-type: none"> ● Natural Resources – Conservation and Management ● Water Conservation and Rainwater Harvesting

Sr. No.	Modules / Units
4	Personality Development and Leadership

	<p>Desired outcome: The student will develop an all-round personality with adequate leadership traits to deal / contribute effectively in life.</p> <ul style="list-style-type: none"> ● Introduction to Personality Development ● Factors Influencing /Shaping Personality: Physical, Social, Physiological, Philosophical and Psychological ● Self-Awareness Know yourself/ Insight ● Change Your Mind Set ● Communication Skills: Group Discussion / Public Speaking ● Leadership Traits ● Types of Leadership
5	Specialized Subject: Army Or Navy Or Air
	<p><u>Army</u></p> <p>Desired outcome: The training shall instill patriotism, commitment and passion to serve the nation motivating the youth to join the defence forces. It will also acquaint, expose & provide basic knowledge about armed, naval and air-force subjects</p> <p>A. Armed Force</p> <ul style="list-style-type: none"> ● Basic organization of Armed Forces ● Organization of Army ● Badges and Ranks <p>B. Introduction to Infantry and weapons and equipments</p> <ul style="list-style-type: none"> ● Characteristics of 7.62mm SLR Rifle, Ammunition, Fire power, Stripping, Assembling and Cleaning <p>C. Military history</p> <ul style="list-style-type: none"> ● Biographies of renowned Generals (Carriapa / Sam Manekshaw) ● Indian Army War Heroes-PVCs <p>D. Communication</p> <ul style="list-style-type: none"> ● Types of Communications ● Characteristics of Wireless Technologies (Mobile, Wi-Fi etc.) <p style="text-align: center;">OR</p> <p><u>Navy</u></p> <p>A. Naval orientation and service subjects</p> <ul style="list-style-type: none"> ● History of the Indian Navy-Pre and Post Independence, Gallantry award winners ● Organization of Navy- NHQ, Commands, Fleets, Ships and shore establishments ● Types of Warships and their role ● Organization of Army and Air Force- Operational and Training commands ● Ranks of Officers and Sailors, Equivalent Ranks in the Three Services <p>B. Ship and Boat Modelling</p> <ul style="list-style-type: none"> ● Principles of Ship Modelling ● Maintenance and Care of tools

Sr. No.	Modules / Units
	<p>C. Search and Rescue</p> <ul style="list-style-type: none"> ● SAR Organization in the Indian ocean <p>D. Swimming</p> <p>Floating for three minutes and Free style swimming for 50 meters</p> <p style="text-align: center;">OR</p> <p><u>AIR</u></p> <p>A. General Service Knowledge</p> <ul style="list-style-type: none"> Development of Aviation History of IAF <p>B. Principles of Flight</p> <ul style="list-style-type: none"> Introduction Laws of Motion Glossary of Terms. <p>C. Airmanship</p> <ul style="list-style-type: none"> Introduction Airfield Layout Rules of the Air Circuit Procedure ATC/RT Procedures Aviation Medicine <p>D. Aero-Engines</p> <ul style="list-style-type: none"> Introduction to Aero-engines
06	Project
	Projects based on social Activities

Course Outcome

Sr. No.	Course Outcome
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01	Trained and disciplined citizens will be developed.
02	Physical fitness and overall personality of the youth will be enhanced.
03	Students will be trained to develop their career in defence / paramilitary/ police forces & civil services

***Revised Syllabus of Courses of Bachelor of Management Studies
(BMS) Programme at Semester I
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Skill Enhancement Courses (SEC)

**Foundation Course in Physical Education -I
Course Code: UMS1PE1**

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to Basic Relevant concepts in Physical Education	10
2	Components of Physical Fitness	15
3	Testing Physical Fitness	10
4	Effect of Exercise on various Body System	10
Total		45

Sr. No.	Modules / Units
1	Introduction to Basic Relevant concepts in Physical Education
	<ul style="list-style-type: none"> ● Dimensions and determinants of Health, Fitness & Wellness ● Concept of Physical Education and its importance ● Concept of Physical Fitness and its types ● Concept of Physical Activity, exercise and its types & benefits
2	Components of Physical Fitness
	<ul style="list-style-type: none"> ● Concept of components of Physical Fitness ● Concept and components of HRPF ● Concept and components of SRPF ● Importance of Physical Education in developing physical fitness components.
3	Testing Physical Fitness
	<ul style="list-style-type: none"> ● Tests for measuring Cardiovascular Endurance ● Tests for measuring Muscular Strength & Endurance ● Tests for measuring Flexibility ● Tests for measuring Body Composition
4	Effect of Exercise on various Body System
	<ul style="list-style-type: none"> ● Effect of exercises on Musculoskeletal system ● Effect of exercises on Circulatory System ● Effect of exercises on Respiratory System ● Effect of exercises on Glandular System

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Skill Enhancement Courses

(SEC) 5. Personality

Development - I

**Course Code: UMS1PD1
*OBJECTIVES***

Sr. No	Objectives
01	To learn about the essential factors for personality development and bringing them into practice.
02	To help the learners to know themselves better and identify their own potentials and accept their limitations.
03	To develop and exhibit an accurate sense of individuality.
04	To involve students in adapting the techniques of personality development.

Modules at a Glance

Sr. No.	Modules	No. of Hours
1	Introduction to Personality Development	7
2	Self-esteem	8
Total		15

Sr. No.	Modules / Units
1	Introduction to Personality Development
	<ul style="list-style-type: none"> ● The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success ● Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis ● Self Confidence, Positive Attitude, Conversation English, Pronunciations, Story narrations.
2	Self-esteem
	<ul style="list-style-type: none"> ● Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem – Low self-esteem- Symptoms - Personality having low self-esteem - Positive and negative self-esteem. ● Interpersonal Relationships – Defining the difference between aggressive, submissive and assertive behaviours – Lateral thinking.

Course Outcomes

Sr. No	Objectives
01	Learners will be able to describe how personality develops
02	Learners will be able to define stages of personality development and basic personality trait's.
03	Learners will be able to describe how morals are developed
04	Learners will be able to describe personality theories about development

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Core Courses (CC)

**Foundation of Human Skills
Course Code: UMS1FHS**

Objectives

Sr.No	Objectives
01	To provide basis of understanding to the learners with reference to human behaviour, human skills and introduction to group behaviour, organizational culture and motivation.

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Understanding of Human Nature	15
2	Introduction to Group Behaviour	15
3	Organizational Culture and Motivation at workplace	15
4	Organizational Change, Creativity and Development and Work Stress	15
Total		60

Sr. No.	Modules / Units
1	<p>Understanding of Human Nature</p> <ul style="list-style-type: none"> <li>● Individual Behaviour: Concept of a man, individual differences, factors affecting individual differences, Influence of environment <li>● Personality and attitude: Determinants of personality, Personality traits theory, Big five model, Personality traits important for organizational behaviour like authoritarianism, locus of control, Machiavellianism, introversion-extroversion achievement orientation , self – esteem, risk taking, self-monitoring and type A and B personalities, Concept of understanding self through JOHARI WINDOWS, Nature and components of attitude, Functions of attitude, Ways of changing attitude, Reading emotions <li>● Thinking, learning and perceptions: Thinking skills, thinking styles and thinking hat, Managerial skills and development, Learning characteristics, theories of learning (classical conditioning, operant conditioning and social learning approaches), Intelligence, type (IQ, EQ, SQ, at work place), Perception features and factor influencing individual perception, Effects of perceptual error in managerial decision making at work place.(Errors such as Halo effect, stereotyping, prejudice attributional).
2	<p>Introduction to Group Behaviour</p> <ul style="list-style-type: none"> <li>● Introduction to Group Behaviour <ul style="list-style-type: none"> <li>▪ Group Dynamics: Nature, types, group behavior model (roles, norms, status, process, structures) <li>▪ Team effectiveness: nature, types of teams, ways of forming an effective team. <li>▪ Setting goals. <p>OB History and Development; Importance of OB to the field of</p> <p>management. Basic behavioral Process: Cognitive functions</p> <p>intelligence, Creativity, Problem solving, Learning and its process - implications,</p> <p>OB History and Development; Importance of OB to the field of management. Basic behavioral Process: Cognitive functions -</p> <p>intelligence, Creativity, Problem solving, Learning and its process - implications,</p> <p>OB History and Development; Importance of OB to the field of management. Basic behavioral Process: Cognitive functions -</p> <p>intelligence, Creativity, Problem solving, Learning and its process - implications,</p> <ul style="list-style-type: none"> <li>● Organizational Behavior & Development <ul style="list-style-type: none"> <li>▪ Organizational behavior -concept and significance;

	<ul style="list-style-type: none"> ▪ OB & Management ▪ Relationship between management and organizational behaviour; ▪ Importance of OB to the field of management, ▪ Basic Behavioral Process, Cognitive functions <ul style="list-style-type: none"> ● Organizational processes and system. <ul style="list-style-type: none"> ▪ Power and politics: nature, bases of power, politics nature, types, causes of organizational politics, political games. ▪ Organizational conflicts and resolution: Conflict features, types, causes leading to organizational conflicts, levels of conflicts, ways to resolve conflicts through five conflicts resolution strategies with outcomes.
3	Organizational Culture and Motivation at workplace
	<ul style="list-style-type: none"> ● Organizational Culture: <ul style="list-style-type: none"> ▪ Characteristics of organizational culture. ▪ Types, functions and barriers of organizational culture ▪ Ways of creating and maintaining effective organization culture ● Motivation at workplace: Concept of motivation Theories of motivation in an organizational setup. <ul style="list-style-type: none"> ▪ A. Maslow Need Hierarchy ▪ F.Hertzberg Dual Factor ▪ Mc.Gregor theory X and theory Y. <p>Ways of motivating through carrot (positive reinforcement) and stick (negative reinforcement) at workplace.</p>
4	Organizational Change, Creativity and Development and Work Stress
	<ul style="list-style-type: none"> ● Organizational change and creativity: Concepts of organizational change, Factors leading/influencing organizational change, Kurt Lewins model of organizational change and development, Creativity and qualities of a creative person, Ways of enhancing creativity for effective decision making, Creative problem solving. ● Organizational Development and work stress: Need for organizational development, OD Techniques, Stress, types of stress, Causes and consequences of job stress, Ways for coping up with job stress

Course Outcome

Sr.No	Course Outcome
01	Develop and nurture a deep understanding of personal motivation
02	Evaluate and improve upon personal leadership strengths and weaknesses
03	Explain the importance of social responsibility & social ethics
04	Elaborate ,lead and also guided by the values of self-awareness, equity, social justice, inclusiveness, empowerment, collaboration, citizenship.

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Core Courses (CC)
Business Economics –I
Course Code: UMS1BE1

Objectives

Sr. No	Objectives
01	To help the students to understand the basic concepts of Business Economics
02	To study the nature and scope of Business Economics
03	To study importance and applications of Business Economics in practical market.
04	Students will be able to identify key economic problems in business firms

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction	15
2	Demand Analysis	15
3	Supply and Production Decisions and Cost of Production	15
4	Market structure: Perfect competition and Monopoly and Pricing and Output Decisions under Imperfect Competition	15
Total		60

Sr. No.	Modules / Units
1	Introduction
	<p>Scope and Importance of Business Economics - basic tools- Opportunity Cost principle, Basic economic relations – functional relations: equations-Total, Average and Marginal relations-use of Marginal analysis in decision making.</p> <p>Introduction to Survey: Meaning, Features- Survey based project (Industry related)</p>
2	Demand Analysis
	<p>Law of Demand, Demand Function Meaning, significance, types and measurement of elasticity of demand (Price, income cross and promotional)</p> <p>The basics of Market Demand & Supply and Equilibrium Price – shifts in the demand and supply curves and equilibrium</p> <p>Indifference curve: Meaning Properties Iso-Cost Line Consumer equilibrium</p> <p>Demand Estimation and forecasting: Meaning and significance-methods of demand estimation: survey and statistical methods</p> <p>(Numerical illustrations on trend analysis and simple linear regression)</p>
3	Production function
	<p>Short run analysis with Law of Variable proportion-isoquants, ridgelines, and least cost combination of inputs-Long run production function and Law of return to Scale-Expansion path</p> <p>Cost Concepts: Accounting cost and economic cost, implicit and explicit cost, fixed and variable cost- total, average and marginal cost, cost output relationship in the short run and long run (hypothetical numerical problems to be discussed) Break even analysis (with business applications)</p>
4	Market Structure
	<p>Perfect competition and monopoly and pricing and output decisions under imperfect competition:-Short run and long run equilibrium of a competitive firm and of industry-Monopoly- Short run and long run equilibrium of a firm under monopoly.</p> <p>Monopolistic Competition: Equilibrium of a firm under monopolistic competition.</p> <p>Oligopolistic markets: Key attributes of oligopoly –price rigidity</p>

Course Outcome

Sr.No	Course Outcome
01	Define the concepts related to business economics and its applications.
02	Illustrate the fundamentals of demand and supply.
03	Make use of various production techniques to understand the functioning of productive units in the economy.
04	Interpret different types of market structures in the economy

Bachelor of Management Studies (BMS) Programme

Under Choice Based Credit System Course Structure

(To be implemented from Academic Year- 2022-2023)

Semester II

No. of Courses	Semester II	Credits
1	<i>Elective Courses (EC)</i>	
UMS2ICA	Introduction to Cost Accounting	03
UMS2ILW	Industrial Law	03
UMS2BMA	Business Mathematics	03
	<i>Ability Enhancement Courses (AEC)</i>	
	<i>Ability Enhancement Compulsory Course (AECC)</i>	
UMS2BC2	Business Communication – II	03
	<i>**Skill Enhancement Courses (SEC)</i>	
	Any one course from the following list of the courses	02
UMS2PD2	Personality Development I	02
	<i>Core Courses (CC)</i>	
UMS2PMK	Principles of Marketing	03
UMS2PMG	Principles of Management	03
Total Credits		22

<i>**List of Skill Enhancement Courses (SEC) for Semester II (Any One)</i>	
UMS2FC2	Foundation Course – II
UMS2NS2	Foundation Course in NSS – II
UMS2NC2	Foundation Course in NCC – II
UMS2PE2	Foundation Course in Physical Education – II

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Elective Courses (EC)

Introduction to Cost Accounting
Course Code: UMS2ICA

OBJECTIVES

Sr.No	Objectives
01	The primary objective of the course is to familiarize the students with the basic cost concepts, allocation and control of various costs and methods of costing.
02	To enable the students to understand the principles and procedure of cost accounting and to apply them to different practical situations.

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction	15
2	Elements of Cost	20
3	Cost Projection	15
4	Emerging Cost Concepts	10
Total		60

Sr. No.	Modules / Units
1	Introduction to Cost Accounting
	<ul style="list-style-type: none"> ● Meaning, Nature and scope, Objective of Cost Accounting, Relationship of Financial Accounting and Cost Accounting, Advantages and disadvantages of Cost Accounting, Cost classification (concept only), Types of costing- Job, process, batch and contract (concept only), Installation of Cost Accounting System.
2	Elements of Cost
	<ul style="list-style-type: none"> ● Material Costing- Introduction, motives of holding stock, Stock valuation (FIFO & weighted average method) (Practical Problems), maintenance of stock levels, EOQ, EOQ with discounts, Calculation of Stock levels (Practical Problems) ● Labour Costing – Introduction, System of Wage Payment and incentives (Time rate & Price rate), labour turnover (Practical Problems) ● Overhead Costing- Introduction, classification of overheads, Distribution/Apportionment of overheads (Primary and Secondary Distribution)
3	Cost Projection
	<ul style="list-style-type: none"> ● Cost Sheet (Current and Estimated) (Practical Problems) ● Reconciliation of Financial Accounts and Cost Accounting (Practical Problems)
4	Emerging Cost Concepts
	<ul style="list-style-type: none"> ● Uniform Costing and Inter-firm Comparison, Emerging Concepts – Targeting Costing, Benchmarking, JIT, The Balanced Scorecard; Strategic Based Control; Concept, Process and Implementation of Balanced Scorecard, Challenges in Implementation of Balanced Scorecard

Course Outcome

Sr.No	Course Outcome
01	Learners will be able to differentiate between Financial and Cost Accounting.
02	Learners will be able to understand concepts and theories of Cost Accounting.
03	Learners will be able to explain Cost elements.
04	Learners will be able to interpret various emerging concepts of Costing

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Elective Courses (EC)

Industrial Law
Course Code: UMS2ILW

OBJECTIVES

Sr.No	Objectives
01	To emphasize on the practical aspects and uses of industrial law by the organization since the students will be joining the industry.
02	To familiarize them with the current industrial practices.

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Laws Related to Industrial Relations and Industrial Disputes and Shop Establishment	18
2	Laws Related to Health, Safety and Welfare	15
3	Social Legislation	15
4	Laws Related to Compensation Management	12
Total		60

Sr. No.	Modules / Units
1	Laws Related to Industrial Relations and Industrial Disputes and Shop Establishment
	<ul style="list-style-type: none"> ● Industrial Disputes Act, 1947: Definition, Authorities, Awards, Settlements, Strikes Lockouts, Lay Offs, Retrenchment and Closure ● The Trade Union Act, 1926 ● Maharashtra Shops and Establishment Act, 2017: Introduction, Definition, Application of Act to Other Establishments and Workers, Suspension of all or any of provisions of this act, Registration of Establishment, Cancellation of Registration, Change to be Communicated to Facilitator, Closing of Establishment to be communicated to Facilitator, Opening & Closing Hours, Hours of Work, Interval for Rest, Spread Over, Wages for overtime and weekly off, Employer to furnish identity card to worker, Enforcement and Inspection, Offences and Penalties
2	Laws Related to Health, Safety and Welfare
	<ul style="list-style-type: none"> ● The Factory Act 1948: (Provisions related to Health, Safety and Welfare) ● The Workmen's Compensation Act, 1923 Provisions: <ul style="list-style-type: none"> ▪ Introduction: The doctrine of assumed risk, The doctrine of Common Employment, The doctrine of Contributory Negligence ▪ Definitions ▪ Employers liability for compensation (S-3 to 13) ▪ Rules as to Compensation (Sec 4 to Sec 9) (14 A & 17)
3	Social Legislation
	<ul style="list-style-type: none"> ● Employee State Insurance Act 1948: Definition and Employees Provident Fund ● Miscellaneous Provision Act 1948: Schemes, Administration and determination of dues
4	Laws Related To Compensation Management
	<ul style="list-style-type: none"> ● The payment of Wages Act 1948: Objectives, Definition, Authorized Deductions ● Payment of Bonus Act, 1965 ● The Payment Of Gratuity Act, 1972

Course Outcome

Sr.No	Course Outcome
01	Learners will be able to summarize the concept of Industrial relations and industrial disputes, also will be able to illustrate the role of trade union in the industrial setup and acquaint knowledge related to shop establishment in Maharashtra.
02	Learners will be able to explain the law related to health, safety and welfare measures in industry and provisions related to employee's compensation.
03	Learners will be able to distinguish various provisions in the industry for the employee benefits.
04	Learners will be able to identify numerous laws related to compensation and make use of it at the work place.

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Elective Courses (EC)

Business Mathematics
Course Code: UMS2BMA

Objectives

Sr.No	Objectives
01	To develop an understanding of the basic mathematics like interest and annuity, matrices, derivatives and numerical analysis and their application.

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Elementary Financial Mathematics	15
2	Matrices and Determinants	15
3	Derivatives and Applications of Derivatives	15
4	Integral Calculus and its Application	15
Total		60

Sr. No.	Modules / Units
1	Elementary Financial Mathematics
	<ul style="list-style-type: none"> ● Simple and Compound Interest: Interest compounded once a year, more than once a year, continuous, nominal and effective rate of interest ● Annuity-Present and future value-sinking funds ● Depreciation of Assets: Equated Monthly Installments (EMI)-using flat interest rate and reducing balance method. ● Functions: Algebraic functions and the functions used in business and economics, Break Even and Equilibrium point.
2	Matrices and Determinants
	<ul style="list-style-type: none"> ● Matrices: Some important definitions and some important results. Matrix operation (Addition, scalar multiplication, matrix multiplication, transpose of a matrix) ● Determinants of a matrix of order two or three: properties and results of Determinants ● Solving a system of linear equations using Cramer's rule ● Inverse of a Matrix (up to order three) using ad-joint of a matrix and matrix inversion method ● Input Output Analysis
3	Derivatives and Applications of Derivatives
	<ul style="list-style-type: none"> ● Introduction and Concept: Derivatives of constant function, logarithmic functions, polynomial and exponential function ● Rules of derivatives: addition, multiplication, quotient ● Second order derivatives ● Application of Derivatives: Maxima, Minima, Average Cost and Marginal Cost. Total revenue, Marginal revenue, Average revenue. Average and Marginal profit. Introduction to Partial derivatives of first order, Price elasticity of demand
4	Integral Calculus and its Application
	<ul style="list-style-type: none"> ● Integral Calculus: Introduction, Integration, Integration as inverse of differentiation, Standard Formulae (integration of constant function, x^n, e^x, a^x, $\log x$) (Simple Problems), definite integrals (Simple problems) (No Properties) ● Application of Integral Calculus: Cost function; Revenue function; Consumer's & Producer's Surplus

Course Outcome

Sr.No	Course Outcome
01	Explain basic mathematical concepts
02	Make use of basics of mathematics for financial calculations like simple interest, compound interest, annuity, depreciation, etc
03	concepts of mathematical and economical functions
04	Predict risk and take decisions accordingly

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Ability Enhancement Courses (AEC)

**Business Communication –II
Course Code: UMS2BC2**

Objectives

Sr.No	Objectives
01	To develop ability to prepare and effectively deliver an oral presentation utilizing electronic software.
02	To learn organization of team activities that lead to development of collaborative work skills.
03	To draft effective business correspondence with brevity and clarity.

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Presentation Skills	15
2	Group Communication	15
3	Business Correspondence	15
4	Language and Writing Skills	15
Total		60

Sr. No.	Modules / Units
1	Presentation Skills
	Presentations <ul style="list-style-type: none"> Principles of Effective Presentation Public Speaking <ul style="list-style-type: none"> Principles of Effective Public Speaking
2	Group Communication
	Interviews: <ul style="list-style-type: none"> Group Discussion Preparing for an Interview, Types of Interviews – Selection, Appraisal, Grievance, Exit Meetings: Need and Importance of Meetings, Conduct of Meeting and Group Dynamics Role of the Chairperson, Role of the Participants, Drafting of Notice, Agenda and Resolutions
	Conference: Meaning and Importance of Conference Organizing a Conference Modern Methods: Video and Tele – Conferencing
	Public Relations: Meaning, Functions of PR Department, External and Internal Measures of PR
3	Business Correspondence
	Trade Letters: Order, Credit and Status Enquiry, Collection Letters of Inquiry, Letters of Complaints, Claims, Adjustments Sales Letters, promotional leaflets and fliers Consumer Grievance Letters, Letters under Right to Information (RTI) Act
4	Language and Writing Skills
	Reports: Parts, Types, Feasibility Reports, Investigative Reports. Book review Mock interview

Course Outcome

Sr.No	Course Outcome
01	Interpret different type of interview organized in commercial world.
02	Develop effective presentation necessary in corporate world
03	Apply mechanism of meeting, conference and its application in business world
04	Construct business letters effectively

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Skill Enhancement Courses (SEC)

**Foundation Course –II
Course Code: UMS2FC2**

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Globalization and Indian Society	08
2	Human Rights	07
3	Ecology and Sustainable Development	15
4	Understanding and Managing Stress and Conflict	15
	Total	45

Sr. No	Modules /Units
1	Globalization and Indian Society
	Understanding the concepts of liberalization, privatization and globalization; Growth of information technology and communication and its impact manifested in everyday life; Impact of globalization on industry: changes in employment and increasing migration; Changes in agrarian sector due to globalization; rise in corporate farming and increase in farmers' suicides.
2	Human Rights
	Concept of Human Rights; origin and evolution of the concept; The Universal Declaration of Human Rights; Human Rights constituents with special reference to Fundamental Rights stated in the Constitution
3	Ecology and Sustainable Development
	Importance of Environment Studies in the current developmental context; Understanding concepts of Environment, Ecology and their interconnectedness; Environment as natural capital and connection to quality of human life; Environmental Degradation- causes and impact on human life; Sustainable development- concept and components; poverty and environment
4	Understanding and Managing Stress and Conflict
	<p>Understanding Stress and Conflict: Causes of stress and conflict in individuals and society; Agents of socialization and the role played by them in developing the individual; Significance of values, ethics and prejudices in developing the individual; Stereotyping and prejudice as significant factors in causing conflicts in society. Aggression and violence as the public expression of conflict.</p> <p>Managing Stress and Conflict in Contemporary Society Types of conflicts and use of coping mechanisms for managing individual stress; Maslow's theory of self-actualization; Different methods of responding to conflicts in society; Conflict-resolution and efforts towards building peace and harmony in society.</p>

Topics for Project Guidance: Growing Social Problems in India:

- Increasing urbanization, problems of housing, health and sanitation.
- Changing lifestyles and impact on culture.
- Farmer's suicide and agrarian distress.
- Debate regarding Genetically Modified Crops.
- Development projects and Human Rights violations.
- Increasing crime/ suicides among youth.

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Skill Enhancement Courses (SEC)

Course Code: UMS2NS2

5. Foundation Course in NSS - II

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Volunteerism & Communication Skills	10
2	Socio-Economic Survey of village / Slum Adoption	15
3	Special Camping Activity	10
4	Government Organizations /Non-Government Organizations	10
Total		45

Sr. No.	Modules / Units
1	Volunteerism & Communication Skills
	<p>Unit I: Concept of Volunteerism Meaning & Features</p> <ul style="list-style-type: none"> ● Need of Training for Volunteerism. ● Role Models of Volunteerism in India. ● Leadership –Meaning & Attributes. ● Communication Skills-Meaning, Types & Importance <p>Unit II: Programme Planning</p> <ul style="list-style-type: none"> ● Requirement of Successful implementation of Programmes ● Importance of Planning and Limitation of Planning. ● Flow chart and Scheduling of the programme.
2	Socio-Economic Survey of village / Slum Adoption
	<p>Unit I: Meaning & Needs of Socio Economic Survey</p> <ul style="list-style-type: none"> ● Process of Socio-Economic Survey <ol style="list-style-type: none"> 1. Design of Questionnaire (Population, Literacy, Family) 2. Design of Interview, Education, Income. 3. Data Analysis (Introduction of Different Tools). 4. Report Writing. <p>Unit II: Village development plan and creation of durable assets</p> <ol style="list-style-type: none"> 1. Short term, Medium term, Long terms plans (14th Finance Commission) 2. Roles of NSSO, NFHS, Census towards plan formation and implementation.
3	Special Camping Activity
	<p>Unit I: Nature & Objectives of Activities</p> <ul style="list-style-type: none"> ● Selection of camp Site ● Identification of specific Theme ● Co-ordination with Local Planning Government and other Agencies. ● Ice breaking & team building activities. <p>Unit II: Feedback and Evaluation</p> <ul style="list-style-type: none"> ● Post camping Activities
4	Government Organizations /Non-Government Organizations
	<p>Unit I: Structure of Government organisations and Non-Government Organisations</p> <ul style="list-style-type: none"> ● Meaning of GOs, VOs/NGOS. ● Rise of NGOs in India (Company Act 2013, Organisation and Registration Act) ● Global Agencies working in India (UNICEF & WHO) ● NGOs: Regulation and Functions. <p>Unit II: Social Justice</p> <ul style="list-style-type: none"> ● Association of NGOs with NSS activities.

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Skill Enhancement Courses (SEC)

**5. Foundation Course in NCC – II
Course Code: UMS2NC2**

Objectives

Sr.No	Objectives
01	To empower and train youth to be responsible citizens and assist civil administration in performance of selective duties during disaster.
02	To teach the values and skills involved in providing voluntary social service.
03	To inculcate spirit of adventure, undertake adventure activities, to hone leadership qualities and risk taking abilities.
04	To instill respect and responsibility towards personal health and hygiene.
05	To train students so as to achieve their physical, mental, psychological and emotional development.
06	To impart elementary knowledge about rifles and firing.
07	To impart basic military training, to develop awareness about the defence forces and expose learners to military ethos / values.
08	To make the students apply the knowledge in specialised military subject/ social topics/ cultural endeavors

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Disaster Management, Social Awareness and Community Development	07
2	Adventure Training and Health and Hygiene	08
3	Drill with Arms	08
4	Weapon Training	10
5	Specialized Subject: Army Or Navy Or Air	12
6	Project	15
Total		60

Sr. No.	Modules / Units
1	<p>Disaster Management, Social Awareness and Community Development</p> <p>Disaster Management:</p> <p>Desired outcome: The student shall gain basic information about civil defence organization / NDMA & shall provide assistance to civil administration in various types of emergencies during natural / manmade disasters</p> <ul style="list-style-type: none"> <li>● Civil Defence Organization and Its Duties/NDMA <li>● Types of Emergencies/ Natural Disaster <li>● Assistance during Natural / Other Calamities: Flood / Cyclone/ Earth Quake/ Accident etc. <li>● ‘Avan’ model of NCC <p>Social Awareness and Community Development:</p> <p>Desired outcome: The student shall have an understanding about social service and its need, about NGOs and shall participate in community action programmes for betterment of the community.</p> <ul style="list-style-type: none"> <li>● Basics of Social Service, Weaker Sections of Our Society and Their Needs <li>● Social/ Rural Development Project: MNREGA, SGSY, NSAP etc. <li>● Contribution of Youth towards Social Welfare <li>● Civic Responsibilities
2	<p>Adventure Training and Health and Hygiene</p> <p>Desired outcome : The students will overcome fear & inculcate within them the sense of adventure , sportsmanship , esprit-d-corp and develop confidence, courage , determination, diligence and quest for excellence.</p> <ul style="list-style-type: none"> <li>● Any Two such as – Obstacle course, Slithering, Trekking, Cycling, Rock Climbing, Para Sailing, Sailing, Scuba Diving etc <p>Desired outcome: The student shall be fully aware about personal health and hygiene lead a healthy life style and foster habits of restraint and self awareness.</p> <ul style="list-style-type: none"> <li>● Hygiene and Sanitation (Personal and Food Hygiene) <li>● Infectious & Contagious Diseases & Their Prevention
3	<p>Drill with Arms</p> <p>Desired outcome: The students will demonstrate the sense of discipline, improve bearing, smartness, turnout, develop the quality of immediate and implicit obedience of orders, with good reflexes.</p> <ul style="list-style-type: none"> <li>● Attention, Stand at Ease and Stand Easy <li>● Getting on Parade with Rifle and Dressing at the Order <li>● Dismissing and Falling Out <li>● Ground / Take Up Arms <li>● Present From the Order and Vice-versa <li>● General Salute, Salami Shastra
4	<p>Weapon Training</p> <p>Desired outcome: The student shall have basic knowledge of weapons and their use and handling.</p> <ul style="list-style-type: none"> <li>● Characteristics of a Rifle / Rifle Ammunition and its Fire Power

	<ul style="list-style-type: none"> ● Stripping, Assembling, Care and Cleaning and Sight Setting of .22rifle ● Stripping, Assembling, Care and Cleaning of 7.62mm SLR ● Loading, Cocking and Unloading ● The lying position, Holding and Aiming-I ● Trigger control and firing a shot ● Range procedure and safety precautions <p>Short range firing, Aiming- II -Alteration of sight</p>
5	Specialized Subject: Army Or Navy Or Air
	<p>Army Desired outcome: The training shall instill patriotism, commitment and passion to serve the nation motivating the youth to join the defence forces. It will also acquaint, expose & provide basic knowledge about armed, naval and air-force subjects</p> <p>A. Map reading</p> <ul style="list-style-type: none"> ● Introduction to types of Maps and Conventional signs ● Scales and Grid system ● Topographical forms and technical terms ● Relief, contours and Gradients ● Cardinal points and Types of North ● Types of bearings and use of Service Protractor ● Prismatic compass and its use and GPS <p>B. Field Craft and Battle Craft</p> <ul style="list-style-type: none"> ● Introduction ● Judging distance ● Description of ground ● Recognition, Description and Indication of landmarks and targets <p style="text-align: center;">OR</p> <p>Navy</p> <p>A. Naval Communication</p> <ul style="list-style-type: none"> Introduction to Naval Modern Communication, Purpose and Principles <ul style="list-style-type: none"> ▪ Introduction of Naval communication ▪ Duties of various communication sub-departments Semaphore <ul style="list-style-type: none"> ▪ Introduction of position of letters and prosigns ▪ Reading of messages ▪ Transmission of messages <p>B. Seamanship</p> <ul style="list-style-type: none"> Anchor work <ul style="list-style-type: none"> ▪ Parts of Anchor and Cable, their identification Rigging <ul style="list-style-type: none"> ▪ Types of ropes and breaking strength- stowing, maintenance and securing of ropes ▪ Practical Bends and Hitches: Reef Knot, Half hitch, Clove Hitch,

	<p>Rolling Hitch, Timber Hitch, Bow Line, Round Turn and Two half hitch and Bow line on the Bight and its basic elements and uses.</p> <ul style="list-style-type: none">▪ Introduction to Shackles, Hooks, Blocks and Derricks, Coiling Down and Splicing of rope <p>C. Boat work</p> <ul style="list-style-type: none"> Parts of Boat and Parts of an Oar Instruction on boat Pulling- Pulling orders Steering of boat under oars, Practical instruction on Boat Pulling, Precautions while pulling
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Sr. No.	Modules / Units
	<i>OR</i>
	<p>Air</p> <p>A. Airframes</p> <ul style="list-style-type: none"> ● Aircraft Controls ● Landing Gear <p>B. Instruments</p> <ul style="list-style-type: none"> ● Basic Flight Instruments <p>C. Aircraft Particulars</p> <ul style="list-style-type: none"> ● Aircraft Particulars (Type specific) <p>D. Aero modelling</p> <ul style="list-style-type: none"> ● History of Aero modelling ● Materials used in Aero modelling ● Type of Aero models ● Flying/ Building of Aero models
6	Project
	Project on Social Activities

Course Outcome

Sr. No.	Course Outcome
01	Trained and disciplined citizens will be developed.
02	Physical fitness and overall personality of the youth will be enhanced.
03	Students will be trained to develop their carrer in defence / paramilitary/ police forces & civil services

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Skill Enhancement Courses (SEC)

**Foundation Course in Physical Education –II
Course Code: UMS2PE2**

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Development of Fitness	10
2	Health, Fitness and Diseases	15
3	Yoga Education	10
4	Daily Schedule of Achieving Quality of Life and Wellness	10
Total		45

Sr. No.	Modules / Units
1	Development of Fitness
	<ul style="list-style-type: none"> ● Benefits of physical fitness and exercise and principles of physical fitness ● Calculation of fitness index level1-4 ● Waist-hip ratio Target Heart Rate, BMI and types and principles of exercise (FITT) ● Methods of training – continues, Interval, circuit, Fartlek and Plyometric
2	Health, Fitness and Diseases
	<ul style="list-style-type: none"> ● Definition of obesity and its management ● Communicable diseases, their preventive and therapeutic aspects ● Factors responsible for communicable diseases ● Preventive and therapeutic aspect of Communicable and non- communicable diseases
3	Yoga Education
	<ul style="list-style-type: none"> ● Meaning and history of yoga ● Ashtang yoga and types of yoga ● Types of Suryanamaskar and Technique of Pranayam ● Benefits of Yoga
4	Daily Schedule of Achieving Quality of Life and Wellness
	<ul style="list-style-type: none"> ● Daily schedule based upon one's attitude, gender, age & occupation. ● Basic – module: - Time split for rest, sleep, diet, activity &recreation. ● Principles to achieve quality of life:- positive attitude, daily regular exercise, control over food habits & healthy hygienic practices.

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Skill Enhancement Courses

(SEC) 5. Personality

Development - II

Course Code: UMS2PD2

OBJECTIVES

Sr. No	Objectives
01	To develop talent, facilitate employability enabling the learners to excel and sustain in highly competitive world of business
02	To make learners know about self - awareness, life skills and need for personal development
03	To bring about personality development with regard to different behavioral dimensions in the direction of organizational effectiveness
04	To increase awareness of personality development, mutual understanding and importance of supportive learning environment.

Modules at a Glance

Sr. No.	Modules	No. of Hours
1	Important Aspects of Personality Development and Self Grooming	7
2	Personality Makeover	8
Total		15

Sr. No.	Modules / Units
1	Important Aspects of Personality Development and Self Grooming
	<ul style="list-style-type: none"> ● Body language - Problem-solving - Conflict and Stress Management - Decision-making skills - Leadership and qualities of a successful leader – Character building - Team-work – Time management - Work ethics –Good manners and etiquette, Assertiveness,. ● Self Image and Self Concept, Dressing Sense, Table Mannerism, Diet Exercise and Mental
2	Personality Makeover
	<ul style="list-style-type: none"> ● Speech fluency, Self Motivation, Confidence Building, Role Plays, Reporting, Speaking habits, Powerful Presentation Techniques, Time management, Voice modulation, Stress Management, Building a positive attitude – creative thinking, Executive Corporate Attire / Formal Dressing, Personality Branding

Course Outcomes

Sr. No	Course Outcomes
01	Learners will be able to develop the basic idea of significance and reasons for personality development and self-grooming
02	Learners will be able to build confidence and overcome the problems associated with personality
03	Learners will be able to understand and demonstrate knowledge of personal beliefs and values
04	Learners will be able to improve their personality and language related difficulties.

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Core Courses (CC)

1.

Principles of Marketing
Course Code: UMS2PMK

OBJECTIVES

Sr.No	Objectives
01	To introduce the marketing concept and how we identify, understand and satisfy the needs of customers in the market.
02	To introduce marketing strategies and current policies.

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to Marketing	15
2	Marketing Environment, Research and Consumer Behaviour	15
3	Marketing Mix	15
4	Segmentation, Targeting and Positioning and Trends In Marketing	15
Total		60

Sr. No.	Modules / Units
1	Introduction to Marketing
	<ul style="list-style-type: none"> ● Introduction to Marketing: Definition, features, advantages and scope of marketing. The 4P's and 4C's of marketing. Marketing v/s Selling. Marketing as an activity and function ● Concepts of Marketing: Needs, wants and demands, transactions, transfer and exchanges. ● Orientations of a firm: Production concept; Product concept; selling concept and marketing concept, social relationship, Holistic marketing.
2	Marketing Environment, Research and Consumer Behaviour
	<ul style="list-style-type: none"> ● The micro environment of business: Management structure; Marketing Channels; Markets in which a firm operates; competitors and stakeholders. ● Macro environment: Political Factors; Economic Factors; Socio Cultural Factors, Technological Factors (PEST Analysis) ● Marketing research: Meaning, features, Importance of marketing research. Types of marketing research: Product research; Sales research; consumer/customer research; production research ● MIS: Meaning, features and Importance ● Consumer Behaviour: Meaning, feature, importance, factors affecting Consumer Behaviour
3	Marketing Mix
	<ul style="list-style-type: none"> ● Marketing mix: Meaning –elements of Marketing Mix. ● Product-product mix-product line lifecycle-product planning – New product development- failure of new product-levels of product. ● Branding –Packing and packaging – role and importance ● Pricing – objectives- factors influencing pricing policy and Pricing strategy. ● Physical distribution – meaning – factor affecting channel selection-types of marketing channels ● Promotion – meaning and significance of promotion. Promotion tools(brief)
4	Service Marketing Segmentation, Targeting and Positioning and Trends In Marketing
	<ul style="list-style-type: none"> ● Service Marketing – Concept. Meaning, Definition of Service Marketing, 7Ps of Service Marketing, Implementation of 7Ps of Service Marketing. ● Types of Business – Meaning and Concept of B2B, B2C, C2B and C2C. ● Segmentation – meaning, importance, basis ● Targeting – meaning, types ● Positioning – meaning –strategies ● New trends in marketing – E-marketing, Internet marketing and marketing

	using Social network ● Social marketing/ Relationship marketing
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Course Outcome

Sr.No	Course Outcome
01	Learners will be able to explain the concept of marketing and define the basic parts of Marketing.
02	Learners will be able to illustrate the marketing environment consisting of micro and macro factors of marketing and consumer behavior.
03	Learners will be able to summarize marketing mix in detail.
04	Learners will be able to describe Service Marketing, Types of Business, Segmentation, Targeting and Positioning also current trends in the marketing field.

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Core Courses (CC)

**7. Principles of Management
Course Code: UMS2PMG**

Objectives

Sr.No	Objectives
01	To provide a basis of understanding to the learners with reference to working of business organization through the process of management.
02	To inculcate managerial skills of planning, organising and controlling and to teach how it can be executed in a variety of circumstances.
03	To apply concepts of strategic and tactical organizational planning

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Nature of Management	15
2	Planning and Decision Making	15
3	Organizing	15
4	Directing, Leadership, Co-ordination and Controlling	15
Total		60

Sr. No.	Modules / Units
1	Nature of Management
	<ul style="list-style-type: none"> ● Management: Concept, Significance, Role & Skills, Levels of Management, Concepts of PODSCORB, Managerial Grid. ● Evolution of Management thoughts, Contribution of F.W Taylor, Henri Fayol And Contingency Approach. <ul style="list-style-type: none"> ● Organization culture and Environment – Current trends and issues in Management. ● Integrative Managerial Issues: Managing in a Global Environment;
2	Planning and Decision Making
	<ul style="list-style-type: none"> ● Planning: Meaning, Importance, Elements, Process, Limitations and MBO. ● Decision Making: Meaning, Importance, Process, Techniques of Decision Making.
3	Organizing
	<ul style="list-style-type: none"> ● Organizing: Concepts, Structure (Formal & Informal, Line & Staff and Matrix), Meaning, Advantages and Limitations ● Departmentation: Meaning, Basis and Significance ● Span of Control: Meaning, Graicunas Theory, Factors affecting span of Control Centralization vs Decentralization ● Delegation: Authority & Responsibility relationship
4	Directing, Leadership, Co-ordination and Controlling
	<ul style="list-style-type: none"> ● Directing: Meaning and Process ● Leadership: Meaning, Styles and Qualities of Good Leader ● Co-ordination as an Essence of Management ● Controlling: Meaning, Process and Techniques ● Recent Trends: Green Management & CSR ● New Perspectives in Management - Strategic alliances - Core competence ● Managing Innovation & Change

Course Outcome

Sr.No	Course Outcome
01	explain the functions and responsibilities of managers & tools and techniques to be used in the performance of the managerial job.
02	analyze and understand the environment of the organization
03	build the leadership capacity and teamwork skills for business decision making.
	elaborate the knowledge of current theory and techniques of major business discipline.

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Reference Books

Reference Books
Introduction to Financial Accounts
<ul style="list-style-type: none"> ● <i>Financial Accounts (a managerial emphasis): By Ashok Banerjee – Excelbooks</i> ● <i>Fundamental of Accounting and Financial Analysis : By Anil Choudhary (Pearsoneducation)</i> ● <i>Indian Accounting Standards and IFRS for non-financial executives : By T.P. Ghosh–Taxman</i> ● <i>Financial Accounting for Business Managers: By Ashish K.Bhattacharya.</i> ● <i>Introduction to Accountancy by T.S. Grewal, S. Chand and Company (P) Ltd., NewDelhi</i> ● <i>Advance Accounts by Shukla and Grewal, S. Chand and Company (P) Ltd., NewDelhi</i> ● <i>Advanced Accountancy by R.L Gupta and M. Radhaswamy, S. Chand and Company (P) Ltd., NewDelhi</i> ● <i>Modern Accountancy by Mukherjee and Hanif, Tata Mc. Grow Hill and Co. Ltd.,Mumbai</i> ● <i>Financial Accounting by LesileChandwichk, Pentice Hall of India AdinBakley (P) Ltd., NewDelhi</i> ● <i>Financial Accounting for Management by Dr. Dinesh Harsalekar, Multi-Tech. Publishing Co. Ltd., Mumbai</i> ● <i>Financial Accounting by P.C. Tulsian, Pearson Publications, NewDelhi</i> ● <i>Accounting Principles by R.N. Anthony and J.S. Reece, Richard Irwin, Inc</i> ● <i>Financial Accounting by Monga, J.R. Ahuja, GirishAhuja and Ashok Shehgal, Mayur Paper Back, Noida</i> ● <i>Compendium of Statement and Standard of Accounting, ICAI</i> ● <i>Indian Accounting Standards, Ashish Bhattacharya, Tata Mc. Grow Hill and Co. Ltd.,Mumbai</i> ● <i>Financial Accounting by Williams, Tata Mc. Grow Hill and Co. Ltd.,Mumbai</i> ● <i>Company Accounting Standards by ShrinivasanAnand, Taxman, NewDelhi</i> ● <i>Financial Accounting by V. Rajasekaran, Pearson Publications, NewDelhi</i> ● <i>Introduction to Financial Accounting by Horngren, Pearson Publications, NewDelhi</i> ● <i>Financial Accounting by M. Mukherjee and M. Hanif, Tata McGraw Hill Education Pvt. Ltd., NewDelhi</i> ● <i>Financial Accounting a Managerial Perspective, Varadraj B. Bapat, MehulRaithatha, Tata McGraw Hill Education Pvt. Ltd., NewDelhi</i>
Business Law
<ul style="list-style-type: none"> <i>Elements of mercantile Law –N.D.Kapoor</i> <i>Business Law – P.C.Tulsian</i> <i>Business Law – SSGulshan</i> <i>Company Law – Dr.AvtarSingh</i> <i>Indian contract Act – Dr.AvtarSingh</i> <i>Law of IntellectualProperty-V.K-Taraporevala</i>
Business Statistics
<ul style="list-style-type: none"> <i>Statistics of Management , Richard Levin &David S. Rubin,Printice Hall of India , NewDelhi.</i> <i>Statistics for Business & Economics, David R Anderson, Dennis J Sweney, ThompsomPublication.</i> <i>Fundamental of Statistics, S C Gupta, Himalya PublicationHouse.</i> <i>Business Statistics , Bharadwaj , Excel Books,Delhi</i> <i>Business Mathematics, S.K Singh & J.K Singh, Brijwasi Book Distributor &Publisher.</i>

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Foundation Course – I

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- *Social and Economic Problems in India, Naseem Azad, R Gupta Pub (2011)*
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- *Faces of Feminine in Ancient, medieval and Modern India, Mandakranta Bose Oxford University Press*
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- *Management Text & Cases , VSP Rao , Excel Books, Delhi*
- *Management Concepts and OB , P S Rao & N V Shah , Ajab Pustakalaya*
- *Essentials of Management , Koontz II & W , Mc. Grew Hill , New York*
- *Principles of Management-Text and Cases –Dr..M.Sakthivel Murugan, New Age Publications*

**Revised Syllabus of Courses of Bachelor of Management Studies
(BMS)**

**Programme at Semester I and II
with effect from the Academic Year 2022-2023**

Scheme of

❖ **Scheme of Examination**

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

**A) Internal Assessment: 40 % 40 Marks
(For Courses without Practical)**

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	One case study/ project with presentation based on curriculum to be assessed by the teacher concerned	15 Marks
	Presentation	10 Marks
	Written Document	05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks

(For Courses with Practical)

Sr. No.	Particular	Marks
01	Practical Examination	20 Marks
	Journal	05 Marks
	Viva Voce	05 Marks
	Laboratory Work	10 Marks
02	One case study /project with presentation to be assessed by teacher concerned (15 Marks)	
	Presentation	10 Marks
	Written Document	05 Marks

03	Active participation in routine class instructional deliveries and Overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks
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Question Paper Pattern

(Periodical Class Test for the Courses at Under Graduate Programmes)

Maximum Marks: 20
Questions to be set: 02
Duration: 40 Minutes
All Questions are Compulsory

Question No	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 % 60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
<ol style="list-style-type: none">1. There shall be four questions each of 15 marks.2. All questions shall be compulsory with internal options.3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

❖ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

❖ Guidelines and Evaluation pattern for project work (100 Marks)

Introduction

Inclusion of project work in the course curriculum of the B.Com. (Accounting & Finance) and B.M.S. programme is one of the ambitious aspects in the programme structure. The main objective of inclusion of project work is to inculcate the element of research analyse and scientific temperament challenging the potential of learner as regards to his/ her eager to enquire and ability to interpret particular aspect of the study. It is expected that the guiding teacher should undertake the counselling sessions and make the awareness among the learners about the methodology of formulation, preparation and evaluation pattern of the project work.

- There are two modes of preparation of project work
 1. Project work based on research methodology in the study area
 2. Project work based on internship in the study area

Guidelines for preparation of Project Work

1. General guidelines for preparation of project work based on Research

Methodology

- The project topic may be undertaken in any area of Elective Courses.
- Each of the learner has to undertake a Project individually under the supervision of a teacher-guide.
- The learner shall decide the topic and title which should be specific, clear and with definite scope in consultation with the teacher-guide concerned.
- University/college shall allot a guiding teacher for guidance to the students based on her / his specialization.
- The project report shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.
 - The project report should be 80 to 100 pages

Format

1st page (Main Page)

Title of the problem of the Project

A Project Submitted to
University of Mumbai for partial completion of the degree of
Bachelor in Commerce (Accounting and Finance)/B.M.S.
Under the Faculty of Commerce

By

Name of the Learner

Under the Guidance of

Name of the Guiding Teacher

Name and address of the College

Month and Year

2nd Page

This page to be repeated on 2nd page (i.e. inside after main page)

On separate page

Index

Chapter No. 1 (sub point 1.1, 1.1.1, And so on)	Title of the Chapter	Page No.
Chapter No. 2	Title of the Chapter	
Chapter No. 3	Title of the Chapter	
Chapter No. 4	Title of the Chapter	
Chapter No. 5	Title of the Chapter	

List of tables, if any, with page numbers.

List of Graphs, if any, with page numbers.

List of Appendix, if any, with page numbers.

Abbreviations used:

Structure to be followed to maintain the uniformity in formulation and presentation of Project Work

(Model Structure of the Project Work)

- **Chapter No. 1: Introduction**

In this chapter Selection and relevance of the problem, historical background of the problem, brief profile of the study area, definition/s of related aspects, characteristics, different concepts pertaining to the problem etc can be incorporated by the learner.

- **Chapter No. 2: Research Methodology**

This chapter will include Objectives, Hypothesis, Scope of the study, limitations of the study, significance of the study, Selection of the problem, Sample size, Data collection, Tabulation of data, Techniques and tools to be used, etc can be incorporated by the learner.

- **Chapter No. 3: Literature Review**

This chapter will provide information about studies done on the respective issue. This would specify how the study undertaken is relevant and contribute for value addition in information/ knowledge/ application of study area which ultimately helps the learner to undertake further study on same issue.

- **Chapter No. 4: Data Analysis, Interpretation and Presentation**

This chapter is the core part of the study. The analysis pertaining to collected data will be done by the learner. The application of selected tools or techniques will be used to arrive at findings. In this, table of information's, presentation of graphs etc. can be provided with interpretation by the learner.

- **Chapter No. 5: Conclusions and Suggestions**

In this chapter of project work, findings of work will be covered and suggestion will be enlisted to validate the objectives and hypotheses.

Note: If required more chapters of data analysis can be added.

- **Bibliography**
- **Appendix**

*On separate page
Name and address of the college*

Certificate

This is to certify that Ms/Mr _____ has worked and duly completed her/his Project Work for the degree of Bachelor in Commerce (Accounting & Finance)/B.M.S. under the Faculty of Commerce in the subject of _____ and her/his project is entitled, “*Title of the Project*” under my supervision.

I further certify that the entire work has been done by the learner under my guidance and that no part of it has been submitted previously for any Degree or Diploma of any University.

It is her/ his own work and facts reported by her/his personal findings and investigations.



Name and Signature of
Guiding Teacher

Date of submission:

On separate page

Acknowledgment

(Model structure of the acknowledgement)

To list who all have helped me is difficult because they are so numerous and the depth is so enormous. I would like to acknowledge the following as being idealistic channels and fresh dimensions in the completion of this project.

I take this opportunity to thank the **University of Mumbai** for giving me chance to do this project.

I would like to thank my **Principal**, _____ for providing the necessary facilities required for completion of this project.

I take this opportunity to thank our **Coordinator** _____, for her moral support and guidance.

I would also like to express my sincere gratitude towards my project guide _____ whose guidance and care made the project successful.

I would like to thank my **College Library**, for having provided various reference books and magazines related to my project.

Lastly, I would like to thank each and every person who directly or indirectly helped me in the completion of the project especially **myParents and Peers** who supported me throughout my project.

2. Guidelines for Internship based project work

- Minimum 20 days/ 100 hours of Internship with an Organisation/ NGO/ Charitable Organisation/ Private firm.
- The theme of the internship should be based on any study area of the elective courses
- Experience Certificate is Mandatory
- A project report has to be brief in content and must include the following aspects:
 - **Executive Summary:**
A bird's eye view of your entire presentation has to be precisely offered under this category.
 - **Introduction on the Company:**
A Concise representation of company/ organization defining its scope, products/ services and its SWOT analysis.
 - **Statement and Objectives:**
The mission and vision of the organization need to be stated enshrining its broad strategies.
 - **Your Role in the Organisation during the internship:**
The key aspects handled, the department under which you were deployed and brief summary report duly acknowledged by the reporting head.
 - **Challenges:**
The challenges confronted while churning out theoretical knowledge into practical world.
 - **Conclusion:**
A brief overview of your experience and suggestions to bridge the gap between theory and practice.
- The project report based on internship shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.
 - The project report should be of minimum 50 pages

Evaluation pattern of the project work

The Project Report shall be evaluated in two stages viz.	
● Evaluation of Project Report (Bound Copy)	60 Marks
▪ Introduction and other areas covered	20 Marks
▪ Research Methodology, Presentation, Analysis and interpretation of data	30 Marks
▪ Conclusion & Recommendations	10 Marks
● Conduct of Viva-voce	40 Marks
▪ In the course of Viva-voce, the questions may be asked such as importance / relevance of the study, objective of the study, methodology of the study/ mode of Enquiry (question responses)	10 Marks
▪ Ability to explain the analysis, findings, concluding observations, recommendation, limitations of the Study	20 Marks
▪ Overall Impression (including Communication Skill)	10 Marks

Note:

- *The guiding teacher along with the external evaluator appointed by the University/ College for the evaluation of project shall conduct the viva-voce examination as per the evaluation pattern*
- *The plagiarism should be maintained as per the UGC guidelines.*

Passing Standard

- Minimum of Grade D in the project component
- In case of failing in the project work, the same project can be revised for ATKT examination.
- Absence of student for viva voce: If any student fails to appear for the viva voce on the date and time fixed by the department such student shall appear for the viva voce on the date and time fixed by the Department, such student shall appear for the viva voce only along with students of the next batch.

Note: 1) It is noted that the concerned regulation of the university is amended and implemented to all Semesters i.e. Semester I to Semester VI to all undergraduate programmes, simultaneously, under faculty of Arts, Commerce and Science with effect from the academic year 2019 - 2020.

2) This scheme of evaluation is discussed in detail, finalised and accepted.



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: BMS

Revised Syllabus of S.Y.BMS Management Studies
Choice Based Credit & Grading System (60:40)
w. e. f. Academic Year 2020-21

S.Y.BMS, Management Studies

Sr. No.	Heading	Particulars
1	Title of Course	Management Studies
2	Eligibility for Admission	First Year with both the semester should be pass (Maximum ATKT allowed for Semester I and Semester II are two subjects per semester)
3	Passing marks criteria	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

Bachelor of Management Studies (BMS) Programme

Under Choice Based Credit, Grading and Semester System

Course Structure

SYBM

(To be implemented from Academic Year- 2020-2021)

No. of Courses	Semester III	Credits	No. of Courses	Semester IV	Credits
1	<i>Elective Courses (EC)</i>		1	<i>Elective Courses (EC)</i>	
	*Any one group of courses from the following list of the courses	06		** Any one group of courses from the following list of the courses	06
2	<i>Ability Enhancement Courses (AEC)</i>		2	<i>Ability Enhancement Courses (AEC)</i>	
2A	<i>Ability Enhancement Compulsory Courses (AECC)</i>		2A	<i>Ability Enhancement Compulsory Courses (AECC)</i>	
UMS3IT1	Information Technology in Business Management - I	03	UMS4IT2	Information Technology in Business Management-II	03
2B	<i>*Skill Enhancement Courses (SEC)</i>		2B	<i>*Skill Enhancement Courses (SEC)</i>	
	Any one course from the following list of the courses	02		Any one course from the following list of the courses	02
3	<i>Core Courses (CC)</i>		3	<i>Core Courses (CC)</i>	
UMS3BPM	Business Planning & Entrepreneurial Management	03	UMS4BE2	Business Economics-II	03
UMS3AMD	Accounting for Managerial Decisions	03	UMS4BRM	Business Research Methods	03
UMS3SMG	Strategic Management	03	UMS4PTQ	Production & Total Quality Management	03
Total Credits		20	Total Credits		20

S.Y.BMS, Management Studies

*List of Skill Enhancement Courses (SEC) for Semester III (Any One)		**List of Skill Enhancement Courses (SEC) for Semester II (Any One)	
UMS3FC 3	Foundation Course (Environmental Management) – III	UMS4FC 4	Foundation Course (Ethics & Governance)- IV
UMS3NS 3	Foundation Course in NSS – III	UMS4NS 4	Foundation Course in NSS - IV
UMS3NC 3	Foundation Course in NCC – III	UMS4NC 4	Foundation Course in NCC - IV
UMS3PE 3	Foundation Course in Physical Education- III	UMS4PE 4	Foundation Course in Physical Education- IV

S.Y.BMS, Management Studies

*List of group of Elective Courses(EC) for Semester III (Any two)		** List of group of Elective Courses(EC) for Semester IV (Any two)	
Group A: Finance Electives (Any Two Courses)			
UMS3BFS	Basics of Financial Services	UMS4SCM	Strategic Cost Management
UMS3COF	Corporate Finance	UMS4COR	Corporate Restructuring
UMS3EDM	Equity and Debt Market	UMS4FIM	Financial Institutions and Markets
UMS3ICA	Introduction to Cost Accounting	UMS4AUD	Auditing
Group B: Marketing Electives (Any Two Courses)			
UMS3COB	Consumer Behaviour	UMS4IMC	Integrated Marketing Communication
UMS3ADV	Advertising	UMS4RUM	Rural Marketing
UMS3PIM	Product Innovations Management	UMS4EVM	Event Marketing
UMS3MSM	Social Marketing	UMS4TUM	Tourism Marketing
Group C: Human Resource Electives(Any Two Courses)			
UMS3R&S	Recruitment & Selection	UMS4CHM	Change Management
UMS3M&L	Motivation and Leadership	UMS4T&D	Training & Development in HRM
UMS3ERW	Employees Relations and Welfare	UMS4HIS	Human Resource Planning & Information System
UMS3OBH	Organisation Behaviour and HRM	UMS4C&N	Conflict and Negotiation

Bachelor of Management Studies (BMS) Programme

Under Choice Based Credit, Grading and Semester System Course Structure

(To be implemented from Academic Year- 2020-2021)

Semester III

No. of Courses	Semester III	Credit s
1	<i>Elective Courses (EC)</i>	
	*Any one group of courses from the following list of the courses	06
2	<i>Ability Enhancement Courses (AEC)</i>	
2A	<i>Ability Enhancement Compulsory Courses (AECC)</i>	
UMS3IT1	Information Technology in Business Management - I	03
2B	<i>*Skill Enhancement Courses (SEC)</i>	
	Any one course from the following list of the courses	02
3	<i>Core Courses (CC)</i>	
UMS3BPM	Business Planning & Entrepreneurial Management	03
UMS3AMD	Accounting for Managerial Decisions	03
UMS3SMG	Strategic Management	03
Total Credits		20

<i>*List of Skill Enhancement Courses (SEC) for Semester III (Any One)</i>	
UMS3FC 3	Foundation Course (Environmental Management) - III
UMS3NS 3	Foundation Course in NSS - III
UMS3NC 3	Foundation Course in NCC - III
UMS3PE 3	Foundation Course in Physical Education- III

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UMS3FC Foundation Course (Environmental Management)

3 - III

S.Y.BMS, Management Studies

*List of group of Elective Courses(EC) for Semester III (Any two)	
Group A: Finance Electives (Any Two Courses)	
UMS3BFS	Basics of Financial Services
UMS3CO F	Corporate Finance
UMS3ED M	Equity and Debt Market
UMS3ICA	Introduction to Cost Accounting
Group B: Marketing Electives (Any Two Courses)	
UMS3CO B	Consumer Behaviour
UMS3AD V	Advertising
UMS3PIM	Product Innovations Management
UMS3MS M	Social Marketing
Group C: Human Resource Electives(Any Two Courses)	
UMS3R& S	Recruitment & Selection
UMS3M& L	Motivation and Leadership
UMS3ER W	Employees Relations and Welfare
UMS3OB H	Organisation Behaviour and HRM

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester III

with Effect from the Academic Year 2020- 2021

Elective Courses (EC)

Group A. Finance

Electives

Basics of Financial Services Course Code: UMS3BFS Modules at a Glance

Sr. No.	Module s	No. of Lectur es
1	Financial System	14
2	Commercial Banks, RBI And Development Banks	16
3	Insurance	15
4	Mutual Funds	15
Total		60

Objectives

S N	Objectives
1	The course aims at explaining the core concepts of business finance and its importance in managing a business

S.Y.BMS, Management Studies

2	The objectives of develop a conceptual frame work of finance function and to acquaint the participants with the tools, types, instruments of financial system in the realm of Indian Financial Market.
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Sr. No.	Modules / Units
1	Financial System:
	<ul style="list-style-type: none"> • An overview of Financial System, Components of Financial System • Financial Services, Characteristics of financial services, Types of financial services, Scope of financial services – (a) Fund Based Financial Services (b) Fee Based Financial Services • Financial Markets, Structure of Financial Market (Organised and Unorganized Market), Major Financial Intermediaries, Financial Products, Function of Financial System, Regulatory Framework of Indian Financial System (Overview of SEBI and RBI-Role and Importance as regulators).
2	Commercial Banks, RBI And Development Banks
	<ul style="list-style-type: none"> • Concept of Commercial Banks- Functions, Investment Policy of Commercial Banks, Liquidity in Banks, Asset Structure of Commercial Banks, Non-Performing Assets, Interest Rate reforms, Capital Adequacy Norms • Reserve Bank of India- Organisation & Management, Role And Functions • Development Banks- Characteristics of Development Banks, Need And Emergence of Development Financial Institutions In India, Function of Development Banks. • Small Finance Banks – Features, Eligibility Criteria, Payment Banks, Net banking and Mobile Banking
3	Insurance:
	<ul style="list-style-type: none"> • Concept, Basic Characteristics of Insurance, Insurance Company Operations, Principles of Insurance, Reinsurance, Purpose And Need Of Insurance, Different Kinds of Life Insurance Products, Basic Idea About Fire And Marine Insurance and Bancassurance
4	Mutual Funds:
	<ul style="list-style-type: none"> • Concept of Mutual Funds, Growth of Mutual Funds in India, Features and Importance of Mutual Fund. Mutual Fund Schemes, Money Market Mutual Funds, Private Sector Mutual Funds, Evaluation of the Performance Of Mutual Funds, Functioning of Mutual Funds In India.

Course Outcome

Sr. No	Course Outcome
01	Enable students to understand financial market and its various segments
02	Students get knowledge about functioning and role of financial institutions
03	To familiarize students with fundamentals of banking and knowledge of banking operations

S.Y.BMS, Management Studies

04	Types and uses of Insurance contracts
05	To impart knowledge about functioning and role of RBI

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Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester III

with Effect from the Academic Year 2020-21

Elective Courses (EC)

Group A. Finance

Electives

Corporate

Finance Course

Code: UMS3COF

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction	15
2	Capital Structure and Leverage	15
3	Time Value of Money	15
4	Mobilisation of Funds	15
Total		60

Objectives

S N	Objectives
1	The objectives of develop a conceptual frame work of finance function and to acquaint the participants with the tools techniques and process of financial management in the realm of financial decision making

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2	The course aims at explaining the core concepts of corporate finance and its importance in managing a business
3	To providing understanding of nature, importance, structure of corporate finance related areas and to impart knowledge regarding source of finance for a business

Sr. No.	Modules / Units
1	Introduction
	<ul style="list-style-type: none"> • Introduction To Corporate Finance: Meaning, Principles of Corporate Finance, Significance of Corporate Finance, Amount of Capitalisation, Over Capitalisation and Under Capitalisation, Fixed capital and Working Capital funds. • Introduction to ownership securities– Ordinary Shares, Reference Shares, Creditor Ship Securities, Debtors and Bonds, Convertible Debentures, Concept of Private Placement of Securities.
2	Capital Structure and Leverage
	<ul style="list-style-type: none"> • Introduction to Capital Structure theories, EBIT – EPS analysis for Capital Structure decision. • Cost of Capital – Cost of Debt, Cost of Preference Shares, Cost of Equity Shares and Cost of Retained Earnings, Calculation of Weighted Cost of Capital. • Introduction to concept of Leverage - Operating Leverage, Financial Leverage and Combined Leverage.
3	Time Value of Money
	<ul style="list-style-type: none"> • Introduction to Time Value of Money – compounding and discounting • Introduction to basics of Capital Budgeting (time value of money based methods) – NPV and IRR (Net Present Value and Internal Rate of Return) • Importance of Risk and Return analysis in Corporate Finance
4	Mobilisation of Funds
	<p>Public deposits and RBI regulations, Company deposits and SEBI regulations, Protection of depositors, RBI and public deposits with NBFC's. Foreign capital and collaborations, Foreign direct Investment (FDI) Emerging trends in FDI Global Depository Receipts, Policy development, Capital flows and Equity Debt. Brief introduction & sources of short term Finance Bank Overdraft, Cash Credit, Factoring</p>

Course Outcomes

S N	Outcomes
1	Learners will be able to estimate company's cost of capital.
2	Learners will be able to value stocks and bonds and assess risk and return of assets.
3	Learners will learn to calculate capital budgeting and resource allocation.
4	Learners will be able explain capital structure and select a company's optimal mix of debt and equity financing.
5	Learners will have overall knowledge about the mobilisation of funds.

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Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

**Programme at Semester III
with Effect from the Academic Year 2020-21**

**Elective Courses
(EC) Group B. Marketing
Electives**

**Consumer
Behaviour Course
Code: UMS3COB
Modules at a Glance**

Sr. No.	Module s	No. of Lectur es
1	Introduction To Consumer Behaviour	14
2	Individual- Determinants of Consumer Behaviour	16
3	Environmental Determinants of Consumer Behaviour	15
4	Consumer decision making models and New Trends	15
Total		60

Objectives

S N	Objectives
1	The basic objective of this course is to develop an understanding about the consumer decision making process and its applications in marketing function of firms

S.Y.BMS, Management Studies

2	This course is meant to equip undergraduate students with basic knowledge about issues and dimensions of Consumer Behaviour. Students are expected to develop the skill of understanding and analysing consumer information and using it to create consumer- oriented marketing strategies.
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Sr. No.	Modules / Units
1	Introduction To Consumer Behaviour:
	<ul style="list-style-type: none"> • Meaning of Consumer Behaviour, Features and Importance • Types of Consumer (Institutional & Retail), Diversity of consumers and their behaviour- Types Of Consumer Behaviour • Profiling the consumer and understanding their needs • Consumer Involvement • Application of Consumer Behaviour knowledge in Marketing • Consumer Decision Making Process and Determinants of Buyer Behaviour, factors affecting each stage, and Need recognition.
2	Individual- Determinants of Consumer Behaviour
	<ul style="list-style-type: none"> • Consumer Needs & Motivation (Theories - Maslow, Mc Cleland). • Personality – Concept, Nature of personality, Freudian, non - Freudian and Trait theories, Personality Traits and it's Marketing significance, Product personality and brand personification. • Self Concept – Concept • Consumer Perception • Learning - Theory, Nature of Consumer Attitudes, Consumer Attitude Formation & Change. • Attitude - Concept of attitude
3	Environmental Determinants of Consumer Behaviour
	<ul style="list-style-type: none"> • Family Influences on Buyer Behaviour, • Roles of different members, needs perceived and evaluation rules. • Factors affecting the need of the family, family life cycle stage and size. • Social Class and Influences. • Group Dynamics & Consumer Reference Groups, Social Class & Consumer Behaviour - Reference Groups, Opinion Leaders and Social Influences In- group versus out-group influences, role of opinion leaders in diffusion of innovation and in purchase process. • Cultural Influences on Consumer Behaviour Understanding cultural and sub- cultural influences on individual, norms and their role, customs, traditions and value system.
4	Consumer decision making models and New Trends
	<ul style="list-style-type: none"> • Consumer Decision making models: Howard Sheth Model, Engel Blackwell, Miniard Model, Nicosia Models of Consumer Decision Making • Diffusion of innovations Process of Diffusion and Adoption, Innovation, Decision process, Innovator profiles • E-Buying behaviour The E-buyer vis-a vis the Brick and Mortar buyer, Influences on E-buying

Course Outcomes

S N	Outcomes
1)	Help the learners to develop and understand about the consumer decision making process and its application in marketing function of firms.
2)	Learners will learn and develop the skill of understanding and analyzing consumer information to create consumer oriented marketing strategies.
3)	Learners will gain the knowledge about the environmental and individual influence on consumer.
4)	Learners will learn and understand the importance of consumer behaviour in marketing and differential consumer behaviour in Indian Context.
5).	Learners will learn about the different consumer decision making models.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

**Programme at Semester III
with Effect from the Academic Year 2020-21**

**Elective Courses
(EC) Group B. Marketing
Electives**

**Advertising
Course Code: UMS3ADV**

Modules at a Glance

Sr. No.	Module s	No. of Lectur es
1	Introduction to Advertising	15
2	Strategy and Planning Process in Advertising	15
3	Creativity in Advertising	15
4	Budget, Evaluation, Current trends and careers in Advertising	15
Total		60

Objectives

S N	Objectives
1	To understand and examine the growing importance of advertising
2	To understand the construction of an effective advertisement
3	To understand the role of advertising in contemporary scenario

S.Y.BMS, Management Studies

4	To understand the future and career in advertising
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Sr. No.	Modules / Units
1	Introduction to Advertising
	<ul style="list-style-type: none"> • Definition, Evolution of Advertising, Importance, Scope, Features, Benefits, Five M's of Advertising • Types of Advertising –consumer advertising, industrial advertising, institutional advertising, classified advertising, national advertising, generic advertising • Theories of Advertising : Stimulus Theory, AIDA, Hierarchy Effects Model, Means – End Theory, Visual Verbal Imaging, Cognitive Dissonance • Ethics and Laws in Advertising : Puffery, Shock Ads, Subliminal Advertising, Weasel Claim, Surrogate Advertising, Comparative Advertising Code of Ethics, Regulatory Bodies, Laws and Regulation – CSR, Public Service Advertising, Corporate Advertising, Advocacy Advertising • Social, cultural and Economic Impact of Advertising, the impact of ads on Kids, Women and Advertising
2	Strategy and Planning Process in Advertising
	<ul style="list-style-type: none"> • Advertising Planning process & Strategy : Introduction to Marketing Plan, Advertising Plan- Background, situational analysis related to Advertising issues, Marketing Objectives, Advertising Objectives, Target Audience, Brand Positioning (equity, image personality), creative Strategy, message strategy, media strategy, Integration of advertising with other communication tools • Role of Advertising in Marketing Mix : Product planning, product brand policy, price, packaging, distribution, Elements of Promotion, Role of Advertising in PLC • Advertising Agencies – Functions – structure – types - Selection criteria for Advertising agency – Maintaining Agency–client relationship, Agency Compensation.
3	Creativity in Advertising

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- Introduction to Creativity – definition, importance, creative process , Creative strategy development – Advertising Campaign – determining the message theme/major selling ideas – introduction to USP – positioning strategies – persuasion and types of advertising appeals – role of source in ads and celebrities as source in Indian ads – execution styles of presenting ads.
- Role of different elements of ads – logo, company signature, slogan, tagline, jingle, illustrations, etc –
- Creating the TV commercial – Visual Techniques, Writing script, developing storyboard, other elements (Optical, Soundtrack, Music)
- Creating Radio Commercial – words, sound, music – scriptwriting the commercial – clarity, coherence, pleasantness, believability, interest, distinctiveness
- Copywriting: Elements of Advertisement copy – Headline, sub-headline, Layout, Body copy, slogans. Signature, closing idea, Principles of Copywriting for print, OOH, essentials of good copy, Types of Copy, Copy Research

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Sr. No.	Modules / Units
4	Budget, Evaluation, Current trends and careers in Advertising
	<ul style="list-style-type: none"> • Advertising Budget – Definition of Advertising Budget, Features, Methods of Budgeting • Evaluation of Advertising Effectiveness – Pre-testing and Post testing Objectives, Testing process for Advertising effectiveness, Methods of Pre- testing and Post-testing, Concept testing v/s Copy testing • Current Trends in Advertising : Rural and Urban Advertising, Digital Advertising, Content Marketing (Advertorials), retail advertising, lifestyle advertising, Ambush Advertising, Global Advertising – scope and challenges – current global trends • Careers in Advertising : careers in Media and supporting firms, freelancing options for career in advertising, role of Advertising Account Executives, campaign Agency family tree – topmost advertising agencies and the famous advertisements designed by them

Course Outcomes

S N	Outcomes
1)	This study gives a brief note on introduction to advertising, its evolution, its different types and the ethics and laws used in advertising.
2)	This study gives knowledge to the learners about the strategy formulation and planning process in advertising and its role in marketing mix.
3)	The study on creativity in advertising helps the learners to design a creative advertisement campaign by making use of the different elements of advertising.
4)	The students gain knowledge about the advertising budget, the evaluation process and its current trends.
5)	The overall study on advertising helps the learners to understand and examine the growing importance of advertising and career opportunities in advertising.

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Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

**Programme at Semester III
with Effect from the Academic Year 2020-21**

Elective Courses (EC)

Group C. Human Resource Electives

Recruitment & Selection

Course Code: UMS3R&S

Modules at a Glance

Sr. No.	Module s	No. of Lectur es
1	Recruitment	18
2	Selection	15
3	Induction	15
4	Soft Skills	12
Total		60

Objectives

S N	Objectives
1	The objective is to familiarize the students with concepts and principles, procedure of Recruitment and Selection in an organization.
2	To give an in depth insight into various aspects of Human Resource management and make them acquainted with practical aspect of the subject.

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Sr. No.	Modules / Units
1	Recruitment
	<ul style="list-style-type: none"> • Concepts of Recruitment- -Meaning, Objectives, Scope & Definition, Importance and relevance of Recruitment. • Job Analysis--Concept, Specifications, Description, Process And Methods, Uses of Job Analysis • Job Design--Introduction, Definition, Modern Techniques, Factors affecting Job Design, Contemporary Issues in Job Designing. • Source or Type of Recruitment– a) Direct/Indirect, b) Internal/ External. Internal-Notification, Promotion– Types, Transfer –Types, Reference External-Campus Recruitment, Advertisement, Job Boards Website/Portals, Internship, Placement Consultancies-Traditional (In- House, Internal Recruitment, On Campus, Employment And Traditional Agency). Modern (Recruitment Books, Niche Recruitments, Internet Recruitment, Service Recruitment, Website and Job, Search Engine, Social Recruiting and Candidate Paid Recruiters). • Technique of Recruitment-Traditional Vs Modern Recruitment • Evaluation of Recruitment-Outsourcing Programme
2	Selection
	<ul style="list-style-type: none"> • Selection-Concept of Selection, Criteria for Selection, Process, Advertisement and Application (Blank Format). • Screening-Pre and Post Criteria for Selection, Steps of Selection • Interviewing-Types and Guidelines for Interviewer & Interviewee, Types of Selection Tests, Effective Interviewing Techniques. • Selection Hurdles and Ways to Overcome Them
3	Induction
	<ul style="list-style-type: none"> • Induction-Concept, Types-Formal / Informal, Advantages of Induction, How to make Induction Effective • Orientation & On boarding-Programme and Types, Process. • Socialisation-Types-Anticipatory, Encounter, Setting in, Socialisation Tactics • Current trends in Recruitment and Selection Strategies– with respect to Service, Finance, I.T., Law And Media Industry
4	Soft Skills
	<ul style="list-style-type: none"> • Preparing Bio-data and C.V. • Social and Soft Skills – Group Discussion & Personal Interview, Video and Tele Conferencing Skills, • Presentation and Negotiation Skills, Aesthetic Skills, • Etiquettes-Different Types and Quitting Techniques. • Exit Interview-Meaning, importance.

Course Outcomes

S N	Outcomes
1)	Learners will understand process of recruitment & selection & various traditional & modern techniques of recruitment.
2)	Learners will be able to list the skills and knowledge needed to conduct full and fair recruitment and selection.
3)	Learners will be able to prepare job profile by defining accountabilities, standards and competencies.
4)	Learners will be able to understand induction & orientation process & will be prepared for interview effectively.
5)	After the successful completion students will understand importance of recruitment & selection, manpower planning, preparation of job description & job analysis & soft skills required for job.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester III

with Effect from the Academic Year 2020- 2021

Elective Courses (EC)

Group C. Human Resource Electives

Motivation & Leadership

Course Code: UMS3M&L

Modules at a Glance

Sr. No.	Module s	No. of Lectures
1	Motivation –I	12
2	Motivation-II	15
3	Leadership-I	17
4	Leadership-II	16
Total		60

Objectives

S N	Objectives
1	To gain knowledge of the leadership strategies for motivating people and changing organizations
2	To study how leaders facilitate group development and problem solving and work through problems and issues as well as transcend differences
3	To acquaint the students about practical approaches to Motivation and Leadership & its application in the Indian context

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Sr. No.	Modules / Units
1	Motivation-I
	<ul style="list-style-type: none"> • Concept of motivation, Importance, Tools of Motivation. • Theory Z, Equity theory. • Process Theories-Vroom’s Expectancy Theory, Valency-Four drive model.
2	Motivation-II
	<ul style="list-style-type: none"> • East v/s West, motivating workers (in context to Indian workers) • The Indian scene – basic differences. • Work –Life balance – concept, differences, generation and tips on work life balance.
3	Leadership-I
	<ul style="list-style-type: none"> • Leadership– Meaning, Traits and Motives of an Effective Leader, Styles of Leadership. • Theories –Trait Theory, Behavioural Theory, Path Goal Theory. • Transactional v/s Transformational leaders. • Strategic leaders– meaning, qualities. • Charismatic Leaders– meaning of charisma, Qualities, characteristics, types of charismatic leaders (socialized, personalized, office-holder, personal, divine)
4	Leadership-II
	<ul style="list-style-type: none"> • Great leaders, their style, activities and skills (Ratan Tata, Narayan Murthy, Dhuru bhai Ambani, Bill Gates, Mark Zuckerberg, Donald Trump) Sudha Murthy. • Characteristics of creative leaders and organization methods to enhance creativity (Andrew Dubrein). • Contemporary issues in leadership–Leadership roles, team leadership, mentoring, self leadership, online leadership, finding and creating effective leader.

Course Outcomes

S N	Outcomes
1)	To enhance the motivation & leadership.
2)	To develop team spirit & morale.
3)	To encourage individuals in planning & important issues.
4)	To meaningful & challenging job.

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5)	Being a role model to reaching goals.
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Revised Syllabus of Courses of Bachelor of Management Studies (BMS) Programme at Semester III with Effect from the Academic Year 2020- 2021

2. Ability Enhancement Courses (AEC) 2A.Ability Enhancement Compulsory Course

3. Information Technology in Business Management-I

Course Code: UMS3IT1

Modules at a Glance

Sr. No	Module s	No. of Lectures
1	Introduction to IT Support in Management	15
2	Office Automation using MS-Office	15
3	Introduction to Google Forms	10
4	Email, Internet and its Applications	10
5	E-Security	10
Total		60

Objectives

S N	Objectives
1	To learn basic concepts of Information Technology, its support and role in Management, for managers

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2	Module II comprises of practical hands on training required for office automation. It is expected to have practical sessions of latest MS-Office software
3	To understand basic concepts of Email, Internet and websites, domains and

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	security therein
4	To recognize security aspects of IT in business, highlighting electronic transactions, advanced security features

Sr. No.	Modules / Units
1	Introduction to IT Support in Management
	<ul style="list-style-type: none"> • Information Technology concepts Concept of Data, Information and Knowledge Concept of Database • Introduction to Information Systems and its major components. Types and Levels of Information systems. Main types of IT Support systems Computer based Information Systems (CBIS) <ul style="list-style-type: none"> ▪ Types of CBIS - brief descriptions and their interrelationships/hierarchies ▪ Office Automation System(OAS) ▪ Transaction Processing System(TPS) ▪ Management Information System(MIS) ▪ Decision Support Systems (DSS) ▪ Executive Information System(EIS) ▪ Knowledge based system, Expert system • Success and Failure of Information Technology. Failures of Nike and AT&T • IT Development Trends. Major areas of IT Applications in Management • Concept of Digital Economy and Digital Organization. • IT Resources Open Source Software - Concept and Applications. Study of Different Operating Systems. (Windows / Linux/ DOS)
2	Office Automation using MS Office
	<ul style="list-style-type: none"> • Learn Word: Creating/Saving of Document Editing and Formatting Features Designing a title page, Preparing Index, Use of SmartArt Cross Reference, Bookmark and Hyperlink. Mail Merge Feature. • Spreadsheet application (e.g. MS-Excel/openoffice.org) Creating/Saving and editing spreadsheets Drawing charts. Using Basic Functions: text, math & trig, statistical, date & time, database, financial, logical Using Advanced Functions : Use of VLookup/HLookup Data analysis – sorting data, filtering data (AutoFilter , Advanced Filter), data validation, what-if analysis (using data tables/scenarios), creating sub-totals

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	and grand totals, pivot table/chart, goal seek/solver,
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	<ul style="list-style-type: none"> • Presentation Software Creating a presentation with minimum 20 slides with a script. Presenting in different views, Inserting Pictures, Videos, Creating animation effects on them Slide Transitions, Timed Presentations Rehearsal of presentation
3	<p>Introduction to Google Forms</p> <ul style="list-style-type: none"> • Google Forms Definition, Uses & Applications Creating/Saving and editing Google Forms Add Questions, Title, Image, Video, Section & Required field Import Questions, Customize Theme, Delete, Copy, Undo, Print, Add Collaborators, Add-ons & Preferences • Validation Length, Number, Maximum Character • Settings General, Presentation & Quiz • Preview your Google Form • Send Google Form E-mail, Link & Html Embed Share forms via Facebook & Twitter • Responses Individual & Summary Responses Download Responses (.csv), Get E-mail notifications for new responses <p>Create a Questionnaire using Google Form with minimum 20 Questions</p>
4	<p>Email, Internet and its Applications</p> <ul style="list-style-type: none"> • Introduction to Email Writing professional emails Creating digitally signed documents. • Use of Outlook : Configuring Outlook, Creating and Managing profile in outlook, Sending and Receiving Emails through outlook Emailing the merged documents. Introduction to Bulk Email software • Internet Understanding Internet Technology Concepts of Internet, Intranet, Extranet Networking Basics, Different types of networks. Concepts (Hubs, Bridges, Routers, IP addresses) Study of LAN, MAN, WAN • DNS Basics. Domain Name Registration, Hosting Basics. • Emergence of E-commerce and M-Commerce Concept of E-commerce and M-Commerce Definition of E-commerce and M-Commerce Business models of e-commerce: models based on transaction party (B2B,

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	<p>B2C,B2G, C2B, C2C, E-Governance) Models based on revenue models, Electronics Funds Transfer, Electronic Data</p>
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	Interchange.
5	E-Security Systems
	<ul style="list-style-type: none"> • Threats to Computer systems and control measures. Types of threats- Virus, hacking, phishing, spyware, spam, physical threats (fire, flood, earthquake, vandalism) Threat Management • IT Risk Definition, Measuring IT Risk, Risk Mitigation and Management • Information Systems Security • Security on the internet Network and website security risks Website Hacking and Issues therein. Security and Email • E-Business Risk Management Issues Firewall concept and component, Benefits of Firewall • Understanding and defining Enterprise wide security framework • Information Security Environment in India with respect to real Time Application in Business Types of Real Time Systems, Distinction between Real Time, On – line and Batch Processing System. Real Time Applications viz. Railway / Airway / Hotel Reservation System, ATMs, EDI Transactions - definition, advantages, examples;E- Cash, Security requirements for Safe E-Payments Security measures in International and Cross Border financial transactions • Threat Hunting Software

Course Outcomes

S N	Outcomes
1)	The learners will be able to analyse the role played by six major types of information systems in organizations and their relationships to each other.
2)	Demonstrate understanding of the concepts, structure and design of different operating systems.
3)	Learners will exhibit proficiency in the use of Word processing, spreadsheet and presentation applications.
4)	Learners will be able to apprehend the concept and application of E-mail, Internet and Domain Name System.
5)	Demonstrate knowledge of security threats to computer systems and perform counter measures to secure it.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS) Programme at Semester III with Effect from the Academic Year 2020- 2021

2. Ability Enhancement Courses (AEC) 2B. Skill Enhancement Courses (SEC)

**4. Foundation Course – III Environmental Management
Course Code: UMS3FC3**

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Environmental Concepts	12
2	Environment degradation	11
3	Sustainability and role of business	11
4	Innovations in business- an environmental Perspective	11
Total		45

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Sr. No.	Modules / Units
1	Environmental Concepts:
	<ul style="list-style-type: none"> • Environment: Definition and composition, Lithosphere, Atmosphere, Hydrosphere, Biosphere • Biogeochemical cycles - Concept and water cycle • Ecosystem & Ecology; Food chain, food web & Energy flow pyramid • Resources: Meaning, classification(Renewable & non-renewable), types & Exploitation of Natural resources in sustainable manner
2	Environment degradation
	<ul style="list-style-type: none"> • Degradation-Meaning and causes, degradation of land, forest and agricultural land and its remedies • Pollution – meaning, types, causes and remedies (land, air, water and others) • Global warming: meaning, causes and effects. • Disaster Management: meaning, disaster management cycle. • Waste Management: Definition and types -solid waste management anthropogenic waste, e-waste & biomedical waste (consumerism as a cause of waste)
3	Sustainability and role of business
	<ul style="list-style-type: none"> • Sustainability: Definition, importance and Environment Conservation. • Environmental clearance for establishing and operating Industries in India. • EIA, Environmental auditing, ISO 14001 • Salient features of Water Act, Air Act and Wildlife Protection Act. • Carbon bank & Kyoto protocol
4	Innovations in business- an environmental perspective
	<p>Non-Conventional energy sources- Wind, Bio-fuel, Solar, Tidal and Nuclear Energy.</p> <p>Innovative Business Models: Eco-tourism, Green marketing, Organic farming, Eco- friendly packaging, Waste management projects for profits ,other business projects for greener future</p>

Course Outcomes

S N	Outcomes
1)	Make deliberate efforts for converting environmental knowledge into action.
2)	Develop methods / approaches for sustainable environmental planning, development and management.
3)	Understand and practice the legal and regulatory policies with regard to environment protection.
4)	Finding solutions to the various environmental problems and challenges faced by us.
5)	Integrating environmental and natural resource management with the strategies, operations sand global surveillance of the organisations.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester III

with Effect from the Academic Year 2020- 2021

2. Ability Enhancement Courses (AEC) 2B. Skill Enhancement Courses (SEC)

**4. Foundation Course in NSS - III
Course Code: UMS3NS3**

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Value System & Gender sensitivity	12
2	Disaster preparedness & Disaster management	10
3	Health, hygiene & Diseases	13
4	Environment & Energy conservation	10
Total		45

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Sr. No.	Modules / Units
1	Value System & Gender sensitivity
	<p>Unit I: Value System Meaning of Values, Types of Values, Human Values & Social Responsibilities, Indian Value System-the concept and its features, Eleven Vows.</p> <p>Unit II: Women Empowerment Concept of empowerment , Causes behind gender related problems, Meaning of women empowerment, Policy legislation and schemes for women empowerment in India.</p>
2	Disaster preparedness & Disaster management
	<p>Unit I: Basics of Disaster Preparedness. Disaster-its meaning and types. (Local disasters- possible Panvel district disaster and its vicinity), Concept of Vulnerability and Risks, Disasters Preparedness-its meaning and methods, Helpline Numbers, First Aids techniques, Breathing techniques (Rescue methods-CPR), Various types of knots and stretchers.</p> <p>Unit II: Disaster Resilient Community Disaster Management-concept, Disaster cycle, evacuation procedure and mock drills, Role of Technology in Disaster Response, Role of volunteer as First response, Disaster Management cells at different levels and its functioning (Local to National), Sendai Convention.</p>
3	Health, hygiene & Diseases
	<p>Unit I: Meaning of Health and Hygiene. Indicators (Physical & Mental) - Types of Health, Role of Health in Development, Public Health System in India(include different schemes NHM, JSSY, AYUSH, Health insurance), Maintenance of Hygiene, Sanitation programmes in India (Local to National).</p> <p>Unit II: Diseases and Disorders- preventive campaigning Diseases and Disorders, Communicable and Non-Communicable Diseases, Preventive campaigning in Malaria, Tuberculosis, Dengue, Cancer, HIV/AIDS, Diabetes.</p>
4	Environment & Energy conservation
	<p>Unit I: Environment and Environmental Enrichment Programme. Environment-Meaning and Features, Contemporary environmental issues in India, MDGs and SDGs, Sustainability in Environment with respect to water conservation, Bandhara, CCT (Continuous Contour trench), Rain Water Harvesting.</p> <p>Unit II: Energy and energy Conservation programme. Energy- Meaning and types, Non-conventional energy and conventional energy, Energy Conservation-the meaning and importance.</p>

***Revised Syllabus of Courses of Bachelor of Management
Studies (BMS)
Programme at Semester III
with Effect from the Academic Year 2020- 2021***

***2. Ability Enhancement Courses
(AEC) 2B. Skill Enhancement
Courses (SEC)***

***4. Foundation Course in NCC - III
Course Code: UMS3NC3***

Modules at a Glance

Sr. No.	Module s	No. of Lectures
1	National Integration & Awareness	10
2	Drill: Foot Drill	10
3	Adventure Training and Environment Awareness and Conservation	05
4	Personality Development and Leadership	10
5	Specialized subject (ARMY)	10

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	Total 45
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Sr. No.	Modules / Units
1	National Integration & Awareness
	<p>Desired outcome: The students will display sense of patriotism, secular values and shall be transformed into motivated youth who will contribute towards nation building through national unity and social cohesion. The students shall enrich themselves about the history of our beloved country and will look forward for the solutions based on strengths to the challenges to the country for its development.</p> <ul style="list-style-type: none"> • Freedom Struggle and nationalist movement in India. • National interests, Objectives, Threats and Opportunities. • Problems/ Challenges of National Integration. • Unity in Diversity
2	Drill: Foot Drill
	<p>Desired outcome: The students will demonstrate the sense of discipline, improve bearing, smartness, turnout, develop the quality of immediate and implicit obedience of orders, with good reflexes.</p> <ul style="list-style-type: none"> • Side pace, pace forward and to the rear • Turning on the march and whiling • Saluting on the march • Marking time, forward march and halt in quick time • Changing step • Formation of squad and squad drill
3	Adventure Training, Environment Awareness and Conservation
3A	Adventure Training
	<p>Desired outcome: The students will overcome fear & inculcate within them the sense of adventure, sportsmanship, esprit-d-corp and develop confidence, courage, determination, diligence and quest for excellence.</p> <ul style="list-style-type: none"> • Any Two such as – Obstacle course, Slithering, Trekking, Cycling, Rock Climbing, Para Sailing, Sailing, Scuba Diving etc.
3B	Environment Awareness and Conservation
	<p>Desired outcome: The student will be made aware of the modern techniques of waste management and pollution control.</p> <ul style="list-style-type: none"> • Waste management • Pollution control, water, Air, Noise and Soil
4	Personality Development and Leadership
	<p>Desired outcome: The student will inculcate officer like qualities with desired ability to take right decisions.</p> <ul style="list-style-type: none"> • Time management • Effect of Leadership with historical examples • Interview Skills

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- Conflict Motives- Resolution

5

Specialized Subject: Army Or Navy Or Air

Army

Desired outcome: It will acquaint, expose & provide knowledge about Army/ Navy/ Air force and to acquire information about expanse of Armed Forces ,service subjects and important battles

A. Armed Force

- Task and Role of Fighting Arms
- Modes of Entry to Army
- Honors and Awards

B. Introduction to Infantry and weapons and equipments

- Characteristics of 5.56mm INSAS Rifle, Ammunition, Fire power, Stripping, Assembling and Cleaning
- Organization of Infantry Battalion.

C. Military history

- Study of battles of Indo-Pak War 1965,1971 and Kargil
- War Movies

D. Communication

- Characteristics of Walkie-Talkies
- Basic RT Procedure
- Latest trends and Development (Multi Media, Video Conferencing, IT)

OR

Navy

A. Naval orientation and service subjects

- Organization of Ship- Introduction on Onboard Organization
- Naval Customs and Traditions
- Mode of Entry into Indian Navy
- Branches of the Navy and their functions
- Naval Campaign (Battle of Atlantic, Pearl Harbour, Falkland War/Fleet Review/ PFR/ IFR)s

B. Ship and Boat Modelling

- Types of Models
- Introduction of Ship Model- Competition Types of Model Prepare in NSC and RDC
- Care and handling of power-tools used- maintenance and purpose of tools

Sr. No.	Modules / Units
	<p>C. Search and Rescue</p> <ul style="list-style-type: none">• Role of Indian Coast Guard related to SAR <p>D. Swimming</p> <ul style="list-style-type: none">• Floating and Breathing Techniques- Precautions while Swimming <p style="text-align: center;">OR</p> <p>A R</p> <p>A. General Service Knowledge</p> <ul style="list-style-type: none">• Organization Of Air Force• Branches of the IAF. <p>B. Principles of Flight</p> <ul style="list-style-type: none">• Venturi Effect• Aerofoil• Forces on an Aircraft• Lift and Drag <p>C. Airmanship</p> <ul style="list-style-type: none">• ATC/RT Procedures• Aviation Medicine <p>D. Aero- Engines</p> <ul style="list-style-type: none">• Types of Engines• Piston Engines• Jet Engines• Turboprop Engines

**Revised Syllabus of Courses of Bachelor of Management Studies (BMS) Programme at Semester III
with Effect from the Academic Year 2020- 2021**

**2. Ability Enhancement Courses
(AEC) 2B. Skill Enhancement
Courses (SEC)**

**4. Foundation Course in Physical Education - III
Course Code: UMS3PE3**

Modules at a Glance

Sr. No.	Module s	No. of Lectures
1	Overview of Nutrition	10
2	Evaluation of Health, Fitness and Wellness	10
3	Prevention and Care of Exercise Injuries	10
4	Sports Training	15
Total		45

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Sr. No.	Modules / Units
1	Overview of Nutrition
	<ul style="list-style-type: none">• Introduction to nutrition & its principles• Role of Nutrition in promotion of health• Dietary Guidelines for Good Health• Regulation of water in body and factors influencing body temperature.
2	Evaluation of Health, Fitness and Wellness
	<ul style="list-style-type: none">• Meaning & Concept of holistic health• Evaluating Personal health-basic parameters• Evaluating Fitness Activities – Walking & Jogging• Myths & mis-conceptions of Personal fitness
3	Prevention and Care of Exercise Injuries
	<ul style="list-style-type: none">• Types of Exercise Injuries• First Aid- Importance & application in Exercise Injuries• Management of Soft tissues injuries• Management of bone injuries
4	Sports Training
	<ul style="list-style-type: none">• Definition, aims & objectives of Sports training• Importance of Sports training• Principles of Sports training• Drug abuse & its effects

**Revised Syllabus of Courses of Bachelor of Management Studies (BMS) Programme at Semester III
With Effect from the Academic Year 2020- 2021**

3. Core Courses (CC)

5. Business Planning & Entrepreneurial Management

Course Code: UMS3BPM

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Foundations of Entrepreneurship Development	15
2	Types & Classification Of Entrepreneurs	15
3	Entrepreneur Project Development & Business Plan	15
4	Venture Development	15
Total		60

Objectives

S N	Objectives
1	Entrepreneurship is one of the major focus are as of the discipline of Management. This course introduces Entrepreneurship to budding managers.

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2	To develop entrepreneurs & to prepare students to take the responsibility of full line of management function of a company with special reference to SME sector.
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Sr. No.	Modules / Units
1	Foundations of Entrepreneurship Development:
	<ul style="list-style-type: none"> • Foundations of Entrepreneurship Development: Concept and Need of Entrepreneurship Development Definition of Entrepreneur, Entrepreneurship, Importance and significance of growth of entrepreneurial activities Characteristics and qualities of entrepreneur • Theories of Entrepreneurship: Innovation Theory by Schumpeter & Imitating Theory of High Achievement by McClelland X-Efficiency Theory by Leibenstein Theory of Profit by Knight Theory of Social change by Everett Hagen • External Influences on Entrepreneurship Development: Socio-Cultural, Political, Economical, Personal. Role of Entrepreneurial culture in Entrepreneurship Development.
2	Types & Classification Of Entrepreneurs
	<ul style="list-style-type: none"> • Intrapreneur –Concept and Development of Intrapreneurship • Women Entrepreneur – concept, development and problems faced by Women Entrepreneurs, Development of Women Entrepreneurs with reference to Self Help Group • Social entrepreneurship–concept, development of Social entrepreneurship in India. Importance and Social responsibility of NGO's. • Family Entrepreneurship- Concept, importance , developments and problems. • Entrepreneurial development Program (EDP)–concept, factor influencing EDP. Option available to Entrepreneur. (Ancillarisation, BPO, Franchise, M&A)
3	Entrepreneur Project Development & Business Plan

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- Innovation, Invention, Creativity, Business Idea, Opportunities through change.
- Idea generation– Sources-Development of product /idea,
- Environmental scanning and SWOT analysis
- Entrepreneurship Development Cycle
- Business Planning Process-The business plan as an Entrepreneurial tool, scope and value of Business plan.
- Elements of Business Plan, Objectives, Market and Feasibility Analysis, Marketing, Finance, Organization & Management, Ownership,
- Critical Risk Contingencies of the proposal, Scheduling and milestones.

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4	Venture Development
	<ul style="list-style-type: none">• Steps involved in starting of Venture• Institutional support to an Entrepreneur• Rules & Regulations of start-up India, requirements of Capital (Fixed and working) Sources of finance, problem of Venture set-up and prospects• Marketing: Methods, Channel of Marketing, Marketing Institutions and Assistance.• New trends in entrepreneurship- E-commerce, Disruptive Innovations, Interactive marketing and IOT in business.

Course Outcomes

S N	Outcomes
1)	Spirit of entrepreneurship will be instilled among the learners. Also they will become familiar to competencies needed to become an entrepreneur.
2)	Learners will understand the different roles and responsibilities taken by an entrepreneur, challenges faced and opportunities available to them.
3)	Learners will be able to learn and understand the various concept in the performance management and various evaluation parameters for performance management.
4)	Learners will be acquainted with different facets of management of an enterprise.
5)	Leaders with concern towards nation and society at large entrepreneurial approach and skill sets to contribute for socio-economic development.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester III

with Effect from the Academic Year 2020- 2021

3. Core Courses (CC)

6. Accounting for Managerial Decisions

Course Code: UMS3AMD

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Working capital	15
2	Receivables Management and Cash Management	15
3	Analysis and Interpretation of Financial statements	15
4	Ratio analysis and Interpretation	15
Total		60

Objectives

S N	Objectives
1	To acquaint management learners with basic accounting fundamentals.
2	To develop financial analysis skills among learners.
3	The course aims at explaining the core concepts of business finance and its importance in managing a business

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Sr. No.	Modules / Units
1	Working capital
	<ul style="list-style-type: none"> • Working capital-Concept, Types of Working Capital, Factors responsible for requirement of working capital, Estimation of requirements of working capital
2	
	<ul style="list-style-type: none"> • Receivables management-Meaning & Importance, Credit Policy Variables, methods of Credit Evaluation (Traditional and Numerical-Credit Scoring); Monitoring the Debtors Techniques [DSO, Ageing Schedule] • Cash Management – Cash Budget, Preparation of Cash Management
3	Analysis and Interpretation of Financial statements
	<ul style="list-style-type: none"> • Study of balance sheet of limited companies. Study of Manufacturing, Trading, Profit and Loss A/c of Limited Companies • Vertical Form of Balance Sheet and Profit & Loss A/c- Trend Analysis, Comparative Statement & Common Size.
4	Ratio analysis and Interpretation
	<ul style="list-style-type: none"> • Ratio analysis and Interpretation(based on vertical form of financial statements) including conventional and functional classification restricted to: • Balance sheet ratios: Current ratio, Liquid Ratio, Stock Working capital ratio, Proprietary ratio, Debt Equity Ratio, Capital Gearing Ratio. • Revenue statement ratios: Gross profit ratio, Expenses ratio, Operating ratio, Net profit ratio, Net Operating Profit Ratio, Stock turnover Ratio, Debtors Turnover, Creditors Turnover Ratio • Combined ratios: Return on capital Employed (including Long term borrowings), Return on Proprietors fund (Shareholder fund and Preference Capital), Return on Equity Capital, Dividend Payout Ratio, Debt Service Ratio, • Different modes of expressing ratios:-Rate, Ratio, Percentage, Number. Limitations of the use of Ratios.

Course Outcome

Sr. No	Course Outcome
01	Help the learners to present the financial statement which can be analysed and Interpret by using Trend %, Common Size and Comparative
02	Understand the Utility of Financial Ratios in any business

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03	Learners will be able to determine the cash Inflows and cash Outflows of the business from Operating , Investing and Financing activity
04	Help to determine the reasons for factors affecting short term finance and will help to learn methods of credit evaluation
05	This course will provide the overall knowledge on tools and techniques to analyse and Interpret financial statements

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester III

with Effect from the Academic Year 2020- 2021

3. Core Courses (CC)

7. Strategic Management

Course Code: UMS3SMG

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction	12
2	Strategy Formulation	16
3	Strategic Implementation	18
4	Strategic Evaluation & Control	14
Total		60

Objectives

S N	Objectives
1	The objective of this course is to learn the management policies and strategies at every Level to develop conceptual skills in this area as well as their application in the corporate world.
2	The focus is to critically examine the management of the entire enterprise from the Top Management viewpoints.
3	This course deals with corporate level Policy & Strategy formulation areas. This course aims to developing conceptual skills in this area as well as their

	application in the corporate world.
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Sr. No.	Modules / Units
1	Introduction
	<ul style="list-style-type: none"> • Business Policy-Meaning, Nature,Importance • Strategy-Meaning,Definition • Strategic Management-Meaning,Definition,Importance, Strategic management • Process&Levelsof Strategyand Concept and importanceof Strategic Business Units (SBU's) • Strategic Intent-Mission, Vision, Goals,Objective, Plans
2	StrategyFormulation
	<ul style="list-style-type: none"> • EnvironmentAnalysisand Scanning(SWOT) • CorporateLevel Strategy (Stability, Growth,Retrenchment,Integration andInternationalization) • BusinessLevel Strategy(CostLeadership,Differentiation,Focus) • FunctionallLevel Strategy(R&D,HR,Finance,Marketing,Production)
3	Strategic Implementation
	<ul style="list-style-type: none"> • Models of Strategymaking. • StrategicAnalysis&Choices &Implementation: BCG Matrix, GE 9Cell, Porter5 Forces, 7S FrameWork • Implementation: Meaning, Steps and implementation at Project, Process, Structural,Behavioural,Functionalleve.
4	Strategic Evaluation&Control
	<p>Strategic Evaluation&Control– Meaning, StepsofEvaluation & Techniques of Control Synergy:Concept , Types , evaluation of Synergy.Synergyas a Component of Strategy&its Relevance.</p> <p>ChangeManagement– ElementaryConcept</p>

Course Outcomes

S N	OUTCOMES
1)	Learners will get basic idea about business policy and strategies and how does it affect the working of any business organizations.
2)	Learners will be able to understand the impact of internal and external environment on strategies of an organization.
3)	Learners will get exposure of various corporate, business and functional level strategies.
4)	Learners will get a chance to learn various innovative and creative strategy making models.

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5)	Learners will be able to implement techniques, tools, models and theories of strategic management into practical business world.
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Bachelor of Management Studies (BMS) Programme

Under Choice Based Credit, Grading and Semester System Course Structure

(To be implemented from Academic Year- 2020-2021)

Semester IV

No. of Courses	Semester IV	Credits
1	<i>Elective Courses (EC)</i>	
1& 2	*Any one group of courses from the following list of the courses	06
2	<i>Ability Enhancement Courses (AEC)</i>	
2A	<i>Ability Enhancement Compulsory Course (AECC)</i>	
UMS4IT2	Information Technology in Business Management-II	03
2B	<i>**Skill Enhancement Courses (SEC)</i>	
4	Any one course from the following list of the courses	02
3	<i>Core Courses (CC)</i>	
UMS4BE2	Business Economics-II	03
UMS4BRM	Business Research Methods	03
UMS4PTQ	Production & Total Quality Management	03
Total Credits		20

<i>**List of Skill Enhancement Courses (SEC) for Semester IV (Any One)</i>	
UMS4FC 4	Foundation Course(Ethics & Governance)- IV
UMS4NS 4	Foundation Course in NSS – IV
UMS4NC 4	Foundation Course in NCC – IV
UMS4PE 4	Foundation Course in Physical Education – IV

** List of group of Elective Courses(EC) for Semester IV (Any two)	
Group A: Finance Electives (Any Two Courses)	
UMS4SCM	Strategic Cost Management
UMS4COR	Corporate Restructuring
UMS4FIM	Financial Institutions and Markets
UMS4AUD	Auditing
Group B: Marketing Electives (Any Two Courses)	
UMS4IMC	Integrated Marketing Communication
UMS4RUM	Rural Marketing
UMS4EVM	Event Marketing
UMS4TUM	Tourism Marketing
Group C: Human Resource Electives(Any Two Courses)	
UMS4CHM	Change Management
UMS4T&D	Training & Development in HRM
UMS4HIS	Human Resource Planning & Information System
UMS4C&N	Conflict and Negotiation

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester IV

with Effect from the Academic Year 2020-2021

Elective Courses (EC)

Group A. Finance

Electives

Strategic Cost

Management Course

Code: UMS4SCM Modules

at a Glance

Sr. No.	Module s	No. of Lectur es
1	Introduction to Strategic Cost Management (Only Theory)	15
2	Elements of Cost	15
3	Cost Projection and Activity Based Costing	15
4	Emerging Cost Concepts - Standard Costing and Marginal Costing	15
Total		60

Objectives

S N	Objectives
1	This course exposes the students to the basic concepts and the tools used in Cost Accounting
2	To enable the students to understand the principles and procedure of cost accounting and to apply them to different practical situations

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3	Learners should develop skills of analysis, evaluation and synthesis in cost and management accounting
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Sr. No.	Modules / Units
1	Introduction to Strategic Cost Management (Only Theory)
	<ul style="list-style-type: none"> • Strategic Cost Management (SCM): Concept and Philosophy- Objectives of SCM-Environmental influences on cost management practices, Key elements in SCM-Different aspects of Strategic Cost Management: Value Analysis & Value Engineering, Wastage Control, Disposal Management, Business Process Re- engineering, Total Quality Management, Total Productive Maintenance, Energy Audit, Control of Total Distribution Cost & Supply Cost, Cost Reduction & Product Life Cycle Costing(An Overview)
2	Elements of Cost
	<ul style="list-style-type: none"> • Meaning, Nature and scope-Objective of Cost Accounting-Financial Accounting v/s Cost Accounting- Advantages and disadvantages of Cost Accounting- Elements of Costs-Cost classification (concept only) • Material Costing- Stock valuation (FIFO & weighted average method), EOQ, Calculation of Stock levels (Practical Problems) • Labour Costing – (Bonus and Incentive Plans) (Practical Problems) • Overhead Costing (Primary and Secondary Distribution)
3	Cost Projection and Activity Based Costing
	<ul style="list-style-type: none"> • Cost Sheet (Practical Problems) • Activity Based Management and Activity Based Budgeting: Concept, rationale, issues, limitations. Design and Implementation of Activity Based Costing (Practical Problems on ABC)
4	Emerging Cost Concepts - Standard Costing and Marginal Costing
	<ul style="list-style-type: none"> • Standard Costing – Introduction , Definition, Setting of standards, Setting of Direct Materials standard and Setting of Direct Labour standards (Practical Problems) • Marginal Costing – Marginal cost, Contribution, P/ V Ratio, Break- Even-Point, Margin of safety (Practical Problems)

Course Outcomes

S N	Outcomes
1	Learners will develop understanding about main elements of Cost
2	Learners will gain accounting knowledge of Cost sheet to determine the cost incurred for making the product.
3	Learners will gain accounting knowledge of how Industry determines the value of Input units and Finished goods under Process Costing.
4	Learners will develop understanding Marginal costing and standard costing.
5	Overall learners will develop proficiency in the area of Cost accounting.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester IV

with Effect from the Academic Year 2020- 2021

Elective Courses (EC)

Group A. Finance

Electives

Corporate Restructuring

Course Code: UMS4COR

Modules at a Glance

Sr. No.	Module s	No. of Lectures
1	Corporate Restructuring – Introduction and Concepts (Only Theory)	15
2	Accounting of Internal Reconstruction (Practical and theory)	15
3	Accounting of External Reconstruction (Amalgamation/ Mergers/ Takeovers and Absorption)(Practical and theory)	15
4	Impact of Reorganization on the Company - An Introduction (Only Theory)	15
Total		60

Objectives

S N	Objectives
1	To impart knowledge relating to legal, accounting and practical implementation of corporate restructuring.
2	The subject covers the complex facets of corporate restructuring process

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Sr. No.	Modules / Units
1	Corporate Restructuring – Introduction and Concepts (Only Theory)
	<ul style="list-style-type: none"> • Corporate Restructuring - Historical Background, Meaning of Corporate Restructuring, Corporate Restructuring as a Business Strategy, Need and Scope of Corporate Restructuring. • Planning, Formulation and Execution of Various Restructuring Strategies, Important Aspects to be considered while Planning or Implementing Corporate Restructuring Strategies. • Forms of Restructuring - Merger, Demerger, Reverse merger , Disinvestment , Takeover/acquisition, Joint Venture (JV), Strategic Alliance, Franchising and Slump sale
2	Accounting of Internal Reconstruction (Practical and theory)
	<ul style="list-style-type: none"> • Need for reconstruction and Company Law provisions, Distinction between internal and external reconstructions • Methods including alteration of share capital, variation of share-holder rights, sub division, consolidation, surrender and reissue/cancellation, reduction of share capital, with relevant legal provisions and accounting treatments for same.
3	Accounting of External Reconstruction (Amalgamation/ Mergers/ Takeovers and Absorption)(Practical and theory)
	<ul style="list-style-type: none"> • In the nature of merger and purchase with corresponding accounting treatments of pooling of interests and purchase methods respectively • Computation and meaning of purchase consideration and Problems based on purchase method of accounting only.
4	Impact of Reorganization on the Company - An Introduction (Only Theory)
	<ul style="list-style-type: none"> • Change in the Internal Aspects on Reorganization – Change of Name and Logo, Revised Organization Chart, Communication, Employee Compensation, Benefits and Welfare Activities, Aligning Company Policies, Aligning Accounting and Internal Database Management Systems, Re-Visiting Internal Processes and Re-Allocation of People • Change in External Aspects on Reorganization - Engagement with Statutory Authorities, Revised ISO Certification and Similar Other Certifications, Revisiting past Government approvals, decisions and other contracts. • Impact of Reorganization - Gain or Loss to Stakeholders, Implementation of Objectives, Integration of Businesses and Operations, Post Merger Success and Valuation and Impact on Human and Cultural Aspects.

Course Outcomes

S N	Outcomes
1	Learners will develop understanding about corporate restructuring.
2	Learners will gain accounting knowledge of internal reconstruction.
3	Learners will gain accounting knowledge of external reconstruction.
4	Learners will develop understanding of pre and post impact of reconstruction.
5	Overall learners will develop proficiency in the area of corporate restructuring.

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Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester IV

with Effect from the Academic Year 2020- 2021

**Elective Courses
(EC) Group B. Marketing
Electives**

**Integrated Marketing Communication
Course Code: UMS4IMC
Modules at a Glance**

Sr. No.	Module s	No. of Lectur es
1	Introduction to Integrated Marketing Communication	15
2	Elements of IMC – I	15
3	Elements of IMC – II	15
4	Evaluation & Ethics in Marketing Communication	15
Total		60

Objectives

S N	Objectives
1	To equip the students with knowledge about the nature, purpose and complex construction in the planning and execution of an effective Integrated Marketing Communication (IMC) program.
2	To understand the various tools of IMC and the importance of co-ordinating

	them for an effective marketing communication program.
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Sr. No.	Modules / Units
1	Introduction to Integrated Marketing Communication
	<ul style="list-style-type: none"> • Meaning, Features of IMC, Evolution of IMC, Reasons for Growth of IMC. • Promotional Tools for IMC, IMC planning process, Role of IMC in Marketing • Communication process, Traditional and alternative Response Hierarchy Models, One voice communication v/s IMC. • Establishing objectives and Budgeting: Determining Promotional Objectives, Sales vs Communication Objectives, DAGMAR, Problems in setting objectives, setting objectives for the IMC Program.
2	Elements of IMC – I
	<ul style="list-style-type: none"> • Advertising – Features, Role of Advertising in IMC, Advantages and Disadvantages, Types of Advertising, Types of Media used for advertising. • Sales promotion – Scope, role of Sales Promotion as IMC tool, Reasons for the growth, Advantages and Disadvantages, Types of Sales Promotion, objectives of consumer and trade promotion, strategies of consumer promotion and trade promotion, sales promotion campaign, evaluation of Sales Promotion campaign.
3	Elements of IMC – II
	<ul style="list-style-type: none"> • Direct Marketing - Role of direct marketing in IMC, Objectives of Direct Marketing, Components for Direct Marketing, Tools of Direct Marketing – direct mail, catalogues, direct response media, internet, telemarketing, alternative media evaluation of effectiveness of direct marketing • Public Relations and Publicity – Introduction, Role of PR in IMC, Advantages and Disadvantages, Types of PR, Tools of PR ,Managing PR – Planning, implementation, evaluation and Research, Publicity, Sponsorship – definition, Essentials of good sponsorship, event sponsorship, cause sponsorship • Personal Selling – Features, Role of Personal Selling in IMC, advantages and disadvantages of Personal Selling, Selling process, Importance of Personal Selling
4	Evaluation & Ethics in Marketing Communication
	<ul style="list-style-type: none"> • Evaluating an Integrated Marketing program – Evaluation process of IMC – Message Evaluations, Advertising tracking research – copy testing – emotional reaction test, cognitive Neuro science – online evaluation, Behavioural Evaluation – sales and response rate, POPAI, Toll free numbers, QR codes and facebook likes, response cards, Internet responses, redemption rate Test Markets – competitive responses, scanner data, Purchase simulation tests • Ethics and Marketing communication – stereotyping, targeting vulnerable customers, offensive brand messages – legal issues – Commercial free speech, misleading claims, puffery, fraud, questionable B2B practices • Current Trends in IMC – Digital Marketing – concept and importance, Internet & IMC, Advertising on internet, PR through Internet Banner, Sales promotion on Internet, direct marketing on internet, Role of AI in IMC- Chatbots & Programmatic advertising.

Course Outcomes

S N	Outcomes
1)	Learners will get an overview of the range of tools available for Marketing Communications.
2)	Learners will understand the basic principles of planning and execution in marketing communications.
3)	Learners will get acquainted with concepts and techniques in the application for developing and designing an effective advertising and sales promotion program.
4)	Learners will develop a managerial perspective and an informed decision-making ability for effective and efficient tackling of promotional situations.
5)	Learners shall be able to gain the knowledge about the various range of tools available for marketing communication, and the various facets of advertising, public relation and promotion management.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester IV

with Effect from the Academic Year 2020- 2021

**Elective Courses
(EC) Group B. Marketing
Electives**

**Rural Marketing
Course Code: UMS4RUM**

Modules at a Glance

Sr. No.	Module s	No. of Lectur es
1	Introduction	15
2	Rural Market	15
3	Rural Marketing Mix	15
4	Rural Marketing Strategies	15
Total		60

Objectives

S N	Objectives
1	The objective of this course is to explore the students to the Agriculture and Rural Marketing environment so that they can understand consumer's and marketing characteristics of the same for understanding and contributing to the emerging challenges in the upcoming global economic scenario.

S.Y.BMS, Management Studies

Sr. No.	Modules / Units
1	Introduction
	<ul style="list-style-type: none"> • Introduction to Rural Market, Definition & Scope of Rural Marketing. • Rural Market in India-Size &Scope, Rural development as a core area, Efforts put for Rural development by government (A brief Overview). • Emerging Profile of Rural Markets in India, • Problems of rural market. • Constraints in Rural Marketing and Strategies to overcome constraints • Rural Consumer Profil
2	Rural Market
	<ul style="list-style-type: none"> • Rural Consumer Vs Urban Consumers– a comparison. • Characteristics of Rural Consumers. • Rural Market Environment: <ul style="list-style-type: none"> a) Demographics– Population, Occupation Pattern, Literacy Level; b)Economic Factors-Income Generation, Expenditure Pattern, Rural Demand and Consumption Pattern, Rural Market Index; Land Use Pattern, c)Rural Infrastructure -Rural Housing, Electrification, Roads • Rural Consumer Behaviour: meaning, Factors affecting Rural Consumer Behaviour-Social factors, Cultural factors, Technological factors, Lifestyle, Personality.
3	Rural Marketing Mix
	<ul style="list-style-type: none"> • Relevance of Marketing mix for Rural market/Consumers. • Product Strategies, Rural Product Categories-FMCGs, Consumer Durables, Agriculture Goods &Services; Importance of Branding, Packaging and Labelling. • Nature of Competition in Rural Markets, the problem of Fake Brands • Pricing Strategies &objectives • Promotional Strategies. Segmentation, Targeting &Positioning for rural market.
4	Rural Marketing Strategies

S.Y.BMS, Management Studies

- **Distribution Strategies for Rural consumers.**

Channels of Distribution- HAATS, Mandis, Public Distribution System, Co- operative society, Distribution Models of FMCG, Companies HUL, ITC etc. Distribution networks, Ideal distribution model for rural markets (Case study based)

- **Communication Strategy.**

Challenges in Rural Communication, Developing Effective Communication, Determining Communication Objectives, Designing the Message, Selecting the Communication Channels. Creating Advertisements for Rural Audiences.

Rural Media-Mass media, Non-Conventional Media, Personalized media;

- Digital Market.
- Impact of Globalisation in Indian Rural Market.

Course Outcomes

S N	Outcomes
1)	Learners will be able to understand the effort put by the government in rural development and the problems in rural market and the ways to overcome it.
2)	Learners will gain knowledge about the consumer behaviors in rural areas and their characteristics.
3)	Learners will be able to understand the nature of competition in rural markets and the use of marketing mix by manufacturers.
4)	Learners will gain knowledge about the various distribution and communication strategies used in rural markets.
5)	Learners will understand the rural aspects of marketing and consumer behaviour and the abilities to design effective strategies.

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Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester IV

with Effect from the Academic Year 2020- 2021

Elective Courses (EC)

Group C. Human Resource Electives

Training & Development in HRM

Course Code: UMS4T&D

Modules at a Glance

Sr. No.	Module s	No. of Lectur es
1	Overview of Training	15
2	Overview of development	15
3	Concept of Management development	15
4	Performance measurement, Talent management & Knowledge management	15
Total		60

Objectives

S N	Objectives
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S.Y.BMS, Management Studies

1

This paper is not pure academic oriented but practice based. It has been designed, keeping in view the needs of the organizations. Successful managerial performance depends on the individual's ability to observe, interpret the issues and modify his approach and behaviour. All organizations need to pay adequate attention to equip their employees. Rapid progress in technology has changed not only in the physical facilities but also in the abstract qualities required of the men who are using them. This paper will attempt to orient the students to tailor themselves to meet the specific needs of the organizations in training and development activities.

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Sr. No.	Modules / Units
1	Overview of Training
	<ul style="list-style-type: none"> • Overview of training– concept, scope, importance, objectives, features, need and assessment of training. • Process of Training–Steps in Training, identification of Job Competencies, criteria for identifying Training Needs(Person Analysis, Task Analysis, Organisation Analysis),Types–On the Job & Off the Job Method. • Assessment of Training Needs, Methods & Process of Needs Assessment. • Criteria & designing-Implementation– an effective training program. • Training calendar in HRM ,Concept, Meaning, Introduction & Format of Training calendar & its preparation.
2	Overview of Development
	<ul style="list-style-type: none"> • Overview of development– concept, scope, importance & need and features, Human Performance Improvement • Counselling techniques with reference to development employees, society and organization. • Career development– Career development cycle, model for planned self development ,succession planning.
3	Concept of Management Development
	<ul style="list-style-type: none"> • Concept of Management Development. • Process of MDP. • Programs & methods, importance, evaluating MDP.
4	Performance measurement, Talent management & Knowledge management
	<ul style="list-style-type: none"> • Performance measurements– Appraisals, pitfalls & ethics of appraisal. • Talent management –Introduction ,Measuring Talent Management, Integration & future of TM, Global TM & knowledge management— OVERVIEW -Introduction: History, Concepts, • Knowledge Management: Definitions and the Antecedents of KM Information Management to Knowledge Management , Knowledge Management: What Is and WhatIs Not?, Three stages of KM, KM Life Cycle

Course Outcomes

S N	Outcomes
1)	Learners will understand the process of training & development & the importance of training & development.
2)	Learners will be able to understand the counselling techniques with reference to the development of employees, society & Organisation.
3)	Learners will be able to evaluate the process of management development.
4)	Learners will be able to interpret the process performance management , appraisals& ethics of appraisal.
5)	Learners will learn to describe advantages of training & development & will also understand how to undertake training needs analysis.

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Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester IV

with Effect from the Academic Year 2020- 2021

Elective Courses (EC)

Group C. Human Resource Electives

**Change Management
Course Code: UMS4CHM**

Modules at a Glance

Sr. No.	Module s	No. of Lectur es
1	Introduction	15
2	Impact of Change	15
3	Resistance to Change	15
4	Effective Implementation of Change	15
Total		60

Objectives

S N	Objectives
1	The objective of this paper is to prepare students as organizational change facilitators using the knowledge and techniques of behavioural science.

S.Y.BMS, Management Studies

Sr. No.	Modules / Units
1	Introduction
	<ul style="list-style-type: none"> • Introduction & levels of change. Importance, imperatives of change, Forces of change. Causes-social, economic, technological and organizational. • Organizational culture & change. • Types & Models of change – Kurt Lewin's change model, Action research, Expanded Process Model., A.J. Leavitts model.
2	Impact of Change
	<ul style="list-style-type: none"> • Change & its implementation.– individual change: concept, need, Importance & risk of not having individual perspective. Team Change – concept, need, importance & limitation • Change & its impact– Resistance to change & sources-sources of individual resistance, sources of organizational resistance
3	Resistance to Change
	<ul style="list-style-type: none"> • Over coming Resistance to change – Manifestations of resistance, Six box model • Minimizing RTC. • OD Interventions to overcome change-meaning and importance, Team intervention, Role analysis Technique, Coaching & mentoring, T-group, Job expectations technique, Behaviour modification, Managing role stress.
4	Effective implementation of change
	<ul style="list-style-type: none"> • Effective implementation of change–change agents and effective change programs. • Systematic approach to change, client & consultant relationship • Classic skills for leaders • Case study on smart change leaders, case lets on Action research.

Course Outcomes

S N	Outcomes
1)	To study innovative Strategies.
2)	To empower agents of change.
3)	Establish best practice for innovation among learners.

S.Y.BMS, Management Studies

4)	To gain acceptance of change.
5)	Helps to sustain Change.

**Revised Syllabus of Courses of Bachelor of Management Studies (BMS) Programme at Semester IV
with Effect from the Academic Year 2020- 2021**

**2. Ability Enhancement Courses
(AEC) 2A.Ability Enhancement
Compulsory Course**

**3. Information Technology in Business
Management-II**

**Course Code: UMS4IT2
Modules at a Glance**

Sr. No	Module s	No. of Lectures
1	Management Information system	15
2	ERP/E-SCM/E-CRM	15
3	Introduction to databases and data warehouse	10
4	Introduction to Big Data	10
5	Outsourcing	10
Total		60

Objectives

S N	Objectives
1	To understand managerial decision-making and to develop perceptives of major functional area of MIS

S.Y.BMS, Management Studies

2	To provide conceptual study of Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, Key issues in implementation. This module provides understanding about emerging MIS technologies like ERP, CRM, SCM and trends in enterprise applications.
3	To learn and understand relationship between database management and data warehouse approaches , the requirements and applications of data

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	warehouse
4	To learn outsourcing concepts. BPO/KPO industries, their structures , Cloud computing

Sr. No.	Modules / Units
1	Management Information System
	<ul style="list-style-type: none"> • Overview of MIS Definition, Characteristics • Subsystems of MIS (Activity and Functional subsystems) • Structure of MIS • Reasons for failure of MIS. • Understanding Major Functional Systems Marketing & Sales Systems Finance & Accounting Systems Manufacturing & Production Systems Human Resource Systems Inventory Systems • Sub systems, description and organizational levels • Decision support system Definition Relationship with MIS • Evolution of DSS, Characteristics, classification, objectives, components, applications of DSS
2	ERP/E-SCM/E-CRM

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- **Concepts of ERP**
- **Architecture of ERP**
Generic modules of ERP
- **Applications of ERP**
- **ERP Implementation concepts**
ERP lifecycle
- **Concept of XRP (extended ERP)**
- **Features of commercial ERP software**
Study of SAP, Oracle Apps, MS Dynamics NAV, Peoplesoft
- **Concept of e-CRM**
E-CRM Solutions and its advantages, How technology helps?
- **CRM Capabilities and customer Life cycle**
Privacy Issues and CRM
- **Data Mining and CRM**
CRM and workflow Automation
- **Concept of E-SCM**
Strategic advantages, benefits
E-SCM Components and Chain Architecture

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	<ul style="list-style-type: none"> • Major Trends in e-SCM • Case studies ERP/SCM/CRM
3	Introduction to Data base and Data warehouse
	<ul style="list-style-type: none"> • Introduction to DBMS Meaning of DBMS, Need for using DBMS. Concepts of tables, records, attributes, keys, integrity constraints, schema architecture, data independence. • Data Warehousing and Data Mining Concepts of Data warehousing, Importance of data warehouse for an organization Characteristics of Data warehouse Functions of Data warehouse Data warehouse architecture Business use of data warehouse Standard Reports and queries • Data Mining The scope and the techniques used • Business Applications of Data warehousing and Data mining
4	Introduction to Big Data
	<ul style="list-style-type: none"> • Big Data Meaning & Characteristics Types of Big Data • Big Data Technologies used to Store and Analyze Data Apache Hadoop, Hive, Sqoop, PolyBase & Big Data in Excel • Real World Big Data Examples • Benefits & Challenges of Big Data
5	Outsourcing

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- **Introduction to Outsourcing**
Meaning of Outsourcing, Need for outsourcing Scope of Outsourcing.
Outsourcing : IT and Business Processes
- **Business Process Outsourcing (BPO)**
Introduction
- **BPO Vendors**
How does BPO
Work? BPO Service
scope Benefits of
BPO
BPO and IT Services
Project Management approach in
BPO BPO and IT-enabled services
- **BPO Business Model**
Strategy for Business Process
Outsourcing Process of BPO
ITO Vs BPO
- **BPO to KPO**

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	<p>Meaning of KPO KPO vs BPO KPO : Opportunity and Scope KPO challenges KPO Indian Scenario</p> <ul style="list-style-type: none">• Outsourcing in Cloud Environment Cloud computing offerings• Traditional Outsourcing Vs. Cloud Computing
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Course Outcomes

S N	Outcomes
1)	Learners will be to explain various roles MIS have towards strategic goals and operational success of an organization.
2)	Recognize the relationship between business information needs and decision making.
3)	Examine and identify all components in an ERP system and the relationship among the components.
4)	Gain an insight of the basic concepts, scope and application of data warehouse and data mining.
5)	Obtain knowledge of BPO/KPO and cloud computing and ability to identify their scope and challenges.

**Revised Syllabus of Courses of Bachelor of Management Studies (BMS) Programme at Semester IV
with Effect from the Academic Year 2020- 2021**

**2. Ability Enhancement Courses
(AEC) 2B. Skill Enhancement
Courses (SEC)**

**4. Foundation Course
–IV Ethics &
Governance Course
Code: UMS4FC4**

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to Ethics and Business Ethics	12
2	Ethics in Marketing, Finance and HRM	11
3	Corporate Governance	11
4	Corporate Social Responsibility (CSR)	11
Total		45

Objectives

S N	Objectives
1	To understand significance of ethics and ethical practices in businesses which are indispensable for progress of a country
2	To learn the applicability of ethics in functional areas like marketing, finance and human resource management
3	To understand the emerging need and growing importance of good governance and CSR by organisations

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4	To study the ethical business practices, CSR and Corporate Governance practiced by various organisations
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Sr. No.	Modules / Units
1	Introduction to Ethics and Business Ethics
	<ul style="list-style-type: none"> • Ethics: Concept of Ethics, Evolution of Ethics, Nature of Ethics- Personal, Professional, Managerial Importance of Ethics, Objectives, Scope, Types – Transactional, Participatory and Recognition • Business Ethics: Meaning, Objectives, Purpose and Scope of Business Ethics Towards Society and Stakeholders, Role of Government in Ensuring Business Ethics Principles of Business Ethics, 3 Cs of Business Ethics – Compliance, Contribution and Consequences Myths about Business Ethics Ethical Performance in Businesses in India
2	Ethics in Marketing, Finance and HRM
	<ul style="list-style-type: none"> • Ethics in Marketing: Ethical issues in Marketing Mix, Unethical Marketing Practices in India, Ethical Dilemmas in Marketing, Ethics in Advertising and Types of Unethical Advertisements • Ethics In Finance: Scope of Ethics in Financial Services, Ethics of a Financial Manager – Legal Issues, Balancing Act and Whistle Blower, Ethics in Taxation, Corporate Crime - White Collar Crime and Organised Crime, Major Corporate Scams in India, Role of SEBI in Ensuring Corporate Governance, Cadbury Committee Report, 1992 • Ethics in Human Resource Management: Importance of Workplace Ethics, Guidelines to Promote Workplace Ethics, Importance of Employee Code of Conduct, Ethical Leadership
3	Corporate Governance
	<ul style="list-style-type: none"> • Concept, History of Corporate Governance in India, Need for Corporate Governance • Significance of Ethics in Corporate Governance, Principles of Corporate Governance, Benefits of Good Governance, Issues in Corporate Governance • Theories- Agency Theory, Shareholder Theory, Stakeholder Theory and Stewardship Theory • Corporate Governance in India, Emerging Trends in Corporate Governance, Models of Corporate Governance, Insider Trading
4	Corporate Social Responsibility (CSR)

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- Meaning of CSR, Evolution of CSR, Types of Social Responsibility
- Aspects of CSR- Responsibility, Accountability, Sustainability and Social Contract
- Need for CSR
- CSR Principles and Strategies
- Issues in CSR
- Social Accounting
- Tata Group's CSR Rating Framework
- Sachar Committee Report on CSR
- Ethical Issues in International Business Practices
- Recent Guidelines in CSR
- Society's Changing Expectations of Business With Respect to Globalisation
- Future of CSR

Course Outcomes

S N	Outcomes
1)	To know the shareholders value for learners.
2)	To develop the interest of corporate sector.
3)	To understand the rules & regulations of corporate sector.
4)	To study about investors.
5)	To study fast growth & profit of companies.

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with Effect from the Academic Year 2020- 2021

2. Ability Enhancement Courses (AEC) 2B. Skill Enhancement Courses (SEC)

**4. Foundation Course in NSS - IV
Course Code: UMS4NS4
Modules at a Glance**

Sr. No.	Modules	No. of Lectures
1	Entrepreneurship Development and Schemes	10
2	Cottage Industries in India	10
3	Rural Resources mobilization and Ideal village	13
4	Voluntary Organisations and Non-Govt.Organisations in Maharashtra	12
Total		45

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Sr. No.	Modules / Units
1	Entrepreneurship Development and Schemes
	<p>Unit I: Entrepreneurship Development Entrepreneurship development-its meaning, Attributes of Entrepreneur, Women Entrepreneur in India (Case Studies)</p> <p>Unit II: Government and Self-Employment Schemes for entrepreneurship development Skill India, Start-up India, Digital India, Make in India, NITI Aayog</p>
2	Cottage Industries in India
	<p>Unit I: Cottage Industries- Its origin Pre-Independent & Post-Independence Scenario, Marketing of Cottage products and outlets.</p> <p>Unit II: Government Policies to encourage cottage industries Hurdles in the development of cottage industries.</p>
3	Rural Resources mobilization and Ideal village
	<p>Unit I: Resources Mobilization- Meaning Resource Native Estimation, Case Study of Eco-Village, Eco-Tourism, Agro- Tourism.</p> <p>Unit II: Concept of 'Ideal Village' Gandhian concept of 'Ideal village', Case studies of Ideal village- Ralegansiddhi, Hiware Bazaar, Mendhalekha.</p>
4	Voluntary Organisations and Non-Govt.Organisations in Maharashtra
	<p>Unit I: Environment and Environmental Enrichment Programme. Search, Anandwan, Muktangan</p> <p>Unit II: Shantivan, Halo Medical Foundation (HMF), Yusuf Meher Ali Centre.</p>

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Studies (BMS) Programme at Semester IV
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**2. Ability Enhancement Courses
(AEC) 2B. Skill Enhancement
Courses (SEC)**

**4. Foundation Course in NCC - IV
Course Code: UMS4NC4
Modules at a Glance**

Sr. No.	Module s	No. of Lectures
1	Disaster Management, Social Awareness and Community Development	10
2	Health and Hygiene	10
3	Drill with Arms	05
4	Weapon Training	10
5	Specialized Subject: Army Or Navy Or Air	10
Total		45

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Sr. No.	Modules / Units
1	Disaster Management, Social Awareness and Community Development
	<p>Disaster Management: Desired outcome: The student shall gain basic information about civil defence organisation / NDMA & shall provide assistance to civil administration in various types of emergencies during natural / manmade disasters</p> <ul style="list-style-type: none"> • Fire Services & Fire fighting • Assistance during Natural / Other Calamities: Flood / Cyclone/ Earth Quake/ Accident etc. <p>Social Awareness and Community Development: Desired outcome: The student shall have an understanding about social evils and shall inculcate sense of whistle blowing against such evils and ways to eradicate such evils.</p> <ul style="list-style-type: none"> • NGOs: Role & Contribution • Drug Abuse & Trafficking • Corruption • Social Evil viz. Dowry/ Female Foeticide/Child Abuse & trafficking etc. • Traffic Control Org. & Anti drunken Driving
2	Health and Hygiene
	<p>Desired outcome: The student shall be fully aware about personal health and hygiene lead a healthy life style and foster habits of restraint and self awareness.</p> <ul style="list-style-type: none"> • Hygiene and Sanitation (Personal and Food Hygiene) • Basics of Home Nursing & First-Aid in common medical emergencies • Wound & Fractures
3	Drill with Arms
	<p>Desired outcome: The students will demonstrate the sense of discipline, improve bearing, smartness, and turnout, and develop the quality of immediate and implicit obedience of orders, with good reflexes.</p> <ul style="list-style-type: none"> • Getting on Parade with Rifle and Dressing at the Order • Dismissing and Falling Out • General Salute, Salami Shastra • Squad Drill • Short/Long tail from the order and vice-versa • Examine Arms
4	Weapon Training

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Desired outcome: The student shall have basic knowledge of weapons and their use and handling.

- The lying position, Holding and Aiming- I
- Trigger control and firing a shot
- Range procedure and safety precautions
- Theory of Group and Snap Shooting
- Short range firing, Aiming- II -Alteration of sight

Sr. No.	Modules / Units
5	Specialized Subject: Army Or Navy Or Air
	<p>Army Desired outcome: The training shall instill patriotism, commitment and passion to serve the nation motivating the youth to join the defence forces. It will also acquaint, expose & provide basic knowledge about armed, naval and air-force subjects</p> <p>A. Map reading</p> <ul style="list-style-type: none"> • Setting a Map, finding North and own position • Map to ground, Ground to Map • Point to Point March <p>B. Field Craft and Battle Craft</p> <ul style="list-style-type: none"> • Observation, Camouflage and Concealment • Field Signals • Types of Knots and Lashing <p>C. Introduction to advanced weapons and role of technology (To be covered by the guest lecturers)</p> <p style="text-align: center;">OR</p> <p>Navy</p> <p>A. Naval Communication</p> <ul style="list-style-type: none"> • Semaphore <ul style="list-style-type: none"> ▪ Phonetic Alphabets ▪ Radio Telephony Procedure ▪ Wearing of National Flag, Ensign and Admiral's Flag. <p>B. Seamanship</p> <ul style="list-style-type: none"> • Anchor work <ul style="list-style-type: none"> ▪ Types of Anchor, Purpose and Holding ground • Boat work <ul style="list-style-type: none"> ▪ Demonstrate Rigging a whaler and enterprise boat- Parts of Sail and Sailing Terms ▪ Instructions in Enterprise Class Board including theory of Sailing, Elementary Sailing Tools ▪ Types of Power Boats Used in the Navy and their uses, Knowledge of Anchoring, Securing and Towing a Boat <p>C. Introduction to advanced weapons and role of technology (To be covered by the guest lecturers)</p>

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Sr. No.	Modules / Units
	<p style="text-align: center;"><i>OR</i></p> <p>Air</p> <p>A. Air frames</p> <ul style="list-style-type: none">• Fuselage• Main and Tail Plain <p>B. Instruments</p> <ul style="list-style-type: none">• Introduction to RADAR <p>C. Aero modelling</p> <ul style="list-style-type: none">• Flying/ Building of Aero models <p>D. Introduction to advanced weapons and role of technology (To be covered by the guest lecturers)</p>

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2. Ability Enhancement Courses (AEC) 2B. Skill Enhancement Courses (SEC)

**4. Foundation Course in Physical Education - IV
Course Code: UMS4PE4
Modules at a Glance**

Sr. No.	Module s	No. of Lectures
1	Stress Management	10
2	Awards, Scholarship & Government Schemes	10
3	Yoga Education	10
4	Exercise Scheduling/Prescription	15
Total		45

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Sr. No.	Modules / Units
1	Stress Management
	<ul style="list-style-type: none">• Meaning & concept of Stress• Causes of Stress• Managing Stress• Coping Strategies
2	Awards, Scholarship & Government Schemes
	<ul style="list-style-type: none">• State & National level Sports Awards• State Sports Policy & Scholarship Schemes• National Sports Policy & Scholarship Schemes• Prominent Sports Personalities
3	Yoga Education
	<ul style="list-style-type: none">• Differences between Yogic Exercises & non- Yogic exercises• Contribution of Yoga to Sports• Principles of Asanas&Bandha• Misconceptions about Yoga
4	Exercise Scheduling/Prescription
	<ul style="list-style-type: none">• Daily Routine Prescription.• Understanding Activity level & Calorie requirement.• Adherence & Motivation for exercise.• Impact of Lifestyle on Health

**Revised Syllabus of Courses of Bachelor of Management Studies (BMS) Programme at Semester IV
With Effect from the Academic Year 2020- 2021**

3. Core Courses (CC)

5.

**Business Economics- II
Course Code: UMS4BE2
Modules at a Glance**

Sr. No.	Modules	No. of Lectures
1	Introduction to Macroeconomic Data and Theory	15
2	Money, Inflation and Monetary Policy	15
3	Constituents of Fiscal Policy	15
4	Open Economy : Theory and Issues of International Trade	15
Total		60

Objectives

Sr. No	Objective
01	To help the students to understand the concepts related to Macro Economics
02	To integrate the concepts of economics in order to analyze and make optimal business decisions.
03	Learners will understand the basic economic theories

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Sr. No.	Modules / Units
1	Introduction to Macroeconomic Data and Theory
	<ul style="list-style-type: none"> • Macroeconomics: Meaning, Scope and Importance. • Circular flow of aggregate income and expenditure: closed and open economy models • The Measurement of national product: Meaning and Importance - conventional and Green GNP and NNP concepts • Short run economic fluctuations: Features and Phases of Trade Cycles • The Keynesian Principle of Effective Demand: Aggregate Demand and Aggregate Supply - Consumption Function - Investment function - effects of Investment Multiplier on Changes in Income and Output • Introduction to The Great Depression Brexit and Euro Zone Crisis
2	Money, Inflation and Monetary Policy
	<ul style="list-style-type: none"> • Money Supply: Determinants of Money Supply - Factors influencing Velocity of Circulation of Money • Demand for Money : Classical and Keynesian approaches and Keynes' liquidity preference theory of interest • Money and prices : Quantity theory of money - Fisher's equation of exchange - Cambridge cash balance approach • Inflation: Demand Pull Inflation and Cost Push Inflation - Effects of Inflation- Nature of inflation in a developing economy. • Monetary policy : Meaning, objectives and instruments, inflation targeting
3	Constituents of Fiscal Policy
	<ul style="list-style-type: none"> • Role of a Government to provide Public goods- Principles of Sound and Functional Finance • Fiscal Policy: Meaning and Objectives • Instruments of Fiscal policy : Canons of taxation - Factors influencing incidence of taxation - Effects of taxation Significance of Public Expenditure - Social security contributions- Low Income Support and Social Insurance Programmes - Public Debt - Types, Public Debt and Fiscal Solvency, Burden of debt finance • Union budget -Structure- Deficit concepts-Fiscal Responsibility and Budget Management Act.
4	Open Economy : Theory and Issues of International Trade
	<ul style="list-style-type: none"> • The basis of international trade : Ricardo's Theory of comparative cost advantage - The Heckscher – Ohlin theory of factor endowments- terms of trade - meaning and types Factors determining terms of trade - Gains from trade - Free trade versus protection • Foreign Investment : Foreign Portfolio investment- Benefits of Portfolio capital flows- Foreign Direct Investment - Merits of Foreign Direct Investment - Role of Multinational corporations • Balance of Payments: Structure -Types of Disequilibrium - Measures to correct disequilibrium in BOP. • Foreign Exchange and foreign exchange market : Spot and Forward rate of Exchange - Hedging, Speculation and Arbitrage -Fixed and Flexible exchange rates- Managed flexibility

Course Outcomes

S N	Outcomes
1)	Learners will understand the concepts related to Macroeconomics and its applications.
2)	Help the learners to understand the fundamentals of National Income.
3)	Learners will gain the knowledge about various Monetary Policies.
4)	It will help the learners to understand various components of Union Budget
5)	To acquaint the learners with various International Trade theories and foreign exchange

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3. Core Courses (CC)

6. Business Research Methods

Course Code: UMS4BRM

Modules at a Glance

Sr. No.	Module s	No. of Lectures
1	Introduction to business research methods	18
2	Data collection and Processing	14
3	Data analysis and Interpretation	16
4	Advanced techniques in Report Writing	12
Total		60

Objectives

S N	Objectives
1	The course is designed to inculcate the analytical abilities and research skills among the students.
2	The course intends to give hands on experience and learning in Business Research.

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Sr. No.	Modules / Units
1	Introduction to business research methods
	<ul style="list-style-type: none"> • Meaning and objectives of research • Types of research– a) Pure, Basic and Fundamental b) Applied, c) Empirical d) Scientific & Social e) Historical f) Exploratory g) Descriptive h) Causal • Concepts in Research: Variables, Qualitative and Quantitative Research • Stages in research process. • Characteristics of Good Research • Hypothesis-Meaning, Nature, Significance, Types of Hypothesis, Sources. • Research design– Meaning, Definition, Need and Importance, Steps in research design, Essentials of a good research design, Areas / Scope of research design and Types-Descriptive, Exploratory and causal. • Sampling– <ul style="list-style-type: none"> a) meaning of sample and sampling, a) methods of sampling– i) Non Probability Sampling– Convenient, Judgment, Quota, Snow ball ii) Probability– Simple Random, Stratified, Cluster, Multi Stage.
2	Data collection and Processing
	<ul style="list-style-type: none"> • Types of data and sources- Primary and Secondary data sources • Methods of collection of primary data <ul style="list-style-type: none"> a) Observation- i) structured and unstructured, ii) disguised and undisguised, iii) mechanical observations (use of gadgets) b) Experimental i) Field ii) Laboratory b) Interview – i) Personal Interview ii) focused group, iii) in- depth interviews - Method, c) Survey– Telephonic survey, Mail, E-mail, Internet survey, Social media, and Media listening. d) Survey instrument– i) Questionnaire designing. e) Types of questions– i) structured/ close ended and ii) unstructured/ open ended, iii) Dicotomous, iv) Multiple Choice Questions. f) Scaling techniques- i) Likert scale, ii) Semantic Differential scale
3	Data analysis and Interpretation
	<ul style="list-style-type: none"> • Processing of data– i) Editing- field and office editing, ii) coding– meaning and essentials, iii) tabulation – note • Analysis of data-Meaning, Purpose, types. • Interpretation of data-Essentials, importance and Significance of processing data • Multivariate analysis– concept only • Testing of hypothesis– concept and problems– i) chi square test, ii) Z and t-test (for large and small sample)
4	Advanced techniques in Report Writing
	<ul style="list-style-type: none"> • Report writing – i) Meaning , importance, functions of reports, essential of a good report, content of report , steps in writing a report, types of reports, Footnotes and Bibliography • Ethics and research • Objectivity, Confidentiality and anonymity in Research • Plagiarism

Course Outcomes

S N	Outcomes
1)	Learners will be able to understand the concept and process of business research in business environment.
2)	Learners will gain knowledge of the use of tools and techniques for exploratory, conclusive and causal research.
3)	Learners will be able to understand the concept of measurement in empirical systems.
4)	Learners will be able to use statistical techniques for analysis of research data.
5)	Learners shall be able to understand the concepts of business research. Enhancing the abilities and imparting the knowledge for using the information in business research area.

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3. Core Courses (CC)

7. Production & Total Quality Management

Course Code: UMS4PTQ

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Production Management	14
2	Materials Management	16
3	Basics Of Productivity & TQM	16
4	Quality Improvement Strategies & Certifications	14
Total		60

Objectives

S N	Objectives
1	To acquaint learners with the basic management decisions with respect to production and quality management
2	To make the learners understand the designing aspect of production systems
3	To enable the learners apply what they have learnt theoretically.

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Sr. No.	Modules / Units
1	Production Management
	<p>Production Management</p> <ul style="list-style-type: none"> Objectives, Components–Manufacturing systems :Intermittent and Continuous Production Systems. Product Development, Classification and Product Design. Plant location & Plant layout– Objectives, Principles of good product layout, types of layout. Importance of purchase management. Production Batch, Batch Release & Batch Certificate of analysis.
2	Materials Management
	<ul style="list-style-type: none"> Materials Management: Concept, Objectives and importance of materials management Various types of Material Handling Systems. Inventory Management: Importance–Inventory Control Techniques ABC, VED, FSN, GOLF, XYZ, SOS, HML. EOQ: Assumptions limitations & advantages of Economic Order Quantity, Simple numerical on EOQ, Lead Time, Reorder Level, Safety Stock.
3	Basics Of Productivity &TQM
	<ul style="list-style-type: none"> Basics Of Productivity &TQM: Concepts of Productivity, modes of calculating productivity. Importance Of Quality Management, factors affecting quality; TQM– concept and importance, Cost of Quality, Philosophies and Approaches To Quality: Edward Deming, J. Juran , Kaizen , P. Crosby’s philosophy. Product & Service Quality Dimensions, SERVQUAL Characteristics of Quality, Quality Assurance, Quality Circle : Objectives Of Quality Circles, Ishikawa Fish Bone, Applications in Organizations. Simple numerical on productivity
4	Quality Improvement Strategies &Certifications
	<ul style="list-style-type: none"> Quality Improvement Strategies &Certifications: Lean Thinking, Kepner Tregor Methodology of problem solving, Sigma features, Enablers, Goals, DMAIC/DMADV. TAGUCHI’S QUALITYENGINEERING, ISO9000 ,ISO 1400, QS9000. Quality Audit.

Course Outcomes

S N	Outcomes
1)	Learners will be able to understand basics of productivity and total quality management
2)	Learners will gain knowledge about various certifications and strategies for quality improvement.
3)	Learners will be able to understand the designing of aspects of production systems.
4)	Learners will be able to understand various inventory control techniques and materials management.
5)	This course will enable the learners apply what they have learnt theoretically.

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Programme at Semester III

with effect from the Academic Year 2020-2021

Reference Books

**Reference
Books**

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2. Varshney P.N. & Mittal MN, Financial System, Sultan Chand & Co
3. A. Avadhani , Marketing of Financial Services-
4. Bhole L. M: Financial Markets and Institutions; Tata McGraw-Hill Publishing Company, New Delhi.
5. Chandra Prasanna: Financial Management: Theory and Practice; Tata McGraw Hill, New Delhi.
6. Gupta Suraj B: Monetary Economics; S. Chand and Co., New Delhi.

Strategic Cost Management

1. Cost Accounting-Principles and Practice; Arora M.N: Vikas, New Delhi.
2. Cost Accounting; Jain S.P. and Narang K.L: Kalyani New Delhi.
3. Principles of Management Accounting; Anthony Robert, Reece, et at: Richard D. Irwin Inc. Illinois.
4. Cost Accounting - A Managerial Emphasis; Prentice-Hall of India, Horngren, Charles, Foster andDatar: New Delhi
5. Dr. GirishJakhotiya-Strategic Financial Management
6. Lall, B.M. and Jain, I.C. – Cost Accounting: Principles and Practice, Prentice Hall, Delhi
7. Welsch, Glenn A., Ronald W. Hilton and Paul N. Gordan – Budgeting, Profit and Control, Prentice Hall, Del
8. John K Shank & Vijay Govindaraja, Strategic Cost Management - The new tool for Competitive Advantage, Free Press

Equity and Debt Market

1. Allen,Larry(1750-2000).TheGlobal Financial System.
2. Ian H. Giddy(1994). Global Financial Markets.Houghton Mifflin.
3. Saunders, Anthony&Cornett, MaricaMillon. Financial markets &institutions: A modern perspective: TMIT
4. LMBhole.Financial institutions &markets: Structure, growth&innovations. TMH (5th ed.)
5. Chandra, P. (2011).Corporate Valuation and ValueCreation, (1st ed).TMH

Corporate Finance

1. Foster, GeorgeFinancial Statement Analysis,2nded., Pearson Education PvtLtd
2. Damodaran,A. (2008).Damodaranon Valuation, SecurityAnalysisforInvestment and

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Corporate Finance (2nd ed.). Wiley India Pvt. Ltd.

3. Chandra, P. (2011). Corporate Valuation and Value Creation, (1st ed). TMH
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5. M.Y. Khan and P.K. Jain- Financial Management-Tata -McGraw Hill Publishing Co. Ltd., New Delhi.
6. Prasanna Chandra -Financial Management- Tata-McGraw Hill

Consumer Behaviour

1. Schiffman, L.G., Kanuk, L.L., & Kumar, S.R. (2011). Consumer Behaviour. (10th ed.). Pearson.
2. Solomon, M.R. (2009). Consumer Behaviour– Buying, Having, and Being. (8th ed.) New Delhi: Pearson .
3. Blackwell, R.D., Miniard, P.W., & Engel, J. F. (2009). Consumer Behaviour. New Delhi: Cengage Learning.
4. Hawkins, D.I., Best, R. J., Coney, K.A., & Mookerjee, A. (2007). Consumer Behaviour– Building Marketing Strategy. (9th ed.). Tata McGraw Hill.
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6. Kotler, P. & Keller, K.L. (2012). Marketing Management (Global Edition) (14th ed.). Pearson
7. Nair, Suja R- Consumer Behaviour in Indian Perspective

Advertising

1. Belch, Michael, "Advertising and Promotion: An integrated marketing communications perspective" Tata McGraw Hill 2010
2. Mohan, Manendra "Advertising Management Concept and Cases", Tata McGraw Hill 2008
3. Kleppner, Russell J; Thomac, Lane W , "Advertising Procedure", Prentice Hall 1999
4. Shimp, Terence, "Advertising and promotion :An IMC Approach", Cengage Learning 2007
5. Sharma, Sangeeta and Singh, Raghuvir "Advertising planning and Implementation", Prentice Hall of India 2006
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7. Duncan, Tom, "Principles of Advertising and IMC", Tata McGraw Hill Pub 2006

Recruitment & Selection

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2. Arun Monappa-Managing Human Resource .
3. C.B. Memoria-Personnel Management-
4. Armstrong, Michael & Baron Angela. (2005). *Handbook of Strategic HRM* (1st ed.). New Delhi: Jaico Publishing House.
5. Mello, Jeffrey A. (2007). *Strategic Human Resource Management* (2nd ed.). India: Thomson South Western.

Motivation & Leadership

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2. Niraj Kumar-Organisational Behaviour: A New Look (Concept, Theory & Cases), Himalaya Publishing House
3. Strategic Leadership—Sahu & Bharati—Excel Books
4. Peter I. Dowling & Denise E. (2006). International HRM (1st ed.). New Delhi. Excel Books.
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Information Technology in Business Management-I

1. Information Technology for Management, 6TH ED (With CD)
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2. Microsoft Office Professional 2013 Step by Step
By Beth Melton, Mark Dodge, Echo Swinford, Andrew Couch
3. Tata McGraw Hill Joseph, P.T. : E-commerce An Indian Perspective (Ch-13, Ch-14)
4. Computer Viruses and Related Threats: A Management Guide (Ch-2, Ch-3) By John P. Wack, Lisa J. Carnaha
Book :
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5. Electronic Commerce - Technologies & Applications.
Bharat, Bhaskar
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Foundation Course –III- Environmental Management

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2. Environmental Management - Text & Cases, Bala Krishnamoorthy, Prentice Hall of India
3. Environmental Management- National and global Perspectives, Swapan C. Deb , JAICO
4. Environmental Management , Dr. Anand S. Bal , Himalaya Publishing House
5. Environmental Priorities in India , Khoshoo , Environmental Society (N. Delhi)

Business Planning & Entrepreneurial Management

1. Dynamics of Entrepreneurial Development Management-Vasant Desai, Himalaya Publishing House.
2. Entrepreneurial Development-S.S. Khanna
3. Entrepreneurship & Small Business Management-CLBansal, Haranand Publication
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2. Anthony R N and Reece JS. *Accounting Principles*, Hoomwood Illinois, Richard D. Irvin
3. Bhattacharya SK and Dearden J. -*Accounting for Management. Text and Cases*, New Delhi.
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Strategic Management

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2. P.K. Ghosh : *Business Policy, Strategy, Planning and Management*
3. Christensen, Andrews Dower: *Business Policy-Text and Cases*
4. William F. Gkycj : *Business Policy- Strategy Formation and Management Action*
5. Bonge and Colonan : *Concept of Corporate Strategy*.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester IV

with effect from the Academic Year 2020-2021

Reference Books

Reference Books

Strategic Cost Management

9. Dr. Girish Jakhotiya - Strategic Financial Management
10. Lall, B.M. and Jain, I.C. – Cost Accounting: Principles and Practice, Prentice Hall, Delhi
11. Welsch, Glenn A., Ronald W. Hilton and Paul N. Gordon – Budgeting, Profit and Control, Prentice Hall, Del
12. John K Shank & Vijay Govindaraja, Strategic Cost Management - The new tool for Competitive Advantage, Free Press

Corporate Restructuring

1. Ramanujam : Mergers et al, LexisNexis Butterworths Wadhwa Nagpur
2. Ray : Mergers and Acquisitions Strategy, Valuation and Integration, PH
3. Advanced Accounts Shukla and Grewal S. Chand and Co. (P) Ltd., New Delhi
4. Advanced accountancy R.L. Gupta and M. Radhaswamy S. Chand and Co. (P) Ltd., New Delhi

Integrated Marketing Communication

1. Belch, Michael, Belch, George "Advertising and Promotion: An integrated marketing communications perspective" Tata Mcgraw Hill 2010
2. Clow, Kenneth E ; Baack, Donald E "Integrated Advertising Promotion and Marketing Communication", Pearson Edu 2014
3. Duncan, Tom, "Principles of Advertising and IMC", Tata Mcgraw Hill Pub 2006
4. Shah, Kruti ; D'Souza, Allan, "Advertising and IMC", Tata Mcgraw Hill 2014
5. Shimp, Terence, "Advertising and promotion : An IMC Approach", Cengage Learning 2007
6. Dutta, Kirti, "Integrated Marketing Communication" Oxford University Press, 2016
7. Gopalakrishnan, P S, "Integrated Marketing Communication: Concepts and Cases", ICFAI University Press, 2008

Rural Marketing

1. Badi & Badi : Rural Marketing
2. Mamoria, C.B. & Badri Vishal : Agriculture problems in India
3. Arora, R.C. : Integrated Rural Development
4. Rajgopal : Managing Rural Business
5. Gopalswamy, T.P. : Rural Marketing

Training & Development in HRM

1. Brinkerhoff, Robert, .AchievingResultsfrom TrainingHowto evaluateHRDto Strengthen programsand Increaseimpact.1987, Josseybass, San Francisco.
2. Craig, RobertL. Trainingand Development Handbook., 3rd ed. 1987. McGraw Hill, New York
3. EmployeeTrainingAndDevelopment-RaymondNoe
4. EveryTrainers Handbook-DevendraAgochia
5. 360 DegreeFeedback, CompetencyMappingAndAssessment Centre-RadhaSharma
6. Training AndDevelopment-S.K. Bhatia.

Change Management

1. Organisational Development byFrench andBell
2. An experiential approachto O.D. byHarveyandBrown
3. Consultants and ConsultingStyles byDharaniSinha P.
4. KavitaSingh-Organization change
5. S.K. Bhatia-OrganisationalChange-
6. K.Ashwathapa-Management &OB, HRM.
7. RadhaSharma-Training &Development.

Information Technology in Business Management-II

1. Information Technology for Management, 6TH ED (With CD)
By Efraim Turban, Dorothy Leidner, Ephraim Mclean, James Wetherbe (Ch1, Ch2)
2. Microsoft Office Professional 2013 Step by Step
By Beth Melton, Mark Dodge, Echo Swinford, Andrew Couch
3. Tata McGraw Hill Joseph, P.T. : E-commerce An Indian Perspective (Ch-13,Ch-14)
4. Computer Viruses and Related Threats: A Management Guide (Ch-2, Ch-3) By John P. Wack, Lisa J. Carnahan
5. (E-Book :
<https://play.google.com/books/reader?id=tsP15h9gr8MC&printsec=frontcover&output=reader&hl=en&pg=GBS.PR7.w.2.1.0>)
6. Electronic Commerce - Technologies & Applications. Bharat, Bhaskar
7. <https://play.google.com/books/reader?id=F1zbUaBtk7IC&printsec=frontcover&output=reader&hl=en&pg=GBS.PP1>

Foundation Course –IV- Ethics & Governance

1. Laura P. Hartman, Joe DesJardins, Business Ethics, Mcgraw Hill, 2nd Edition
2. C. Fernando, Business Ethics – An Indian Perspective, Pearson, 2010
3. Joseph DesJardins, An Introduction to Business Ethics, Tata McGraw Hill, 2nd Edition
4. Richard T DeGeorge, Business Ethics, Pearson, 7th Edition
5. Dr.A.K. Gavai, Business Ethics, Himalaya Publishing House, 2008
6. S.K. Mandal, Ethics is Business and Corporate Governance, McGraw Hill, 2010
7. Laura Pincus Hartman, Perspectives in Business Ethics, McGraw Hill International Editions, 1998

S.Y.BMS, Management Studies

Business Research Methods

1. Research for Marketing Decisions Paul E. Green, Donald S. Tull
2. Marketing Research-Text and Cases Harper W. Boyd Jr. , Ralph Westfall.
3. Research methodology in Social sciences, O.R. Krishnaswamy, Himalaya Publication
4. Business Research Methods, Donald R Cooper, Pamela Schindler, Tata McGraw Hill
5. Marketing research and applied orientation, Naresh K Malhotra, Pearson
6. Statistics for management, Levin and Reuben, Prentice Hall.
7. Research Methods for Management: S Shajahan, Jaico Publishing

Production & Total Quality Management

1. Production and Operations Management: R. Paneerselvam
2. Production (Operations) Management: L.C. Jhamb
3. K. Ashwathappa and K. Shridhar Bhatt; Production and Operations management
4. Productivity Management: Concepts and Techniques, Sawhney S.C., Tata McGraw Hill
5. Srinivas Gondhalekar and Uday Salunkhe, "Productivity Techniques", Himalaya Publishing House
6. Gerard Leone and Richard D. Rahn, "Productivity Techniques", Jaico Book House
7. John S. Oakland, "TQM: Text with Cases", Butterworth-Heinemann
8. David J. Sumanth, "Total Productivity Management (TPM): A systematic and quantitative approach to compete in quality, price and time", St. Lucie Press

Business Economics - II

1. Principles of Macro Economics, by Case & Fair, Pearson Publication
2. Principles of Macro Economics, by Gregory Mankiw
3. A 100 Small Steps, by Raghuram Rajan
4. Essentials of Business Economics, D.N. Dwivedi, Pearson 2010
5. Business Economics, H L Ahuja, Mc Graw Hill, 2001
6. Business Economics, Shiv Kumar Agarwal, Pooja Law, 1996
7. Managerial Economics, Pandya, Pearson, 1994

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)
Programme at Semester III and IV
with effect from the Academic Year *2020-2021*

Scheme of

❖ Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

(For Courses without Practical)

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	One case study/ project with presentation based on curriculum to be assessed by the teacher concerned	15 Marks
	Presentation	10 Marks
	Written Document	05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks

(For Courses with Practical)

Sr. No.	Particular	Marks
01	Practical Examination	20 Marks
	Journal	05 Marks
	Viva Voce	05 Marks
	Laboratory Work	10 Marks

02	One case study /project with presentation to be assessed by teacher concerned (15 Marks)	
	Presentation	10 Marks
	Written Document	05 Marks

03	Active participation in routine class instructional deliveries and Overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks
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Question Paper Pattern

(Periodical Class Test for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Questions to be set:

02 Duration: 40

Minutes

All Questions are Compulsory

Question No	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

**Theory question paper
pattern**

1. There shall be four questions each of 15 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

❖ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

❖ Guidelines and Evaluation pattern for project work (100 Marks)

Introduction

Inclusion of project work in the course curriculum of the B.Com. (Accounting & Finance) and B.M.S. programme is one of the ambitious aspects in the programme structure. The main objective of inclusion of project work is to inculcate the element of research analyse and scientific temperament challenging the potential of learner as regards to his/ her eager to enquire and ability to interpret particular aspect of the study. It is expected that the guiding teacher should undertake the counselling sessions and make the awareness among the learners about the methodology of formulation, preparation and evaluation pattern of the project work.

- There are two modes of preparation of project work
 1. Project work based on research methodology in the study area
 2. Project work based on internship in the study area

Guidelines for preparation of Project Work

1. General guidelines for preparation of project work based on Research

Methodology

- The project topic may be undertaken in any area of Elective Courses.
- Each of the learner has to undertake a Project individually under the supervision of a teacher-guide.
- The learner shall decide the topic and title which should be specific, clear and with definite scope in consultation with the teacher-guide concerned.
- University/college shall allot a guiding teacher for guidance to the students based on her / his specialization.
- The project report shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.
 - The project report should be 80 to 100 pages

Format

1st page (Main Page)

Title of the problem of the

**A Project Submitted to
University of Mumbai for partial completion of the
degree of Bachelor in Commerce (Accounting and
Finance)/B.M.S. Under the Faculty of Commerce**

By

Name of the Learner

Under the Guidance of

Name of the Guiding Teacher

Name and address of the College

Month and Year

2nd Page

***This page to be repeated on 2nd page (i.e. inside after
main page)***

On separate page

Index

Chapter No. 1	Title of the Chapter	Page No.
---------------	----------------------	----------

(sub point 1.1, 1.1.1, . And so on)

Chapter No. 2	Title of the Chapter
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Chapter No. 3	Title of the Chapter
---------------	----------------------

Chapter No. 4	Title of the Chapter
---------------	----------------------

Chapter No. 5	Title of the Chapter
---------------	----------------------

List of tables, if any, with page numbers
List of Graphs, if any, with page numbers
List of Appendix, if any, with page numbers

Abbreviations used:

Structure to be followed to maintain the uniformity in Formulation and presentation of Project Work

(Model Structure of the Project Work)

- **Chapter No. 1: Introduction**

In this chapter Selection and relevance of the problem, historical background of the problem, brief profile of the study area, definition/s of related aspects, characteristics, different concepts pertaining to the problem etc can be incorporated by the learner.

- **Chapter No. 2: Research Methodology**

This chapter will include Objectives, Hypothesis, Scope of the study, limitations of the study, significance of the study, Selection of the problem, Sample size, Data collection, Tabulation of data, Techniques and tools to be used, etc can be incorporated by the learner.

- **Chapter No. 3: Literature Review**

This chapter will provide information about studies done on the respective issue. This would specify how the study undertaken is relevant and contribute for value addition in information/ knowledge/ application of study area which ultimately helps the learner to undertake further study on same issue.

- **Chapter No. 4: Data Analysis, Interpretation and Presentation**

This chapter is the core part of the study. The analysis pertaining to collected data will be done by the learner. The application of selected tools or techniques will be used to arrive at findings. In this, table of information's, presentation of graphs etc. can be provided with interpretation by the learner.

- **Chapter No. 5: Conclusions and Suggestions**

In this chapter of project work, findings of work will be covered and suggestion will be enlisted to validate the objectives and hypotheses.

Note: If required more chapters of data analysis can be added.

- **Bibliography**
- **Appendix**

On separate page

Name and address of the college

Certificate

This is to certify that Ms/Mr _____ has worked and duly completed her/his Project Work for the degree of Bachelor in Commerce (Accounting & Finance)/B.M.S. under the Faculty of Commerce in the subject of

_____ and her/his project is entitled
“ *Title of the Project* ” under my

supervision.

I further certify that the entire work has been done by the learner under my guidance and that no part of it has been submitted previously for any Degree or Diploma of any University.

It is her/ his own work and facts reported by her/his personal findings and investigations.



Name and Signature of
Guiding Teacher

Date of submission:

On separate page

Declaration by learner

Name of the learner

I the undersigned Miss / Mr. _____ here by, declare that
the work embodied in this project work titled “_____”
Title of the Project, forms my own

contribution to the research work carried out under the guidance of
Name of the guiding teacher _____ is a result of my own research work and has not been
previously submitted to any other University for any other Degree/ Diploma to this or any
other University.

Wherever reference has been made to previous works of others, it has been clearly
indicated as such and included in the bibliography.

I, here by further declare that all information of this document has been obtained and
presented in accordance with academic rules and ethical conduct.

Name and Signature of the learner

Certified by

Name and signature of the Guiding Teacher

On separate page

Acknowledgment

(Model structure of the acknowledgement)

To list who all have helped me is difficult because they are so numerous and the depth is so enormous.

I would like to acknowledge the following as being idealistic channels and fresh dimensions in the completion of this project.

I take this opportunity to thank the **University of Mumbai** for giving me chance to do this project.

I would like to thank my **Principal**,_____for providing the necessary facilities required for completion of this project.

I take this opportunity to thank our **Coordinator**_____, for her moral support and guidance.

I would also like to express my sincere gratitude towards my project guide _____whos e guidance and care made the project successful.

I would like to thank my **College Library**, for having provided various reference books and magazines related to my project.

Lastly, I would like to thank each and every person who directly or indirectly helped me in the completion of the project especially **myParents and Peers** who supported me throughout my project.

2. Guidelines for Internship based project work

- Minimum 20 days/ 100 hours of Internship with an Organisation/ NGO/ Charitable Organisation/ Private firm.
- The theme of the internship should be based on any study area of the elective courses
- Experience Certificate is Mandatory
- A project report has to be brief in content and must include the following aspects:
 - **Executive Summary:**
A bird's eye view of your entire presentation has to be precisely offered under this category.
 - **Introduction on the Company:**
A Concise representation of company/ organization defining its scope, products/ services and its SWOT analysis
 - **Statement and Objectives:**
The mission and vision of the organization need to be stated enshrining its broad strategies.
 - **Your Role in the Organisation during the internship:**
The key aspects handled, the department under which you were deployed and brief summary report duly acknowledged by the reporting head.
 - **Challenges:**
The challenges confronted while churning out theoretical knowledge into practical world.
 - **Conclusion:**
A brief overview of your experience and suggestions to bridge the gap between theory and practice
- The project report based on internship shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.
 - The project report should be of minimum 50 pages

Evaluation pattern of the project work

The Project Report shall be evaluated in two stages viz.	
• Evaluation of Project Report (Bound Copy)	60 Marks
▪ Introduction and other areas covered	20 Marks
▪ Research Methodology, Presentation, Analysis and interpretation of data	30 Marks
▪ Conclusion & Recommendations	10 Marks
• Conduct of Viva-voce	40 Marks
▪ In the course of Viva-voce, the questions may be asked such as importance / relevance of the study, objective of the study, methodology of the study/ mode of Enquiry (question responses)	10 Marks
▪ Ability to explain the analysis, findings, concluding observations, recommendation, limitations of the Study	20 Marks
▪ Overall Impression (including Communication Skill)	10 Marks

Note:

- ***The guiding teacher along with the external evaluator appointed by the University/ College for the evaluation of project shall conduct the viva-voce examination as per the evaluation pattern***
- ***The plagiarism should be maintained as per the UGC guidelines.***

Passing Standard

- Minimum of Grade D in the project component
- In case of failing in the project work, the same project can be revised for ATKT examination.
- Absence of student for viva voce: If any student fails to appear for the viva voce on the date and time fixed by the department such student shall appear for the viva voce on the date and time fixed by the Department, such student shall appear for the viva voce only along with students of the next batch.

- Note:** 1) It is noted that the concerned regulation of the university is amended and implemented to all Semesters i.e. Semester I to Semester VI to all undergraduate programmes, simultaneously, under faculty of Arts, Commerce and Science with effect from the academic year 2020-2021
- 2) This scheme of evaluation is discussed in detail, finalised and accepted



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by
UGC
'Best College Award' by University of Mumbai

Program: Bachelor of Management Studies

Revised Syllabus of T.Y.BMS Management Studies
Choice Based Credit & Grading System (60:40)
w. e. f. Academic Year 2021-22

T. Y. BMS, Management Studies

Sr. No.	Heading	Particulars
1	Title of Course	Management Studies
2	Eligibility for Admission	First Year with both the semesters should be passed (Maximum ATKT allowed for Semester I and Semester II are two subjects per semester) OR Second Year with both the semesters should be passed (Maximum ATKT allowed for Semester III and Semester IV are two subjects per semester)
3	Passing marks criteria	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

Bachelor of Management Studies (BMS)
Programme
Under Choice Based Credit, Grading and Semester System

Course Structure

TYBMS

(To be implemented from Academic Year- 2021-2022)

No. of Courses	Semester V	Credits	No. of Courses	Semester VI	Credits
1	Elective Courses (EC)		1	Elective Courses (EC)	
1,2,3 & 4	*List of the courses as per specialisation	12	1,2,3 & 4	**List of the courses as per specialisation	12
2	Core Course (CC)		2	Core Course (CC)	
UMS5LSM	Logistics & Supply Chain Management	04	UMS6OPR	Operation Research	04
3	Ability Enhancement Course (AEC)		3	Ability Enhancement Course (AEC)	
UMS5CCP	Corporate Communication & Public Relations	04	UMS6PRW	Project Work	04
Total Credits		20	Total Credits		20

✓ **Note:** Project work is considered as a special course involving application of knowledge in solving/analysing/exploring a real life situation/ difficult problem. Project work would be of 04 credits. A project work may be undertaken in any area of Elective Courses/ study area selected

T. Y. BMS, Management Studies

*List of group of Elective Courses(EC) for Semester V		** List of group of Elective Courses(EC) for Semester VI	
Group A: Finance Electives			
UMS5IAP	Investment Analysis & Portfolio Management	UMS6IFS	Innovative Financial Services
UMS5C&D	Commodity & Derivatives Market	UMS6PRM	Project Management
UMS5WEM	Wealth Management	UMS6SFM	Strategic Financial Management
UMS5DIT	Direct Taxes	UMS6INT	Indirect Taxes
Group B: Marketing Electives			
UMS5SEM	Services Marketing	UMS6BRM	Brand Management
UMS5EDM	E-Commerce & Digital Marketing	UMS6REM	Retail Management
UMS5SDM	Sales & Distribution Management	UMS6INM	International Marketing
UMS5CRM	Customer Relationship Management	UMS6MPM	Media Planning & Management
Group C: Human Resource Electives			
UMS5FCM	Finance for HR Professionals & Compensation Management	UMS6HGP	HRM in Global Perspective
UMS5SHR	Strategic Human Resource Management & HR Policies	UMS6ORD	Organisational Development
UMS5PMC	Performance Management & Career Planning	UMS6HSM	HRM in Service Sector Management
UMS5INR	Industrial Relations	UMS6IEM	Indian Ethos in Management
Note: Group selected in Semester III will continue in Semester V & Semester VI			

**Bachelor of Management Studies
(BMS) Programme**
*Under Choice Based Credit, Grading and Semester
System Course Structure*
(To be implemented from Academic Year : 2021-2022)

Semester V

No. of Courses	Semester V	Credits
1	<i>Elective Courses (EC)</i>	
1,2,3 & 4	*Any four courses from the following list of the Courses	12
2	<i>Core Course (CC)</i>	
UMS5LSM	Logistics & Supply Chain Management	04
3	<i>Ability Enhancement Course (AEC)</i>	
UMS5CCP	Corporate Communication & Public Relations	04
Total Credits		20

***List of group of Elective Courses(EC)for Semester V
(Any Four)**

Group A: Finance Electives	
UMS5IAP	Investment Analysis & Portfolio Management
UMS5C&D	Commodity & Derivatives Market
UMS5WEM	Wealth Management
UMS5DIT	Direct Taxes
Group B: Marketing Electives	
UMS5SEM	Services Marketing
UMS5EDM	E-Commerce & Digital Marketing
UMS5SDM	Sales & Distribution Management
UMS5CRM	Customer Relationship Management
Group C: Human Resource Electives	
UMS5FCM	Finance for HR Professionals & Compensation Management
UMS5SHR	Strategic Human Resource Management & HR Policies

T. Y. BMS, Management Studies

UMS5PM C	Performance Management & Career Planning
UMS5INR	Industrial Relations

**Revised Syllabus of Courses of Bachelor of Management Studies
(BMS)**

**Programme at Semester V
with effect from the Academic Year 2021-2022**

Elective Courses (EC)

Group A: Finance

Electives

**1. Investment Analysis and Portfolio Management
Course Code: UMS5IAP**

Modules at a Glance

S N	Module s	No. of Lectures
1	Introduction to Investment Environment	15
2	Risk - Return Relationship	15
3	Portfolio Management and Security Analysis	15
4	Theories, Capital Asset Pricing Model and Portfolio Performance Measurement	15
Total		60

Objectives

S N	Objectives
1	To acquaint the learners with various concepts of finance
2	To understand the terms which are often confronted while reading newspaper, magazines etc for better correlation with the practical world

3	To understand various models and techniques of security and portfolio Analysis
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SN	Modules/ Units
1	Introduction to Investment Environment
	<p>a) Introduction to Investment Environment</p> <ul style="list-style-type: none"> ● Introduction, Investment Process, Criteria for Investment, Types of Investors, Investment V/s Speculation V/s Gambling, Investment Avenues, Factors Influencing Selection of Investment Alternatives <p>b) Capital Market in India</p> <ul style="list-style-type: none"> ● Introduction, Concepts of Investment Banks its Role and Functions, Stock Market Index, The NASDAQ, SDL, NSDL, Benefits of Depository Settlement, Online Share Trading and its Advantages, Concepts of Small cap, Large cap, Midcap and Penny stocks
2	Risk - Return Relationship
	<p>a) Meaning, Types of Risk- Systematic and Unsystematic risk, Measurement of Beta, Standard Deviation, Variance, Reduction of Risk through Diversification. Practical Problems on Calculation of Standard Deviation, Variance and Beta.</p>
3	Portfolio Management and Security Analysis
	<p>a) Portfolio Management:</p> <ul style="list-style-type: none"> ● Meaning and Concept, Portfolio Management Process, Objectives, Basic Principles, Factors affecting Investment Decisions in Portfolio Management, Portfolio Strategy Mix, Efficient Frontier, Markowitz Portfolio Model <p>b) Security Analysis:</p> <ul style="list-style-type: none"> ● Fundamental Analysis, Economic Analysis, Industry Analysis, Company Analysis, Technical Analysis - Basic Principles of Technical Analysis., Uses of Charts: Line Chart, Bar Chart, Candlestick Chart, Mathematical Indicators: Moving Averages, Oscillators.
4	Theories, Capital Asset Pricing Model and Portfolio Performance Measurement
	<p>a) Theories:</p> <ul style="list-style-type: none"> ● Dow Jones Theory, Elliott Wave Theory, Efficient Market Theory <p>b) Capital Asset Pricing Model:</p> <ul style="list-style-type: none"> ● Assumptions of CAPM, CAPM Equation, Capital Market Line, Security Market Line <p>c) Portfolio Performance Measurement:</p> <ul style="list-style-type: none"> ● Meaning of Portfolio Evaluation, Sharpe's Ratio (Basic Problems), Treynor's Ratio (Basic Problems), Jensen's Differential Returns (Basic Problems)

Course Outcome

Sr. No	Course Outcome
01	Help the learners to understand various Investment avenues available in the market.
02	Learners will learn to calculate Return and Risk involved in the securities by using various methods like HPR, Beta etc.
03	Learners will gain the knowledge about Portfolio management and the techniques to manage the portfolio with the help of graphs by using Fundamental analysis and Returns by using Technical analysis.
04	Learners will learn the traditional theories related to investment and measurement tools for evaluation of portfolio performance.
05	This course will provide the overall knowledge about Investment avenues available and Return- Risk Relationship by using various techniques.

**Revised Syllabus of Courses of Bachelor of Management
Studies (BMS)
Programme at Semester V
with effect from the Academic Year 2021-2022**

Elective Courses

(EC) Group A: Finance

Electives

**2. Commodity and Derivatives
Market Course Code :
UMS5C&D**

Modules at a Glance

S N	Modules	No. of Lectures
1	Introduction to Commodities Market and Derivatives Market	15
2	Futures and Hedging	15
3	Options and Option Pricing Models	15
4	Trading, Clearing & Settlement In Derivatives Market and Types of Risk	15
Total		60

Objectives

S N	Objectives
1	To understand the concepts related to Commodities and Derivatives market

2	To study the various aspects related to options and futures
3	To acquaint learners with the trading, clearing and settlement mechanism in derivatives market.

SN	Modules/ Units
1	Introduction to Commodities Market and Derivatives Market
	<p>a) Introduction to Commodities Market :</p> <ul style="list-style-type: none"> ● Meaning, History & Origin, Types of Commodities Traded, Structure of Commodities Market in India, Participants in Commodities Market, Trading in Commodities in India(Cash & Derivative Segment), Commodity Exchanges in India & Abroad, Reasons for Investing in Commodities <p>b) Introduction to Derivatives Market:</p> <ul style="list-style-type: none"> ● Meaning, History & Origin, Elements of a Derivative Contract, Factors Driving Growth of Derivatives Market, Types of Derivatives, Types of Underlying Assets, Participants in Derivatives Market, Advantages & Disadvantages of Trading in Derivatives Market, Current Volumes of Derivative Trade in India, Difference between Forwards & Futures.
2	Futures and Hedging
	<p>a) Futures:</p> <ul style="list-style-type: none"> ● Futures Contract Specification, Terminologies, Concept of Convergence, Relationship between Futures Price & Expected Spot Price, Basis & Basis Risk, Pricing of Futures Contract, Cost of Carry Model <p>b) Hedging:</p> <ul style="list-style-type: none"> ● Speculation & Arbitrage using Futures, Long Hedge – Short Hedge, Cash & Carry Arbitrage, Reverse Cash & Carry Arbitrage, Payoff Charts & Diagrams for Futures Contract, Perfect & Imperfect Hedge
3	Options and Option Pricing Models
	<p>a) Options:</p> <ul style="list-style-type: none"> ● Options Contract Specifications, Terminologies, Call Option, Put Option, Difference between Futures & Options, Trading of Options, Valuation of Options Contract, Factors affecting Option Premium, Payoff Charts & Diagrams for Options Contract, Basic Understanding of Option Strategies <p>b) Options Pricing Models:</p> <ul style="list-style-type: none"> ● Binomial Option Pricing Model, Black - Scholes Option Pricing Model
4	Trading, Clearing & Settlement In Derivatives Market and Types of Risk

a) Trading, Clearing & Settlement In Derivatives Market:

- Meaning and Concept, SEBI Guidelines, Trading Mechanism – Types of Orders, Clearing Mechanism – NSCCL – its Objectives & Functions, Settlement Mechanism – Types of Settlement

b) Types of Risk:

- Value at Risk, Methods of calculating VaR, Risk Management Measures, Types of Margins, SPAN Margin

Course Outcome

Sr. No	Course Outcome
01	Learners will understand the meaning of financial derivatives.
02	To help the learners understand difference between forward futures and options contracts.
03	Be aware about the growth of futures markets worldwide as well as in India.
04	To help the learners understand about the concept of Derivatives and its types.
05	To know about Hedging and the development position of Derivatives in India.

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Elective Courses (EC)

Group A: Finance

Electives

3. Wealth Management

Course Code : UMS5WEM

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction	15
2	Insurance Planning and Investment Planning	15
3	Financial Mathematics/ Tax and Estate Planning	15
4	Retirement Planning/ Income Streams & Tax Savings Schemes	15
Total		60

Objectives

SN	Objectives
1	To provide an overview of various aspects related to wealth management
2	To study the relevance and importance of Insurance in wealth management

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3	To acquaint the learners with issues related to taxation in wealth Management
4	To understand various components of retirement planning

SN	Modules/ Units
1	Introduction
	<p>a) Introduction To Wealth Management:</p> <ul style="list-style-type: none"> ● Meaning of WM, Scope of WM, Components of WM, Process of WM, WM Needs & Expectation of Clients, Code of Ethics for Wealth Manager <p>b) Personal Financial Statement Analysis:</p> <ul style="list-style-type: none"> ● Financial Literacy, Financial Goals and Planning, Cash Flow Analysis, Building Financial Plans, Life Cycle Management. <p>c) Economic Environment Analysis:</p> <ul style="list-style-type: none"> ● Interest Rate, Yield Curves, Real Return, Key Indicators-Leading, Lagging, Concurrent
2	Insurance Planning and Investment Planning
	<p>a) Insurance Planning:</p> <ul style="list-style-type: none"> ● Meaning, Basic Principles of Insurance, Functions and Characteristics of Insurance, Rights and Responsibilities of Insurer and Insured, Types of life Insurance Policies, Types of General Insurance Policies, Health Insurance – Mediclaime – Calculation of Human Life Value - Belth Method/CPT <p>b) Investment Planning:</p> <ul style="list-style-type: none"> ● Types of Investment Risk, Risk Profiling of Investors & Asset Allocation (Life Cycle Model), Asset Allocation Strategies(Strategic, Tactical, Life-Cycle based), Goal-based Financial Planning, Active & Passive Investment Strategies
3	Financial Mathematics/ Tax and Estate Planning
	<p>a) Financial Mathematics:</p> <ul style="list-style-type: none"> ● Calculation of Returns (CAGR ,Post-tax Returns etc.), Total Assets, Net Worth Calculations, Financial Ratios <p>b) Tax and Estate Planning:</p> <ul style="list-style-type: none"> ● Tax Planning Concepts, Assessment Year, Financial Year, Income Tax Slabs, TDS, Advance Tax, LTCG, STCG, Carry Forward & Set-off, Estate Planning Concepts – Types of Will – Requirements of a Valid Will– Trust – Deductions - Exemptions
4	Retirement Planning/ Income Streams & Tax Savings Schemes

a) Retirement Planning:

- Understanding of different Salary Components, Introduction to Retirement Planning, Purpose & Need, Life Cycle Planning, Financial Objectives in Retirement Planning, Wealth Creation (Factors and Principles), Retirement (Evaluation & Planning), Pre & Post-Retirement Strategies - Tax Treatment

b) Income Streams & Tax Savings Schemes:

- Pension Schemes, Annuities- Types of Annuities, Various Income Tax Savings Schemes

Course Outcome

Sr. No	Course Outcome
01	Provide advice on personal wealth management and pension planning.
02	Help learners to understand the role of financial planners.
03	Construct a financial plan.
04	Assess personal financial goals and create a saving plan.
05	Select appropriate Insurance product to cover financial risks.
06	Give overview about various asset classes & tools to analyse such investments.

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Elective Courses (EC)

Group A: Finance

Electives

4. Direct Taxes

**Course Code : UMS5DIT
Modules at a Glance**

Sr. No.	Module s	No. of Lectures
1	Definitions and Residential Status	10
2	Heads of Income – I	15
3	Heads of Income – II	15
4	Deductions under Chapter VI A	10
5	Computation of Taxable Income of Individuals	10
Total		60

Objectives

SN	Objectives
01	To understand the provisions of determining residential status of individual
02	To study various heads of income
03	To study deductions from total income

04	To compute taxable income of Individuals
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Sr. No.	Modules / Units
1	Definitions and Residential Status
	Basic Terms (S. 2,3,4) Assessee, Assessment, Assessment Year, Annual Value, Business, Capital Assets, Income, Previous Year, Person, Transfer, Tax Planning . Determination of Residential Status of Individual, Scope of Total Income (S.5)
2	Heads of Income – I
	Salary (S.15-17) Income from House Property (S. 22-27) Profit & Gain from Business and Profession(S. 28, 30,31,32, 35, 35D,36,37, 40, 40A and 43B)
3	Heads of Income – II
	Capital Gain (S. 45, 48, 49, 50 and 54) Income from other sources (S.56- 59) Exclusions from Total Income (S.10) (Exclusions related to specified heads to be covered with relevant heads of income)
4	Deductions under Chapter VI A & Computation of Taxable Income and Tax Liability of an Individual
	Deductions from Total Income S. 80C, 80CCC, 80D, 80DD, 80E, 80U, 80TTA Computation of Total Income and Taxable Income and Tax Liability of an Individuals
5	TDS, TCS, Advance Tax & Provision for filing return of income
	Tax Deducted at Source, Tax Collected at Source, Advance Tax Provisions for filing return of income

Note: The Syllabus is restricted to study of particular sections, specifically mentioned rules and notifications only.

1. All modules / units include Computational problems / Case Study.
2. The Law In force on 1st April immediately preceding the commencement of Academic year will be applicable for ensuing Examinations.

Course Outcomes

SN	Outcomes
01	Learners will be able to understand basic concepts of direct taxes and its principles.
02	Learners will be able to understand various definitions covered under Income Tax Act, 1961.
03	Learners will be able to determine residential status of an individual.
04	Learners will be able to compute the scope of income of an individual.
05	Learners will have a knowledge of heads of income like Income from Salary, Income from House Property, Profits & Gains from Business & Profession, Capital Gains & Income from Other Sources.
06	Learners will learn incomes exempted from taxation under section 10.
07	Learners will learn various Deductions under Chapter VI A.
08	Learners will be able to compute the taxable income and tax liability of an individual.

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Elective Courses

(EC) Group B: Marketing

Electives

1. Service Marketing

Course Code : UMS5SEM

Modules at a Glance

S N	Modules	No. of Lectur es
1	Introduction of Services Marketing	15
2	Key Elements of Services Marketing Mix	15
3	Managing Quality Aspects of Services Marketing	15
4	Marketing of Services	15
Total		60

Objectives

SN	Objectives
1	To understand distinctive features of services and key elements in services marketing
2	To provide insight into ways to improve service quality and productivity

3	To understand marketing of different services in Indian context
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SN	Modules/ Units
1	Introduction of Services Marketing
	<ul style="list-style-type: none"> • Services Marketing Concept, Distinctive Characteristics of Services, Services Marketing Triangle, Purchase Process for Services, Marketing Challenges of Services • Role of Services in Modern Economy, Services Marketing Environment • Goods vs Services Marketing, Goods Services Continuum • Consumer Behaviour, Positioning a Service in the Market Place • Variations in Customer Involvement, Impact of Service Recovery Efforts on Consumer Loyalty • Type of Contact: High Contact Services and Low Contact Services • Sensitivity to Customers' Reluctance to Change
2	Key Elements of Services Marketing Mix
	<ul style="list-style-type: none"> • The Service Product, Pricing Mix, Promotion & Communication Mix, Place/Distribution of Service, People, Physical Evidence, Process-Service Mapping- Flowcharting • Branding of Services – Problems and Solutions • Options for Service Delivery
3	Managing Quality Aspects of Services Marketing
	<ul style="list-style-type: none"> • Improving Service Quality and Productivity • Service Quality – GAP Model, Benchmarking, Measuring Service Quality - Zone of Tolerance and Improving Service Quality • The SERVQUAL Model • Defining Productivity – Improving Productivity • Demand and Capacity Alignment
4	Marketing of Services
	<ul style="list-style-type: none"> • International and Global Strategies in Services Marketing: Services in the Global Economy- Moving from Domestic to Transnational Marketing • Factors Favouring Transnational Strategy • Elements of Transnational Strategy • Recent Trends in Marketing Of Services in: Tourism, Hospitality, Healthcare, Banking, Insurance, Education, IT and Entertainment Industry • Ethics in Services Marketing: Meaning, Importance, Unethical Practices in Service Sector

Course Outcome

Sr. No	Course Outcome
01	Learners will be able to understand basic concept of service marketing and how does it differ from product marketing.
02	Learners will be able to analyse impact of service recovery efforts on consumer loyalty.
03	Learners will be able to understand key elements of service marketing mix.
04	Learners will get knowledge about how to manage quality aspects of service marketing.
05	To understand recent trends in marketing of services in various service sector.
06	Learners will understand the importance of ethics in service marketing.
07	Learners will be able to understand how the services sector operates in developed economies like Indian market.
08	Learners will be able to understand the unique challenges of services marketing, including the elements of product, price, place, promotion, processes, physical evidence, and people.

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Elective Courses

(EC) Group B: Marketing

Electives

2. E-Commerce and Digital Marketing

Course Code : UMS5EDM

Modules at a Glance

S N	Module s	No. of Lectur es
1	Introduction to E-commerce	15
2	E-Business & Applications	15
3	Payment, Security, Privacy & Legal Issues in E-Commerce	15
4	Digital Marketing	15
Total		60

Objectives

SN	Objectives
1	To understand increasing significance of E-Commerce and its applications in Business and Various Sectors
2	To provide an insight on Digital Marketing activities on various Social Media

	platforms and its emerging significance in Business
3	To understand Latest Trends and Practices in E-Commerce and Digital Marketing, along with its Challenges and Opportunities for an Organisation

SN	Modules/ Units
1	Introduction to E-commerce
	<ul style="list-style-type: none"> • Ecommerce- Meaning, Features of E-commerce, Categories of E-commerce, Advantages & Limitations of E-Commerce, Traditional Commerce & E-Commerce • Ecommerce Environmental Factors: Economic, Technological, Legal , Cultural & Social • Factors Responsible for Growth of E-Commerce, Issues in Implementing E- Commerce, Myths of E-Commerce • Impact of E-Commerce on Business, Ecommerce in India • Trends in E-Commerce in Various Sectors: Retail, Banking, Tourism, Government, Education • Porter Value Chain in E-Commerce • Meaning of M-Commerce, Benefits of M-Commerce, Trends in M-Commerce
2	E-Business & Applications
	<ul style="list-style-type: none"> • E-Business: Meaning, Launching an E-Business, Different phases of Launching an E- Business • Important Concepts in E-Business: Data Warehouse, Customer Relationship Management , Supply Chain Management, Enterprise Resource Planning • Bricks and Clicks business models in E-Business: Brick and Mortar, Pure Online, Bricks and Clicks, Advantages of Bricks & Clicks Business Model, Superiority of Bricks and Clicks E-Business Applications: E-Procurement, E-Communication, E- Delivery, E- Auction, E-Trading. • Electronic Data Interchange (EDI) in E-Business: Meaning of EDI, Benefits of EDI, Drawbacks of EDI, Applications of EDI. • Website : Design and Development of Website, Advantages of Website, Principles of Web Design, Life Cycle Approach for Building a Website, Different Ways of Building a Website
3	Payment, Security, Privacy & Legal Issues in E-Commerce
	<ul style="list-style-type: none"> • Issues Relating to Privacy and Security in E-Business • Electronic Payment Systems: Features, Different Payment Systems :Debit Card, Credit Card ,Smart Card, E-cash, E-Cheque, E-wallet, Electronic Fund Transfer. • Payment Gateway: Introduction, Payment Gateway Process, Payment Gateway Types, Advantages and Disadvantages of Payment Gateway. • Types of Transaction Security • E-Commerce Laws: Need for E-Commerce laws, E-Commerce laws in India, Legal Issues in E-commerce in India, IT Act 2000

SN	Modules/ Units
4	Digital Marketing
	<ul style="list-style-type: none"> • Introduction to Digital Marketing, Advantages and Limitations of Digital Marketing. • Various Activities of Digital Marketing: Search Engine Optimization, Search Engine Marketing, Content Marketing & Content Influencer Marketing, Campaign Marketing, Email Marketing, Display Advertising, Blog Marketing, Viral Marketing, Podcasts & Vodcasts. • Digital Marketing on various Social Media platforms. • Online Advertisement, Online Marketing Research, Online PR • Web Analytics • Promoting Web Traffic • Latest developments and Strategies in Digital Marketing.

Course Outcome

Sr. No	Course Outcome
01	Learners gain insight on innovative uses of e-commerce, its significance and application for developing competitive advantage.
02	Learners will gain a comprehensive understanding of the e-commerce landscape, current and emerging business models, the technology and infrastructure underpinnings of the business.
03	Learners gain an understanding on the importance of security, privacy, ethical issues and avenues related to e-commerce.
04	Learners will gain understanding of building blocks that constitute digital marketing and the tools, techniques, knowledge to develop cohesive digital market strategies.
05	Learners gain an understanding on how the internet can help business grow and the different e-commerce platforms to enhance current business or incubate new businesses.

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Elective Courses

(EC) Group B: Marketing

Electives

3. Sales and Distribution Management

Course Code : UMS5SDM

Modules at a Glance

S N	Module s	No. of Lectur es
1	Introduction	15
2	Market Analysis and Selling	15
3	Distribution Channel Management	15
4	Performance Evaluation, Ethics and Trends	15
Total		60

Objectives

SN	Objectives
1	To develop understanding of the sales & distribution processes in organizations
2	To get familiarized with concepts, approaches and the practical aspects of the key decision making variables in sales management and distribution

	channel management
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SN	Modules/ Units
1	Introduction
	<p>a) Sales Management:</p> <ul style="list-style-type: none"> ● Meaning, Role of Sales Department, Evolution of Sales Management ● Interface of Sales with Other Management Functions ● Qualities of a Sales Manager ● Sales Management: Meaning, Developments in Sales Management- Effectiveness to Efficiency, Multidisciplinary Approach, Internal Marketing, Increased Use of Internet, CRM, Professionalism in Selling. ● Structure of Sales Organization – Functional, Product Based, Market Based, Territory Based, Combination or Hybrid Structure <p>b) Distribution Management:</p> <ul style="list-style-type: none"> ● Meaning, Importance, Role of Distribution, Role of Intermediaries, Evolution of Distribution Channels. <p>c) Integration of Marketing, Sales and Distribution</p>
2	Market Analysis and Selling
	<p>a) Market Analysis:</p> <ul style="list-style-type: none"> ● Market Analysis and Sales Forecasting, Methods of Sales Forecasting ● Types of Sales Quotas – Value Quota, Volume Quota, Activity Quota, Combination Quota ● Factors Determining Fixation of Sales Quota ● Assigning Territories to Salespeople <p>b) Selling:</p> <ul style="list-style-type: none"> ● Process of Selling, Methods of Closing a Sale, Reasons for Unsuccessful Closing ● Theories of Selling – Stimulus Response Theory, Product Orientation Theory, Need Satisfaction Theory ● Selling Skills – Communication Skill, Listening Skill, Trust Building Skill, Negotiation Skill, Problem Solving Skill, Conflict Management Skill ● Selling Strategies – Softsell Vs. Hardsell Strategy, Client Centered Strategy, Product-Price Strategy, Win-Win Strategy, Negotiation Strategy ● Difference Between Consumer Selling and Organizational Selling ● Difference Between National Selling and International Selling

SN	Modules/ Units
3	Distribution Channel Management
	<ul style="list-style-type: none"> • Management of Distribution Channel – Meaning & Need • Channel Partners- Wholesalers, Distributors and Retailers & their Functions in Distribution Channel, Difference Between a Distributor and a Wholesaler • Choice of Distribution System – Intensive, Selective, Exclusive • Factors Affecting Distribution Strategy – Locational Demand, Product Characteristics, Pricing Policy, Speed or Efficiency, Distribution Cost • Factors Affecting Effective Management Of Distribution Channels <ul style="list-style-type: none"> ▪ Channel Design ▪ Channel Policy ▪ Channel Conflicts: Meaning, Types – Vertical, Horizontal, Multichannel, Reasons for Channel Conflict ▪ Resolution of Conflicts: Methods – Kenneth Thomas’s Five Styles of Conflict Resolution ▪ Motivating Channel Members ▪ Selecting Channel Partners ▪ Evaluating Channels ▪ Channel Control
4	Performance Evaluation, Ethics and Trends
	<p>a) Evaluation & Control of Sales Performance:</p> <ul style="list-style-type: none"> ● Sales Performance – Meaning ● Methods of Supervision and Control of Sales Force ● Sales Performance Evaluation Criteria- Key Result Areas (KRAs) ● Sales Performance Review ● Sales Management Audit <p>b) Measuring Distribution Channel Performance:</p> <ul style="list-style-type: none"> ● Evaluating Channels- Effectiveness, Efficiency and Equity ● Control of Channel – Instruments of Control – Contract or Agreement, Budgets and Reports, Distribution Audit <p>c) Ethics in Sales Management</p> <p>d) New Trends in Sales and Distribution Management</p>

Course Outcome

Sr. No	Course Outcome
01	Learners will gain knowledge about different components of sales and distribution management.
02	Learners will understand various facets of the job of a sales manager.
03	Learners will be able to focus on decision making aspects and implementation of decisions in sales and distribution management.
04	Learners will learn about different performance evaluation techniques their uses, ethics and trends in sales and distribution.
05	Learners will gain knowledge of sales and distribution management and ability of decision-making and implementation of decision in sales and distribution management.

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Elective Courses

(EC) Group B: Marketing

Electives

4. Customer Relationship Management

Course Code :UMS5CRM

Modules at a Glance

S N	Modules	No. of Lectur es
1	Introduction to Customer Relationship Management	15
2	CRM Marketing Initiatives, Customer Service and Data Management	15
3	CRM Strategy, Planning, Implementation and Evaluation	15
4	CRM New Horizons	15
Total		60

Objectives

SN	Objectives
1	To understand concept of Customer Relationship Management (CRM) and implementation of Customer Relationship Management

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2	To provide insight into CRM marketing initiatives, customer service and designing CRM strategy
3	To understand new trends in CRM, challenges and opportunities for organizations

SN	Modules/ Units
1	Introduction to Customer Relationship Management
	<ul style="list-style-type: none"> ● Concept, Evolution of Customer Relationships: Customers as strangers, acquaintances, friends and partners, Customer Touch Points ● Objectives, Benefits of CRM to Customers and Organisations, Customer Profitability Segments, Components of CRM: Information, Process, Technology and People, Barriers to CRM ● Relationship Marketing and CRM: Relationship Development Strategies: Organizational Pervasive Approach, Managing Customer Emotions, Brand Building through Relationship Marketing, Service Level Agreements, Relationship Challenges, Case Studies on Customer Retention
2	CRM Marketing Initiatives, Customer Service and Data Management
	<ul style="list-style-type: none"> ● CRM Marketing Initiatives: Cross-Selling and Up-Selling, Customer Retention, Behaviour Prediction, Customer Profitability and Value Modeling, Channel Optimization, Personalization and Event-Based Marketing ● CRM and Customer Service: Call Center and Customer Care: Call Routing, Contact Center Sales-Support, Web Based Self Service, Customer Satisfaction Measurement, Call-Scripting, Cyber Agents and Workforce Management ● CRM and Data Management: Types of Data: Reference Data, Transactional Data, Warehouse Data and Business View Data, Identifying Data Quality Issues, Planning and Getting Information Quality, Using Tools to Manage Data, Types of Data Analysis: Online Analytical Processing (OLAP), Clickstream Analysis, Personalisation and Collaborative Filtering, Data Reporting
3	CRM Strategy, Planning, Implementation and Evaluation
	<ul style="list-style-type: none"> ● Understanding Customers: Customer Value, Customer Care, Company Profit Chain: Satisfaction, Loyalty, Retention and Profits ● Objectives of CRM Strategy, The CRM Strategy Cycle: Acquisition, Retention and Win Back, Complexities of CRM Strategy ● Planning and Implementation of CRM: Business to Business CRM, Sales and CRM, Sales Force Automation, Sales Process/ Activity Management, Sales Territory Management, Contact Management, Lead Management, Configuration Support, Knowledge Management CRM Implementation: Steps- Business Planning, Architecture and Design, Technology Selection, Development, Delivery and Measurement ● CRM Evaluation: Basic Measures: Service Quality, Customer Satisfaction and Loyalty, Company 3E Measures: Efficiency, Effectiveness and Employee Change

4	CRM New Horizons
	<ul style="list-style-type: none"> ● e-CRM: Concept, Different Levels of E- CRM, Privacy in E-CRM: ● Software App for Customer Service: <ul style="list-style-type: none"> ▪ Activity Management, Agent Management, Case Assignment, Contract Management, Customer Self Service, Email Response Management, Escalation, Inbound Communication Management, Invoicing, Outbound Communication Management, Queuing and Routing, Scheduling ● Social Networking and CRM ● Mobile-CRM ● CRM Trends, Challenges and Opportunities ● Ethical Issues in CRM ● Industry Specific Use of CRM

Course Outcome

Sr. No	Course Outcome
01	Articulating CRM goals and identify milestones in relationship management.
02	Bonding with customers and building their loyalty.
03	Capability to shift short term customer transactions to a long term relationship mode.
04	Implementation of best CRM strategies and practices.
05	Ability to measure the success of their relationship management efforts.
06	Putting software support in place for providing effective customer services.

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Elective Courses (EC)

Group C: Human Resource Electives

**1. Finance for HR
Professionals and
Compensation
Management**

Course Code : UMS5FCM

Modules at a Glance

S N	Module s	No. of Lectur es
1	Compensation Plans and HR Professionals	15
2	Incentives and Wages	15
3	Compensation to Special Groups and Recent Trends	15
4	Legal and Ethical issues in Compensation	15
Total		60

Objectives

SN	Objectives
1	To orient HR professionals with financial concepts to enable them to make prudent HR decisions

2	To understand the various compensation plans
3	To study the issues related to compensation management and understand the legal framework of compensation management

SN	Modules/ Units
1	Compensation Plans and HR Professionals
	<ul style="list-style-type: none"> ● Meaning, Objectives of Compensation Plans, Role of HR Professionals in Compensation Plans, Types of Compensation: Financial and non-financial, Factors Influencing Compensation ● Compensation Tools: Job based and Skill based, Models: Distributive Justice Model and Labour Market Model, Dimensions of Compensation ● 3 Ps Compensation Concept, Benefits of Compensation: Personal, Health and Safety, Welfare, Social Security ● Pay Structure: Meaning, Features, Factors, Designing the Compensation System, Compensation Scenario in India.
2	Incentives and Wages
	<ul style="list-style-type: none"> ● Incentive Plans – Meaning and Types: Piecework, Team, Incentives for Managers and Executives, Salespeople, Merit pay, Scanlon Pay, Profit Sharing Plan, ESOP, Gain Sharing, Earning at Risk plan, Technology and Incentives. Prerequisites of an Effective Incentive System ● Wage Differentials: Concepts, Factors contributing to Wage Differentials, Types of Wage Differentials, Importance of Wage Differentials, Elements of a Good Wage Plan. ● Theories of Wages: Subsistence Theory, Wage Fund Theory, Marginal Productivity Theory, Residual Claimant Theory, Bargaining Theory.
3	Compensation to Special Groups and Recent Trends
	<ul style="list-style-type: none"> ● Compensation for Special Groups: Team Based pay, Remunerating Professionals, Contract Employees, Corporate Directors, CEOs, Expatriates and Executives. ● Human Resource Accounting – Meaning, Features, Objectives and Methods ● Recent Trends: Golden Parachutes, e-Compensation, Salary Progression Curve, Competency and Skill based, Broad banding and New Pay, Cafeteria approach – Features, Advantages and Disadvantages.
4	Legal and Ethical issues in Compensation
	<ul style="list-style-type: none"> ● Legal Framework of Compensation in India: Wage Policy in India, Payment of Bonus Act 1965, Equal Remuneration Act 1976, Payment of Wages Act 1936, Payment of Gratuity Act 1972, Employee Compensation Act 1923, Employees Provident Funds and Miscellaneous Provision Act 1952. ● Pay Commissions, Wage Boards, Adjudication, Legal considerations, COBRA requirement, Pay Restructuring in Mergers and Acquisitions, Current Issues and Challenges in Compensation Management, Ethics in Compensation Management.

Course Outcome

Sr. No	Course Outcome
01	Learners will understand the basic compensation concepts and the context of compensation practice.
02	Learners will be able to illustrate different ways to strengthen the pay-for performance link.
03	Learners will understand the Legally required employee benefits.
04	Learners will Identify the internal and external environmental factors that have an impact on the pay structure of an organization.
05	Learners will be able to demonstrate an understanding of the process of designing a pay structure taking account of the company environment.

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Elective Courses (EC)

Group C: Human Resource Electives

**2. Strategic Human Resource Management
and HR**

Policies Course

Code : UMS5SHR

Modules at a Glance

S N	Modules	No. of Lectur es
1	SHRM - An Overview	15
2	HR Strategies	15
3	HR Policies	15
4	Recent Trends in SHRM	15
Total		60

Objectives

SN	Objectives
1	To understand human resource management from a strategic perspective
2	To link the HRM functions to corporate strategies in order to understand HR as a strategic resource
3	To understand the relationship between strategic human resource management and organizational performance

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4	To apply the theories and concepts relevant to strategic human resource management in contemporary organizations
5	To understand the purpose and process of developing Human Resource Policies

SN	Modules/ Units
1	SHRM - An Overview
	<ul style="list-style-type: none"> ● Strategic Human Resource Management (SHRM) – Meaning, Features, Evolution, Objectives, Advantages, Barriers to SHRM, SHRM v/s Traditional HRM, Steps in SHRM, Roles in SHRM - Top Management, Front-line Management, HR, Changing Role of HR Professionals, Models of SHRM – High Performance Working Model, High Commitment Management Model, High Involvement Management Model ● HR Environment –Environmental trends and HR Challenges ● Linking SHRM and Business Performance
2	HR Strategies
	<ul style="list-style-type: none"> ● Developing HR Strategies to Support Organisational Strategies, Resourcing Strategy <ul style="list-style-type: none"> – Meaning and Objectives, Strategic HR Planning – Meaning, Advantages, Interaction between Strategic Planning and HRP, Managing HR Surplus and Shortages, Strategic Recruitment and Selection – Meaning and Need, Strategic Human Resource Development – Meaning, Advantages and Process, Strategic Compensation as a Competitive Advantage, Rewards Strategies – Meaning, Importance, Employee Relations Strategy, Retention Strategies, Strategies for Enhancing Employee Work Performance
3	HR Policies
	<ul style="list-style-type: none"> ● Human Resource Policies – Meaning, Features, Purpose of HR Policies, Process of Developing HR Policies, Factors affecting HR Policies, Areas of HR Policies in Organisation, Requisites of a Sound HR Policies – Recruitment, Selection, Training and Development, Performance Appraisal, Compensation, Promotion, Outsourcing, Retrenchment, Barriers to Effective Implementation of HR Policies and Ways to Overcome These Barriers, Need for Reviewing and Updating HR Policies, Importance of Strategic HR Policies to Maintain Workplace Harmony, HR policies for work from home
4	Recent Trends in SHRM
	<ul style="list-style-type: none"> ● i.e. Mentoring ● Employee Engagement – Meaning, Factors Influencing Employee Engagement, Strategies for Enhancing Employee Engagement ● Contemporary Approaches to HR Evaluation – Balance Score Card, HR Score Card, Benchmarking and Business Excellence Model ● Competency based HRM – Meaning, Types of Competencies, Benefits of Competencies for Effective Execution of HRM Functions. ● Human Capital Management –Meaning and Role

	<ul style="list-style-type: none"> • New Approaches to Recruitment – Employer Branding, Special Event Recruiting, Contest Recruitment, e - Recruitment • Strategic International Human Resource Management – Meaning and Features, International SHRM Strategic Issues, Approaches to Strategic International HRM.
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Course Outcome

Sr. No	Course Outcome
01	The learners will be able to understand strategic human resource management so as to address business challenges and accomplish organisational goals.
02	Acquaint the students with various HR strategies that create high performance culture within an organization.
03	Make the students understand and assess the importance of strategic human resource management and its correlation with organizational performance.
04	Familiarize students with the Human Resource Policies and its contribution towards workplace harmony.
05	Gain an insight of the changes and developments in strategic human resource management.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester V

with effect from the Academic Year 2021-2022

Elective Courses (EC)

Group C: Human Resource Electives

3. Performance Management and Career Planning

Course Code : UMS5PMC

Modules at a Glance

S N	Modules	No. of Lectur es
1	Performance Management – An Overview	15
2	Performance Management Process	15
3	Ethics, Under Performance and Key Issues in Performance Management	15
4	Career Planning and Development	15
Total		60

Objectives

SN	Objectives
1	To understand the concept of performance management in organizations
2	To review performance appraisal systems
3	To understand the significance of career planning and practices

SN	Modules/ Units
1	Performance Management – An Overview
	<ul style="list-style-type: none"> ● Performance Management– Meaning, Features, Components of Performance Management, Evolution, Objectives, Need and Importance, Scope, Performance Management Process, Pre-Requisites of Performance Management, Linkage of Performance Management with other HR functions, Performance Management and Performance Appraisal, Performance Management Cycle ● Best Practices in Performance Management, Future of Performance Management. ● Role of Technology in Performance Management
2	Performance Management Process
	<ul style="list-style-type: none"> ● Performance Planning – Meaning, Objectives, Steps for Setting Performance Criteria, Performance Benchmarking ● Performance Managing – Meaning, Objectives, Process ● Performance Appraisal – Meaning, Approaches of Performance Appraisal – Trait Approach, Behaviour Approach, Result Approach ● Performance Monitoring–Meaning, Objectives and Process ● Performance Management Implementation – Strategies for Effective Implementation of Performance Management ● Linking Performance Management to Compensation ● Concept of High Performance Teams
3	Ethics, Under Performance and Key Issues in Performance Management
	<ul style="list-style-type: none"> ● Ethical Performance Management - Meaning, Principles, Significance of Ethics in Performance Management, Ethical Issues in Performance Management, Code of Ethics in Performance Management, Building Ethical Performance Culture, Future Implications of Ethics in Performance Management ● Under Performers and Approaches to Manage Under Performers, Retraining ● Key Issues and Challenges in Performance Management ● Potential Appraisal: Steps, Advantages and Limitations. ● Pay Criteria -Performance related pay, Competence related pay, Team based pay, Contribution related pay.
4	Career Planning and Development
	<ul style="list-style-type: none"> ● Career Planning - Meaning, Objectives, Benefits and Limitations, Steps in Career Planning, Factors affecting Individual Career Planning, Role of Mentor in Career Planning, Requisites of Effective Career Planning

	<ul style="list-style-type: none"> ● Career Development – Meaning, Role of employer and employee in Career Development, Career Development Initiatives ● Role of Technology in Career Planning and Development ● Career Models – Pyramidal Model, Obsolescence Model, Japanese Career Model ● New Organizational Structures and Changing Career Patterns
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Course Outcome

Sr. No	Course Outcome
01	This study acquaints the learners with a perspective of different facets of management of an enterprise.
02	The study on performance management gives an overview on its features, components, its evolution and the best practices in performance management.
03	The study gives knowledge about the performance management process like performance planning, benchmarking, managing and performance appraisal.
04	The learners gain knowledge about the ethics under performance management and its key issues.
05	This course intends to provide knowledge on career planning and development, its benefits and limitations.

**Revised Syllabus of Courses of Bachelor of Management Studies
(BMS)**

**Programme at Semester V
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Elective Courses (EC)

Group C: Human Resource Electives

4. Industrial

Relations Course

Code : UMS5INR

Modules at a Glance

S N	Modules	No. of Lectur es
1	Industrial Relations- An overview	15
2	Industrial Disputes	15
3	Trade Unions and Collective Bargaining	15
4	Industrial Relations Related Laws in India	15
Total		60

Objectives

SN	Objectives
1	To understand the concept of performance management in organizations
2	To review performance appraisal systems
3	To understand the significance of career planning and practices

SN	Modules/ Units
1	Industrial Relations- An overview
	<ul style="list-style-type: none"> • Meaning, Objectives, Characteristics of a good Industrial Relations System/Principles of a good IR/Essentials of good IR, Scope, Significance/Need and Importance of IR, Major Stakeholders of IR, Evolution of IR in India, Factors affecting IR, Role of State, Employers and Unions in IR, Changing Dimensions of IR in India, Impact of Liberalisation, Privatisation and Globalisation on Industrial Relations, Issues and Challenges of industrial relations in India
2	Industrial Disputes
	<p>a) Industrial Disputes:</p> <ul style="list-style-type: none"> • Meaning of Industrial Dispute, Causes, Forms/Types, Consequences/Effects, Methods of Settling Industrial Disputes (Arbitration, Joint Consultations, Works Committee, Conciliation, Adjudication etc) • Concepts Related to Industrial Disputes (Relevant Examples): Strike, Layoff, Lockout, Retrenchment <p>b) Employee Discipline:</p> <ul style="list-style-type: none"> • Meaning, Determinants, Causes of Indiscipline, Code of Discipline and its Enforcement. <p>c) Grievance Handling:</p> <ul style="list-style-type: none"> • Meaning of Grievances, Causes of Grievances, Guidelines for Grievance Handling, Grievance Redressal Procedure in India. <p>d) Workers' Participation in Management:</p> <ul style="list-style-type: none"> • Meaning and Types with Respect to India
3	Trade Unions and Collective Bargaining
	<p>a) Trade Unions:</p> <ul style="list-style-type: none"> • Meaning, Features, Objectives, Role of Trade Unions, Functions/Activities, Types, Evolution of Trade Unions across Globe, Evolution of Trade Unions in India, Structure of Trade Unions in India, Recognition of Trade Unions, Rights and Privileges of Registered Trade Unions, Impact of Globalisation on Trade Unions in India, Central Organisations of Indian Trade Unions : INTUC, AITUC, HMS,UTUC, Problems of Trade Unions in India. <p>b) Collective Bargaining:</p> <ul style="list-style-type: none"> • Meaning, Features, Importance, Scope, Collective Bargaining Process, Prerequisites of Collective Bargaining, Types of Collective Bargaining Contracts, Levels of Collective Bargaining, Growth of Collective Bargaining in India, Obstacles to Collective Bargaining in India.

SN	Modules/ Units
4	Industrial Relations Related Laws in India
	<ul style="list-style-type: none"> • Role of Judiciary in Industrial Relations: Labour Court, Industrial Tribunal, National Tribunal • The Trade Unions Act, 1926; • The Industrial Employment (Standing Orders) Act, 1946; • The Industrial Disputes Act, 1947; • The Factories' Act, 1948 • The Minimum Wages Act, 1948

Course Outcome

Sr. No	Course Outcome
01	The learners will be able to demonstrate descriptive knowledge in the field of Industrial Relations.
02	Apply the essential concepts of Industrial Relations at the organisational level.
03	Understand the genesis of Industrial Disputes & various methods to prevent the same.
04	Analyse how trade unions are helpful in effective communication between the workers and the management through collective bargaining.
05	Familiarize students with the history, provisions of various legislations related to Industrial Relations in India.

**Revised Syllabus of Courses of Bachelor of Management Studies
(BMS)**

**Programme at Semester V
with effect from the Academic Year 2021-2022**

Core Course (CC)

Logistics and Supply Chain

Management Course Code

: UMS5LSM

Modules at a Glance

S N	Modules	No. of Lectur es
1	Overview of Logistics and Supply Chain Management	15
2	Elements of Logistics Mix	15
3	Inventory Management, Logistics Costing, Performance Management and Logistical Network Analysis	15
4	Recent Trends in Logistics and Supply Chain Management	15
Total		60

Objectives

S N	Objectives
1	To provide students with basic understanding of concepts of logistics and supply chain management
2	To introduce students to the key activities performed by the logistics function
3	To provide an insight in to the nature of supply chain, its functions and supply chain systems

4	To understand global trends in logistics and supply chain management
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SN	Modules/ Units
1	Overview of Logistics and Supply Chain Management
	<p>a) Introduction to Logistics Management</p> <ul style="list-style-type: none"> • Meaning, Basic Concepts of Logistics- Logistical Performance Cycle, Inbound Logistics, Inprocess Logistics, Outbound Logistics, Logistical Competency, Integrated Logistics , Reverse Logistics and Green Logistics • Objectives of Logistics, Importance of Logistics, Scope of Logistics, Logistical Functions/Logistic Mix, Changing Logistics Environment <p>b) Introduction to Supply Chain Management</p> <ul style="list-style-type: none"> • Meaning, Objectives, Functions, Participants of Supply Chain, Role of Logistics in Supply Chain, Comparison between Logistics and Supply Chain Management, Channel Management and Channel Integration <p>c) Customer Service: Key Element of Logistics</p> <ul style="list-style-type: none"> • Meaning of Customer Service, Objectives, Elements, Levels of customer service, Rights of Customers <p>d) Demand Forecasting</p> <ul style="list-style-type: none"> • Meaning, Objectives ,Approaches to Forecasting, Forecasting Methods, Forecasting Techniques, (Numerical on Simple Moving Average, Weighted Moving Average)
2	Elements of Logistics Mix
	<p>a) Transportation</p> <ul style="list-style-type: none"> • Introduction, Principles and Participants in Transportation, Transport Functionality, Factors Influencing Transportation Decisions, Modes of Transportation- Railways, Roadways, Airways, Waterways, Ropeways, Pipeline, Transportation Infrastructure, Intermodal Transportation <p>b) Warehousing</p> <ul style="list-style-type: none"> • Introduction, Warehouse Functionality, Benefits of Warehousing, Warehouse Operating Principles, Types of Warehouses, Warehousing Strategies, Factors affecting Warehousing <p>c) Materials Handling</p> <ul style="list-style-type: none"> • Meaning, Objectives, Principles of Materials Handling, Systems of Materials Handling, Equipments used for Materials Handling, Factors affecting Materials Handling Equipments <p>d) Packaging</p> <ul style="list-style-type: none"> • Introduction, Objectives of Packaging, Functions/Benefits of Packaging, Design Considerations in Packaging, Types of Packaging Material, Packaging Costs

SN	Modules/ Units
3	Inventory Management, Logistics Costing, Performance Management and Logistical Network Analysis
	<p>a) Inventory Management</p> <ul style="list-style-type: none"> • Meaning, Objectives, Functions, Importance, Techniques of Inventory Management (Numericals - EOQ and Reorder levels) <p>b) Logistics Costing</p> <ul style="list-style-type: none"> • Meaning, Total Cost Approach, Activity Based Costing, Mission Based Costing <p>c) Performance Measurement in Supply Chain</p> <ul style="list-style-type: none"> • Meaning, Objectives of Performance Measurement, Types of Performance Measurement, Dimensions of Performance Measurement, Characteristics of Ideal Measurement System <p>d) Logistical Network Analysis</p> <ul style="list-style-type: none"> • Meaning, Objectives, Importance, Scope, RORO/LASH
4	Recent Trends in Logistics and Supply Chain Management
	<p>a) Information Technology in Logistics</p> <ul style="list-style-type: none"> • Introduction, Objectives, Role of Information Technology in Logistics and Supply Chain Management, Logistical Information System, Principles of Logistical Information System, Types of Logistical Information System, Logistical Information Functionality, Information Technology Infrastructure <p>b) Modern Logistics Infrastructure</p> <ul style="list-style-type: none"> • Golden Quadrilateral, Logistics Parks, Deep Water Ports, Dedicated Freight Corridor, Inland Container Depots/Container Freight Stations, Maritime Logistics, Double Stack Containers/Unit Trains <p>c) Logistics Outsourcing</p> <ul style="list-style-type: none"> • Meaning, Objectives, Benefits/Advantages of Outsourcing, Third Party Logistics Provider, Fourth Party Logistics Provider, Drawbacks of Outsourcing, Selection of Logistics Service Provider, Outsourcing-Value Proposition <p>d) Logistics in the Global Environment</p> <ul style="list-style-type: none"> • Managing the Global Supply Chain, Impact of Globalization on Logistics and Supply Chain Management, Global Logistics Trends, Global Issues and Challenges in Logistics and Supply Chain Management

Course Outcome

Sr. No	Course Outcome
01	Learners will be able to understand various technical concepts used in logistics and supply chain management.
02	Learners will be able to identify the impact of logistical costing on customer satisfaction.
03	Learners will be able to gain an insight into the nature of supply chain, its functions and supply chain systems.
04	Learners will get an insight into the overall inventory management system for efficient supply chain management, logistics costing, performance measurement and logistics network analysis.
05	Learners will be able to understand global trends in logistics and supply chain management.

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Programme at Semester V
with effect from the Academic Year 2021-2022

Ability Enhancement Courses (AEC)

**5. Corporate Communication & Public Relations Course Code :
 UMS5CCP**

Modules at a Glance

S N	Module s	No. of Lectur es
1	Foundation of Corporate Communication	15
2	Understanding Public Relations	15
3	Functions of Corporate Communication and Public Relations	15
4	Emerging Technology in Corporate Communication and Public Relations	15
Total		60

Objectives

SN	Objectives
1	To provide the students with basic understanding of the concepts of corporate communication and public relations
2	To introduce the various elements of corporate communication and consider their roles in managing organizations
3	To examine how various elements of corporate communication must be coordinated to communicate effectively
4	To develop critical understanding of the different practices associated with corporate communication

SN	Modules/ Units
1	Foundation of Corporate Communication
	<p>a) Corporate Communication: Scope and Relevance</p> <ul style="list-style-type: none"> ● Introduction, Meaning, Scope, Corporate Communication in India, Need/ Relevance of Corporate Communication in Contemporary Scenario <p>b) Keys concept in Corporate Communication</p> <ul style="list-style-type: none"> ● Corporate Identity: Meaning and Features, Corporate Image: Meaning, Factors Influencing Corporate Image, Corporate Reputation: Meaning, Advantages of Good Corporate Reputation <p>c) Ethics and Law in Corporate Communication</p> <ul style="list-style-type: none"> ● Importance of Ethics in Corporate Communication, Corporate Communication and Professional Code of Ethics, Mass Media Laws: Defamation, Invasion of Privacy, Copyright Act, Digital Piracy, RTI
2	Understanding Public Relations
	<p>a) Fundamental of Public Relations:</p> <ul style="list-style-type: none"> ● Introduction, Meaning, Essentials of Public Relations, Objectives of Public Relations, Scope of Public Relations, Significance of Public Relations in Business <p>b) Emergence of Public Relations:</p> <ul style="list-style-type: none"> ● Tracing Growth of Public Relations, Public Relations in India, Reasons for Emerging International Public Relations <p>c) Public Relations Environment:</p> <ul style="list-style-type: none"> ● Introduction, Social and Cultural Issues, Economic Issues, Political Issues, Legal Issues <p>d) Theories used in Public Relations:</p> <ul style="list-style-type: none"> ● Systems Theory, Situational Theory, Social Exchange Theory, Diffusion Theory
3	Functions of Corporate Communication and Public Relations
	<p>a) Media Relations:</p> <ul style="list-style-type: none"> ● Introduction, Importance of Media Relations, Sources of Media Information, Building Effective Media Relations, Principles of Good Media Relations <p>b) Employee Communication:</p> <ul style="list-style-type: none"> ● Introduction, Sources of Employee Communications, Organizing Employee Communications, Benefits of Good Employee Communications, Steps in Implementing An Effective Employee Communications Programme, Role of Management in Employee Communications

	<p>c) Crisis Communication:</p> <ul style="list-style-type: none"> • Introduction, Impact of Crisis, Role of Communication in Crisis, Guidelines for Handling Crisis, Trust Building <p>d) Financial Communication:</p> <ul style="list-style-type: none"> • Introduction, Tracing the Growth of Financial Communication in India, Audiences for Financial Communication, Financial Advertising
4	Emerging Technology in Corporate Communication and Public Relations
	<p>a) Contribution of Technology to Corporate Communication</p> <ul style="list-style-type: none"> • Introduction, Today's Communication Technology, Importance of Technology to Corporate Communication, Functions of Communication Technology in Corporate Communication, Types of Communication Technology, New Media: Web Conferencing, Really Simple Syndication (RSS) <p>b) Information Technology in Corporate Communication</p> <ul style="list-style-type: none"> • Introduction, E-media Relations, E-internal Communication, E-brand Identity and Company Reputation <p>c) Corporate Blogging</p> <ul style="list-style-type: none"> • Introduction, Defining Corporate Blogging, Characteristics of a Blog, Types of Corporate Blogs, Role of Corporate Blogs, Making a Business Blog • Digital Language, Managing & Monitoring E-Office

Course Outcome

Sr. No	Course Outcome
01	The study on Corporate Communication and Public Relation helps the learners to get a brief idea about their work life, how to understand their assignments and deliverables.
02	This study helps the learners about how quality work life can be improved.
03	Corporate communication study can help in benefiting and improving the communication between corporate, employees and the public.
04	It gives a brief idea about how effective business communication increases productivity.
05	This study emphasizes on the aspect to work more efficiently, with less human error.
06	This study helps the learners to understand the main functions of Corporate communication and public relations.

Bachelor of Management Studies (BMS)
Programme
Under Choice Based Credit, Grading and Semester System
Course Structure
 (To be implemented from Academic Year : 2021-2022)

Semester VI

No. of Courses	Semester VI	Credits
1	<i>Elective Courses (EC)</i>	
1,2,3 & 4	**Any four courses from the following list of the courses	12
2	<i>Core Course (CC)</i>	
UMS6OPR	Operation Research	04
3	<i>Ability Enhancement Course (AEC)</i>	
UMS6PRW	Project Work	04
Total Credits		20

** List of group of Elective Courses(EC)for Semester VI (Any Four)	
Group A: Finance Electives (Any four Courses)	
UMS6IFS	Innovative Financial Services
UMS6PRM	Project Management
UMS6SFM	Strategic Financial Management
UMS6INT	Indirect Taxes
Group B: Marketing Electives (Any four Courses)	
UMS6BRM	Brand Management
UMS6REM	Retail Management
UMS6INM	International Marketing
UMS6MPM	Media Planning & Management
Group C: Human Resource Electives (Any four Courses)	
UMS6HGP	HRM in Global Perspective
UMS6ORD	Organisational Development
UMS6HSM	HRM in Service Sector Management
UMS6IEM	Indian Ethos in Management

**Revised Syllabus of Courses of Bachelor of Management Studies
(BMS)**

**Programme at Semester VI
with effect from the Academic Year 2021-2022**

Elective Courses (EC)

Group A: Finance

Electives

1. Innovative Financial Services

Course Code : UMS6IFS

Modules at a Glance

S N	Module s	No. of Lectur es
1	Introduction to Traditional Financial Services	15
2	Issue Management and Securitization	15
3	Financial Services and its Mechanism	15
4	Consumer Finance and Credit Rating	15
Total		60

Objectives

SN	Objectives
1	To familiarize the learners with the fundamental aspects of various issues associated with various Financial Services
2	To give a comprehensive overview of emerging financial services in the light of globalization

3	To introduce the basic concepts, functions, process, techniques and create an awareness of the role, functions and functioning of financial services
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SN	Modules/ Units
1	Introduction to Traditional Financial Services
	<p>a) Financial Services:</p> <ul style="list-style-type: none"> ● Concept, Objectives/Functions, Characteristics, Financial Service Market, Financial Service Market Constituents, Growth of Financial Services in India, Problems in Financial Services Sector, Banking and Non-Banking Companies, Regulatory Framework <p>b) Factoring and Forfaiting:</p> <ul style="list-style-type: none"> ● Introduction, Types of Factoring, Theoretical Framework, Factoring Cost, Advantages and Disadvantages of Factoring, Factoring in India, Factoring v/s Forfaiting, Working of Forfaiting, Benefits and Drawbacks of Forfaiting, Practical Problems. <p>c) Bill Discounting:</p> <ul style="list-style-type: none"> ● Introduction, Framework, Bill Market Schemes, Factoring V/s Bill Discounting in Receivable Management.
2	Issue Management and Securitization
	<p>a) Issue Management and Intermediaries:</p> <ul style="list-style-type: none"> ● Introduction, Merchant Bankers/ Lead Managers, Underwriters, Bankers to an Issue, Brokers to an Issue <p>b) Stock Broking:</p> <ul style="list-style-type: none"> ● Introduction, Stock Brokers, SubBrokers, Foreign Brokers, Trading and Clearing/Self Clearing Members, Stock Trading (Cash and Normal) Derivative Trading <p>c) Securitization:</p> <ul style="list-style-type: none"> ● Definition, Securitization v/s Factoring, Features of Securitization, Pass Through Certificates, Securitization Mechanism, Special Purpose Vehicle, Securitisable Assets, Benefits of Securitization, New Guidelines on Securitization
3	Financial Services and its Mechanism
	<p>a) Lease and Hire-Purchase:</p> <ul style="list-style-type: none"> ● Meaning, Types of Lease - Finance Lease, Operating Lease, Advantages and Disadvantages of Leasing, Leasing in India, Legal Aspects of Leasing. ● Definition of Hire Purchase, Hire Purchase and Installment Sale Characteristics, Hire Purchase and Leasing, Advantages of Hire Purchase, Problems of Hire Purchase. <p>b) Housing Finance:</p> <ul style="list-style-type: none"> ● Introduction, Housing Finance Industry, Housing Finance Policy Aspect, Sources of Funds, Market of Housing Finance, Housing Finance in India- Major

	<p>Issues, Housing Finance in India – Growth Factors, Housing Finance Institutions in India,</p>
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	<p>National Housing Bank (NHB), Guidelines for Asset Liability Management System in HFC, Fair Trade Practice Code for HFC's, Housing Finance Agencies</p> <p>c) Venture Capital: Introduction, Features of Venture Capital, Types of Venture Capital Financing Stages, Disinvestment mechanisms, Venture Capital Investment process, Indian Scenario</p>
4	Consumer Finance and Credit Rating
	<p>a) Consumer Finance:</p> <ul style="list-style-type: none"> • Introduction, Sources, Types of Products, Consumer Finance Practice in India, Mechanics of Consumer Finance, Terms, Pricing, Marketing and Insurance of Consumer Finance, Consumer Credit Scoring, Case for and against Consumer Finance <p>b) Plastic Money:</p> <ul style="list-style-type: none"> • Growth of Plastic Money Services in India, Types of Plastic Cards- Credit card- Debit Card- Smart card- Add-on Cards, Performance of Credit Cards and Debit Cards, Benefits of Credit Cards, Dangers of Debit Cards, Prevention of Frauds and Misuse, Consumer Protection. Indian Scenario. • Smart Cards- Features, Types, Security Features and Financial Applications <p>c) Credit Rating:</p> <ul style="list-style-type: none"> • Meaning, Origin, Features, Advantages of Rating, Regulatory Framework, Credit Rating Agencies, Credit Rating Process, Credit Rating Symbols. Credit Rating Agencies in India, Limitations of Rating

Course Outcome

Sr. No	Course Outcome
01	Help the learners to understand traditional as well as modern financial services based on Fee based and Fund based services
02	Learners will gain a knowledge about various intermediaries between the industry and the investors and the process of securitization
03	Help the learners to understand the facility available in the financial market regarding leasing , Hire purchase , housing finance etc.
04	Learners will learn about the financial products available in the market related with consumer durables and plastic money
05	This course will provide the overall knowledge about Innovative financial services and financial products available in current market scenario

**Revised Syllabus of Courses of Bachelor of Management Studies
(BMS)**

**Programme at Semester VI
with effect from the Academic Year 2021-2022**

Elective Courses (EC)

Group A: Finance

Electives

2. Project Management

Course Code : UMS6PRM

Modules at a Glance

S N	Module s	No. of Lectur es
1	Introduction to Project Management & Project Initiation	15
2	Analyzing Project Feasibility	15
3	Budgeting, Cost & Risk Estimation in Project Management	15
4	New Dimensions in Project Management	15
Total		60

Objectives

SN	Objectives
1	The objective of this course is to familiarize the learners with the fundamental aspects of various issues associated with Project Management
2	To give a comprehensive overview of Project Management as a separate area

T. Y. BMS, Management Studies

	of Management
3	To introduce the basic concepts, functions, process, techniques and create an awareness of the role, functions and functioning of Project Management

SN	Modules/ Units
1	Introduction to Project Management & Project Initiation
	<p>a) Introduction to Project Management:</p> <ul style="list-style-type: none"> ● Meaning/Definition of Project & Project Management, Classification of Projects, Why Project Management, Characteristics/Importance of Project Management, Need for Project Management (Objectives), History of Project Management <p>b) Organizational Structure (Project Organization):</p> <ul style="list-style-type: none"> ● Meaning/Definition of Organizational Structure, Organizational Work Flow, Developing Work Integration Positions, Types of Organizational Structure, Forms of Organization, Strategic Business Units (SBU) in Project Management. <p>c) Project Initiation:</p> <ul style="list-style-type: none"> ● Project Selection-Meaning of Project Selection, Importance of Project Selection, Criteria for Project Selection (Models), Types of Project Selection, Understanding Risk & Uncertainty in Project Selection ● Project Manager-Meaning of Project Manager, Role of Project Manager, Importance of Project Manager, Role of Consultants in Project Management, Selecting Criteria for Project Manager ● Project Planning-Importance of Project Planning, Functions of Project Planning, System Integration, Project Management Life Cycle, Conflicts & Negotiation Handling in Project Management, Planning Cycle & Master Production Scheduling
2	Analyzing Project Feasibility

a) Project Feasibility Analysis:

- Meaning/Definition of Project Feasibility, Importance of Project Feasibility, Scope of Project Feasibility
- Types of Project Feasibility- Market Feasibility, Technical Feasibility, Financial Feasibility, Economic Viability, Operational Feasibility
- SWOT Analysis (Environment Impact Assessment, Social Cost Benefit Analysis)

b) Market Analysis:

- Meaning of Market Analysis, Demand Forecasting, Product Mix Analysis, Customer Requirement Analysis

c) Technical Analysis:

- Meaning of Technical Analysis, Use of Various Informational Tools for Analyzing,
Advancement in the Era of E- Commerce in Project Management

d) Operational Analysis:

- Meaning of Operation Management, Importance of Operation Management,
Operation Strategy - Levels of Decisions, Production Planning & Control,
Material Management - Work Study & Method Study, Lean Operations

3	Budgeting, Cost & Risk Estimation in Project Management
	<p>a) Funds Estimation in Project:</p> <ul style="list-style-type: none"> • Means of Financing, Types of Financing, Sources of Finance, Government Assistance towards Project Management for Start ups, Cost Control (Operating Cycle, Budgets & Allocations), Determining Financial Needs for Projects, Impact of Leveraging on Cost of Finance <p>b) Risk Management in Projects:</p> <ul style="list-style-type: none"> • What is Risk, Types of Risk in Projects, Risk Management Process, Risk Analysis & Identification, Impact of Risk Handling Measures, Work break Down Structure, New Venture Valuation (Asset Based, Earnings Based, Discounted Cash flow Models) <p>c) Cost Benefit Analysis in Projects</p> <ul style="list-style-type: none"> • Introduction to Cost Benefit Analysis, Efficient Investment Analysis, Cash - Flow Projections, Financial Criteria for Capital Allocation, Strategic Investment Decisions
4	New Dimensions in Project Management
	<p>a) Modern Development in Project Management:</p> <ul style="list-style-type: none"> • Introduction to Modern Development in Project Management, Project Management Maturity Model (PMMM), Continuous Improvement, Developing Effective Procedural Documentation, Capacity Planning <p>b) Project Monitoring & Controlling:</p> <ul style="list-style-type: none"> • Introduction to Project Monitoring & Controlling, The Planning – Monitoring- Controlling Cycle, Computerized Project Management Information System (PMIS), Balance in Control System in Project Management, Project Auditing Life Cycle <p>c) Project Termination & Solving Project Management Problems:</p> <ul style="list-style-type: none"> • Meaning of Project Termination, Reasons for Termination of Projects, Process for Terminating Projects, Strategy/ Ways to Solve Project Management Problems, Project Review & Administrative Aspects, Execution Tools for Closing of Projects

Course Outcome

Sr. No	Course Outcome
01	Enable students to apply project management practices to the launch of new programs, products and services.
02	To provide overview of planning and controlling activities to effectively produce and deliver goods and services.
03	Enable students to analyze and evaluate appropriate business strategies and practices.
04	To impart knowledge about capital budgeting, capital structure and asset valuation.
05	Develop strategies to initiate, plan, execute, monitor and control and close projects in business environment.
06	To equip students with necessary tools to conduct detailed project feasibility analysis and viability study.

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Studies (BMS)
Programme at Semester VI
with effect from the Academic Year 2021-2022**

Elective Courses (EC)

Group A: Finance

Electives

3. Strategic Financial Management

Course Code : UMS6SFM

Modules at a Glance

S N	Modules	No. of Lectures
1	Dividend Decision and XBRL	15
2	Capital Budgeting and Capital Rationing	15
3	Shareholder Value and Corporate Governance/ Corporate Restructuring	15
4	Financial Management in Banking Sector and Working Capital Financing	15
Total		60

Objectives

SN	Objectives
1	To match the needs of current market scenario and upgrade the learner's skills and knowledge for long term sustainability
2	Changing scenario in Banking Sector and the inclination of learners towards choosing banking as a career option has made study of financial management in banking sector inevitable
3	To acquaint learners with contemporary issues related to financial management

SN	Modules/ Units
1	Dividend Decision and XBRL
	<p>a) Dividend Decision:</p> <ul style="list-style-type: none"> ● Meaning and Forms of Dividend, Dividend-Modigliani and Miller's Approach, Walter Model, Gordon Model, Factors determining Dividend Policy, Types of Dividend Policy <p>b) XBRL:</p> <ul style="list-style-type: none"> ● Introduction, Advantages and Disadvantages, Features and Users
2	Capital Budgeting and Capital Rationing
	<p>a) Capital Budgeting:</p> <ul style="list-style-type: none"> ● Risk and Uncertainty in Capital Budgeting, Risk Adjusted Cut off Rate, Certainty Equivalent Method, Sensitivity Technique, Probability Technique, Standard Deviation Method, Co-efficient of Variation Method, Decision Tree Analysis, Construction of Decision Tree. <p>b) Capital Rationing:</p> <ul style="list-style-type: none"> ● Meaning, Advantages, Disadvantages, Practical Problems
3	Shareholder Value and Corporate Governance/Corporate Restructuring
	<p>a) Shareholder Value and Corporate Governance:</p> <ul style="list-style-type: none"> ● Financial Goals and Strategy, Shareholder Value Creation: EVA and MVA Approach, Theories of Corporate Governance, Practices of Corporate Governance in India <p>b) Corporate Restructuring:</p> <ul style="list-style-type: none"> ● Meaning, Types, Limitations of Merger, Amalgamation, Acquisition, Takeover, Determination of Firm's Value, Effect of Merger on EPS and MPS, Pre Merger and Post Merger Impact.
4	Financial Management in Banking Sector and Working Capital Financing
	<p>a) Financial Management in Banking Sector:</p> <ul style="list-style-type: none"> ● An Introduction, Classification of Investments, NPA & their Provisioning, Classes of Advances, Capital Adequacy Norms, Rebate on Bill Discounting, Treatment of Interest on Advances <p>b) Working Capital Financing:</p> <ul style="list-style-type: none"> ● Maximum Permissible Bank Finance (Tandon Committee), Cost of issuing Commercial Paper and Trade Credit, Matching Approach, Aggressive Approach, Conservative Approach

Course Outcome

Sr. No	Course Outcome
01	Learners will understand the basis of various dividend policy framed by the companies and models used for calculation of dividend
02	Learners will learn the assessment tools to evaluate the projects which will be base for taking decision to start with or not to start with new projects
03	Help the learners to understand the concept of corporate governance and corporate restructuring like merger, acquisition , takeover etc.
04	Learners will gain the knowledge about short term finance and Banking norms on NPAs
05	This course will provide the overall knowledge about strategic financial management

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Elective Courses (EC)

Group A: Finance

Electives

Indirect Taxes

Course Code : UMS6INT

Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to Indirect Taxation and GST	10
2	Concept of Supply	20
3	Registration and Computation of GST	20
4	Filing of Returns	10
	Total	60

Objectives

SN	Objectives
01	To understand the basics of GST
02	To study the registration and computation of GST
03	To acquaint the students with filing of returns in GST

Sr. No.	Modules / Units
1	Introduction to Indirect Taxation and GST
	<p>A. Basics for Taxation - Direct Taxes and Indirect Taxes – Difference, Advantages and Disadvantages, Sources and Authority of Taxes in India (Art 246 of the Indian Constitution)</p> <p>B. Introduction to GST – Genesis of GST in India, Power to tax GST (Constitutional Provisions), Extent and Commencement, Meaning and Definition of GST, Benefits of GST, Conceptual Framework – CGST, IGST, SGST, UTGST, Imports of goods or services or both, Export of goods or services or both, Taxes subsumed and not subsumed under GST.</p> <p>C. Definitions – Goods (2(52) of CGST Act), Services (2(102) of CGST Act), Money (2(75) of CGST Act), Securities (2(101) of SCRA Act,1956), India(2(56) of CGST Act), Persons (2(84) of CGST Act),Taxable Person (2(107) of CGST Act), Business (2(17) of CGST Act), Consideration(2(31) of CGST Act), E- Commerce Operator (2(45) of CGST Act), Supplier(2(105) of CGST Act),Recipient(2(93) of CGST Act)</p> <p>D. Levy and Collection of GST – Levy and Collection of CGST, IGST, SGST,UTGST (Sec 9 of CGST Act), Composition Scheme under GST (Sec 10 of CGST Act), Power to Grant Exemption (Sec 11 of CGST Act) GST Rate Schedule for Goods and Services.</p>
2	Concept of Supply
	<p>A. Taxable Event Supply– Meaning and Scope of Supply (Section 7 Subsection 1, 2 and 3 of Act) Schedule I, Schedule II, Schedule III, Composite and Mixed Supplies (Sec 8 of CGST Act)</p> <p>B. Place of Supply – Location of Supplier of Goods and Services, Place of Supply of Goods (Sec 10, 11,12 and 13 of IGST Act), Special Provision for Payment of Tax by a Supplier of Online Information Database Access Retrieval.</p> <p>C. Time of Supply- Time of Supply (Sec 31 of CGST Act), Issue of Invoice by the Supplier (Sec 31 (1) and Sec 31(2)of CGST Act), Continuous Supply of Goods and Services, Goods Sent on Approval (Sec 31(7) of CGST Act)</p> <p>D. Value of Supply – Determination of Value of Supply (Sec 15 of CGST Act and CGST Rules 2017), Input Tax Credit (Sec 2(62) of CGST Act) Capital Goods (Sec 2(19) of CGST Act), Input Sec 2(59) of CGST Act), Input Service (Sec 2(60) of CGST Act). Eligibility and Conditions for taking Input Tax Credit (Sec 16 of CGST Act)</p>
3	Registration and Computation of GST
	<p>A. Registration – Persons liable for Registration (Sec 22 of the Act), Persons not liable for Registration, Procedure for Registration (Sec 25 of the Act), Deemed Registration(Sec 26 of the Act), Special Provisions (Sec 27 of the Act), Amendment, Cancellation and Revocation of Registration(Sec 28,Sec29and Sec 31 of the Act)</p> <p>B. Computation of GST – Computation of GST under Inter State and Intra State Supplies.</p> <p>C. Payment of Tax- Payment of Tax, Interest and other Amounts(Sec 49 of the Act), Interest on delayed Payment (Sec 50 of the Act), TDS (Sec 51 of the Act), TCS (Sec 52 of the Act)</p>

4	Filing of Returns
	<p>A. Documentation- Tax Invoices (Sec 31 and 32 of the Act), Credit and Debit notes (Sec 34 of the Act), Electronic Way Bill</p> <p>B. Returns –Types of Returns and Provisions relating to filing of Returns (Sec 37 to Sec 48 of the Act)</p>

Course Outcomes

SN	Outcomes
01	Learners will be able to learn the background of GST.
02	Learners will learn the definitions covered under GST.
03	Learners will learn levy & collection of GST and composition scheme.
04	Learners will understand supply concepts in terms of place, time and value of supply.
05	Learners will be able to learn how to adjust input tax credit and make GST payments.
06	Learners will learn the registration procedure for GST.
07	Learners will learn the documentation and filing of returns.
08	Learners will gain knowledge on GST and application of the same in an organization.

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Elective Courses

(EC) Group B: Marketing

Electives

1. Brand Management

Course Code : UMS6BRM

Modules at a Glance

S N	Modules	No. of Lectures
1	Introduction to Brand Management	15
2	Planning and Implementing Brand Marketing Programs	15
3	Measuring and Interpreting Brand Performance	15
4	Growing and Sustaining Brand Equity	15
Total		60

Objectives

SN	Objectives
1	To understand the meaning and significance of Brand Management
2	To Know how to build, sustain and grow brands
3	To know the various sources of brand equity

SN	Modules/ Units
1	Introduction to Brand Management
	<p>a) Introduction to Brand Management:</p> <ul style="list-style-type: none"> ● Meaning of Brand, Branding, Brand Management, Importance of Branding to Consumers, Firms, Brands v/s Products, Scope of Branding, Branding Challenges and Opportunities, Strategic Brand Management Process, Customer Based Brand Equity model (CBBE), Sources of Brand Equity, Steps of Brand Building including Brand Building Blocks, Brand Positioning: Meaning, Importance, Basis
2	Planning and Implementing Brand Marketing Programs
	<p>a) Planning and Implementing Brand Marketing Programs:</p> <ul style="list-style-type: none"> ● Brand Elements: Meaning, Criteria for choosing Brand Elements, Types of Brand Elements ● Integrating Marketing Programs and Activities ● Personalising Marketing: Experiential Marketing, One to One Marketing, Permission Marketing ● Product Strategy: Perceived Quality and Relationship Marketing ● Pricing Strategy: Setting Prices to Build Brand Equity ● Channel Strategy: Direct, Indirect Channels ● Promotion Strategy: Developing Integrated Marketing Communication Programs ● Leveraging Secondary Brand Associations to Build Brand Equity: Companies, Countries, Channel of Distribution, Co-branding, Characters, Events.
3	Measuring and Interpreting Brand Performance
	<p>a) The Brand Value Chain</p> <p>b) Measuring Sources of Brand Equity:</p> <ul style="list-style-type: none"> ● Qualitative Research Techniques: Projective Techniques: Completion, Comparison, Brand Personality and Values: The Big Five, Free Association ● Quantitative Research Techniques: Brand Awareness: Recognition, Recall, Brand Image, Brand Responses <p>c) Young and Rubicam's Brand Asset Valuator</p> <p>d) Measuring Outcomes of Brand Equity</p> <ul style="list-style-type: none"> ● Comparative Methods: Brand based Comparative Approaches, Marketing Based Comparative Approaches, Conjoint Analysis ● Holistic Methods: Residual Approaches, Valuation Approaches: Historical Perspectives and Interbrand's Brand Valuation Methodology

4	Growing and Sustaining Brand Equity
	<p>a) Designing & Implementing Branding Strategies:</p> <ul style="list-style-type: none"> ● Brand Architecture: Meaning of Brand Architecture, The Brand-Product Matri, Breadth of a Branding Strategy, Depth of a Branding Strategy ● Brand Hierarchy: Meaning of Brand Hierarchy, Building Equity at Different Hierarchy Levels ● Cause Marketing to Build Brand Equity: Meaning of Cause Marketing, Advantages, Green Marketing <p>b) Brand Extensions:</p> <ul style="list-style-type: none"> ● Meaning, Advantages, Disadvantages, Brand Extension and Brand Equity <p>c) Managing Brands over Time:</p> <ul style="list-style-type: none"> ● Reinforcing Brands, Revitalising Brands <p>d) Building Global Customer Based Brand Equity</p>

Course Outcome

Sr. No	Course Outcome
01	Learners will be able to understand the meaning and significance of brand management.
02	Learners will be able to know how to build, sustain and grow brands.
03	Learners will get ideas about various sources of brand equity.
04	Learners will be able to plan and implement various brand management programmes.
05	This course will enable the learners to apply what they have learnt theoretically.
06	Learners will consider ethical issues in Branding and Brand Management.
07	Learners will get ideas to Formulate effective branding strategies for both consumer and business products/services.
08	Learners will be able to learn key strategies for developing brands including brand ownership, brand and line extensions, co-branding and licensing the brand-building process.

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Elective Courses

(EC) Group B: Marketing

Electives

2. Retail Management

**Course Code : UMS6REM
Modules at a Glance**

S N	Module s	No. of Lectures
1	Retail Management- An overview	15
2	Retail Consumer and Retail Strategy	15
3	Merchandise Management and Pricing	15
4	Managing and Sustaining Retail	15
Total		60

Objectives

SN	Objectives
1	To familiarize the students with retail management concepts and operations
2	To provide understanding of retail management and types of retailers
3	To develop an understanding of retail management terminology including merchandize management, store management and retail strategy.
4	To acquaint the students with legal and ethical aspects of retail management

5	To create awareness about emerging trends in retail management
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SN	Modules/ Units
1	Retail Management- An overview
	<p>a) Retail Management:</p> <ul style="list-style-type: none"> ● Introduction and Meaning, Significance, Factors Influencing Retail Management, Scope of Retail Management <p>b) Retail Formats:</p> <ul style="list-style-type: none"> ● Concept of Organized Retailing: Factors Responsible for the Growth of Organized Retail in India, Multichannel Retailing: Meaning and Types, E-tailing: Meaning, Advantages and Limitations <p>c) Emerging Trends in Retailing</p> <ul style="list-style-type: none"> ● Impact of Globalization on Retailing ● I.T in Retail: Importance, Advantages and Limitations, Applications of I.T. in Retail: EDI, Bar Coding, RFID Tags, Electronic Surveillance, Electronic Shelf Labels ● FDI in Retailing: Meaning, Need for FDI in Indian Retail Scenario ● Franchising: Meaning, Types, Advantages and Limitations, Franchising in India ● Green Retailing ● Airport Retailing
2	Retail Consumer and Retail Strategy
	<p>a) Retail Consumer/Shopper:</p> <ul style="list-style-type: none"> ● Meaning of Retail Shopper, Factors Influencing Retail Shoppers, Changing Profile of Retail Shoppers, Market Research as a Tool for Understanding Retail Markets and Shoppers <p>b) CRM in Retail:</p> <ul style="list-style-type: none"> ● Meaning, Objectives ● Customer Retention Approaches: Frequent Shopper Programme, Special Customer Services, Personalization, Community <p>c) Retail Strategy:</p> <ul style="list-style-type: none"> ● Meaning, Steps in Developing Retail Strategy, Retail Value Chain <p>d) Store Location Selection:</p> <ul style="list-style-type: none"> ● Meaning, Types of Retail Locations, Factors Influencing Store Location <p>e) HRM in Retail:</p> <ul style="list-style-type: none"> ● Meaning, Significance, Functions ● Organization Structure in Retail: Meaning, Factors Influencing Designing Organization Structure, Organization Structure for Small Stores/Single Stores/Independent Retailers and Retail Store Chain/Department Store

SN	Modules/ Units
3	Merchandise Management and Pricing
	<p>a) Merchandise Management</p> <ul style="list-style-type: none"> ● Concept, Types of Merchandise, Principles of Merchandising, Merchandise Planning- Meaning and Process, Merchandise Category – Meaning, Importance, Components, Role of Category Captain, Merchandise Procurement/Sourcing- Meaning, Process, Sources for Merchandise <p>b) Buying Function:</p> <ul style="list-style-type: none"> ● Meaning, Buying Cycle, Factors Affecting Buying Functions, Functions of Buying for Different Types of Organizations Young and Rubicam's Brand Asset Valuator- Independent Store, Retail Chain, Non-store Retailer <p>c) Concept of Lifestyle Merchandising</p> <p>d) Private Label</p> <ul style="list-style-type: none"> ● Meaning, Need and Importance, Private Labels in India <p>e) Retail Pricing</p> <ul style="list-style-type: none"> ● Meaning, Considerations in Setting Retail Pricing ● Pricing Strategies: High/ Low Pricing: Meaning, Benefits, Everyday Low Pricing: Meaning, Benefits, Market Skimming, Market Penetration, Leader Pricing, Odd Pricing, Single Pricing, Multiple Pricing, Anchor Pricing ● Variable Pricing and Price Discrimination- Meaning Types: <ul style="list-style-type: none"> ▪ Individualized Variable Pricing/First Degree Price ▪ Self-Selected Variable Pricing/ Second Degree Price Discrimination- Clearance and Promotional Markdowns, Coupons, Price Bundling, Multiple – Unit Pricing ▪ Variable Pricing by Market Segment/ Third Degree Price Discrimination
4	Managing and Sustaining Retail
	<p>a) Retail Store Operations:</p> <ul style="list-style-type: none"> ● Meaning, Responsibilities of Store Manager, The 5 S's of Retail Operations (Systems, Standards, Stock, Space, Staff) <p>b) Store Design and Layout:</p> <ul style="list-style-type: none"> ● Store Design- Meaning, Objectives, Principles, Elements of Exterior and Interior Store Design, Store Atmospherics and Aesthetics ● Store Layout- Meaning, Types: Grid, Racetrack, Free Form ● Signage and Graphics: Meaning, Significance, Concept of Digital Signage ● Feature Areas: Meaning, Types: Windows, Entrances, Freestanding Displays, End Caps, Promotional Aisles, Walls, Dressing Rooms, Cash Wraps

SN	Modules/ Units
	<p>c) Visual Merchandising and Display:</p> <ul style="list-style-type: none"> ● Visual Merchandising- Meaning, Significance, Tools Used for Visual Merchandising ● The Concept of Planogram ● Display- Meaning, Methods of Display, Errors in Creating Display <p>d) Mall Management</p> <ul style="list-style-type: none"> ● Meaning and Components: Positioning, Zoning, Promotion and Marketing, Facility Management, Finance Management <p>e) Legal and Ethical Aspects of Retailing</p> <ul style="list-style-type: none"> ● Licenses/Permissions Required to Start Retail Store in India ● Ethical Issues in Retailing <p>Career Options in Retailing</p>

Course Outcome

Sr. No	Course Outcome
01	Learners will gain knowledge of all functional areas of retailing and essential principles of retailing.
02	Learners will get knowledge of essential principles of retailing.
03	Learners will gain insight of the Indian retailing scenario.
04	Learners will develop a sense of legal and ethical aspects of retail management.
05	Learners will be able to understand retail management terminology

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Elective Courses

(EC) Group B: Marketing

Electives

3. International Marketing

Course Code : UMS6INM

Modules at a Glance

S N	Module s	No. of Lectur es
1	Introduction to International Marketing & Trade	15
2	International Marketing Environment and Marketing Research	15
3	International Marketing Mix	15
4	Developments in International Marketing	15
Total		60

Objectives

SN	Objectives
1	To understand International Marketing, its Advantages and Challenges.
2	To provide an insight on the dynamics of International Marketing Environment.
3	To understand the relevance of International Marketing Mix decisions and recent developments in Global Market

SN	Modules/ Units
1	Introduction to International Marketing & Trade
	<p>a) Introduction of International Marketing:</p> <ul style="list-style-type: none"> • Meaning, Features of International Marketing, Need and Drivers of International Marketing, Process of International Marketing, Phases of International Marketing, Benefits of International Marketing, Challenges of International Marketing, Difference between Domestic and International Marketing, Different Orientations of International Marketing : EPRG Framework, Entering International Markets :Exporting, Licensing, Franchising, Mergers and Acquisition, Joint Ventures, Strategic Alliance, Wholly Owned Subsidiaries, Contract Manufacturing and Turnkey Projects, Concept of Globalization <p>b) Introduction to International Trade:</p> <ul style="list-style-type: none"> • Concept of International Trade, Barriers to Trade: Tariff and Non Tariff, Trading Blocs : SAARC, ASEAN, NAFTA, EU, OPEC
2	International Marketing Environment and Marketing Research
	<p>a) International Marketing Environment:</p> <ul style="list-style-type: none"> • Economic Environment : International Economic Institution (World Bank, IMF, IFC) ,International Economic Integration (Free Trade Agreement, Customs Union, Common Market, Economic Union) • Political and Legal Environment: Political System (Democracy, Authoritarianism, Communism), Political Risk, Political Instability, Political Intervention. Legal Systems (Common Law, Civil Law, Theocratic Law), Legal Differences, Anti Dumping Law and Import License. • Cultural Environment : Concept , Elements of Culture (Language, Religion, Values and Attitude , Manners and Customs, Aesthetics and Education) , HOFSTEDE's Six Dimension of Culture , Cultural Values (Individualism v/s Collectivism) <p>b) Marketing Research:</p> <ul style="list-style-type: none"> • Introduction, Need for Conducting International Marketing Research, International Marketing Research Process, Scope of International Marketing Research, IT in Marketing Research
3	International Marketing Mix
	<p>a) International Product Decision</p> <ul style="list-style-type: none"> • International Product Line Decisions, Product Standardization v/s Adaptation Argument, International Product Life Cycle, Role of Packaging and Labelling in International Markets, Branding Decisions in International Markets, International Market Segmentation and Targeting, International Product Positioning
SN	Modules/ Units

	<p>b) International Pricing Decision:</p> <ul style="list-style-type: none"> ● Concept of International Pricing, Objectives of International Pricing, Factors Affecting International Pricing ● International Pricing Methods: Cost Based, Demand Based, Competition Based , Value Pricing, Target Return Pricing and Going Rate Pricing ● International Pricing Strategies : Skimming Pricing, Penetration Pricing , Predatory Pricing ● International Pricing Issues : Gray Market , Counter Trade, Dumping, Transfer Pricing ● Overview of Foreign Currency involved in International Marketing <p>c) International Distribution Decisions</p> <ul style="list-style-type: none"> ● Concept of International Distribution Channels, Types of International Distribution Channels, Factors Influencing Selection of International Distribution Channel, Mode of Transportation in International Marketing <p>d) International Promotion Decisions</p> <ul style="list-style-type: none"> ● Concept of International Promotion Decision ● Planning International Promotional Campaigns: Steps - Determine the Target Audience, Determine Specific Campaigns, Determine Budget, Determine Message, Determine Campaign Approach and Determine Campaign Effectiveness ● Standardization V/S Adaptation of International Promotional Strategies ● International Promotional Tools/Elements
4	Developments in International Marketing
	<p>a) Introduction -Developing International Marketing Plan:</p> <ul style="list-style-type: none"> ● Preparing International Marketing Plan, Examining International Organisational Design, Controlling International Marketing Operations, Devising International Marketing Plan <p>b) International strategies:</p> <ul style="list-style-type: none"> ● Need for International Strategies, Types of International Strategies <p>c) International Marketing of Services</p> <ul style="list-style-type: none"> ● Concept of International Service Marketing, Features of International Service Marketing, Need of International Service Marketing, Drivers of Global Service Marketing, Advantages and Disadvantages of Global Service Marketing, Service Culture

Course Outcome

Sr. No	Course Outcome
01	Ability to analyze environmental variables that influence international marketing.
02	Ability to research, select and enter a new international market.
03	Develop strategies and tactics that can lead to successful international marketing.
04	More typical management decisions peculiar to problems faced in international arena.
05	Produce a comprehensive international marketing plan
06	Perform the functional tasks constituting marketing intelligence and mix adaptations.

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Elective Courses

(EC) Group B: Marketing

Electives

4. Media Planning and Management

**Course Code : UMS6MPM
Modules at a Glance**

S N	Module s	No. of Lectur es
1	Overview of Media and Media Planning	15
2	Media Mix & Media Strategy	15
3	Media Budgeting, Buying & Scheduling	15
4	Media Measurement, Evaluation	15
Total		60

Objectives

SN	Objectives
1	To understand Media Planning, Strategy and Management with reference to current business scenario.
2	To know the basic characteristics of all media to ensure most effective use of advertising budget.
3	To provide an insight on Media Planning, Budgeting, Scheduling and Evaluating the Different Media Buys.

SN	Modules/ Units
1	Overview of Media and Media Planning
	<p>a) Overview of Media and Media Planning:</p> <ul style="list-style-type: none"> ● Meaning of Media & Features of Media, Meaning of Media Planning , Scope of Media planning , Media Planning Elements, Role of Media in Business, Media Planning Process, Impact of Marketing Objectives on Media Planning, Factors Influencing Media Planning Decisions, Role and Importance of Media in Consumer Buying Decision, Role of Media Planner, Challenges of Media Planning, Organization Structure of Media Company, Regulatory Framework and Legal Aspects in Media Planning <p>b) Media Research:</p> <ul style="list-style-type: none"> ● Meaning, Role and Importance ● Sources of Media Research : Audit Bureau of Circulation, Press Audits, National Readership Survey/IRS, Businessmen's Readership Survey, TRP, National Television Study, ADMAR Satellite Cable Network Study, Reach and Coverage Study, CIB Listenership Survey
2	Media Mix and Media Strategy
	<p>a) Media Mix:</p> <ul style="list-style-type: none"> ● Meaning, Need for Media Mix, Identifying Audience for Mass Media , Factors Affecting Media Mix Decision, Types of Media Mix Decisions: Broad Media Classes, Media Vehicles, Media Units, Deciding Ideal Media Mix <p>b) Media Choices:</p> <ul style="list-style-type: none"> ● Print Meaning- Factors Affecting Selection of Print Media Decisions , Types of Print Media, Advantages and Limitations ● Television- Meaning, Factors Affecting Selection of Television Media Decisions, Advantages and Limitations ● Radio- Meaning, Factors Affecting Selection of Radio Media Decision, Advantages and Limitations ● Out of Home (OOH)- Meaning, Types of OOH, Factors Affecting OOH Planning Decision, Advantages and Limitations <p>c) Emerging Media: Digital Marketing</p> <ul style="list-style-type: none"> ● Online, Mobile, Gaming, In flight, In Store, Interactive Media <p>d) Media Strategy:</p> <ul style="list-style-type: none"> ● Meaning, Need for Media Strategy, Situation Analysis for Media Strategy and its Components ● Steps in Formulating Media Strategies: Defining the Target Group, Market Prioritization, Media Weights, Media Mix, Media Scheduling.

SN	Modules/ Units
3	Media Budgeting, Buying & Scheduling
	<p>a) Media Budget</p> <ul style="list-style-type: none"> ● Meaning ● Factors to be considered while Framing a Budget: Advertising Task, Competitive Framework, Market Dominance, Market Coverage, Media Cost, Market Task, Pricing ,Frequency of Purchase ● Importance of Media Budget. ● Methods of Setting Media Budget - Status Quo, Inflation Adjusted, Advertising Sales, Case Rate & Advertising Margin Method, Share of Market, Yardstick Method, Effective Frequency & Reach Method & Margin Analysis ROI Based Approach, Experimental Approach, Break Even Planning. <p>b) Media Buying:</p> <ul style="list-style-type: none"> ● Meaning, Role of Media Buyer, Objectives of Media Buying, ● Buying Process: Buying Brief, Environmental Analysis, Science and Art of Buying, Benchmarking Buying Plan Presentation Deal Management and Post Buy ● Buying brief: Concept & Elements of Buying Brief, Art of Media Buying – Negotiation in Media Buying, Plan Presentation and Client Feedback ● Criteria in Media Buying <p>c) Media Scheduling</p> <ul style="list-style-type: none"> ● Meaning, Importance ● Factors Affecting Scheduling: Sales Pattern, Purchase Cycle, Product Availability, Competitive Activity, Marketing Task, Budget Constraints, Target Group. ● Scheduling Patterns – Continuity, Flighting, Pulsing ● Scheduling Strategies for Creating Impact: Road Block , Day or Day part ● Emphasis, Multiple Spotting, Teasers

SN	Modules/ Units
4	Developments in International Marketing
	<p>a) Media Measurement:</p> <ul style="list-style-type: none"> ● Basic Metrics: Reach, Cumulative/Frequency Reach, Discrete & Cumulative distribution, Average Opportunity to See (AOTS), Effective frequency/Reach ● Television Metrics: Dairy v/s Peoplemeter,TRP,/TVR, Program Reach & Time Spent, Stickiness Index, Ad Viewership ● Radio Metrics: Arbitron Radio Rating ● Print Metrics: Circulation, Average Issue Readership (AIR), Total or Claimed Reader, Sole or Solus reader. ● OOH Metrics: Traffic Audit Bureau (TAB) <p>b) Benchmarking Metrics:</p> <ul style="list-style-type: none"> ● Share, Profile, and Selectivity Index <p>c) Plan Metrics:</p> <ul style="list-style-type: none"> ● Gross Rating Points (GRP), Gross Impressions (GI), Share of Voice (SOV). <p>d) Evaluating Media Buys</p> <ul style="list-style-type: none"> ● Evaluating Television Media Buying: Dysfunctional Card Rate, Secondary and Effective Rate, Deal Composition, Cost Per Rating Point(CPRP), Reach Delivered by the Buy, Visibility Spots, Bonus Percentage, Upgrades and Spot Fixing, Sponsorships ● Evaluating Print Media Buying: Discount on Rate Card, Negotiated Rate, Cost Per Thousand (CPT), Market Share Incentives, Readership v/s Circulation Track, Growth Incentives, Combination Rate Incentives, Full Page Discounts and Size Upgrades, Discount for Colour Ads, Date Flexibility Incentives, Positioning, Innovations. ● Evaluating Other Media Buys: Radio Buys, Outdoor Buys, Cinema Buys, Internet Buys, and Mobile Buys

Course Outcome

Sr. No	Course Outcome
01	Learners will get an overview of different features, impact and role of media in marketing.
02	Learners will get knowledge of underlying criteria for evaluating the advantages and failure in data sources, media research, media mix and media strategies.
03	Learners will gain insight in different budgeting techniques used, buying processes and tactics, and scheduling of media.
04	Learners will develop a sense of judgment when evaluating media with the help of different media measurement metrics and media buys.
05	Learners will be able to solve marketing problems through understanding how the media operates from the perspective of the advertiser, the agency and the medium itself.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester VI

with effect from the Academic Year 2021-2022

Elective Courses (EC)

Group C: Human Resource Electives

1. HRM in Global

Perspective Course

Code : UMS6HGP

Modules at a Glance

S N	Modules	No. of Lectures
1	International HRM – An Overview	15
2	Global HRM Functions	15
3	Managing Expatriation and Repatriation	15
4	International HRM Trends and Challenges	15
Total		60

Objectives

SN	Objectives
1	To introduce the students to the study and practice of IHRM
2	To understand the concepts, theoretical framework and issues of HRM in Global Perspective
3	To get insights of the concepts of Expatriates and Repatriates
4	To find out the impact of cross culture on Human Resource Management
5	To provide information about Global Workforce Management

6	To study International HRM Trends and Challenges
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SN	Modules/ Units
1	International HRM – An Overview
	<p>a) International HRM – An Overview:</p> <ul style="list-style-type: none"> ● International HRM- Meaning and Features, Objectives, Evolution of IHRM, Reasons for Emergency of IHRM, Significance of IHRM in International Business, Scope/Functions ● Difference between International HRM and Domestic HRM ● Approaches to IHRM- Ethnocentric, Polycentric, Geocentric and Regiocentric ● Limitations to IHRM ● Qualities of Global Managers ● Organizational Dynamics and IHRM ● Components of IHRM- Cross Cultural Management and Comparative HRM ● Cross Cultural Management- Meaning, Features, Convergence of Cultures, Role of IHRM in Cross Culture Management, Problems of Cross Cultural Issues in Organizations, Importance of Cultural Sensitivity to International Managers ● Comparative HRM- Meaning, Importance, Difference between IHRM and Comparative HRM ● Managing Diversity in Workforce ● Dealing with Cultural Shock
2	Global HRM Functions
	<p>a) Global HRM Functions:</p> <ul style="list-style-type: none"> ● International Recruitment and Selection- Meaning- Sources of International Labour Market, Global Staffing, Selection Criteria, Managing Global Diverse Workforce ● International Compensation – Meaning, Objectives, Components of International Compensation Program, Approaches to International Compensation ● HRM Perspectives in Training and Development - Meaning, Advantages, Cross Cultural Training, Issues in Cross Cultural Training ● International Performance Management – Meaning, Factors Influencing Performance, Criterion used for Performance Appraisal of International Employees, Problems Faced in International Performance Management ● Motivation and Reward System- Meaning, Benchmarking Global Practices ● International Industrial Relations – Meaning, Key Issues in International Industrial Relations, Trade Union and International IR

SN	Modules/ Units
3	Managing Expatriation and Repatriation
	<p>a) Managing Expatriation and Repatriation</p> <ul style="list-style-type: none"> ● Concepts of PCNs (Parent-Country Nationals), TCNs(Third-Country Nationals) and HCNs(Host-Country Nationals) ● Expatriation- Meaning, Reasons for Expatriation, Factors in Selection of Expatriates, Advantages of Using Expatriates, Limitations of using Expatriates, Role of Family, the Role of Non-expatriates, Reasons for Expatriate Failure, Women and Expatriation, Requirements/Characteristics of Effective Expatriate Managers ● Repatriation- Meaning, Repatriation Process, Factors affecting Repatriation Process, Role of Repatriate, Challenges faced by Repatriates
4	International HRM Trends and Challenges
	<p>a) International HRM Trends and Challenges:</p> <ul style="list-style-type: none"> ● Emerging Trends in IHRM ● Off Shoring – Meaning, Importance, Off Shoring and HRM in India ● International Business Ethics and IHRM – Meaning of Business Ethics, Global Values, International Corporate Code of Conduct, Criminalization of Bribery, Operationalizing Corporate Ethics of HR in Overall Corporate Ethics Programme ● Managing International Projects and Teams- Meaning, How Projects are Managed across the World and Challenges in Managing International Projects across the World ● HR in MNCs – Industrial Relations in MNCs ● Role of Technology on IHRM ● IHRM and Virtual Organization- Meaning and Features of Virtual Organization, Difference between Virtual Organization and Traditional Organization, Managing HR in Virtual Organization ● Growth in Strategic Alliances and Cross Border Mergers and Acquisitions- Impact on IHRM ● Knowledge Management and IHRM

Course Outcome

Sr. No	Course Outcome
01	Demonstrate an understanding of key terms, theories and practices within the field of IHRM.
02	Familiarize students with the basic concepts and challenges of Expatriates and Repatriates.
03	Learners will be able to have profound understanding of Global Workforce Management.
04	Students will be able to explicate the influence of cross culture on Human Resource Management.
05	An analysis of trends and challenges of IHRM guiding students to arrive at potential remedies of it.

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Elective Courses (EC)

Group C: Human Resource Electives

2. Organisational

Development Course Code

: UMS6ORD

Modules at a Glance

S N	Module s	No. of Lectures
1	International HRM – An Overview	15
2	Global HRM Functions	15
3	Managing Expatriation and Repatriation	15
4	International HRM Trends and Challenges	15
Total		60

Objectives

SN	Objectives
1	To understand the concept of Organisational Development and its Relevance in the organisation
2	To Study the Issues and Challenges of OD while undergoing Changes
3	To get an Understanding of Phases of OD Programme

4	To Study the OD Intervention to meet the Challenges faced in the Organisation
5	To get an Insight into Ethical Issues in OD

SN	Modules/ Units
1	Organisational Development – An Overview
	<p>a) Organisational Development – An Overview:</p> <ul style="list-style-type: none"> ● Organisational Development – Meaning, Features, Evolution, Components, Objectives, Principles, Process, Importance ● Relevance of Organisational Development for Managers, OD- HRD Interface, Participation of Top Management in OD ● OD Practitioner – Meaning, Role of OD Practitioner, Competencies of an OD Practitioner ● Emerging Trends in OD ● OD in Global Setting
2	Organisational Diagnosis, Renewal and Change
	<p>a) Organisational Diagnosis, Renewal and Change:</p> <ul style="list-style-type: none"> ● Organisational Diagnosis - Meaning, Need, Phases, Levels of Organisational Diagnosis, Techniques of Organisational Diagnosis, Tools used in Organisational Diagnosis ● Organizational Renewal, Re-energising, OD and Business Process Re-Engineering (BPR), OD and Leadership Development ● Organisational Change- Meaning, Organisational Life Cycle, Planned Change, Organizational Growth and its Implication for Change ● Change Agents- Meaning, Features, Types, Role, Skills required
3	OD Interventions
	<p>a) Managing Expatriation and Repatriation</p> <ul style="list-style-type: none"> ● OD Interventions- Meaning, Features, Factors Affecting Success of Interventions, Steps in OD Interventions ● Types of Interventions- Human Resource Intervention, Structural Intervention, Strategic Interventions, Third Party Peace Making Intervention ● Techniques of OD Intervention : <ul style="list-style-type: none"> ▪ Traditional: Sensitive Training, Grid Training, Survey Feedback. ▪ Modern : Process Consultation, Third Party, Team Building, Transactional Analysis ● Evaluation of OD Interventions : Process, Types, Methods, Importance

SN	Modules/ Units
4	OD Effectiveness
	<p>a) OD Effectiveness:</p> <ul style="list-style-type: none"> • Issues Faced in OD- Issues Related to Client Relationship, Power- Individual skills and Attributes as a Source of Power, Power and Influence Tactics, Politics and OD • Values in OD – Meaning, Professional Values, Value Conflict and Dilemma • Ethics in OD – Meaning, Factors Influencing Ethical Judgement, Ethical Guidelines for OD Professionals • Organisational Effectiveness- Meaning , Effectiveness v/s Efficiency, Approaches of Organisational Effectiveness : Goal Approach, System Resource Approach, Strategic Constituency Approach, Internal Process Approach; Parameters for Judging Organisational Effectiveness, Ways to Enhance Organisational Effectiveness

Course Outcome

Sr. No	Course Outcome
01	Learners will be able to understand basics of Organisational development & role of OD practitioner.
02	Learners will understand how human process issues can be used by the OD consultant to diagnose organisation effectiveness.
03	Learners will evaluate the implementation of OD interventions and judge their usefulness against other change tools and techniques.
04	Learners will be able to collect and evaluate data to judge the effectiveness of OD interventions.
05	Learners will formulate an approach for organization development in response to appropriate organizational diagnosis, business imperatives and internal and external contextual forces.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester VI

with effect from the Academic Year 2021-2022

Elective Courses (EC)

Group C: Human Resource Electives

3. HRM in Service Sector

Management Course Code :

UMS6HSM

Modules at a Glance

S N	Module s	No. of Lectures
1	Service Sector Management- An Overview	15
2	Managing Human Element in Service Sector	15
3	Issues and Challenges of HR in Service Sector	15
4	HRP Evaluation, Attrition, Retention & Globalization	15
Total		60

Objectives

SN	Objectives
1	To understand the concept and growing importance of HRM in service sector
2	To understand how to manage human resources in service sector
3	To understand the significance of human element in creating customer satisfaction through service quality

4	To understand the Issues and Challenges of HR in various service sectors
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SN	Modules/ Units
1	Service Sector Management- An Overview
	<p>a) Service Sector Management- An Overview:</p> <ul style="list-style-type: none"> ● Services - Meaning, Features, Classification of Services: End User, Degree of Tangibility, People Based Services, Expertise Required, Orientation Towards Profit, By Location ● Service Sector Management – Meaning, Significance of Service Sector, Reasons for Growth in Service Sector ● Service Organization - Importance of Layout and Design of Service Organization, Servicescape ● Service Culture in Organization – Meaning, Developing Service Culture in Organization ● Relationship Marketing – Meaning, Need and Importance in Service Sector Organizations, Six Market Model ● Role of Service Employee ● Role of Customers in Service Process– Customers as Productive Resources, Customers as Contributors to Service Quality, Customers as Competitors ● Service Encounter and Moment of Truth –Meaning, Nature, Elements of Service Encounter
2	Managing Human Element in Service Sector

	<p>a) Managing Human Element in Service Sector:</p> <ul style="list-style-type: none"> ● Human Element in Service Sector – Introduction, Role and Significance ● The Services Triangle ● Front Line Employees /Boundary Spanners– Meaning, Issues Faced by Front Line Employees: Person/ Role Conflicts, Organization/ Client Conflict, Interclient Conflict ● Emotional Labour – Meaning, Strategies for Managing Emotional Labour ● Recruitment in Service Sector– Recruiting Right People, Recruitment Procedures and Criteria, Challenges in Recruitment in Service Sector ● Selection of Employees in Service Sector – Interviewing Techniques: Abstract Questioning, Situational Vignette, Role Playing ● Develop People to Deliver Service Quality ● Compensating Employees in Service Sector ● Motivating Employees for Services ● Empowerment of Service Workers – Meaning, Advantages and Limitations
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SN	Modules/ Units
3	Issues and Challenges of HR in Service Sector
	<p>a) Issues and Challenges of HR in Service Sector:</p> <ul style="list-style-type: none"> ● Quality Issues in Services: Meaning and Dimensions of Service Quality, The Service – Gap Model, Reasons and Strategies to fill the Gaps ● Delivering Services through Agents and Brokers - Meaning, Advantages, Challenges, Strategies for Effective Service Delivery through Agents and Brokers ● HRM in Public Sector Organizations and Non – Profit Sector in India ● Issues and Challenges of HR in Specific Services: <ul style="list-style-type: none"> ▪ Business and Professional Services: Banking and Insurance, Legal, Accountancy ▪ Infrastructure: Roads, Railways, Power ▪ Public Services: Police, Defense, Disaster Management ▪ Trade Services: Wholesale and Retail, Advertising, Maintenance and Repairs ▪ Personnel Services: Education, Health Care, Hotels ● Social and Charitable Services ●

4	HRP Evaluation, Attrition, Retention & Globalization
	<p>a) HRP Evaluation, Attrition, Retention & Globalization:</p> <ul style="list-style-type: none"> ● Human Resource Planning Evaluation in Service Sector – Meaning, HRP Evaluation Process, Purpose of HRP Evaluation in Service Sector, Issues Influencing HRP Evaluation in Service Sector ● Service Leadership – Meaning, Integrating Marketing Operation and Human Resources, Creating a Leading Service Organization, The Service – Profit Chain Model ● Attrition in Service Sector – Meaning, Reasons for Attrition in Service Sector, Cycle of Failure, Cycle of Mediocrity and Cycle of Success ● Retaining the Best People in Service Sector – Including Employees in Company's Vision, Treat Employees as Customers, Measure and Reward String Service Performers ● Globalization of Services- Meaning, Reasons for Globalization of Services, Impact of Globalization on Indian Service Sector. Organisational Effectiveness, Ways to Enhance Organisational Effectiveness

Course Outcome

Sr. No	Course Outcome
01	Learners will be able to understand the concept and growing importance of HRM in the service sector.
02	Learners will understand the ways of managing human resources in the service sector.
03	Learners will be able to understand the significance of the human element in creating customer satisfaction through service quality.
04	Learners will gain knowledge about trending issues and challenges of HR in various service sectors.
05	This course will enable the learners to apply what they have learnt theoretically.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS)

Programme at Semester VI

with effect from the Academic Year 2021-2022

Elective Courses (EC)

Group C: Human Resource Electives

4. Indian Ethos in

Management Course Code

: UMS6IEM

Modules at a Glance

S N	Module s	No. of Lectur es
1	Indian Ethos – An Overview	15
2	Work Ethos and Values	15
3	Stress Management	15
4	Indian Systems of Learning	15
Total		60

Objectives

SN	Objectives
1	To understand the concept of Indian Ethos in Management
2	To link the Traditional Management System to Modern Management System
3	To understand the Techniques of Stress Management

4	To understand the Evolution of Learning Systems in India
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SN	Modules/ Units
1	Indian Ethos – An Overview
	<p>a) Indian Ethos</p> <ul style="list-style-type: none"> • Meaning, Features, Need, History, Relevance, Principles Practised by Indian Companies, Requisites, Elements, Role of Indian Ethos in Managerial Practices <p>b) Management Lessons from Scriptures:</p> <ul style="list-style-type: none"> • Management Lessons from Vedas, Management Lessons from Mahabharata, Management Lessons from Bible, Management Lessons from Quran, Management Lessons from Kautilya's Arthashastra <p>Indian Heritage in Business, Management, Production and Consumption. Ethics v/s Ethos Indian Management v/s Western Management</p>
2	Work Ethos and Values
	<p>a) Work Ethos:</p> <ul style="list-style-type: none"> • Meaning, Levels, Dimensions, Steps, Factors Responsible for Poor Work Ethos <p>b) Values:</p> <ul style="list-style-type: none"> • Meaning, Features, Values for Indian Managers, Relevance of Value Based Management in Global Change, Impact of Values on Stakeholders: Employees, Customers, Government, Competitors and Society. • Values for Managers, Trans-Cultural Human Values in Management and Management Education, Secular v/s Spiritual Values in Management, Importance of Value System in Work Culture
3	Stress Management
	<p>a) Stress Management:</p> <ul style="list-style-type: none"> • Meaning, Types of Stress at Work, Causes of Stress, Consequences of Stress <p>b) Stress Management Techniques:</p> <ul style="list-style-type: none"> • Meditation : Meaning, Techniques, Advantages, Mental Health and its Importance in Management, Brain Storming, Brain Stilling, Yoga: Meaning, Significance <p>c) Leadership:</p> <ul style="list-style-type: none"> • Meaning, Contemporary Approaches to Leadership, Joint Hindu Family Business <ul style="list-style-type: none"> – Leadership Qualities of Karta <p>d) Motivation:</p> <ul style="list-style-type: none"> • Meaning, Indian Approach to Motivation, Techniques

SN	Modules/ Units
4	Indian Systems of Learning
	<p>a) Learning: Meaning, Mechanisms</p> <ul style="list-style-type: none"> ● Gurukul System of Learning : Meaning, Features, Advantages, Disadvantages ● Modern System of Learning: Meanings, Features, Advantages, Disadvantages ● Karma: Meaning, Importance of Karma to Managers, Nishkama Karma ● Laws of Karma: The Great Law, Law of Creation, Law of Humility, Law of Growth, Law of Responsibility, Law of Connection ● Corporate Karma: Meaning, Methodology, Guidelines for good Corporate Karma ● Self-Management: Personal growth and Lessons from Ancient Indian Education System ● Personality Development: Meaning, Determinants, Indian Ethos and Personality Development

Course Outcome

Sr. No	Course Outcome
01	Helping learners to imbibe values and practices of Indian Ethos in Management.
02	Learners will be able to establish correlation between Traditional and Modern Management System
03	Learners will be able to discover a wide spectrum of Stress Management Techniques.
04	Understand and analyse the concept and importance of Learning System in India.
05	Allow students to have an essence of values and its importance in work culture.

***Revised Syllabus of Courses of Bachelor of Management Studies
(BMS)***

**Programme at Semester VI
with effect from the Academic Year 2021-2022**

Core Course (CC)

Operations Research

Course Code :

UMS6OPR Modules

at a Glance

S N	Modules	No. of Lectur es
1	Introduction to Operations Research and Linear Programming	15
2	Assignment and Transportation Models	15
3	Network Analysis	15
4	Job Sequencing and Theory of Games	15
Total		60

Objectives

SN	Objectives
1	To help students to understand operations research methodologies
2	To help students to solve various problems practically
3	To make students proficient in case analysis and interpretation

SN	Modules/ Units
1	Introduction to Operations Research and Linear Programming
	<p>a) Introduction To Operations Research</p> <ul style="list-style-type: none"> ● Operations Research - Definition, Characteristics of OR, OR Techniques, Areas of Application, Limitations of OR. <p>b) Linear Programming Problems: Introduction and Formulation</p> <ul style="list-style-type: none"> ● Introduction to Linear Programming ● Applications of LP ● Components of LP ● Requirements for Formulation of LP Problem ● Assumptions Underlying Linear Programming ● Steps in Solving LP Problems ● LPP Formulation (Decision Variables, Objective Function, Constraints, Non Negativity Constraints) <p>c) Linear Programming Problems: Graphical Method</p> <ul style="list-style-type: none"> ● Maximization & Minimization Type Problems. (Max. Z & Min. Z) ● Two Decision Variables and Maximum Three Constraints Problem ● Constraints can be “less than or equal to”, “greater than or equal to” or a combination of both the types i.e. mixed constraints. ● Concepts: Feasible Region of Solution, Unbounded Solution, Redundant Constraint, Infeasible Solution, Alternative Optima. <p>d) Linear Programming Problems: Simplex Method</p> <ul style="list-style-type: none"> ● Only Maximization Type Problems. (<u>Only Max. Z</u>). No Minimization problems. (No Min. Z) Numericals on Degeneracy in Maximization Simplex Problems. ● Two or Three Decision Variables and Maximum Three Constraints Problem. (Up to Maximum Two Iterations) ● All Constraints to be “less than or equal to” Constraints. (“Greater than or Equal to” Constraints not included.) ● Concepts : Slack Variables, Surplus Variables, Artificial Variables, Duality, Product Mix and Profit, Feasible and Infeasible Solution, Unique or Alternate Optimal Solution, Degeneracy, Non Degenerate, Shadow Prices of Resources, Scarce and Abundant Resources, Utilized and Unutilized Capacity of Resources, Percentage Utilization of Resources, Decision for Introduction of a New Product. <p>Note:</p> <ol style="list-style-type: none"> 1. Surplus Variable, Artificial Variable and Duality to be covered only at <u>Conceptual</u> level for Theory Questions only and not included in Numerical. 2. Sensitivity Analysis including Profit Range and Capacity Range is not included.

SN	Modules/ Units
2	Assignment and Transportation Models
	<p>a) Assignment Problem – Hungarian Method</p> <ul style="list-style-type: none"> ● Maximization & Minimization Type Problems. ● Balanced and Unbalanced Problems. ● Prohibited Assignment Problems, Unique or Multiple Optimal Solutions. ● Simple Formulation of Assignment Problems. ● Maximum 5 x 5 Matrix. Up to Maximum Two Iterations after Row and Column Minimization. <p>Note:</p> <ol style="list-style-type: none"> 1. Travelling Salesman Assignment Problem is not included. <p>b) Transportation Problems</p> <ul style="list-style-type: none"> ● Maximization & Minimization Type Problems. ● Balanced and Unbalanced problems. ● Prohibited Transportation Problems, Unique or Multiple Optimal Solutions. ● Simple Formulation of Transportation Problems. ● <u>Initial Feasible Solution (IFS)</u> by: <ol style="list-style-type: none"> a. North West Corner Rule (NWCR) b. Least Cost Method (LCM) c. Vogel's Approximation Method (VAM) ● Maximum 5 x 5 Transportation Matrix. ● Finding Optimal Solution by <u>Modified Distribution (MODI) Method</u>. (u, v and Δ) ● <u>Maximum Two Iterations</u> (i.e. Maximum Two Loops) after IFS. <p>Note:</p> <ol style="list-style-type: none"> 1. Production Scheduling Problem is not included. 2. Time Minimization Problem is not included. 3. Degeneracy Concept to be covered only at Conceptual Level. Not to be included in Numerical.

SN	Modules/ Units
3	Network Analysis
	<p>a) Critical Path Method (CPM)</p> <ul style="list-style-type: none"> ● Concepts: Activity, Event, Network Diagram, Merge Event, Burst Event, Concurrent and Burst Activity, ● Construction of a Network Diagram. Node Relationship and Precedence Relationship. ● Principles of Constructing Network Diagram. ● Use of Dummy Activity ● Numerical Consisting of Maximum Ten (10) Activities. ● Critical Path, Sub-critical Path, Critical and Non-critical Activities, Project Completion Time. ● Forward Pass and Backward Pass Methods. ● Calculation of EST, EFT, LST, LFT, Head Event Slack, Tail Event Slack, Total Float, Free Float, Independent Float and Interfering Float <p>b) Project Crashing</p> <ul style="list-style-type: none"> ● Meaning of Project Crashing. ● Concepts: Normal Time, Normal Cost, Crash Time, Crash Cost of Activities. Cost Slope of an Activity. ● Costs involved in Project Crashing: Numericals with Direct, Indirect, Penalty, crash cost and Total Costs. ● Time – Cost Trade off in Project Crashing. ● Optimal (Minimum) Project Cost and Optimal Project Completion Time. ● Process of Project Crashing. ● Numerical Consisting of Maximum Ten (10) Activities. ● Numerical based on Maximum Four (04) Iterations of Crashing <p>c) Program Evaluation and Review Technique (PERT)</p> <ul style="list-style-type: none"> ● Three Time Estimates of PERT: Optimistic Time (a), Most Likely Time (m) and Pessimistic Time (b). ● Expected Time (te) of an Activity Using Three Time Estimates. ● Difference between CPM and PERT. ● Numerical Consisting of Maximum Ten (10) Activities. ● Construction of PERT Network using tevalues of all Activities. ● Mean (Expected) Project Completion Time. ● Standard Deviation and Variance of Activities.

	<ul style="list-style-type: none"> ● Project Variance and Project Standard Deviation. ● 'Prob. Z' Formula. ● Standard Normal Probability Table. Calculation of Probability from the Probability Table using 'Z' Value and Simple Questions related to PERT Technique. ● Meaning, Objectives, Importance, Scope, RORO/LASH
4	Job Sequencing and Theory of Games
	<p>a) Job Sequencing Problem</p> <ul style="list-style-type: none"> ● Processing Maximum 9 Jobs through Two Machines only. ● Processing Maximum 6 Jobs through Three Machines only. ● Calculations of Idle Time, Elapsed Time etc. <p>b) Theory of Games</p> <ul style="list-style-type: none"> ● Introduction ● Terminology of Game Theory: Players, Strategies, Play, Payoff, Payoff matrix, Maximin, Maximax, Saddle Point. ● Types of Games. ● Numericals based on: <ul style="list-style-type: none"> ▪ Two Person Zero Sum Games including strictly determinable and Fair Game - Pure Strategy Games (Saddle Point available). Principles of Dominance method.

Course Outcome

Sr. No	Course Outcome
01	Understand the meaning, purpose and tools of Operations Research.
02	An ability to identify, formulate and solve complex problems by minimizing cost.
03	Learners will identify and express a decision problem and solve it graphically and by Simplex method.
04	To help the learners to recognize and formulate assignment and transportation problems, and how to reach optimal solution.
05	Identify parameters that will influence the optimal solution.

Revised Syllabus of Courses of Bachelor of Management Studies (BMS) Programme at Semester V with effect from the Academic Year 2021-2022 Reference Books

Reference Books
Investment Analysis & Portfolio Management
<ul style="list-style-type: none"> ● Kevin. S, <i>Security Analysis and Portfolio Management</i> ● Donald Fischer & Ronald Jordon, <i>Security Analysis & Portfolio Management</i> ● Prasanna Chandra, <i>Security Analysis & Portfolio Management</i> ● Sudhindhra Bhatt, <i>Security Analysis and Portfolio Management.</i>
Commodity & Derivatives Market
<ul style="list-style-type: none"> ● John C. Hull & Basu -<i>Futures, options & other derivatives</i> ● Robert McDonald, <i>Derivatives market, Pearson education</i> ● John Hull, <i>Fundamentals of futures & options</i> ● Ankit Gala & Jitendra Gala, <i>Guide to Indian Commodity market, Buzzingstock publishing house</i> ● K.Sasidharan & Alex K. Mathews, <i>Option trading – bull market strategies, McGraw Hill publication</i> ● Niti Chatnani, <i>Commodity markets, McGraw Hill Publication</i> ● S. Kevin, <i>Commodities & financial derivatives, PHI learning Pvt ltd</i> ● Suni K Parmeswaran, <i>Futures & options, McGraw Hill</i>
Wealth Management
<ul style="list-style-type: none"> ● Harold Evensky, <i>Wealth Management, McGraw Hill Publication</i> ● NCFM, CFP, IIBF, etc, <i>Wealth Management modules</i> ● Harold Evensky, <i>The new wealth Management, CFA Institute Investment Series Publication</i>
Direct Taxes
<ul style="list-style-type: none"> ● <i>Income Tax Act- Bare act</i> ● Dr V K Singhania-<i>Direct Tax Law & Practice</i>
Services Marketing
<ul style="list-style-type: none"> ● Valarie A. Zeuhaml & Mary Jo Bitner, <i>Service Marketing, Tata McgrawHill, 6th Edition</i> ● Christoper Lovelock, JochenWirtz, Jayanta Chatterjee, <i>Service Marketing People, Technology, Strategy – A South Asian Perspective , Pearson Education, 7th Edition</i> ● Ramneek Kapoor, Justin Paul & Biplab Halder, <i>Services Marketing-Concepts And Practices, McgrawHill, 2011</i> ● Harsh V. Verma, <i>Services Marketing Text & Cases, Pearson Education, 2nd Edition</i> ● K. Ram Mohan Rao, <i>Services Marketing, Pearson Education, 2nd Edition, 2011</i> ● C. Bhattacharjee, <i>Service Sector Management, Jaico Publishing House, Mumbai, 2008</i> ● Govind Apte, <i>Services Marketing, Oxford Press, 2004</i>

E-Commerce & Digital Marketing

- *D Nidhi, E-Commerce Concepts and Applications, Edn 2011, International Book house P.ltd*
- *Bajaj Kamlesh K, E-Commerce- The cutting edge of Business*
- *Whiteley David, E-Commerce Technologies and Applications-2013*
- *E-Business & E-Commerce Management 3rd Ed, Pearson Education*
- *Kalokota & Robinson, E-Business 2.0 Road map for Success, Pearson Education*
- *Elias M. Awad, Electronic Commerce, 3rd Edition, Pearson Education*
- *Erfan Turban et.al, Electronic Commerce - A Managerial Perspective, Pearson Education*
- *R. Kalokota, Andrew V. Winston, Electronic Commerce - A Manger's Guide, Pearson Education*
- *Tripathi, E-Commerce, Jaico Publishing House, Mumbai, Edn. 2010.*

Sales & Distribution Management

- *A. Nag, Sales And Distribution Management, Mcgraw Hill, 2013 Edition*
- *Richard R. Still, Edward W. Cundiff, Norman A.P. Govoni, Sales Management, Pearson Education, 5th Edition*
- *Krishna K. Havaladar, Vasant M. Cavale, Sales And Distribution Management – Text & Cases, Mcgraw Hill Education, 2nd Edition, 2011*
- *Dr.Matin Khan, Sakes And Distribution Management, Excel Books, 1st Edition*
- *Kotler & Armstrong, Principles Of Marketing – South Asian Perspective, Pearson Education, 13th Edition*

Customer Relationship Management

- *Baran Roger J. & Robert J. Galka (2014), Customer Relationship Management: The Foundation of Contemporary Marketing Strategy, Routledge Taylor & Francis Group.*
- *Anderrson Kristin and Carol Kerr (2002), Customer Relationship Management, Tata McGraw-Hill.*
- *Ed Peelen, Customer Relationship Management, Pearson Education*
- *Bhasin Jaspreet Kaur (2012), Customer Relationship Management, Dreamtech Press.*
- *Judith W. Kincaid (2006), Customer Relationship Management Getting it Right, Pearson Education.*
- *Jill Dyche' (2007), The CTM Handbook: A Business Guide to Customer Relationship Management, Pearson Education.*
- *Valarie A Zeithmal, Mary Jo Bitner, Dwayne D Gremler and Ajay Pandit (2010), Services Marketing Integrating Customer Focus Across the Firm, Tata McGraw Hill.*
- *Urvashi Makkar and Harinder Kumar Makkar (2013), CRM Customer Relationship Management, McGraw Hill Education.*

Finance for HR Professionals & Compensation Management

- *Gary Dessler, Biju Varkkey, Human Resource Management, Pearson, 12th edition*
- *Mick Marchington and Adrian Wilkinson, Human Resource Management at Work – People Management and Development- Illrd Edition,*
- *Shashi K. Gupta, Rosy Joshi, Human Resource Management, Kalyani Publishers*
- *Gary Dessler, Framework for HRM, 3rd Edition, Pearson Education*
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- *Luis.R.Gomez, David.B.Balkin, Robert. L. Cardy, Managing Human Resources – IVth Edition, (Eastern Economy Edition)*
- *Milkovich, George T, Newman J.M, Compensation, Tata Mc Graw Hill.*
- *Henderson, R.O, Compensation Management, Pearson Edition .*

- *BD Singh, Compensation and Reward Management, Excel Books.*
- *Karen Permant, Joe Knight, Financial Intelligence for HR Professionals*
- *Sharma A.M, Understanding Wage system, Himalaya Publishing House, Mumbai.*

Strategic Human Resource Management & HR Policies

- *Michael Armstrong, Angela Baron, Handbook of Strategic HRM, Jaico publishing House*
- *Armstrong M.-Strategic Human Resource Management_ A Guide to Action (2006)*
- *Strategic Human Resource Management, Tanuja Agarwal*
- *Strategic Human Resource Management, Jeffrey A. Mello*
- *Gary Dessler, Human Resource Management, PHI, New Delhi, 2003*
- *Charles R. Greer, Strategic Human Resource Management, Pearson Education, 2003*
- *Rajib Lochan Dhar, Strategic Human Resource Management, Excel Books, NewDelhi, 2008*

Performance Management & Career Planning

- *Shashi K. Gupta, Rosy Joshi, Human Resource Management, Kalyani Publishers*
- *Armstrong, Michael, Baron, Performance Management, Jaico Publishers*
- *Robert Bacal, Performance Management, McGraw-Hill Education, 2007*
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- *A.S. Kohli, T.Deb, Performance Management, Oxford University Press.*
- *Herman Aguinis, Performance Management, Second edition, Pearson Education.*

Industrial Relations

- *Davar R S: Personnel Management and Industrial Relations in India*
- *Mamoria C B: Industrial Relations*
- *Charles Myeres: Industrial Relations in India*
- *Arun Monappa: Industrial Relations*
- *Sharma A M : Industrial Relations*
- *Ahuja K K : Industrial Relations Theory and Practice*
- *C.S. Vekata Ratnam : Globalisation and Labour-Management Relations*
- *Srivastava K D: Laws relating to Trade Unions and Unfair Labour Practice*
- *A.M.Sarma: A conceptual and legal frame work*
- *Farnham, David and John Pimlot, Understanding Industrial Relations, London: Cassell*
- *Ratna Sen, Industrial Relations in India, Shifting Paradigms, Macmillan India Ltd., New Delhi, 2009.*
- *C.S.Venkata Ratnam, Globalisation and Labour Management Relations, Response Books, 2010.*
- *Srivastava, Industrial Relations and Labour Laws, Vikas, 6 th edition, 2012.*
- *P.R.N Sinha, Indu Bala Sinha, Seema Priyadarshini Shekhar. Industrial Relations, Trade Unions and Labour Legislation.*
- *Srivastava, S. C. :Industrial Relations and Labour Laws, Vikas Publishing House Pvt Ltd, New Delhi.*
- *Sinha, P.R.N., Sinha, Indu Bala and Shekhar, Seema Priyadarshini Industrial Relations, Trade Unions and Labour Legislation, Pearson Education, New Delhi.*

**Revised Syllabus of Courses of Bachelor of
Management Studies
(BMS) Programme at Semester V
with effect from the Academic Year**

**Reference
Books**

Logistics and Supply Chain Management

- *David Simchi Levi, Philip Kaminshy, Edith Simchi Levi, Designing & Managing the Supply Chain - Concepts, Strategies and Case Studies Logistics*
- *Donald Waters, An Introduction to Supply Chain*
- *Martin Christopher, Logistics & Supply Chain Management - Strategies for Reducing Cost & Improving Services*
- *Vinod Sople, Logistic Management - The Supply Chain Imperative*
- *Donald J Bowersox & David J Closs, Logistic Management - The Integrated Supply Chain Process*
- *Alan Rushton, Phil Croucher, Peter Baker, The Handbook of Logistics and Distribution Management- Understanding the Supply Chain*
- *Donald J. Bowersox & David J Closs, Logistical Management-The Integrated Supply Chain Process, McGraw Hill Education*
- *Ronald H Ballou & Samir K Srivastava, Business Logistics/ Supply Chain Management- Pearson*
- *Donald J Bowersox, David J Closs & M Bixby Cooper, Supply Chain Logistics Management- The McGraw Hill Companies*

Corporate Communication & Public Relations

- *Richard R. Dolphin, The Fundamentals of Corporate Communication*
- *Joep Cornelissen, Corporate Communications: Theory and Practice*
- *James L.Horton, Integrating Corporate Communication: The Cost Effective Use of Message & Medium*
- *Sandra Oliver, Handbook of Corporate Communication & Public Relations A Cross-Cultural Approach*
- *Rosella Gambetti, Stephen Quigley, Managing Corporate Communication*
- *Joseph Fernandez, Corporate Communications: A 21st Century Primer*
- *C.B.M. van Riel, Chris Blackburn, Principles of Corporate Communication*
- *Jaishri Jethwaney, Corporate Communication: Principles and Practice*

**Revised Syllabus of Courses of Bachelor of
Management Studies
(BMS) Programme at Semester VI
with effect from the Academic Year**

Reference Books
Innovative Financial Services
<ul style="list-style-type: none"> ● <i>IM Pandey, Financial Management, Vikas Publishing House Ltd.</i> ● <i>Khan M.Y., Financial Services, Mc Graw Hill Education.</i> ● <i>Dr.S.Gurusamy, Financial Services, Vijay Nicole Imprints.</i> ● <i>Financial Market and Services, E, Gordon and K. Natrajan, Himalaya Publishing House</i>
Project Management
<ul style="list-style-type: none"> ● <i>Harold Kerzer, Project Management – A System Approach to Planning, Scheduling & Controlling</i> ● <i>Jack.R.Meredith & Samuel.J.Mantel, Jr.,Project Management – A Managerial Approach</i> ● <i>Bhavesh.M.Patel, Project Management – Strategic Financial Planning , Evaluation & Control</i>
Strategic Financial Management
<ul style="list-style-type: none"> ● <i>C. Paramasivan& T. Subramanian, Financial Management</i> ● <i>IM Pandey, Financial Management</i> ● <i>Ravi Kishor, Financial Management</i> ● <i>Khan & Jain, Financial Management</i> ● <i>Van Horne &Wachowiz, Fundamentals of Financial Management</i> ● <i>Prasanna Chandra, Strategic Financial Management</i>
Indirect Taxes
<ul style="list-style-type: none"> ● <i>GST Bare Act 2017</i> ● <i>GST Law & Practice - V.S Datey (6th Edition)</i> ● <i>GST Laws – National Academy of Customs, Indirect Tax</i>
Brand Management
<ul style="list-style-type: none"> ● <i>Keller Kevin Lane, Strategic Brand Management: Building, Measuring and Managing Brand Equity</i> ● <i>Keller Kevin Lane, Strategic Brand Management-2008</i> ● <i>Elliot, Richard, Strategic Brand Management-2008</i> ● <i>Kapferer, Jean-Noel, Strategic Brand Management-2000</i> ● <i>Kishen, Ram, Strategic Brand Management- 2013</i> ● <i>Keller Kevin Lane, Strategic Brand Management 4e-2015</i>
Retail Management

- Michael Levy & Barton A Weitz, "Retailing Management", Tata Mc Graw Hill
- Gibson G. Vedamani, "Retail Management- Functional Principles and Practices", Jaico Publishing House, Mumbai.
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- Dunne Lusch, "Retail Management", South Western Cengage Learning
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- Keith Lincoln, Lars Thomessen & Anthony Aconis, "Retailization -Brand Survival in the Age of Retailer Power", Kogan Page Ltd.,
- Swapna Pradhan, "Retailing Management–Text and Cases", 4th Edn, Tata Mc Graw Hill.
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- Kishore Biyani, "It Happens in India", & " The Wall Mart Story"
- Store Manager, Organiser / Planner- DMS Retail
- Dr. RamKishen Y. "International Retail Marketing Strategies", Jaico Publishing House, Mumbai.

International Marketing

- Dr. Shakeel Ahmad Siddiqui, International Marketing, Dreamtech press , Edition 2011
- Philip R.Cateora, John L. Graham, Prashanth Salwan, International Marketing , Tata Mcgraw hill Education Private limited, New Delhi, Thirteenth Edition .
- RajGopal, International Marketing, Vikas Publishing House Pvt. Ltd., Edition 2007.
- Sak Onkvisit, John J.Shaw, International Marketing Analysis and Strategy, Pearson Publication, Third Edition
- Francis Cherunilam, International Business, PHI Learning Private Limited New Delhi, Fifth Edition .
- Justin Paul and Ramneek Kapoor, International Marketing Text and Cases, Tata Mcgraw Hill Education Private Limited New Delhi, Second Edition.
- Rakesh Mohan Joshi, International Marketing, Oxford University Press, Second Edition
- Philip R. Cateora, John L. Graham, International Marketing, Tata Mcgraw Hill, Twelfth Edition
- Rakesh Mohan Joshi, International Marketing Oxford University Press, First Edition
- Michael R. Czinkota, Iikka A Ronkainen, International Marketing, Cengage Learning Edition 2007
- Gerald Albaum, Edwin Duerr, Jesper Strandskov, International Marketing and Export Management, Pearson Publication , Fifth Edition

Media Planning & Management

- Arpita Menon , Media Planning and Buying, Tata McGraw Hill Education Private Limited , Second Edition 2010
- Jack Z Sissors and Roger B. Baron, Advertising Media Planning, McGraw Hill Education India Pvt. Limited, Seventh Edition.
- Larry Percy and Richard Elliott, Strategic Advertising Management , Oxford University Press, Second Edition
- Larry d. Kelly and Donald W.Jugeneimer, Advertising Media Planning , PHI learning Private Limited,
- Dennis .F.Herrick, Media Management in Age of Giants, Surjeet Publications
- Charles Warner and Joseph Buchman, Media selling , Surjeet Publication ,3rd edition

HRM in Global Perspective

- Peter J. Dowling, Marion Festing, Allen d. Engle Sr: *International Human Resource Management, 5th Edition, Cengage Learning*
- P. L. Rao: *International Human Resource Management, Text and Cases, Excel Books*
- Peer J. Dowling, Denice E. Welch and Randall S. Schuler (1999): *International Human Resource Management, Managing People in a Multinational Context', South Western College Publishing.*
- Chris Brewster, Paul Sparrow and Guy Vernon, *International Human Resource Management, The Universities Press*
- A.V.Phatak: *International Dimensions of Management, Cincinnati, South Western College*
- Peter J. Dowling, Marion Festing, Allen D. Engle, *International Human Resource Management, Thomson Learning.*
- Dennis R. Briscoe, Randall S. Schuler, *International Human Resource Management: Policy and Practice for the Global Enterprise, Psychology Press*
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Organisational Development

- Dr. Mrs. Anjali Ghanekar, *Essentials of Organisation Development, Everest Publishing House*
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- Richard L, *Organisation, Theory, Change and Design , India Edition(Cengage Learning)*
- Garath R Jones, Mary Mathew , *Organisation Theory, Design and Change: Sixth Edition, Pearson*
- Wendell L French, Cecil H Bell, Jr, Veena Vohra , *Organisation Development , Sixth Edition, Pearson Education*

HRM in Service Sector Management

- C. Bhattacharjee: *Service Sector Management, An Indian Perspective, Jaico Publishing House*
- Christopher Lovelock, Jochen Wirtz, Jayanta Chatterjee: *Services Marketing, Pearson*
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- James A. Fitzsimmons, Mona J, Fitzsimmons: *Service Management , Operations, Strategy, Information Technology, Tata McGraw – Hill*
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- K. Rao: *Services Marketing, Pearson Education*
- Ramneek Kapoor, Justin Paul, Biplab Halder: *Services Marketing*

Reference Books

Indian Ethos in Management

- *R Nandagopal, Ajith Sankar RN: Indian Ethics and Values in Management, Tata Mc Graw Hill*
- *Bhatta, S.K., Business Ethics & Managerial Values.*
- *Dave, Nalini V: Vedanta and Mana*
- *Chakraborty, S.K.: Foundation of Managerial Work-Contributions from Indian Thought, Himalaya Publication House, Delhi 1998*
- *Chakraborty, S.K.: Managerial Effectiveness and Quality of Work life – Indian Insights, Tata McGraw Hill Publishing Company, New Delhi – 1987*
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Operation Research

- *Taha H.A., Operations Research - An Introduction, 6th Edition , Hall of India*
- *Kapoor V.K., Operations Research Techniques for Management, 7th Edition, Sultan Chand & Sons*
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- *Vora N.D, Quantitative Techniques in Management, 3rd Edition, Tata McGraw Hill co.*
- *Shreenath L.S, Principles & Application 3rd Ed.,, PERT & CPM, Affiliated East-West Press Pvt. Ltd.*
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- *G. Hadley, Linear Programming, Narosa Book Distributors Private Ltd*
- *L.C. Jhamb, Quantitative Techniques (For Managerial Decisions VOL I), Everest Publishing House, Pune.*
- *Paul Loomba, Linear Programming, Tata McGraw Hill Publishing Co. Ltd.*
- *Aditham B. Rao , Operations Research Edition 2008, Jaico Publishing House, Mumbai*

**Revised Syllabus of Courses of Bachelor of Management Studies
Programme at Semester V and VI
with effect from the Academic Year 2021-2022**

Scheme of

❖ **Scheme of Examination**

The performance of the learners will be evaluated in two Components. One component will be the Internal Assessment component carrying 25% marks and the second component will be the Semester-wise End Examination component carrying 75% marks. The allocation of marks for the Internal Assessment and Semester End Examinations will be as shown below:-

**A) Internal Assessment: 40 % 40 Marks
(For Courses without Practical)**

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	One case study/ project with presentation based on curriculum to be assessed by the teacher concerned	15 Marks
	Presentation	10 Marks
	Written Document	05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks

(For Courses with Practical)

Sr. No.	Particular	Marks
01	Practical Examination	20 Marks
	Journal	05 Marks
	Viva Voce	05 Marks
	Laboratory Work	10 Marks
02	One case study /project with presentation to be assessed by teacher concerned (15 Marks)	
	Presentation	10 Marks
	Written Document	05 Marks

03	Active participation in routine class instructional deliveries and Overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks
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Question Paper Pattern

(Periodical Class Test for the Courses at Under Graduate Programmes)

Maximum Marks: 20
Questions to be set:
02 Duration: 40
Minutes
All Questions are Compulsory

Question No	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
1. There shall be four questions each of 15 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

❖ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Guidelines and Evaluation Pattern for Project Work (100 Marks)

Introduction

Inclusion of project work in the course curriculum of the B.Com. (Accounting & Finance) and Bachelor of Management Studies programme is one of the ambitious aspects in the programme structure. The main objective of inclusion of project work is to inculcate the element of research analyse and scientific temperament challenging the potential of learner as regards to his/ her eager to enquire and ability to interpret particular aspect of the study. It is expected that the guiding teacher should undertake the counselling sessions and make the awareness among the learners about the methodology of formulation, preparation and evaluation pattern of the project work.

- There are two modes of preparation of project work
 1. Project work based on research methodology in the study area
 2. Project work based on internship in the study area

Guidelines for preparation of Project Work

1. General guidelines for preparation of project work based on Research Methodology

- The project topic may be undertaken in any area of Elective Courses.
- Each of the learner has to undertake a Project individually under the supervision of a teacher-guide.
- The learner shall decide the topic and title which should be specific, clear and with definite scope in consultation with the teacher-guide concerned.
- University/college shall allot a guiding teacher for guidance to the students based on her / his specialization.
- The project report shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1
 - The Project Report shall be bounded.
 - The project report should be 80 to 100 pages

Format

1st page (Main Page)

Title of the problem of the Project

**A Project Submitted to
University of Mumbai for partial completion of the
degree of Bachelor of Management Studies
Under the Faculty of Commerce**

By

Name of the Learner

Under the Guidance of

Name of the Guiding Teacher

Name and address of the College

Month and Year

2nd Page

This page to be repeated on 2nd page (i.e. inside after main page)

On separate page

Index

Chapter No. 1 (sub point 1.1, 1.1.1, . And so on)	Title of the Chapter	Page No.
Chapter No. 2	Title of the Chapter	
Chapter No. 3	Title of the Chapter	
Chapter No. 4	Title of the Chapter	
Chapter No. 5	Title of the Chapter	

List of tables, if any, with page numbers. List of Graphs, if any, with page numbers.

List of Appendix, if any, with page numbers. Abbreviations used:

Structure to be followed to maintain the uniformity in formulation and presentation of Project Work

(Model Structure of the Project Work)

- **Chapter No. 1: Introduction**

In this chapter Selection and relevance of the problem, historical background of the problem, brief profile of the study area, definition/s of related aspects, characteristics, different concepts pertaining to the problem etc can be incorporated by the learner.

- **Chapter No. 2: Research Methodology**

This chapter will include Objectives, Hypothesis, Scope of the study, limitations of the study, significance of the study, Selection of the problem, Sample size, Data collection, Tabulation of data, Techniques and tools to be used, etc can be incorporated by the learner.

- **Chapter No. 3: Literature Review**

This chapter will provide information about studies done on the respective issue. This would specify how the study undertaken is relevant and contribute for value addition in information/ knowledge/ application of study area which ultimately helps the learner to undertake further study on same issue.

- **Chapter No. 4: Data Analysis, Interpretation and Presentation**

This chapter is the core part of the study. The analysis pertaining to collected data will be done by the learner. The application of selected tools or techniques will be used to arrive at findings. In this, table of information's, presentation of graphs etc. can be provided with interpretation by the learner.

- **Chapter No. 5: Conclusions and Suggestions**

In this chapter of project work, findings of work will be covered and suggestion will be enlisted to validate the objectives and hypotheses.

Note: If required more chapters of data analysis can be added.

- **Bibliography**
- **Appendix**

On separate

Name and address of the college

Certificate

This is to certify that Ms/Mr _____ has worked and duly completed her/his Project Work for the degree of Bachelor of Management Studies under the Faculty of Commerce in the subject of _____ and her/his project is entitled, “
_____ *Title of the Project* _____” under my supervision.

I further certify that the entire work has been done by the learner under my guidance and that no part of it has been submitted previously for any Degree or Diploma of any University.

It is her/ his own work and facts reported by her/his personal findings and investigations.



Name and Signature
of Guiding
Teacher

Date of submission:

On separate

Declaration by learner

Name of the learner

I the undersigned Miss / Mr. _____ here by, declare that the

work embodied in this project work titled “_____”
Title of the Project

contribution to the research work carried out under the guidance of
Name of the guiding teacher _____ is a result of my own research work and has not been

previously submitted to any other University for any other Degree/ Diploma to this or any other University.

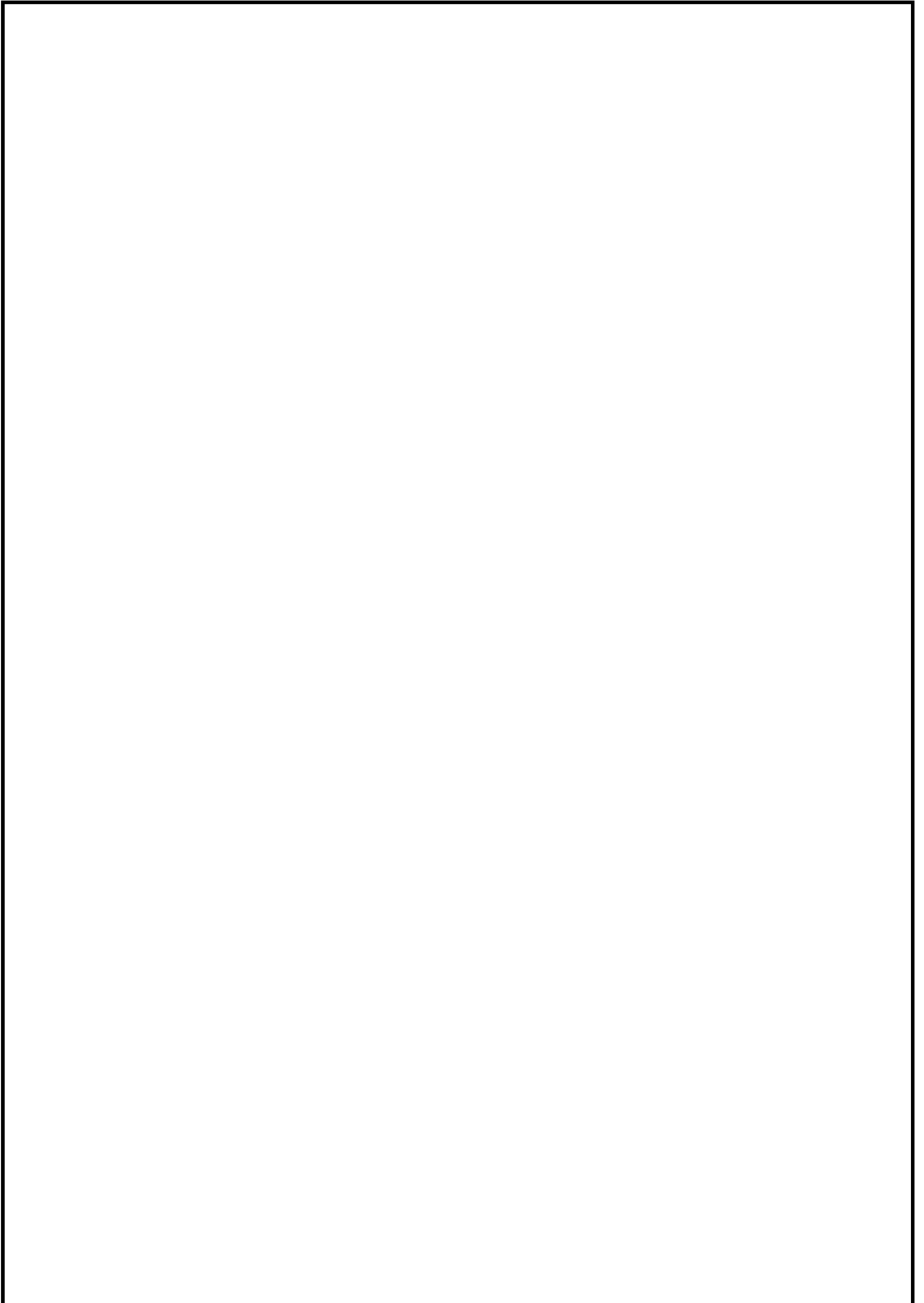
Wherever reference has been made to previous works of others, it has been clearly indicated as such and included in the bibliography.

I, here by further declare that all information of this document has been obtained and presented in accordance with academic rules and ethical conduct.

Name and Signature of the learner

Certified by

Name and signature of the Guiding Teacher



On separate page

Acknowledgment

(Model structure of the acknowledgement)

To list who all have helped me is difficult because they are so numerous and the depth is so enormous.

I would like to acknowledge the following as being idealistic channels and fresh dimensions in the completion of this project.

I take this opportunity to thank the **University of Mumbai** for giving me chance to do this project.

I would like to thank my **Principal**, _____ for providing the necessary facilities required for completion of this project.

I take this opportunity to thank our **Coordinator** _____, for her moral support and guidance.

I would also like to express my sincere gratitude towards my project guide _____ whose guidance and care made the project successful.

I would like to thank my **College Library**, for having provided various reference books and magazines related to my project.

Lastly, I would like to thank each and every person who directly or indirectly helped me in the completion of the project especially **my Parents and Peers** who supported me throughout my project.

2. Guidelines for Internship based project work

- Minimum 20 days/ 100 hours of Internship with an Organisation/ NGO/ Charitable Organisation/ Private firm.
- The theme of the internship should be based on any study area of the elective courses
- Experience Certificate is Mandatory
- A project report has to be brief in content and must include the following aspects:
 - **Executive Summary:**
A bird's eye view of your entire presentation has to be precisely offered under this category.
 - **Introduction on the Company:**
A Concise representation of company/ organization defining its scope, products/ services and its SWOT analysis.
 - **Statement and Objectives:**
The mission and vision of the organization need to be stated enshrining its broad strategies.
 - **Your Role in the Organisation during the internship:**
The key aspects handled, the department under which you were deployed and brief summary report duly acknowledged by the reporting head.
 - **Challenges:**
The challenges confronted while churning out theoretical knowledge into practical world.
 - **Conclusion:**
A brief overview of your experience and suggestions to bridge the gap between theory and practice.
- The project report based on internship shall be prepared as per the broad guidelines given below:
 - Font type: Times New Roman
 - Font size: 12-For content, 14-for Title
 - Line Space : 1.5-for content and 1-for in table work
 - Paper Size: A4
 - Margin : in Left-1.5, Up-Down-Right-1

- The Project Report shall be bounded.
- The project report should be of minimum 50 pages

Evaluation pattern of the project work

The Project Report shall be evaluated in two stages viz.	
● Evaluation of Project Report (Bound Copy)	60 Marks
▪ Introduction and other areas covered	20 Marks
▪ Research Methodology, Presentation, Analysis and interpretation of data	30 Marks
▪ Conclusion & Recommendations	10 Marks
● Conduct of Viva-voce	40 Marks
▪ In the course of Viva-voce, the questions may be asked such as importance / relevance of the study, objective of the study, methodology of the study/ mode of Enquiry (question responses)	10 Marks
▪ Ability to explain the analysis, findings, concluding observations, recommendation, limitations of the Study	20 Marks
▪ Overall Impression (including Communication Skill)	10 Marks

Note:

- ***The guiding teacher along with the external evaluator appointed by the University/ College for the evaluation of project shall conduct the viva-voce examination as per the evaluation pattern***
- ***The plagiarism should be maintained as per the UGC guidelines***

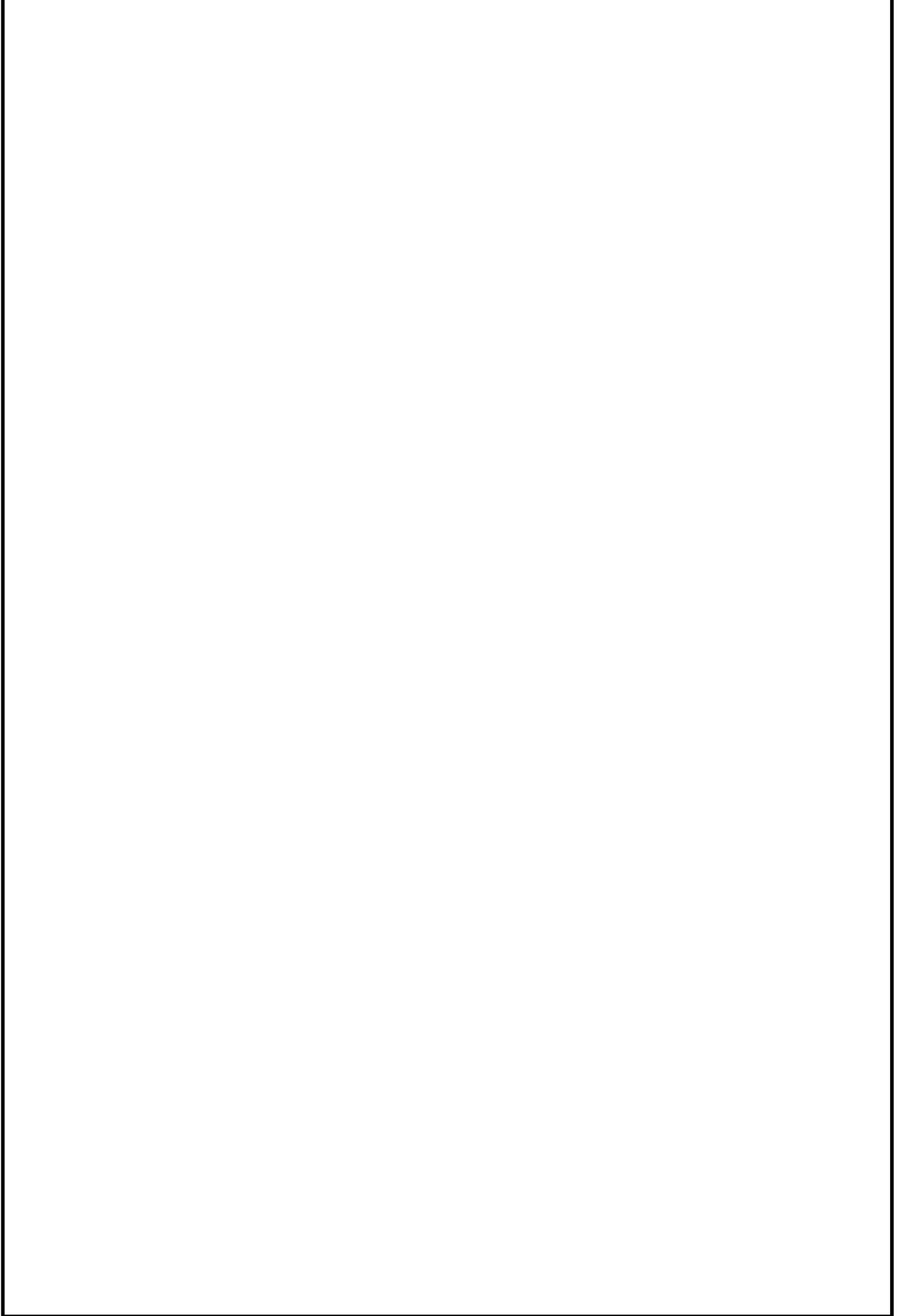
Passing Standard

- Minimum of Grade D in the project component
- In case of failing in the project work, the same project can be revised for ATKT examination.
- Absence of student for viva voce: If any student fails to appear for the viva voce on the date and time fixed by the department such student shall appear for the viva voce on the date and time fixed by the Department, such student shall appear for the viva voce only along with students of the next batch.

Note: 1) It is noted that the concerned regulation of the university is amended and implemented to all Semesters i.e. Semester I to Semester

VI to all undergraduate programmes, simultaneously, under faculty of Arts, Commerce and Science with effect from the academic year 2020- 2021

2) This scheme of evaluation is discussed in detail, finalised and accepted.



University of Mumbai



**JANARDAN BHAGAT SHIKSHAN PRASARAK
SANSTHA'S**

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC 'Best
College Award' by University of Mumbai**

**F. Y. B. Sc. Chemistry
Revised as per
Choice Based Credit System (60:40)
w. e. f. Academic Year 2022-23**

BACHELOR'S IN SCIENCE (B. Sc.)

Sr. No.	Heading	Particulars
1	Title of Course	Chemistry
2	Eligibility for Admission	12th Science of all recognised Board
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2022-2023

Name of BOS Chairperson:

Prof. Dr. B.V. Jadhav

Date:

Signature:

PREAMBLE OF THE SYLLABUS:

Bachelor of Science (B.Sc.) in Chemistry is an undergraduate course of Department of Chemistry, Changu Kana Thakur Arts, Commerce & Science College, New Panvel (Autonomous). The Choice Based Credit System to be implemented through this curriculum would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities.

This syllabus is prepared to give the sound knowledge and understanding of chemistry to undergraduate students at first year of the B.Sc. degree course. The goal of the syllabus is to make the study of Chemistry as stimulating, interesting and relevant as possible. The syllabus is prepared by keeping in mind the aim to make students capable of studying Chemistry in academic and industrial courses. Also to expose the students and to develop interest in them in various fields of Chemistry.

The new and updated syllabus is based on disciplinary approach with vigour and depth taking care of the syllabus is not heavy at the same time it is comparable to the syllabi of other universities at the same level. The students pursuing this course would have to develop understanding of various aspects of the chemistry. The conceptual understanding, development of experimental skills, developing the aptitude for academic and professional skills, obtaining basic ideas and understanding of hyphenated techniques, understanding the fundamental chemical processes and rationale towards application of knowledge are among such important aspects.

OBJECTIVES OF THE COURSE:

1. To promote understanding of basic facts and concepts in Chemistry while retaining the excitement of Chemistry.
2. To make students capable of studying Chemistry in academic and Industrial courses.
3. To expose the students to various emerging new areas of Chemistry and apprise them with their prevalent in their future studies and their applications in various spheres of chemical sciences.
4. To develop problem solving skills in students.
5. To acquaint students with the fundamental Organic, Inorganic, Physical & Analytical Chemistry.
 - To develop analytical skills and critical thinking through application of theory knowledge into practical course.
 - To construct and apply knowledge of chemistry, and appreciate the relationship between Chemistry and other disciplines.
 - To enable students to understand Chemistry and its Industrial and Social Context.

COURSE OUTCOME: BY THE END OF THE COURSE, A STUDENT SHOULD DEVELOP THE ABILITY:

- To understand, coherently and effectively about various genres of Chemistry.
- To develop the understanding and interest in the field of Chemistry
- To develop basic skills in practical Chemistry and its industrial applications.

F. Y. B. SC. CHEMISTRY

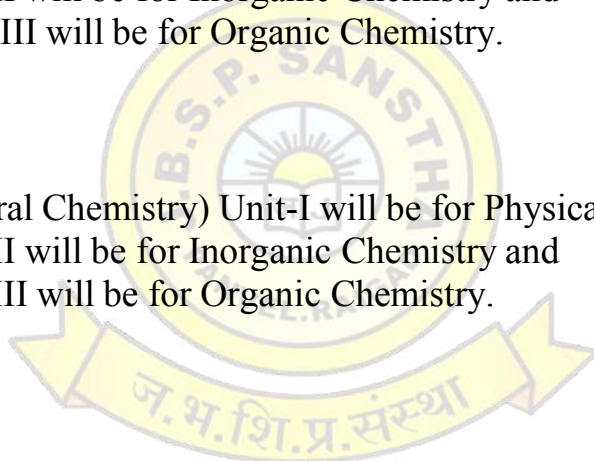
For the subject of Chemistry there shall be two papers for 45 lectures each comprising of three units of 15 L each.

SEMESTER-I

1. Paper-I / II (General Chemistry) Unit-I will be for Physical Chemistry
2. Paper-I / II Unit-II will be for Inorganic Chemistry and
3. Paper- I / II Unit-III will be for Organic Chemistry.

SEMESTER-II

1. Paper-I /II (General Chemistry) Unit-I will be for Physical Chemistry
2. Paper-I / II Unit-II will be for Inorganic Chemistry and
3. Paper-I / II Unit-III will be for Organic Chemistry.



SCHEME OF EXAMINATION FOR EACH SEMESTER:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options.	
	Q-1	From Unit – I (having internal options.) 20 M
	Q-2	From Unit – II (having internal options.) 20M
	Q-3	From Unit – III (having internal options.) 20M
	Q-4	Questions from all the THREE Units with equal weightage of marks Allotted to each Unit. 15 M
II	Practical	The External examination per practical course will be conducted as per the Following scheme.
Sr. No.	Particulars of External Practical Examination	Marks%
1	Laboratory Work	35+35 =70
2	Journal	5+5 = 10
3	Viva	10+10 = 20
	TOTAL	100

Choice Based Credit System (CBCS)
F.Y.B. Sc. Chemistry Syllabus
To be implemented from the
Academic year 2022-23
SEMESTER I

Course Code	Unit	Topics	Credits	L / Week
USC1CH1	I	Chemical Thermodynamics Chemical Calculations.	2	1
	II	Atomic structure, Periodic Table and periodicity		1
	III	Introduction, general properties of & applications of organic compounds. Classification and Nomenclature of Organic Compounds Bonding and Structure of organic Compounds Fundamentals of organic reaction Mechanism		1
USC1CH2	I	Chemical Kinetics Mathematical concepts in chemistry	2	1
	II	Comparative chemistry of Main Group Elements Chemistry of noble gases		1
	III	Stereochemistry I		1
USC1PR1		Chemistry Practical	2	6

Choice Based Credit System (CBCGS)
F.Y.B. Sc. Chemistry Syllabus
 To be implemented from the Academic year 2022-2023
SEMESTER II

Course Code	Unit	Topics	Credits	L / Week
USC2CH1	I	Gaseous state Chemical Equilibrium and Nanochemistry	2	1
	II	Concept of Qualitative Analysis, Acid Base Theories, Coordination chemistry, Chemistry of 3d series elements		1
	III	Chemistry of Aliphatic Hydrocarbons		1
USC2CH2	I	Ionic equilibria, Solid state chemistry , Liquid State Chemistry	2	1
	II	Chemical bond and Reactivity Oxidation Reduction Chemistry, General principle of Metallurgy		1
	III	Aromatic hydrocarbons		1
USC2PR2		Chemistry Practical	2	6

Semester I
Paper I
Unit-I

1.1 Chemical Thermodynamics: (10L)

Thermodynamic terms: System, surrounding, boundaries, open, closed and isolated system, intensive and extensive properties, state functions and path functions, zeroth law of thermodynamics First law of thermodynamics: concept of heat (q), work (w), internal energy (U), statement of first law, enthalpy, relation between heat capacities, sign conventions, calculations of heat (q), work (w), internal energy (U), and enthalpy (H) (Numericals expected) Thermochemistry: Heats of reactions, standard states, enthalpy of formation of molecules, enthalpy of combustion and its applications, calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, Kirchhoff's equation (Numericals expected)

1.2 Chemical Calculations: (5L)

Expressing concentration of solutions: Normality, molality, molarity, formality, mole fractions, weight ratio, volume ratio, weight to volume ratio, ppm, ppb, millimoles, milliequivalents (Numericals expected)

Unit II

2.1 Atomic structure: (10L)

(Qualitative treatment only; it is expected that the learner knows the mathematical statements and understands their physical significance after completing this topic. No derivations of the mathematical equations required)

- a) Historical perspectives of the atomic structure; Rutherford's Atomic Model, Bohr's theory, its limitations and atomic spectrum of hydrogen atom. Structure of hydrogen atom.
- b) Hydrogenic atoms:
 1. Simple principles of quantum mechanics;
 2. Atomic orbitals
 - i) Hydrogenic energy levels
 - ii) Shells, subshells and orbitals
 - iii) Electron spin
 - iv) Radial shapes of orbitals
 - v) Radial distribution function
 - vi) Angular shapes of orbitals.
 3. Many Electron Atoms
 - i) Penetration and shielding
 - ii) Effective nuclear charge
 4. Aufbau principle

2.2: Periodic Table and periodicity: (5L)

Long form of Periodic Table; Classification for elements as main group, transition and inner transition elements; Periodicity in the following properties: Atomic and ionic size; electron gain enthalpy; ionization enthalpy, effective nuclear charge (Slater's rule); electronegativity; Pauling, Mulliken and Alred Rochow electronegativities (Numerical problems expected, wherever applicable.)

Unit III

3. Basics of Organic Chemistry

3.1 Classification and Nomenclature of Organic Compounds: (5L)

Review of basic rules of IUPAC nomenclature. Nomenclature of mono and bi-functional aliphatic compounds on the basis of priority order of the following classes of compounds: alkanes, alkenes, alkynes, haloalkanes, alcohols, ethers, aldehydes, ketones, carboxylic acids, nitriles and amines; including their cyclic analogues.

3.2 Bonding and Structure of organic compounds: (4L)

Hybridization: sp^3 , sp^2 , sp hybridization of carbon and nitrogen; sp^3 and sp^2 hybridizations of oxygen in Organic compounds (alcohol, ether, aldehyde, ketone, carboxylic acid, ester, cyanide, amine and amide) Overlap of atomic orbitals: Overlaps of atomic orbitals to form sigma and pi bonds, shapes of organic molecules. Shapes of molecules; Influence of hybridization on bond properties (as applicable to ethane, ethene, ethyne)

3.3 Fundamentals of organic reaction mechanism: (6L)

Electronic Effects: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strengths.

Bond fission: Homolytic and Heterolytic fission with suitable examples. Electrophiles and Nucleophiles; Nucleophilicity and basicity;

Types (primary, secondary, tertiary, allyl, benzyl), shape and their relative stability of reactive intermediates: Carbocations, Carbanions and Free radicals.

Introduction to polymer chemistry: (2L) Introduction, Basic concept, Classification of polymers, Properties of polymers, applications of polymers.

Semester I

Paper II

Unit I

1.1 Chemical Kinetics: (7L)

Rate of reaction, rate constant, measurement of reaction rates, order and molecularity of reaction, integrated rate equation of first and second order reactions (with equal initial concentration of reactants) (Numericals expected) Determination of order of reaction by

(a) Integration method (b) Graphical method (c) Ostwald's isolation method (d) Half time method (Numericals expected))

1.2 Mathematical Concept in Chemistry: (8L)

Graphical representation of equations: Rules for drawing graph co-ordinates etc., Equation of straight line, slope and intercept, plotting the graph from the data of chemical properties and problems. Derivative: Rules of differentiation (without proof), Algebraic, Logarithmic and exponential functions and numerical. Integration: rules of integration (without proof), Integration with limit, Algebraic, Logarithmic and exponential functions and numerical. Numerical related to Chemistry.

Unit-II

2.0 Comparative chemistry of Main Group Elements: (15L)

Metallic and non-metallic nature, oxidation states, electronegativity, anomalous behaviour of second period elements, allotropy, catenation, diagonal relationship. Comparative chemistry of carbides, nitrides, oxides and hydroxides of group I and group II elements. Some important compounds- NaHCO_3 , Na_2CO_3 , NaCl , NaOH , CaO , CaCO_3 ;

2.2 Chemistry of Noble Gases 1 Physical properties . 2 Chemical properties. 3 Clathrate compounds

Unit III

3. Stereochemistry I: (15L)

Classification of isomer, IUPAC nomenclature of stereoisomers.

Fischer Projection, Newman and Sawhorse Projection formulae (of erythro, threo isomers of tartaric acid and 2,3 dichlorobutane) and their interconversions;

Geometrical isomerism in alkene and cycloalkanes: cis-trans and syn-anti isomerism E/Z notations with C.I.P rules.

Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two similar and dissimilar chiral-centres, Distereoisomers, meso structures, racemic mixture and resolution (methods of resolution not expected).

Relative and absolute configuration: D/L and R/S designations.

Conformation analysis of alkanes (ethane, propane and n-butane); Relative stability with energy diagrams.

Semester II Paper I Unit-I

1.1 Gaseous State: (8L)

Ideal gas laws, kinetic theory of gases, Maxwell-Boltzmann's distribution of velocities (qualitative discussion), ideal gases, real gases, compressibility factor, Boyle's temperature (Numericals expected)

Deviation from ideal gas laws, reasons for deviation from ideal gas laws, Van der Waals equation of state, Joule-Thomson effect: qualitative discussion and experimentation, inversion temperature. (Numericals expected)

1.2 Chemical Equilibria (4L)

Reversible and irreversible reactions, law of mass action, dynamic equilibria, equilibrium constant, (K_c and K_p), relationship between K_c and K_p , Le Chatelier's principle, factors affecting chemical equilibrium (Numericals expected)

1.3 Nanochemistry: (3L) Introduction, Definition of Nanochemistry, nanoparticles, Basic concept explanation., all types of nanoparticles.

Unit II

2.1 Concept of Qualitative Analysis: (4L)

Precipitation equilibria, effect of common ions, uncommon ions, oxidation states, buffer action, complexing agents on precipitation of ionic compounds. (Balanced chemical equations and numerical problems expected.)

2.2 Coordination chemistry (3L)

- 1) Introduction to coordination compound
- 2) Terminology in coordination compound
- 3) Types of ligands

2.3 Acid Base Theories: (5L)

Arrhenius, Lowry- Bronsted, Lewis, Lux-Flood acid –base concept, Usanovich acid –base concept, Solvent – Solute concept of acids and bases, Hard and Soft acids and bases, Applications of HSAB

2.4 Chemistry of 3d series elements: (3L)

Introduction Characteristics of d-block elements with special reference to i) Electronic structure ii) Oxidation states iii) Magnetic character iv) Colored ions v) Complex formation.

Unit III

3. Chemistry of Aliphatic Hydrocarbons

3.1 Physical and chemical properties of alkane, alkene and alkynes : (1L)

3.2 Carbon-Carbon sigma bonds: (3L)

Chemistry of alkanes: Formation of alkanes by Corey-House reaction, Sabatier Sanderens reaction, and Reaction of alkanes- , Chlorination, Iodination, Nitration, Sulphonation, Combustion.

3.1 Carbon-Carbon pi bonds: (11 L)

Formation of alkenes and alkynes by elimination reactions: Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/ Anti Markownikoff addition),

Mechanism of oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, Reduction (catalytic and chemical), syn and anti-hydroxylation (oxidation). 1, 2- and 1, 4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination using N-bromosuccinimide and mechanism, e.g. propene, 1-butene, toluene, ethylbenzene.

Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

Semester II Paper II Unit I

1.1 Ionic Equilibria: (7L)

Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water, ionization of weak acids and bases, pH scale, common ion effect, dissociation constants of mono-, di- and triprotic acid (exact treatment for monoprotic acid)

Buffers: Introduction, types of buffers, derivation of Henderson equation for acidic and basic buffers, buffer action, buffer capacity. (Numericals expected)

1.2 Liquid State: (4L)

Surface tension: Introduction, methods of determination of surface tension by drop number method (Numericals expected) Viscosity: Introduction, coefficient of viscosity, relative viscosity, specific viscosity, reduced viscosity, determination of viscosity by Ostwald viscometer (Numericals expected) Refractive index: Introduction, molar refraction and polarizability, determination of refractive index by Abbe's refractometer (Numerical expected)

1.3 Solid State Chemistry (4L)

Types of solids, crystal lattice, lattice points, unit cell, space lattice and lattice plane, laws of crystallography: Law of constancy of interfacial angle, law of symmetry and law of rational indices (Numericals expected)

Unit II

2.1: Chemical Bond and Reactivity: (7L)

Types of chemical bond, comparison between ionic and covalent bonds, polarizability(Fajan's Rule), shapes of molecules, Lewis dot structure, Sidgwick Powell Theory, basic VSEPR theory for AB_n type molecules with and without lone pair of electrons, isoelectronic principles, applications and limitations of VSEPR theory.

2.2: Oxidation Reduction Chemistry: (3L)

- a) Reduction potentials
- b) Redox potentials: half reactions; balancing redox equations..
- c) Applications of redox chemistry.

2.3 General Principles of Metallurgy: (5L)

i) Introduction, occurrence of metals, ores and minerals, types of ores. ii) operations involved in metallurgy:- crushing, methods of concentration such as hand picking, gravity separation, Froth floatation, Calcinations, Roasting etc. iii) Reduction:- Auto reduction, Aluminothermic process and electrolytic reduction. iv) Refining of metals:- poling, liquation, electrolytic and vapour phase refining. i) Extraction of elements: (example: isolation of copper by auto reduction)

Unit III

3.2 Aromatic Hydrocarbons: (15L)

Aromaticity: Hückel's rule anti-aromaticity, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft alkylation/acylation with their mechanism. Hammond's postulate, directing effects of The groups. Disadvantages of F&C acylation and alkylation reaction. Name reaction Involving Electrophilic aromatic substitution.

Activating and deactivating groups Mono and Disubstituted compounds and their orienting effects.

Reference Books:

1. Atkins P.W. and Paula J.de, Atkin's Physical Chemistry, 10th Ed., Oxford University 12 Press (2014).
2. Ball D.W., Physical Chemistry, Thomson Press, India (2007).
3. Castellan G.W., Physical Chemistry, 4th Ed., Narosa (2004).
4. Mortimer R.G., Physical Chemistry, 3rd Ed., Elsevier: NOIDA, UP (2009).
5. Engel T. and Reid P., Physical Chemistry, 3rd Ed., Pearson (2013).
6. Peter A. and Paula J. de., Physical Chemistry, 10th Ed., Oxford University Press(2014).
7. McQuarrie D.A. and Simon J.D., Molecular Thermodynamics, Viva Books Pvt.

Ltd., New Delhi (2004).

8. Levine I.N., Physical Chemistry, 6th Ed., Tata Mc Graw Hill (2010).

9. Metz C.R., 2000 Solved Problems in Chemistry, Schaum Series (2006).

10. Mortimer R.G., Physical Chemistry, 3rd Ed., Elsevier: NOIDA, UP (2009).

11. Banwell C.N., Fundamentals of Molecular Spectroscopy, 4th Ed., Tata McGrawHill (1994).

12. K.L. Kapoor, A Textbook of Physical Chemistry, Macmillan (2000).

Unit II

1. Lee, J.D. Concise Inorganic Chemistry ELBS, 1991.

2. Douglas, B.E. and McDaniel, D.H. Concepts & Models of Inorganic Chemistry Oxford, 1970

3. Atkins, P.W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014.

4. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications, 1962.

5. Rodger, G.E. Inorganic and Solid State Chemistry, Cengage Learning India Edition, 2002.

Unit III

1. Morrison, R. T. and Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt Ltd. (Pearson Education). 2012

2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt Ltd. (Pearson Education).

3. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt Ltd. (Pearson Education).

4. Eliel, E. L. and Wilen, S. H. Stereochemistry of Organic Compounds, Wiley: London, 1994.

5. Kalsi, P. S. Stereochemistry Conformation and Mechanism, New Age International, 2005.

6. Mc Murry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.

CHEMISTRY PRACTICALS:

Semester I

Unit I: Physical Chemistry

1. To prepare 0.1 N succinic acid and standardize the NaOH of two different Concentrations

2. To determine the rate constant for the hydrolysis of ester using HCl as catalyst

3. To determine enthalpy of dissolution of salt (like KNO_3)

4. Preparation of different normal and molar solutions

Unit II: Inorganic Chemistry

1. Commercial analysis of
 - a) Mineral acid
 - b) Organic acid
2. Titration using double indicator: analysis of solution of Na_2CO_3 and NaHCO_3 .
3. Gravimetric analysis
 - a) To determine the percent purity of sample of BaSO_4 containing NH_4Cl
 - b)) To determine the percentage purity of given sample of ascorbic acid .

Unit III: Organic Chemistry

Purification of Organic Compound compounds by 1.

Recrystallization (02) (Benzoic acid, Acetanilide)

2. Sublimation (01) Phthalic anhydride to Phthalic acid³.

Distillation. (01)

(Recording of M.P. & B.P.)

Learners are expected to report

- a) Solvent for recrystallization. (Recrystallization)
- b) Mass and the M.P. & B.P. of purified compound.

Learners should calibrate thermometer before determining melting point.

2. Chromatography

- b) Separation of a mixture of o-and p-nitrophenols by thin layer chromatography(TLC)

CHEMISTRY PRACTICALS:

Semester II

Unit I: Physical Chemistry

1. Determination of viscosity of given liquid by viscometer.
2. . To determine dissociation constant of weak acid (K_a) using Henderson's equation and the method of incomplete titration pH metrically.
3. . To verify Beer-Lambert's law, using KMnO_4 solution by colorimetric method.
4. To standardize commercial sample of HCl using borax and to write material safety data of the chemicals involved.

Unit II: Inorganic Chemistry

1. Qualitative analysis: (at least 4 mixtures to be analyzed)

Semi-micro inorganic qualitative analysis of a sample containing two cations and two anions.

Cations (from amongst):

Ba^{2+} , Ca^{2+} , Sr^{2+} , Cu^{2+} , Cd^{2+} , Fe^{2+} , Ni^{2+} , Mn^{2+} , Mg^{2+} , Al^{3+} , Cr^{3+} , K^+ , NH_4^+

Anions (From amongst): CO_3^{2-} , S^{2-} , SO_3^{2-} , NO_2^- , NO_3^- , Cl^- , Br^- , I^- , SO_4^{2-} , PO_4^{3-} .

(Scheme of analysis should avoid use of sulphide ion in any form for Precipitation / separation of cations.)

2. Redox Titration: 1. To determine the percentage of copper(II) present in a given sample by titration against a standard aqueous solution of sodium thiosulfate (iodometry titration)

2 Estimation of available chlorine in bleaching powder iodometrically.

Unit III: Organic Chemistry

Characterization of monofunctional organic compound (solid, liquid) containing C, H, (O), N, S, X elements. (minimum 6 compounds)

Characteristic Reactions of following Test

1) Test for unsaturation (KMnO_4 and bromine water)

2) Test for acid 3) Test for phenol

4) Test for base 5) Test for nitrogen

6) Test for sulphur 7) Test for halogens

8) Functional groups test

A) Alcohols

B) Aldehyde and ketone

C) Esters

D) Primary aromatic amines

E) Nitro/Dinitro

F) Phenol

G) Amide

Reference Books

Unit I: Physical Chemistry

1. Khosla B.D., Garg V.C. and Gulati A., Senior Practical Physical Chemistry, R.Chand and Co., New Delhi (2011).

2. Garland C. W., Nibler J.W. and Shoemaker D.P., Experiments in Physical Chemistry, 8th Ed., McGraw-Hill, New York (2003).

3. Halpern A.M. and McBane G.C., Experimental Physical Chemistry, 3rd Ed., W.H. Freeman and Co., New York (2003).

4. Athawale V.D. and Mathur P., Experimental Physical Chemistry, New Age International, New Delhi (2001).

Unit II: Inorganic Chemistry

Mendham, J., A. I. Vogel's *Quantitative Chemical Analysis 6th Ed.*, Pearson, 2009.

1. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry, Pearson Education (2009)
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. Practical Organic Chemistry, 5th Ed., Pearson (2012)
3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996

UNIVERSITY OF MUMBAI



JanardanBhagatshikshanPrasarakSanstha's
Changu Kana Thakur
Arts, Commerce and Science College, New Panvel
(Autonomous)

Re-accredited A+ Grade by NAAC
'College with Potential for Excellence' Status Awarded by University
Grants Commission 'Best College Award' by University of Mumbai

Programme : S.Y.B.Sc.
(Choice Based Credit System)
Course: Chemistry
Syllabus for Semester III and IV

To be implemented from the Academic year 2020-2021

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**Draft of the proposed revised syllabus for
Choice Based Credit System**

S.Y.B.Sc. Chemistry

To be implemented from the Academic year 2020-2021

For the subject of chemistry there shall be three papers for 45 lectures each comprising of three units of 15 L each.

Semester-III

1. Paper-I (General Chemistry) Unit-I Physical Chemistry
Unit-II Inorganic Chemistry
Unit-III Organic Chemistry.
2. Paper-II (General Chemistry) Unit-I Physical Chemistry
Unit-II Inorganic Chemistry
Unit-III Organic Chemistry.
3. Paper III Basics of Analytical Chemistry
Unit-I Introduction to Analytical Chemistry and Statistical Treatment of analytical data-
Unit-II Classical Methods of Analysis
Unit-III Instrumental Methods-I

Semester-IV

1. Paper-I (General Chemistry) Unit-I Physical Chemistry
Unit-II Inorganic Chemistry
Unit-III Organic Chemistry.
2. Paper-II (General Chemistry) Unit-I Physical Chemistry
Unit-II Inorganic Chemistry
Unit-III Organic Chemistry.
4. Paper III Basics of Analytical Chemistry
Unit-I Separation Techniques in Analytical Chemistry.
Unit-II Instrumental Methods-II
Unit-III Statistical Treatment of analytical data --II

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Choice Based Credit System

S. Y. B. Sc.

Chemistry Syllabus

To be implemented from the Academic year 2020-2021

Course Content

Semester III

Course Code	Unit	Topic	Credits	L/week
USC3CH1	I	Chemical Thermodynamics-II, Electrochemistry	2	1
	II	Chemical Bonding		1
	III	Reactions and reactivity of nitrogenated hydrocarbons, alcohols, phenols and epoxides		1
USC3CH2	I	Chemical Kinetics-II, Solutions	2	1
	II	Selected topics on p block elements		1
	III	Carbonyl Compounds		1
USC3CH3	I	Introduction to Analytical Chemistry and Statistical Treatment of analytical data-I	2	1
	II	Classical Methods of Analysis.		1
	III	Instrumental Methods-I		1
USC3CHP		Chemistry Practicals I	1	3
		Chemistry Practicals II	1	3
		Chemistry Practicals III	1	3

Semester IV

Course Code	Unit	Topics	Credits	L/week
USC4CH1	I	Electrochemistry-II, Phase Equilibria	2	1
	II	Comparative Chemistry of the transition metals & Coordination Chemistry		1
	III	Carboxylic acids and their derivatives, Stereochemistry		1
USC4CH2	I	Solid state, Catalysis	2	1
	II	Ions in aqueous medium & Uses and Environmental Chemistry of volatile Oxides and oxo-acids		1
	III	Amines, Diazonium salts, Heterocyclic Compounds, Stereochemistry		1
USC4CH3	I	Separation Techniques in Analytical Chemistry	2	1
	II	Instrumental Methods-II		1
	III	Statistical Treatment of analytical data --II		1
USC4CHP		Chemistry Practicals I	1	3
		Chemistry Practicals II	1	3
		Chemistry Practicals III	1	3

Semester III
Paper I
Theory: 45 Lectures

Unit I:Physical Chemistry

1.1 Chemical Thermodynamics-II(8L)

1.1.1 Free Energy Functions: Helmholtz Free Energy, Gibb's Free Energy, Variation of Gibb's

free energy with Pressure and Temperature.

1.1.2 Gibbs-Helmholtz equation, van't Hoff reaction isotherm and van't Hoff reaction isochore.

(Numericals expected).

1.1.3 Thermodynamics of Open System: Partial Molal Properties, Chemical Potential and its variation with Pressure and Temperature, Gibb's Duhem equation.

1.1.4 Concept of Fugacity and Activity

1.2 Electrochemistry: (7L)

1.2.1 Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes.

1.2.2 Kohlrausch law of independent migration of ions.

1.2.3 Applications of conductance measurements: determination of degree of ionization and ionization constant of weak electrolyte, solubility and solubility product of sparingly soluble salts, ionic product of water. (Numericals expected).

1.2.4 Transference number and its experimental determination using Moving boundary method. (Numericals expected). Factors affecting transference number.

Unit-II

Chemical Bonding

2.1 Non-Directional Bonding (4L)

2.1.1 Ionic Bond: Conditions for the Formation of Ionic Bond.

2.1.2 Types of Ionic Crystals

2.1.3 Radius Ratio Rules

2.1.4 Lattice Energy, Born-Landé Equation

2.1.5 Kapustinski Equation

2.1.6 Born-Haber Cycle and its Application

2.2. Directional Bonding: Orbital Approach. (6L)

2.2.1 Covalent Bonding The Valence Bond Theory- Introduction and basic tenets.

- 2.2.2 Interaction between two hydrogen atoms and the Potential energy diagram of the resultant system.
- 2.2.3 Homonuclear diatomic molecules from He₂ to Ne₂
- 2.2.4 Resonance and the concept of Formal Charge; Rules for Resonance or Canonical structures.
- 2.2.5 Bonding in Polyatomic Species: The role of Hybridization. And types of hybrid orbitals-*sp*, *sp*², *sp*³, *sp*³*d*, *sp*²*d*² and *sp*²*d* *sp*³*d*².
- 2.2.6 Equivalent and Non-Equivalent hybrid orbitals
- 2.2.7 Contribution of a given atomic orbital to the hybrid orbitals (with reference to *sp*³ hybridisation as in CH₄, NH₃ and H₂O and series like NH₃, PH₃, AsH₃, BiH₃)

2.3 Molecular Orbital Theory (5L)

- 2.3.1. Comparing Atomic Orbitals and Molecular Orbitals.
- 2.3.2. Linear combination of atomic orbitals. to give molecular orbitals LCAO-MO approach for diatomic homonuclear molecules).
- 2.3.3 Molecular orbital Theory and Bond Order and magnetic property: with reference to O₂, O₂⁺, O₂⁻, O₂²⁻

(Problems and numerical problems expected wherever possible)

Unit III: Organic Chemistry

3.1.1. Reactions and reactivity of halogenated hydrocarbons: [4L]

- 3.1.1. **Alkyl halides:** Nucleophilic substitution reactions: S_N1, S_N2 and S_Ni mechanisms with stereochemical aspects and factors affecting nucleophilic substitution reactions-nature of substrate, solvent, nucleophilic reagent and leaving group.
- 3.1.2. **Aryl halides:** Reactivity of aryl halides towards nucleophilic substitution reactions. Nucleophilic aromatic substitution (S_NAr) addition-elimination mechanism and benzyne mechanism.

3.1.3. Organomagnesium and organolithium compounds: [3L]

Nomenclature, nature, type and reactivity of carbon-metal bond. Preparation using alkyl / aryl halide. Structure, stability and reactions with compounds containing acidic hydrogen, carbonyl compounds, CO₂, cyanides and epoxides.

3.2 Alcohols, phenols and epoxides: [8L]

3.2.1. Alcohols: Nomenclature, Preparation: Hydration of alkenes, hydrolysis of alkyl halides, reduction of aldehydes and ketones, using Grignard reagent. Properties: Hydrogen bonding, types and effect of hydrogen bonding on different properties. Acidity of alcohols, Reactions of alcohols

3.2.2. Phenols: Preparation, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols.

3.2.3. Epoxides: Nomenclature, methods of preparation and reactions of epoxides: reactivity, ring opening reactions by nucleophiles (a) In acidic conditions: hydrolysis, reaction with halogen halide, alcohol, hydrogen cyanide. (b) In neutral or basic conditions: ammonia, amines, Grignard reagents, alkoxides.

Semester III Paper II

Unit I: Physical Chemistry

1.1 Chemical Kinetics-II (7L)

1.1.1 Types of Complex Chemical reactions: Reversible or opposing, consecutive and parallel reactions (No derivations, only examples expected),

Thermal chain reactions: H. and Br. reaction. (only steps involved, no kinetic expression expected).

1.1.2 Effect of temperature on the rate of reaction, Arrhenius equation, Concept of energy of activation (E_a). (Numericals expected).

1.1.3 Theories of reaction rates: Collision theory and activated complex theory of bimolecular reactions. Comparison between the two theories (Qualitative treatment only)

1.2 Solutions: (8 L)

1.2.1 Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law–non-ideal solutions. Vapour pressure-composition and temperature -composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes.

1.2.2 Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids with respect to Phenol-Water, Triethanolamine – Water and Nicotine – Water systems

1.2.3 Immiscibility of liquids- Principle of steam distillation.

1.2.4 Nernst distribution law and its applications, solvent extraction.

Unit-II

2. Selected topics on p block elements (15L)

2.1 Chemistry of Boron compounds

- 2.1.1 Electron deficient compounds – BH_3 , BF_3 , BCl_3 with respect to Lewis acidity and applications.
- 2.1.2 Preparation of simple boranes like diborane and tetraborane.
- 2.1.3 Structure and bonding in diborane and tetraborane (2e-3c bonds)
- 2.1.4 Synthesis of Borax.

2.2 Chemistry of Silicon and Germanium

- 2.2.1 Silicon compounds: Occurrence, Structure and inertness of SiO_2
- 2.2.2 Preparation of structure of SiCl_4
- 2.2.3 Occurrence and extraction of Germanium
- 2.2.4 Preparation of extra pure Silicon and Germanium

2.3 Chemistry of Nitrogen family

- 2.3.1 Trends in chemical reactivity - Formation of hydrides, halides, oxides with special reference to oxides of nitrogen.
- 2.3.2 Oxides of nitrogen with respect to preparation and structure of NO , NO_2 , N_2O and N_2O_4 .
- 2.3.3 Synthesis of ammonia by Bosch – Haber process.

Unit III: Organic Chemistry

Carbonyl Compounds: [15L]

- 31 Nomenclature of aliphatic, alicyclic and aromatic carbonyl compounds. Structure, reactivity of aldehydes and ketones and methods of preparation; Oxidation of primary and secondary alcohols using PCC, hydration of alkynes, action of Grignard reagent on esters, Rosenmund reduction, Gattermann – Koch formylation and Friedel Craft acylation of arenes
- 32 General mechanism of nucleophilic addition, and acid catalyzed nucleophilic addition reactions.
- 33 Reactions of aldehydes and ketones with NaHSO_3 , HCN , RMgX , alcohol, amine, , 2,4-Dinitrophenyl hydrazine, LiAlH_4 and NaBH_4 .
- 34 Mechanisms of following reactions: Benzoin condensation, Knoevenagel condensation, and Cannizzaro reaction.
- 35 Keto-enol tautomerism: Mechanism of acid and base catalysed enolization
- 36 Active methylene compounds: Acetylacetone, ethyl acetoacetate diethyl malonate, stabilised enols.
- 37 **Stereochemistry: (5 L)**
Regioselective, chemoselective, stereoselective and stereospecific reactions.
Stereochemistry of: i) Substitution reaction (SN^1 , SN^2 and SN^i)
ii) Addition reaction (catalytic hydrogenation) (5L)

Semester III

Paper III

Basics in analytical Chemistry

1. Introduction to Analytical Chemistry (15 L)

1.1 Introduction (6L)

1.1.1 General introduction of analytical chemistry

1.1.2 Chemical Analysis: Qualitative and Quantitative analysis. Common Analytical Problems, Important terms associated with chemical analysis, Steps in chemical analysis, Purpose of chemical analysis; Analysis Based (i) On the nature of information required: (Proximate, Partial, Trace, Complete Analysis) and (ii) On the size of the sample used (Macro, semi-micro and micro analysis)

1.1.3 Classification of analytical methods (Classical & instrumental methods)

Importance of analytical chemistry in various fields (Pharmaceutical, Clinical, agriculture, environmental studies and research).

1.2 Errors in Analysis (3L)

1.2.1 Concepts of Accuracy and Precision: terms,

1.2.2 Types of Errors: Determinate and Indeterminate error

1.2.3 Expression of error: Absolute and Relative Error & Constant and proportionate error

1.2.4 Minimization of Determinate error

1.3 Interpretation of Results of Analysis (6L)

1.3.1 Concept of true and acceptable value

1.3.2 Measures of central tendency: Mean, median, mode

1.3.3 Measures of Dispersion: Absolute Deviation, Relative Deviation, Relative average deviation, standard deviation, variance, coefficient of variation.

1.4 Significant Figure

(Problems including Numericals expected)

2. Classical methods of Analysis –I (15L)

2.1 Titrimetric Analysis -I(1L)

2.1.1 Terms involved in Titrimetric Analysis

2.1.2 Types of Titrations

2.2 Tools of titrimetry: Graduated glassware and their Calibration (3L)

i) Volumetric Flask

ii) Burette

iii) Pipette

2.3 Standardization (4L)

2.3.1 Introduction, Concept of standard solution, primary standard, secondary standard

2.3.2 Requirements for primary and secondary standard

2.3.3 Preparation of standard solutions: (Molarity, Formality Normality W/W W/V, ppm) dilution of solution. (Numerical Problems expected)

2.4 Neutralization Titrations (6L)

2.4.1. Concept of pH and its importance in Neutralisation Titrations

2.4.2 End point and Equivalence point of Neutralisation titrations

2.4.3 Construction of titration curve (on the basis of change in pH) and choice of indicator of a titration of

i. Strong acid-strong base

ii. Strong acid-weak base

iii. Strong base-weak acid

2.4.4 Theory of Acid base indicators; Illustrate Acid base indicators with examples (1L)

3. Basic Concepts in Instrumental methods (15L)

- 3.1 Relation between the Analyte, Stimulus and measurement of change in the observable property.
- 3.2 Block Diagram of an Analytical instrument.
- 3.3 Types of Analytical Instrumental methods based on
 - i. Optical interactions (eg. Spectrometry: uv-visible, Polarimetry)
 - ii. Electrochemical interactions (eg. Potentiometry, Conductometry,)
 - iii. Thermal interactions (eg. Thermogravimetry) (3L)
- 3.4. Absorption Spectroscopy(12 L)
 - 3.4.1. Interaction of electromagnetic radiation with matter: Absorption and Emission spectroscopy
 - 3.4.2. Basic Terms: Radiant Power, Absorbance, Transmittance, Monochromatic light, Polychromatic light, Wavelength of maximum absorbance, Absorptivity and Molar Absorbitivity
 - 3.4.3. Statement of Beer's Law and Lambert's Law, Combined Mathematical Expression of Beer - Lambert's Law, Validity of Beer-Lambert's Law, Deviations from Beer-Lambert's Law ((Real deviations, Instrumental deviations and Chemical deviations)
(Numerical problems based on Beer-Lambert's Law)
 - 3.4.4. Instrumentation for absorption spectroscopy: Colorimeters
 - 3.4.5. Block Diagrams for Single beam and double beam Colorimeter
 - 3.4.6. quantitative applications of colorimetry: Calibration curve method

Semester IV
Paper I

Unit I: Physical Chemistry

1.1 Electrochemistry-II: (8 L)

- 1.1.1 Electrochemical conventions, Reversible and irreversible cells.
- 1.1.2 Nernst equation and its importance, Types of electrodes, Standard electrode potential, Electrochemical series (Numericals expected).
- 1.1.3 Thermodynamics of a reversible cell, calculation of thermodynamic properties: ΔG , ΔH and ΔS from EMF data. (Numericals expected)
- 1.1.4 Calculation of equilibrium constant from EMF data. (Numericals expected)
- 1.1.5 Concentration cells with transference and without transference. Liquid junction potential and salt bridge.
- 1.1.6 pH determination using hydrogen electrode and quinhydrone electrode. (Numericals expected)

1.2 Phase Equilibria: (7L)

- 1.2.1 Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation.
- 1.2.2 Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. (numericals expected)
- 1.2.3 Phase diagrams of one-component systems (water and sulphur).

- 1.2.4 Two component systems involving eutectics, congruent and incongruent melting points (lead-silver system).

Unit-II

2.1 Comparative Chemistry of the transition metals (9 L)

- 2.1.1 Position in the periodic table; Natural occurrence principal ores and minerals;
- 2.1.2 Significance of special stability of d^0 , d^5 and d^{10} leading to variable oxidation states; Unusual oxidation states and their stabilities in aqueous solutions (with special reference to vanadium, and chromium.)
- 2.1.3 Origin of colour for transition metals and their compounds: such as reflectivity, surface coatings, particle size, packing density for metals and nature of d-orbitals, number of electrons in the d-orbitals, geometry, and ability for charge transfer).
- 2.1.4 Magnetic properties of transition metal compounds: Origin of magnetism-spin and orbital motion of electrons; equation for spin only and spin-orbital magnetism in terms of Bohr magnetons (No derivation of relevant equations expected); Reasons for quenching of orbital moments.
- 2.1.5 Chemistry of Titanium and vanadium: properties of Oxides and chlorides; use in titrimetric analysis
- 2.1.6 Qualitative tests for transition metal ions: General considerations in devising tests (with reference to Chromium, Manganese, iron, Cobalt Nickel and Copper)

2.2 Coordination Chemistry : (6 L)

2.2.1 Introduction to Chemistry of Coordination Compounds

- i. Isomerism :General Types with special reference to stereoisomerism of coordination compounds (C.N=6)
- ii. Evidence for the formation of coordination compounds,

2.2.2. Theories of coordination compounds

- i. Effective atomic number rule.
- ii. Eighteen electron Rule

2.2.3. Nature of the Metal-Ligand Bond:

- i. Valence Bond Theory; Hybridisation of the central metal orbitals- sp^3 , sd^3/d^3s sp^3d^2/d^2sp^3 , sp^2d ,
- ii. Inner and outer orbital complexes of .(suitable examples of Mn(II) Fe(II),Fe(III),Co(II)/Co(III),Ni(II), Cu(II) Zn(II) complexes with ligands like aqua, ammonia CN^- and halides may be used)
- iii. Limitations of V.B.T

2.2.4. Application of coordination compounds.

Unit III: Organic Chemistry

3.1 Carboxylic Acids and their Derivatives :(11 Lectures)

3.1.1. Nomenclature, structure and physical properties, acidity of carboxylic acids, effects of substituents on acid strength of aliphatic and aromatic carboxylic acids.

3.1.2. Preparation of carboxylic acids: oxidation of alcohols and alkyl benzene, carbonation of Grignard and hydrolysis of nitriles.

3.1.3. Reactions: Acidity, salt formation, decarboxylation, Reduction of carboxylic acids with LiAlH_4 , diborane, Hell-Volhard-Zelinsky reaction, Conversion of carboxylic acid to acid chlorides, esters, amides and acid anhydrides and their relative reactivity.

3.1.4. Mechanism of nucleophilic acyl substitution and acid-catalysed nucleophilic acyl substitution. Interconversion of acid derivatives by nucleophilic acyl substitution.

3.1.5. Mechanism of Claisen condensation and Dieckmann condensation.

3.2 Stereochemistry (4L) Stability of cycloalkane: Strain in cycloalkanes, angle, eclipsing, trans annular (3 to 6membered). Conformations of cyclohexane, mono and di-alkyl cyclohexane and their relative stability.(4L)

Semester IV
Paper II

Unit I: Physical Chemistry

1.1 Solid State: (7L)

- 1.1.1 Recapitulation of laws of crystallography and types of crystals
- 1.1.2 Characteristics of simple cubic, face centered cubic and body centered cubic systems, interplanar distance in cubic lattice (only expression for ratio of interplanar distances are expected)
- 1.1.3 Use of X-rays in the study of crystal structure, Bragg's equation (derivation expected), X-rays diffraction method of studying crystal lattice structure, structure of NaCl and KCl. Determination of Avogadro's number (Numericals expected)

1.2 Catalysis: (8 L)

- 1.2.1 Types of catalysis, catalytic activity, specificity and selectivity, inhibitors, catalyst poisoning and deactivation
- 1.2.2 Mechanisms and kinetics of acid-base catalyzed reactions, effect of pH.
- 1.2.3 Mechanisms and kinetics of enzyme catalyzed reactions (Michaelis-Menten equation)
- 1.2.4 Effect of particle size and efficiency of nanoparticles as catalyst.

Unit-II

2 Ions in aqueous medium

2.1. Acidity of Cations and Basicity of Anions

- i. Hydration of Cations; Hydrolysis of Cations predicting degree of hydrolysis of Cations-effect of Charge and Radius.
- ii. Latimer Equation. Relationship between pKa, acidity and z^2/r ratios of metal ions graphical Presentation
- iii. Classification of cations on the basis of acidity category – Non acidic, Moderately acidic, strongly acidic, very strongly acidic with pKa values range and examples
- iv. Hydration of Anions; Effect of Charge and Radius; Hydration of anions- concept, diagram classification on the basis of basicity

2.2. Uses and Environmental Chemistry of volatile Oxides and oxo-acids

- i. Physical properties of concentrated oxo-acids like sulfuric, Nitric and Phosphoric acid
- ii. Uses and environments aspects of these acids

Unit III: Organic Chemistry

Nitrogen containing compounds and heterocyclic compounds:

3.1 Amines: Nomenclature, effect of substituent on basicity of aliphatic and aromatic amines;

3.1.1. Preparation: Reduction of aromatic nitro compounds using catalytic hydrogenation, chemical reduction using Fe-HCl, Sn-HCl, Zn-acetic acid, reduction of nitriles, ammonolysis of halides, reductive amination, Hofmann bromamide reaction.

3.1.2. Reactions- Salt Formation, N-acylation, N-alkylation, Hofmann's exhaustive methylation (HEM), Hofmann-elimination reaction, reaction with nitrous acid, carbylamine reaction, Electrophilic substitution in aromatic amines: bromination, nitration and sulphonation.

3.2 Diazonium Salts: (7 Lectures)

Preparation and their reactions/synthetic application - Sandmeyer reaction, Gattermann reaction, Gomberg reaction, Replacement of diazo group by -H, -OH. Azo coupling with phenols, naphthols and aromatic amines, reduction of diazonium salt to aryl hydrazine

3.3 Heterocyclic Compounds: (8 Lectures)

- 3.3.1. Classification, nomenclature, electronic structure, aromaticity in 5-numbered and 6-membered rings containing one heteroatom;
- 3.3.2. Synthesis of Furan, Pyrrole (Paal-Knorr synthesis and Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis),
- 3.3.3. Reactivity of furan, pyrrole and thiophene towards electrophilic substitution reactions on the basis of stability of intermediate and of pyridine on the basis of electron distribution. Reactivity of pyridine towards nucleophilic substitution on the basis of electron distribution.
- 3.3.4. Reactions of furan, pyrrole and thiophene: halogenation, nitration, sulphonation, Vilsmeier-Haack reaction, Friedel-Crafts reaction. Furan: Diels-Alder reaction, Pyrrole: Acidity and basicity of pyrrole. Comparison of basicity of pyrrole and pyrrolidine.
- 3.3.5. Pyridine: Basicity. Comparison of basicity of pyridine, pyrrole and piperidine. Sulphonation of pyridine (with and without catalyst), reduction and action of sodamide (Chichibabin reaction).

Semester IV

Paper III

Basics in analytical Chemistry

1. Methods of Separation in Analytical Chemistry (15L)

1.1 An Introduction to Analytical Separations and its importance in analysis. (2L)

1.2 Estimation of an analyte without effecting separation.

1.3 Types of separation methods

1.3.1 Based on Solubilities (Precipitation, Filtration Crystallisation)

1.3.2 Based on Gravity- Centrifugation

1.3.3 Based on volatility-Distillation ;

1.3.4 Based on Electrical effects-Electrophoresis

1.3.5 Based on retention capacity of a Stationary Phase -Chromatography;

1.3.6 Based on distribution in two immiscible phases-Solvent Extraction;

1.3.7 Based on capacity to exchange with a resin-Ion Exchange;

1.4 Chromatography:(2L)

1.4.1 Introduction to Chromatography

1.4.2 Classification of chromatographic methods based on stationary and mobile phase

1.5 Planar Chromatography (7L)

Principle, techniques and applications of

1.5.1 Paper chromatography

1.5.2 Thin layer chromatography

1.6 Electrophoresis (4L)

Introduction, Principle and theory of electrophoresis, Different types of electrophoresis techniques, Moving Boundary Electrophoresis, Zone electrophoresis- Paper, Cellulose acetate and Gel electrophoresis, Applications of electrophoresis

2. Instrumental Methods – II (15L)

Instrumental techniques based on the electrochemical properties of the analytes

2.1 Potentiometry: (5 L)

2.1.1 Principle. Selection of indicator electrode system for various types of titrimetric reaction Acid base titrations

2.1.2. Role of Reference and indicator electrodes

2.1.3. Applications, advantages and limitations

2.1.4. detection of equivalence points Graphically

2.2. pHmetry: (4 L)

2.2.1. Principle

2.2.2. Types of pH meters.

2.2.3. Principle, Construction Working and Care of Combined Glass electrode

2.2.4. Applications in Titrimetry (Strong acid-Strong Base) biological and environmental analysis.

2.3. Conductometry(6 L)

2.3.1. Principle

2.3.2. Conductivity cell its construction and care

2.3.3. conductometric titration curves for following titrations

i. Strong Acid-Strong Base

ii. Strong Acid-Weak Base

iii. Strong Base-weak Acid

iv. Weak Acid- Weak Base.

2.3.4. Advantages & limitations of conductometric titrations.

3. A] Classical Methods of Analysis -II (10L)

3.1. Titrimetric Analysis-II

3.2. Precipitation Titration (4L)

3.1.1. Argentometric titration

3.1.2 Construction of titration curve(numerical problems expected)

3.2.3 Selecting and evaluating the end point: Volhard method, Mohr's method, using adsorption indicator

3.2 Gravimetric Analysis (6 L)

3.2.1. General Introduction to Gravimetry.

3.2.2. Types of Gravimetric Methods

3.2.3 Steps involved in gravimetry analysis

3.2.4 Isolation of ion of interest

3.2.5. Precipitation: Nucleation (homogeneous and herogeneous)& crystal growth, Super solubility curve, significance of metastable region

i. Factors affecting precipitation: Common ion effect and solubility product

ii. Colloidal precipitates (coagulation of colloids, peptization of colloids, treatment of colloidal precipitates). Crystalline precipitates (particle size and filterability).

iii. Conditions for precipitation

iv. Completion of precipitation,

v. Role of Digestion, Filtration, Washing : Choice of washing liquid, Drying Ignition of precipitate.

3.2.6 Co-precipitation (surface adsorption, mixed-crystal formation, occlusion, and mechanical entrapment, co precipitation errors).

B] Introduction to environmental analysis (5 L)

3.3.1 Environmental pollution from industrial effluents.

- i. sources and types of pollutants
- ii. Causes and consequences

- iii. Role of EPA and central pollution control board.
- 3.3.2 Analysis of soil: Composition of soil, Sampling of soil, Industrial effluents and their interactions with soil components.
 - i. Determination of pH of soil samples.
 - ii. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration.
- 3.3.3 Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods.
 - i. Physical Parameters: Colour, Temperature, Taste and Odour, Turbidity, Conductivity, Hydrogen Ion Concentration (pH), Total Solids, Suspended and Dissolved Solids.
 - ii. Chemical Parameters: Acidity, Alkalinity, Hardness, Chlorides, Fluorides, Dissolved Oxygen,
 - iii. Determination of pH, acidity and alkalinity of a water sample.
 - iv. Determination of dissolved oxygen (DO) of a water sample.

(Semester 4 is not having any numerical based unit; however semester 3 is having all 3 units with numericals)

**Semester III Chemistry
Practicals:**

Unit I: Physical Chemistry

1. To verify Ostwald's dilution law for weak acid conductometrically.
2. To determine dissociation constant of weak acid conductometrically.
3. Determination of energy of activation of acid catalyzed hydrolysis of methyl acetate.
4. To investigate the reaction between $K_2S_2O_8$ and KI with equal initial concentrations of the reactants
5. To determine solubility of sparingly soluble salts (any two) conductometrically.

Unit II: Inorganic Chemistry

1. 1) Identification of two cations and two anions in a given mixture containing following: cations Pb^{2+} (II), Ba^{2+} (II), Ca^{2+} (II), Sr^{2+} (II), Cu^{2+} (II), Cd^{2+} (II), Mg^{2+} (II), Zn^{2+} (II), Fe^{2+} (II), Fe^{3+} (III), Ni^{2+} (II), Co^{2+} (II) Al^{3+} (III), Cr^{3+} (III)] and Anions : Cl^- , Br^- , I^- , NO_3^- , SO_4^{2-} , and CO_3^{2-}
2. Crystallization of potassium iodate and to estimate its purity before and after the separation.
3. Estimation of total hardness
4. Investigation of the reaction between Copper sulfate and Sodium Hydroxide (Standard EDTA solution to be provided to the learner).

Unit III: Organic Chemistry

Short organic preparation and their purification: Use 0.5-1.0g of the organic compound.

Purify the product by recrystallization. Report theoretical yield, percentage yield and melting point of the purified product.

Preparation of:

1. Cyclohexanone oxime from cyclohexanone.
2. Glucosazone from dextrose or fructose
3. Tribromoaniline from aniline.
4. β -Naphthylbenzoate
5. m-Dinitrobenzene from nitrobenzene

6. Phthalic anhydride from phthalic acid by sublimation
7. Acetanilide from aniline
8. p-Bromoacetanilide from acetanilide
9. Iodoform from acetone

(Any eight preparations)

Semester IV Chemistry Practicals:

Unit I: Physical Chemistry

1. To determine standard EMF and the standard free energy change of Daniel cell potentiometrically .
2. To determine the amount of HCl in the given sample potentiometrically.
3. Compare the strengths of HCl and H₂SO₄ by studying kinetics of acid hydrolysis of methyl acetate.
6. Industrial visit report.

Unit II: Inorganic Chemistry

1. Inorganic preparation – Nickel dimethyl glyoxime using microscale method.
2. Complex cation – *Tris* (ethylene diamine) nickel (II) thiosulphate.
3. Complex anion – Sodium Hexanitrocobaltate (III) The aim of this experiment is to understand the preparation of a soluble cation (sodium) and a large anion hexanitrocobaltate(III) and its use to precipitate a large cation (potassium)

Unit III: Organic Chemistry

Qualitative Analysis of bi-functional organic compounds on the basis of

1. Preliminary examination
2. Solubility profile
3. Detection of elements C, H, (O), N, S, X.
4. Detection of functional groups
5. Determination of physical constants (M.P/B.P)

Solid or liquid Compounds containing not more than two functional groups from among the following classes may be given for analysis to be given: Carboxylic acids, phenol, carbohydrates, aldehydes, ketones, ester, amides, nitro, anilides, amines, alkyl and aryl halides.

Students are expected to write balanced chemical reactions wherever necessary.
(Minimum 6 compounds to be analyzed)

As such it is felt that this paper will be a subject of choice and interest for learners preferring a specialisation in Chemistry as well as to those who may have interests in other science fields as Physics, Botany, Zoology, Microbiology, Geochemistry and so on.

Goal:

To introduce the learner to an area of learning that is vital for the inherent nature of the subject itself but also is important and irreplaceable irrespective of the long term interest of specialisation or subject of interest of the learner.

**Unit I- Introduction to Analytical Chemistry and Statistical Treatment
of analytical data-I (15 L)**

Scope/ Objectives:

Learners should be able to

1. Select a method of analysis
2. Decide how to identify a sample and prepare it for analysis
3. Select a procedure for analysis
4. Identify sources of possible errors in the results obtained.

(Problems including numericals expected wherever necessary)

1.1. Role of Analytical Chemistry (9 L)

- 1.1.1. Language of analytical chemistry: important terms and their significance in Analytical Chemistry.
- 1.1.2. Purpose of Chemical Analysis; Analysis Based (i) On the nature of information required: (Proximate, Partial, Trace, Complete Analysis) and (ii) On the size of the sample used (Macro, semi-micro and micro analysis)
- 1.1.3. Classical and Non-Classical Methods of Analysis; their types and importance.

1.2. Significance of Sampling in Analytical Chemistry

- 1.2.1. Terms involved in Sampling
- 1.2.2. Types of Sampling
- 1.2.3. Sampling techniques

1.3. Results of Analysis. (6L)

- 1.3.1. Errors in Analysis and their types
- 1.3.2. Precision and Accuracy in Analysis
- 1.3.3. Corrections for Determinate Errors

(Problems including Numericals expected wherever required)

References:

1. Instrumental Analysis by Douglas A. Skoog, F. James Holler, Stanley R. Crouch
2. Instrumental methods of analysis by Willard, H.H.; Merritt, L.L. Jr.; Dean, J.A.; Settle, 7th Edition

3. Fundamental of Analytical Chemistry by Douglas A. Skoog, West, F. James Holler, S. R. Crouch

4. Modern Analytical Chemistry by David Harvey, McGraw-Hill Higher Education

Unit II- Classical Methods of Analysis(15 L)

Objectives:

The main objectives of this unit is to

- Introduce classical methods of chemical analysis.
- Appreciate the various terms and types of titrimetric analysis.
- Ability to select proper titrimetric method
- Appreciate the usefulness of the gravimetric method of analysis
- Identify a suitable gravimetric method
- Perform the required calculations involved in the analysis by titrimetry as well as gravimetry.

2. Classical Methods of Analysis. (04L)

21. Titrimetric Methods

- 2.1.1. Terms involved in Titrimetric methods of analysis. Comparing volumetry and Titrimetry
- 2.1.2. The Conditions suitable for titrimetry
- 2.1.3. Types of titrimetry – Neutralisation (Acidimetry, alkalimetry), Redox, (Iodometry, Iodimetry,) Precipitation and Complexometric titrations and indicators used in these titrations
- 2.1.4. Tools of Titrimetry: Graduated glasswares and Calibration

22. Standard solutions (Primary and Secondary standards in Titrimetry) and Calculations in Titrimetry.

23. Neutralisation Titrations (04L)

- 2.3.1. Concept of pH and its importance in Neutralisation Titrations
- 2.3.2. End point and Equivalence point of Neutralisation titrations
- 2.3.3. Determination of End point by using
 - i. Indicators causing colour change
 - ii. Change in potential, (by potentiometry)
 - iii. Change in conductance (by conductometry)
- 2.3.4. Construction of titration curve (on the basis of change in pH)of a titration of
 - i. Strong acid-weak base
 - ii. Strong base-weak acid

24. Gravimetric analysis (06 L)

- 2.4.1. General Introduction to Gravimetry.
- 2.4.2. Types of Gravimetric Methods –
- 2.4.3. Precipitation Gravimetry:
 - i. Steps involved in precipitation gravimetry analysis
 - ii. Conditions for precipitation
 - iii. Completion of precipitation,
 - iv. Role of Digestion, Filtration, Washing, Drying Ignition of precipitate.

- v. Applications of Gravimetric Analysis: Determination of sulfur in organic compounds; Estimation of Nickel in Cu-Ni alloy using dimethyl glyoxime; Determination of Aluminum by converting it to its oxide.

References:

- 1) Skoog et al. "Fundamentals of Analytical chemistry" Cengage Learning, Eight Edition, chapter 13, 14 and 15
- 2) Day and Underwood, "Quantitative analysis" prentice hall 1991, chapter 3
- 3) S.M. Khopkar, "Basic Concepts of Analytical Chemistry", IInd Edition NewAge International Publisher
- 4) Gary D. Christan, "Analytical Chemistry", VIth Edition, Wiley Students Edition, Chapter No 8,9,10
- 5) Fundamental of Analytical Chemistry by Douglas A. Skoog, West, F. James Holler, S. R. Crouch
- 6) Modern Analytical Chemistry, David Harvey (page numbers 232 -265)

Unit III: Instrumental Methods-I [15 L]

Objectives:

On completing the learning of this unit the learner is expected to

- Know the various instrumental methods of analysis
- Advantages of using instruments to make measurements
- The various observable properties of a given analyte and the stimulus best suited for its analysis
- Know about a generalized diagram of an analytical instrument
- Select a suitable instrumental method for analysis
- Appreciate the basic terms in spectrometry
- Use the relationship between absorbance (and its variations) and concentration of the analyte.
- Chose a suitable method for photometric titrations.

3. Basic Concepts in Instrumental methods (03)

31. Relation between the Analyte, Stimulus and measurement of change in the observable property.
32. Block Diagram of an Analytical instrument.
33. Types of Analytical Instrumental methods based on
 - i. Optical interactions (eg. Spectrometry: uv-visible, Polarimetry)
 - ii. Electrochemical interactions (eg. Potentiometry, Conductometry,)
 - iii. Thermal interactions (eg. Thermogravimetry)

34. Spectrometry (07 L)

- 3.4.1. Interaction of electromagnetic radiation with matter: Absorption and Emission spectroscopy
- 3.4.2. Basic Terms: Radiant Power, Absorbance, Transmittance, Monochromatic

- light, Polychromatic light, Wavelength of maximum absorbance, Absorptivity and Molar Absorbivity
- 3.4.3. Statement of Beer's Law and Lambert's Law, Combined Mathematical Expression of Beer -Lambert's Law, Validity of Beer-Lambert's Law, Deviations from Beer-Lambert's Law ((Real deviations, Instrumental deviations and Chemical deviations)
(Numerical problems based on Beer-Lambert's Law)
- 3.4.4. Instrumentation for absorption spectroscopy: Colorimeters and Spectrophotometers
- 3.4.5. Block Diagrams for Single beam and Colorimeter, and Spectrophotometer (Principles, Construction and working-Details of Components expected i.e , source ,Sample holder , Filters/Monochromators, Detectors such as Photomultiplier tube)
- 3.4.6. Applications of UV-Visible Spectrophotometry (02 L)**
- (a) Qualitative analysis such as Identification of functional groups in Organic compounds ,Chromophores and Auxochrome,*cis* and *trans* isomers
- (b) Quantitative analysis by Calibration curve method and
- 3.4.7. Photometric Titrations: Principle ,Instrumentation, Types of Photometric titration Curves with examples. (03L)**

**Semester III Chemistry
Practicals: Paper III
Basics in Analytical Chemistry**

1. Tools of Analytical Chemistry-I:

- a) Analytical glass wares like burettes, pipettes, Standard flasks, Separating funnels.
- b) Weighing tools such as two pan balance and monopan balance, digital balances:
- c) Incineration devices: Burners, Electrical Incinerators, Muffle Furnace,
- d) Drying Devices: Hot Air Oven, Microwave Oven, Descicators, Vacuum descicators
- e) Monochromators, Filters, Sample holders, Prisms, Diffraction Gratings, Photoemissive cells, Photomultiplier tubes

(The learner should draw diagrams and write-ups providing uses, care and maintenance of the items mentioned in (a) and principle, construction and uses of items (b) to (e) in his journal.

2. Gravimetric estimation of Nickel (II) as Ni-DMG and calculation of % error.
(The learner is expected to know the role of the various reagents/chemicals used In the estimation, various steps involved. They should write the complete and Balanced chemical reaction for the formation of the Ni(DMG)₂ complex.
3. Colorimetric Determination of Copper Ions in given Solution by using calibration curve method and calculation of % error.
(The learner is expected to learn the relation between concentration and Absorbance, to draw a calibration curve, use the slope of the calibration curve and compare it with the calculated slope. They are also expected to state the error estimate of their results).
4. Determination of buffer capacity of acid buffer and basic buffer.
(The learner is expected to learn the use pH meter, standardization of pH meter, use of Henderson's equation and calculation of buffer capacity)
5. Estimation of Aspirin
6. Gravimetric estimation of barium ions using K₂CrO₄ as precipitant calculation of % error.
(The learner is expected to learn the skills of using the counterpoise technique used in this gravimetric estimation; Using counterpoise method whatman No.42 for filtration. In such a case no incineration or use of silica crucible is required. They are also expected to state the error estimate of their results)

Objectives:

Semester IV
Paper III Basics in Analytical Chemistry -II
Theory: 45 Lectures
Unit –I -Methods of separation (15 L)

The learner is expected to understand

- The importance of separation in sample treatment
- Various methods of separations
- How to select a method of separation of an analyte from the matrix
- How a solute gets distributed between two immiscible phases
- Principle of solvent extraction and various terms involved therein
- Effect of various parameters on solvent extraction of a solute
- Classification of Chromatographic methods
- Paper and thin layer chromatography and using them in practice.

1. Separation Techniques in Analytical Chemistry **(02 L)**

- 1.1. An Introduction to Analytical Separations and its importance in analysis.
- 1.2. Estimation of an analyte without effecting separation.
- 1.3. Types of separation methods
 - 1.3.1. Based on Solubilities (Precipitation, Filtration Crystallisation)
 - 1.3.2. Based on Gravity- Centrifugation
 - 1.3.3. Based on volatility-Distillation ;

- 1.3.4. Based on Electrical effects-Electrophoresis
1.3.5. Based on retention capacity of a Stationary Phase -Chromatography;
1.3.6. Based on distribution in two immiscible phases-Solvent Extraction;
1.3.7. Based on capacity to exchange with a resin-Ion Exchange;
1.4. Electrophoresis: Principles, Basic Instrumentation, Working and Application in separation of biomolecules like enzymes and DNA. (02L)
1.5. Solvent extraction (06 L)
1.5.1. Introduction, Nernst distribution Law, Distribution Ratio, Partition Coefficient.
1.5.2. Conditions of extraction: Equilibration time, Solvent volumes, temperature, pH.
1.5.3. Single step and multi step extraction, Percentage extraction for single step and multistep extraction. Separation factor.
1.5.4. Batch and continuous extraction
1.6. Chromatography : (05L)
1.6.1. Introduction to Chromatography
1.6.2. Classification of chromatographic methods based on stationary and mobile phase
1.6.3. Paper Chromatography: Principle, techniques and applications of Paper Chromatography in separation of cations.
1.6.4. Thin layer Chromatography Principle, technique and Applications in determining the purity of a given solute; Following progress of a given reaction .

References :

1. D.A. Skoog, D.M. West, F.J. Holler and CX.R. Crouch – Fundamentals of Analytical chemistry, 8th edition
2. G.H. Morrison and H. Freiser , Solvent extraction in analytical chemistry
3. P. G. Swell and B. Clarke, Chromatographic separations , Analytical chemistry by open Learning , John Wiley and sons, 1987
4. Modern Analytical Chemistry , David Harvey (page numbers 596 -606)
5. Modern Analytical Chemistry , David Harvey (page numbers 215 -217)

Unit –II - Instrumental Methods-II (15 L)

Objectives

On completing this unit the learner is

- Expected to appreciate the nature of interaction between applied electrical potential and the concentration of the analyte.
- The nature of chemical reactions that influence potential of a given cell.
- Familiar with the various types of electrodes or half cells.
- Appreciate the nature, need and importance of pH
- Expected to know the applications of the various instrumental methods dealt with in this unit.

2. Instruments based on the electrochemical properties of the analytes

- 2.1. Potentiometry: (05 L)**
2.1.1. Principle.
2.1.2. Role of Reference and indicator electrodes

2.1.3. Applications in Neutralisation reactions with reference to the titration of a Strong acid against a Strong Base (using quinhydrone electrode)

2.1.4. Graphical methods for detection of end points

2.2. pHmetry: (04 L)

2.2.1. Principle

2.2.2. Types of pH meters.

2.2.3. Principle, Construction Working and Care of Combined Glass electrode

2.2.4. Applications in Titrimetry (Strong acid-Strong Base) biological and environmental analysis.

2.3. Conductometry: (06 L)

2.3.1. Principle

2.3.2. Conductivity cell its construction and care

2.3.3. Applications in Neutralisation Titrimetry with respect to

i. Strong Acid-Strong Base

ii. Strong Acid-Weak Base

iii. Strong Base-weak Acid

iv. Weak Acid- Weak Base.

2.3.4. Advantages & limitations of conductometric titrations.

References:

- 1) Principles of Instrumental analysis, D. A. Skoog, 3rd edition, Saunders college publishing. Chapters: 20, 23 Page nos: 600 - 605, 631, 704 - 711.
- 2) Vogel's Text book of quantitative inorganic analysis, 4th edition, ELBS/ Longman. Chapters: XIV, XV Page nos: 566 - 601, 615 - 625.
- 3) Instrumental methods of analysis, B. K. Sharma, Goel publishing house. Miscellaneous methods: Chapters: 1, 3, 4 Page nos: 1 - 14, 21 - 57.

Unit III- Statistical Treatment of analytical data --II (15 L)

Objectives:

On completing this unit the learner is expected to understand

- i) The use of statistical methods in chemical analysis.
- ii) The nature of indeterminate errors
- iii) The randomness of such errors and its distribution around a correct or acceptable result
- iv) Computation of Confidence limits and confidence interval
- v) Test for rejection of doubtful result
- vi) Method to draw best fitting straight line

3.1. Nature of Indeterminate Errors: (03L)

3.1.1. The true and acceptable value of a result of analysis

3.1.2. Measures of central tendency: mean, median, mode, average

3.1.3. Measures of dispersion: Absolute deviation, relative deviation, relative average deviation, standard deviation, (s, sigma) variance, coefficient of variation

3.2. Distribution of random errors: (02L)

3.2.1. Gaussian distribution curve.

3.2.2. Equation and salient features of Gaussian distribution curve

3.3. Concept of Confidence limits and confidence interval and its computation using (03 L)

(i) Population standard deviation

(ii) Student's *t* test

(iii) Range

3.4. Criteria for rejection of doubtful result (02 L)

(i) 2.5 d rule

(ii) 4.0 d rule

(iii) Q test

3.5. Test of Significance (02 L)

(i) Null hypothesis

(ii) F-test (variance ratio test)

3.6. Graphical representation of data and obtaining best fitting straight line (03 L)

(a) For line passing through origin

(b) For line not passing through origin

[Numerical problems wherever possible, expected]

References:

1. Modern Analytical Chemistry , David Harvey (page numbers 53 -84)
2. Fundamentals of analytical chemistry – Skoog and West

Practicals:

Paper III Elective

(Basics in analytical Chemistry)

1. Tools of Analytical Chemistry-II
 - a. Filtration Flasks, Funnels, Separating Funnels, Distillation apparatus, Vacuum Distillation assembly, Centrifuge machine, Electrophoresis apparatus.
 - b. Development chamber for chromatography
 - c. Electrodes like Reference Electrodes and Indicator Electrodes (with respect to care and maintenance.)
 - d. Conductivity cell (with respect to care and maintenance.)
 - e. Combined Glass electrode (with respect to care and maintenance.)
 - f. Types of Salt Bridges and preparation of any one or use of salt bridge, its effect on the potential of a given electrode/cell

(The learner should draw diagrams and write-ups providing uses of the items mentioned in (a and b) and Principle, Construction care and Uses of items (c) to (f) in his journal.)

2. **Paper chromatography:** Separation of cations like Fe(III), Ni(II) and Cu(II) in a sample.
3. Separation of a solute between two immiscible solvents to determine the distribution ratio and/or extraction efficiency. (Solutes could be as their aqueous solutions and the organic solvent ethyl acetate) Suggested solute for the distribution study: Fe (III) in aqueous solutions.

(The learner is expected to learn the technique of solvent extraction by using separating funnel, method to estimate the concentrations of the solute distributed in the two immiscible phases, determination of the extraction efficiency)

4. Conductometric titration: Estimation of given acid by conductometric titration with strong base and calculation of % error. (The learner is expected to learn the handling of the conductometer and the conductivity cell, determination of end point by plotting a graph. They are also expected to state the error estimate of their results).
5. Estimation of Fe(II) in the given solution by titrating against $K_2Cr_2O_7$ potentiometrically and calculation of % error. (The learner is expected to learn the handling of the potentiometer, use of Platinum electrode and reference electrode like SCE. They will learn to determine end point by plotting a graph. They are also expected to state the error estimate of their results).
6. Gravimetric estimation of Sulfate as $BaSO_4$ and calculation of % error. (The learner is expected to write a balanced chemical reaction, need for digestion of the precipitate and the skill required to carry out the incineration and to estimate the % error.)
(The learner is expected to write a balanced chemical reaction, need for digestion of the precipitate and the skill required to carry out the incineration and to estimate the % error.)

REFERENCES:

For paper III

1. **D. A. Skoog, D. M. West, F. J. Holler, and S. R. Crouch, Analytical Chemistry: An Introduction, 7th ed., Chapter 15, pp. 345-381.**
2. **A.I. Vogel. "Textbook of Quantitative Inorganic Analysis," Longman, London (1961).**
3. **R.V. Dils. "Analytical Chemistry. Methods of Separation," van Nostrand, N.Y. (1974).**
4. **Some Experiments for B. Tech in Chemistry & Chemical Technology compiled by Prof. J.B.BARUAH, Mrs. Abhilasha Mohan Bauah and Mr. Parikshit Gogoi**

UNIVERSITY OF MUMBAI



Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

Arts, Commerce and Science College, New Panvel (Autonomous)

Re-accredited A⁺ Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Programme: B.Sc.

(Choice Based Credit System)

Course: Chemistry

Syllabus for Semester V and VI

(To be implemented from the Academic Year 2021-2022)

Draft Syllabus
Syllabus for the T.Y.B.Sc. Chemistry Semester V and VI
 Credit Based Semester and Grading System

Course: B.Sc.

To be implemented from the academic year 2021-2022

Paper I (Physical Chemistry)

SEMESTER V

Course Code	Paper No. and Name	Unit	Topics	Credits	L/Week
USC5CH1	Paper I Physical Chemistry	I	Molecular Spectroscopy	2.5	4
		II	i) Chemical Thermodynamics ii) Chemical Kinetics		
		III	Nuclear Chemistry		
		IV	i) Surface Chemistry and Catalysis ii) Colloidal State		
USC5CP1	Practical's	<ul style="list-style-type: none"> • Non- Instrumentation • Instrumentation 	1.5	4	

SEMESTER VI

Course Code	Paper No. and Name	Unit	Topics	Credits	L/Week
USC6CH1	Paper I Physical Chemistry	I	i) Electrochemistry ii) Nanomaterials	1.5	4
		II	Polymers		
		III	i) Basics of Quantum Chemistry ii) Renewable Energy Resources		
		IV	i) NMR- Nuclear Magnetic Resonance Spectroscopy ii) Phase Rule		
USC6CP1	Practical's	<ul style="list-style-type: none"> • Non-Instrumentation • Instrumentation 	1.5	4	

SEMESTER V (THEORY)

COURSE CODE: USC5CH1

CREDITS: 2.50

LECTURES: 60

Unit		Topics	
I	1.0	MOLECULAR SPECTROSCOPY	(15L)
	1.1	Rotational Spectrum: Introduction to dipole moment, polarization of a bond, bond moment, molecular structure, Rotational spectrum of a diatomic molecule, rigid rotor, moment of inertia, energy levels, conditions for obtaining pure rotational spectrum, selection rule, nature of spectrum, determination of internuclear distance and isotopic shift.	
	1.2	Vibrational spectrum: Vibrational motion, degrees of freedom, modes of vibration, vibrational spectrum of a diatomic molecule, simple harmonic oscillator, energy levels, zero-point energy, conditions for obtaining vibrational spectrum, selection rule, nature of spectrum.	
	1.3	Vibrational-Rotational spectrum of diatomic molecule: Energy levels, selection rule, nature of spectrum, P and R branch lines. Anharmonic oscillator - energy levels, selection rule, fundamental band, overtones. Application of vibrational-rotational spectrum in determination of force constant and its significance. Infrared spectra of simple molecules like H ₂ O and CO ₂ .	
	1.4	Raman Spectroscopy: Scattering of electromagnetic radiation, Rayleigh scattering, Raman scattering, nature of Raman spectrum, Stoke's lines, anti-Stoke's lines, Raman shift, quantum theory of Raman spectrum, comparative study of IR and Raman spectra, rule of mutual exclusion- CO ₂ molecule.	
II	2.1	CHEMICAL THERMODYNAMICS	(9L)
	2.1.1	Colligative properties: Vapour pressure, Raoult's law and relative lowering of vapour	

			pressure.	
		2.1.2	Solutions of Solid in Liquid: Elevation in boiling point of a solution, thermodynamic derivation relating elevation in boiling point of the solution and molar mass of non-volatile solute. Depression in freezing point of a solution, thermodynamic derivation relating the depression in the freezing point of a solution and the molar mass of the non-volatile solute.	
		2.1.3	Osmotic Pressure: Introduction, thermodynamic derivation of Van't Hoff equation, Van't Hoff Factor, Reverse Osmosis.	
	2.2		CHEMICAL KINETICS	(6L)
		2.2.1	Collision theory of reaction rates: Application of collision theory to i. Unimolecular reaction Lindemann theory ii. Bimolecular reaction. (derivation expected for both) Merits and drawbacks of collision theory	
		2.2.2	Activated complex theory: Activated complex theory of bimolecular reactions. Merits of Activated complex theory. comparison of collision theory and activated complex theory.	
		2.2.3	Classification of reactions as slow, fast and ultra -fast. Study of kinetics of fast reactions by Stop flow method and Flash photolysis (No derivation expected).	
III	3.0		NUCLEAR CHEMISTRY	(15L)
		3.1	Introduction: Nuclear disintegration/ Nuclear radioactivity, Types of nuclear radiations (α -particle, β - particle and γ -ray). Basic terms-radioactive constants (decay constant, half-life and average life) and units of radioactivity.	
		3.2	Detection and Measurement of Radioactivity: Types and characteristics of nuclear radiations, behavior of ion pairs in electric field, detection and measurement of nuclear radiations using G.M. Counter and Scintillation Counter.	

		3.3	Application of use of radioisotopes as Tracers: Chemical reaction mechanism, age determination - dating by C ¹⁴ .	
		3.4	Nuclear reactions: Nuclear transmutation (one example for each projectile), artificial radioactivity, Q - value of nuclear reaction, threshold energy.	
		3.5	Fission Process: Fissile and fertile material, nuclear fission, chain reaction, factor controlling fission process. Multiplication factor and critical size or mass of fissionable material, nuclear power reactor and breeder reactor.	
		3.6	Fusion Process: Thermonuclear reactions occurring on stellar bodies and earth.	
IV	4.1		SURFACE CHEMISTRY AND CATALYSIS	(10L)
		4.1.1	Adsorption: Physical and Chemical Adsorption, types of adsorption isotherms. Langmuir's adsorption isotherm (Postulates and derivation expected). B.E.T. equation for multilayer adsorption, (derivation not expected). Determination of surface area of an adsorbent using B.E.T. equation.	
		4.1.2	Catalysis: Homogeneous and heterogeneous catalysis, catalytic activity and selectivity, promoters, inhibitors, catalyst poisoning and deactivation.	
		4.1.3	Acid catalysis and Base catalysis, mechanism and kinetics of acid and base catalysed reactions, effect of pH on acid and base catalysed reactions. Enzyme catalysis, mechanism and kinetics of reaction (Michaelis- Menten equation).	
	4.2		COLLOIDAL STATE	(5L)
		4.2.1	Introduction to colloids: Emulsions, Sols and Gels	
		4.2.2	Colloidal electrolytes: Introduction, micelle formation.	
		4.2.3	Surfactants: Classification and applications of surfactants in detergents and food industry.	

Reference Books:

1. **Physical Chemistry**, Ira Levine, 5th Edition, 2002 Tata McGraw Hill Publishing Co.Ltd.
2. **Physical Chemistry**, P.C. Rakshit, 6th Edition, 2001, Sarat Book Distributors, Kolkata.
3. **Physical Chemistry**, R.J. Silbey, & R.A. Alberty, 3rd edition, John Wiley & Sons, Inc [part 1]
4. **Physical Chemistry**, G. Castellan, 3rd edition, 5th Reprint, 1995 Narosa Publishing House.
5. **Modern Electrochemistry**, J.O.M Bockris & A.K.N. Reddy, Maria Gamboa – Aldeco 2nd Edition, 1st Indian reprint, 2006 Springer
6. **Fundamental of Molecular Spectroscopy**, 4th Edn., Colin N Banwell and Elaine M McCash Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2008.
7. **Physical Chemistry**, G.M. Barrow, 6th Edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
8. **The Elements of Physical Chemistry**, P.W. Atkins, 2nd Edition, Oxford University Press Oxford.
9. **Physical Chemistry**, G.K. Vemullapallie, 1997, Prentice Hall of India, Pvt.Ltd. New Delhi.
10. **Principles of Physical Chemistry** B.R. Puri, L.R. Sharma, M.S. Pathania, VISHAL PUBLISHING Company, 2008.
11. **Textbook of Polymer Science**, Fred W Bilmeyer, John Wiley & Sons (Asia) Ple. Ltd., Singapore, 2007.
12. **Polymer Science**, V.R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar, New Age International (P) Ltd., Publishers, 2005.
13. **Essentials of Nuclear Chemistry**, Arnikar, Hari Jeevan, New Age International (P) Ltd., Publishers, 2011.
14. **Chemical Kinetics**, K. Laidler, Pearson Education India, 1987.

SEMESTER V (PRACTICAL'S)

COURSE CODE: USC5CP1 CREDITS: 1.50 for USC5CH1 (Physical Chemistry)

Sr. No.	TYPE	PRINCIPLE	TITLE
1	Non-Instruments	Colligative properties	To determine the molecular weight of compound by Rast Method
2		Chemical Kinetics	To determine the order between $K_2S_2O_8$ and KI by fractional change method.
3		Surface phenomena	To investigate the adsorption of acetic acid on activated charcoal and test the validity of Freundlich adsorption isotherm.
4	Instruments	Potentiometry	To determine the solubility product and solubility of AgCl potentiometrically using chemical cell.
5		Conductometry	To determine the velocity constant of alkaline hydrolysis of ethyl acetate by conductometric method.
6		pH-metry	To determine acidic and basic dissociation constants of amino acid and hence to calculate isoelectric point.

Reference books

1. **Practical Physical Chemistry** 3rd edition A.M. James and F.E. Prichard, Longman publication
2. **Experiments in Physical Chemistry** R.C. Das and B. Behra, Tata Mc Graw Hill
3. **Advanced Practical Physical Chemistry** J.B. Yadav, Goel Publishing House
4. **Advanced Experimental Chemistry** Vol-I J.N. Gurtu and R Kapoor, S. Chand and Co.
5. **Experimental Physical Chemistry** by V.D. Athawale.
6. **Senior Practical Physical Chemistry** by B.D. Khosla, V.C. Garg and A. Gulati, R

SEMESTER VI (THEORY)

COURSE CODE: USC6CH1

CREDITS 2.50

LECTURES: 60

Unit			Topics	
I	1.1		ELECTROCHEMISTRY	(7L)
		1.1.1	Activity and Activity Coefficient: Lewis concept, ionic strength, mean ionic activity and mean ionic activity coefficient of an electrolyte, expression for activities of electrolytes. Debye-Huckel limiting law (No derivation).	
		1.1.2	Classification of cells: Chemical cells and Concentration cells Chemical cells with and without transference, Electrode Concentration cells, Electrolyte concentration cells with and without transference (Derivation expected)	
	1.2		NANOMATERIALS	(8L)
		1.2.1	Terminology and history: Optical properties of nanomaterials. i. Semiconducting nanoparticle ii. Metallic nanoparticle	
		1.2.2	Characterization and fabrication: i. Characterization methods a) Scanning electron microscopy (SEM) b) Transmission electron microscopy (TEM) ii. Top-down, bottom-up fabrication a) Co-precipitation method b) Sol-gel method c) Chemical reduction method d) Electrochemical method.	
		1.2.3	Applications of Nanomaterials.	
II	2.0		POLYMERS	(15L)
		2.1	Basic terms: Macromolecule, monomer, repeat unit, degree of polymerization.	
		2.2	Classification of polymers: Classification based on source, structure, thermal response and physical properties.	
		2.3	Molar masses of polymers: Number average, Weight average, Viscosity average molar	

			mass, Monodispersity and Polydispersity	
		2.4	Method of determining molar masses of polymers: Viscosity method using Ostwald Viscometer. (Derivation expected)	
		2.5	Light Emitting Polymers: Introduction, Characteristics, Method of preparation and applications.	
		2.6	Antioxidants and Stabilizers: Antioxidants, Ultraviolet stabilizers, Colourants, Antistatic agents and Curing agents.	
III	3.1		BASICS OF QUANTUM CHEMISTRY	(10L)
		3.1.1	Classical mechanics: Introduction, limitations of classical mechanics, Black body radiation, photoelectric effect, Compton effect.	
		3.1.2	Quantum mechanics: Introduction, Planck's theory of quantization, wave particle duality, de-Broglie's equation, Heisenberg's uncertainty principle.	
		3.1.3	Interpretation and properties of the wave function on the basis of postulates of quantum mechanics: State function and its significance, Concept of operators - definition, addition, subtraction and multiplication of operators, commutative and non - commutative operators, linear operator, Hamiltonian operator, Eigen function and Eigen value.	
	3.2		RENEWABLE ENERGY RESOURCES	(5L)
		3.2.1	Renewable energy resources: Introduction.	
		3.2.2	Solar energy: Solar cells, Photovoltaic effect, Differences between conductors, semiconductors, insulators and its band gap, Semiconductors as solar energy converters, Silicon solar cell.	
		3.2.3	Hydrogen: Fuel of the future, production of hydrogen by direct electrolysis of water, advantages of hydrogen as a universal energy medium.	
IV	4.1		NMR- NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY	(7L)
		4.1.1	Principle:	

			Nuclear spin, magnetic moment, nuclear 'g' factor, energy levels, Larmor precession, Relaxation processes in NMR (spin-spin relaxation and spin-lattice relaxation).	
		4.1.2	Instrumentation: NMR Spectrometer.	
	4.2		PHASE RULE	(8L)
		4.2.1	Gibb's phase rule and terms involved in the equation.	
		4.2.2	Application of phase rule to TWO component systems, condensed systems, condensed phase rule, eutectic systems (Lead-Silver system), desilverisation of lead.	
		4.2.3	Introduction to THREE component systems, explanation of the phase diagram for three liquids forming one immiscible pair.	

Note
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Num

ericals and word problems are expected from all units of semester V and VI.

Reference Books:

1. **Physical Chemistry**, Ira Levine, 5th Edition, 2002 Tata McGraw Hill Publishing Co.Ltd.
2. **Physical Chemistry**, P.C. Rakshit, 6th Edition, 2001, Sarat Book Distributors, Kolkata.
3. **Physical Chemistry**, R.J. Silbey, & R.A. Alberty, 3rd edition, John Wiley & Sons, Inc [part 1]
4. **Physical Chemistry**, G. Castellan, 3rd edition, 5th Reprint, 1995 Narosa Publishing House.
5. **Modern Electrochemistry**, J.O.M Bockris & A.K.N. Reddy, Maria Gamboa – Aldeco 2nd Edition, 1st Indian reprint, 2006 Springer
6. **Fundamental of Molecular Spectroscopy**, 4th Edn., Colin N Banwell and Elaine M McCash Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2008.
7. **Physical Chemistry**, G.M. Barrow, 6th Edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
8. **The Elements of Physical Chemistry**, P.W. Atkins, 2nd Edition, Oxford University Press Oxford.
9. **Physical Chemistry**, G.K. Vemullapallie, 1997, Prentice Hall of India, Pvt. Ltd. New Delhi.
10. **Principles of Physical Chemistry** B.R. Puri, L.R. Sharma, M.S. Pathania, VISHAL PUBLISHING Company, 2008.
11. **Textbook of Polymer Science**, Fred W Bilmeyer, John Wiley & Sons Ple. Ltd., Singapore, 2007.
12. **Polymer Science**, V.R. Gowariker, N.V. Viswanathan, Jayadev Sreedhar, New Age International

(P) Ltd., Publishers, 2005.

13. **Essentials of Nuclear Chemistry**, Arnikar, Hari Jeevan, New Age International (P) Ltd., Publishers, 2011.

14. **Chemical Kinetics**, K. Laidler, Pearson Education India, 1987.

15. **Fundamentals of nanoparticles** Ahmed Barhoum, Abdel Salam, Hamdy Makhlouf, Micro and nanotechnologies series, 2018.

16. **Nanotechnology - Fundamentals and Applications** Manasi Karkare, 2020.

17. **Nanotechnology: Principles and Practices** – Sulbha Kulkarni

SEMESTER VI (PRACTICAL'S)

COURSE CODE: USC6CP1 CREDITS: 1.50 for USC6CH1 (Physical chemistry)

Sr. No.	TYPE	PRINCIPLE	TITLE
1	Non-Instruments	Viscosity	To determine the molecular weight of high polymer polyvinyl alcohol (PVA) by viscosity measurement.
2		Chemical Kinetics	To interpret the order of reaction graphically (Graph should be plot traditional way or using origin software) from the given experimental data and calculate the specific rate constant. (No fractional order)
3	Instruments	Potentiometry	i. To determine the amount of iodide, bromide and chloride in the mixture by potentiometric titration with silver nitrate. ii. To determine the number of electrons in the redox reaction between ferrous ammonium sulphate and ceric sulphate potentiometrically.
4		Conductometry	To titrate a mixture of weak acid and strong acid against strong base and estimate the amount of each acid in the mixture conductometrically.
5		Colorimetry	To estimate the amount of Fe (III) in the complex formation with salicylic acid by Static Method.

References

1. **Practical Physical Chemistry** 3rd edition A.M. James and F.E. Prichard, Longman publication
2. **Experiments in Physical Chemistry** R.C. Das and B. Behra, Tata Mc Graw Hill
3. **Advanced Practical Physical Chemistry** J.B. Yadav, Goel Publishing House
4. **Advanced Experimental Chemistry** Vol-I J.N. Gurtu and R Kapoor, S. Chand and Co.
5. **Experimental Physical Chemistry** by V.D. Athawale.

6. Senior Practical Physical Chemistry by B.D. Khosla, V.C. Garg and A. Gulati, R. Chand and Co. 2011.

Draft Syllabus

Syllabus for the T.Y.B.Sc. Chemistry Semester V and VI

Credit Based Semester and Grading System

Course: B.Sc.

To be implemented from the academic year 2021-2022

Paper I (Inorganic Chemistry)

SEMESTER V

Course Code	Paper No. and Name	Unit	Topics	Credits	L/Week	SEMESTER VI
USC5CH2	Paper No. Paper II Inorganic Chemistry	I	1. Molecular symmetry and Chemical Bonding	2.5	4	
		II	2. Solid State Chemistry			
USC6CH2	Paper II Inorganic Chemistry	III	3. Chemistry of Inner transition Elements	2.5	4	
		IV	4. Some selected topics (II)			
USC5CP1	Inorganic Practicals Chemistry	III	3. Organic Preparations	1.5	4	Semester V (THE
		IV	4. Quantitative and Qualitative Analysis			
USC6CP1	Practicals		<ul style="list-style-type: none"> Inorganic Preparations Quantitative and Qualitative Analysis 	1.5	4	

ORY)

COURSE CODE: USC5CH2

CREDITS: 2.50

LECTURES: 60

Unit		Topics	
I	1.0	MOLECULAR SYMMETRY AND CHEMICAL BONDING	(6L)
	1.1	MOLECULAR SYMMETRY	
	1.1.1	Introduction and Importance of Symmetry in Chemistry.	
	1.1.2	Symmetry elements and Symmetry operations.	
	1.1.3	Concept of a Point Group with illustrations using the following point groups : (i) $C_{\infty v}$ (ii) $D_{\infty h}$ (iii) C_{2v} (iv) C_{3v} (v) C_{2h} and (vi) D_{3h}	
	1.2	MOLECULAR ORBITAL THEORY FOR HETERONUCLEAR	(9L)

			DIATOMIC MOLECULES AND POLYATOMIC SPECIES	
		1.2.1.	Comparison between homonuclear and heteronuclear diatomic molecules.	
		1.2.2	Heteronuclear diatomic molecules like CO, NO and HCl, appreciation of modified MO diagram for CO.	
		1.2.3	Molecular orbital theory for H_3 and H_3^+ (correlation diagram expected).	
		1.2.4	Molecular shape to molecular orbital approach in AB_2 molecules. Application of symmetry concepts for linear and angular species considering σ - bonding only. (Examples like: i) BeH_2 , ii) H_2O).	
II	2.0		SOLID STATE CHEMISTRY	
	2.1		STRUCTURES OF SOLIDS	(11L)
		2.1.1	Explanation of terms viz. crystal lattice, lattice point, unit cell and lattice constants.	
		2.1.2	Closest packing of rigid spheres (hcp, ccp), packing density in simple cubic, bcc and fcc lattices. Relationship between density, radius of unit cell and lattice parameters.	
		2.1.3	Stoichiometric Point defects in solids (discussion on Frenkel and Schottky defects expected).	
		2.1.4	Metallic Bond: Band theory, Explanation of electrical properties of conductors, insulators and semiconductors (n- and p- types) on the basis of Band theory.	
	2.2		SUPERCONDUCTIVITY	(4L)
		2.2.1	Discovery of superconductivity.	
		2.2.2	Explanation of terms like superconductivity, transition temperature, Meissner effect.	
		2.2.3	Different types of super conductors viz. conventional superconductors, alkali metal fullerenes, high temperature super conductors.	
		2.2.4	Brief application of superconductors.	
III	3.0		CHEMISTRY OF INNER TRANSITION ELEMENTS	(15L)
		3.1	Introduction: Position in periodic table and electronic configuration of lanthanides and actinides.	
		3.2	Chemistry of Lanthanides with reference to (i) lanthanide contraction	

			and its consequences(ii) Oxidation states (iii) Ability to form complexes (iv) Magnetic and spectral properties	
		3.3	Occurrence, extraction and separation of lanthanides by (i) Ion Exchange method and (ii) Solvent extraction method (Principles and technique)	
		3.4	Applications of lanthanides	
		3.5	Chemistry of Uranium with reference to occurrence, extraction (solvent extraction method), properties and applications.	
IV	4.0		SOME SELECTED TOPICS	
	4.1		CHEMISTRY OF NON-AQUEOUS SOLVENTS	(5L)
		4.1.1	Classification of solvents and importance of non-aqueous solvents.	
		4.1.2	Characteristics and study of liquid ammonia, dinitrogen tetra oxide as non-aqueous solvents with respect to: (i) acid-base reactions and (ii) redox reactions.	
	4.2		COMPARATIVE CHEMISTRY OF GROUP 16	(5L)
		4.2.1	Electronic configuration, trends in physical properties, allotropy	
		4.2.2	Manufacture of sulphuric acid by Contact process.	
	4.3		COMPARATIVE CHEMISTRY OF GROUP 17	(5L)
		4.3.1	Electronic configuration, General characteristics, anomalous properties of fluorine, comparative study of acidity of oxyacids of chlorine w.r.t acidity, oxidizing properties and structures (on the basis of VSEPR theory)	
		4.3.2	Chemistry of interhalogens with reference to preparations, properties and structures (on the basis of VSEPR theory).	

REFERENCES:

Unit-I

1. Per Jensen and Philip R. Bunker, Fundamentals of Molecular Symmetry, Series in Chemical Physics, Taylor & Francis Group
2. J. S. Ogden, Introduction to Molecular Symmetry, Oxford University Press
3. Derek W. Smith, Molecular orbital theory in inorganic chemistry Publisher: Cambridge University Press
4. C. J. Ballhausen, Carl Johan Ballhausen, Harry B. Gray, Molecular Orbital Theory: An Introductory Lecture Note and Reprint Volume Frontiers in chemistry Publisher W.A. Benjamin, 1965
5. Jack Barrett and Mounir A Malati, Fundamentals of Inorganic Chemistry, Affiliated East west Press Pvt. Ltd., New Delhi.

6. Satya Prakash, G.D.Tuli, R.D. Madan, Advanced Inorganic Chemistry. S. Chand & Co. Ltd

Unit-II

7. Lesley E. Smart, Elaine A. Moore Solid State Chemistry: An Introduction, 2nd Edition CRC Press,
1. C. N. R. Rao, Advances in Solid State Chemistry
2. R.G. Sharma, Superconductivity: Basics and Applications to Magnets
3. Michael Tinkham ,Introduction to Superconductivity: Vol I (Dover Books on Physics)
4. R. Gopalan, Inorganic Chemistry for Undergraduates, Universities Press India.
5. Richard Harwood, Chemistry, Cambridge University Press,
6. Satya Prakash, G.D. Tuli, R.D. Madan, Advanced Inorganic Chemistry. S. Chand & Co Ltd.

Unit-III

1. Cotton, Wilkinson, Murillo and Bochmann, Advanced Inorganic Chemistry, 6th Edition.
2. Greenwood, N.N. and Earnshaw, Chemistry of the Elements, Butterworth Heinemann. 1997.
3. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.
4. G. Singh, Chemistry of Lanthanides and Actinides, Discovery Publishing House
5. Simon Cotton, Lanthanide and Actinide Chemistry Publisher: Wiley-Blackwell

Unit-IV

1. B. H. Mahan, University Chemistry, Narosa publishing.
2. R. Gopalan, Inorganic Chemistry for Undergraduates, Universities Press India.
3. J. D. Lee, Concise Inorganic Chemistry, 4thEdn., ELBS,
4. D. F. Shriver and P. W. Atkins, Inorganic chemistry, 3rd edition, Oxford University Press
5. Cotton, Wilkinson, Murillo and Bochmann, Advanced Inorganic Chemistry, 6th Edition.
6. Gary Wulfsberg, Inorganic chemistry, Viva Books Pvt, Ltd. (2002).
7. Richard Harwood, Chemistry, chapter 10 Industrial inorganic chemistry
8. Greenwood, N.N. and Earnshaw, Chemistry of the Elements, Butterworth Heinemann. 1997.
9. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993
10. Satya Prakash, G.D. Tuli, R.D. Madan, Advanced Inorganic Chemistry. S. Chand & Co Ltd 2004

SEMESTER V (PRACTICAL'S)

COURSE CODE: USC5CP1 CREDITS: 1.50 for USC5CH2 (Inorganic Chemistry)

Sr. No.	TYPE	TITLE
1	Inorganic preparations	Preparation of Potassium diaquobis-(oxalato)cuprate (II)
2		Preparation of Ferrous ethylene diammonium sulphate.
3		Preparation of bis-acetylacetonato copper (II)
4	percentage purity	Determination of percentage purity of the given water-soluble salt and qualitative detection w.r.t added cation and/or anion (qualitative analysis only by wet tests).

(Any three salts of transition metal ions)

References

1. Vogel Textbook of Quantitative Chemical Analysis G.H. Jeffery, J. Basset.
2. Advanced experiments in Inorganic Chemistry., G. N. Mukherjee., 1st Edn., 2010., U.N. Dhur & Sons Pvt Ltd.
3. Vogel's. Textbook of. Macro and Semi micro *qualitative inorganic analysis*. Fifth edition.

Semester VI (THEORY)

COURSE CODE: USC5CH2

CREDITS: 2.50

LECTURES: 60

Unit	Topics			
I	1.0	THEORIES OF THE METAL-LIGAND BOND (I)		(15L)
	1.1	Limitations of Valence Bond Theory.		
	1.2	Crystal Field Theory and effect of crystal field on central metal valence orbitals in various geometries from linear to octahedral (from coordination number 2 to coordination number 6)		
	1.3	Splitting of d orbitals in octahedral, square planar and tetrahedral crystal fields.		
	1.4	Distortions from the octahedral geometry: (i) effect of ligand field and (ii) Jahn-Teller distortions.		
	1.5	Crystal field splitting parameter Δ ; its calculation and factors affecting it in octahedral complexes, Spectrochemical series.		
	1.6	Crystal field stabilization energy (CFSE), calculation of CFSE for octahedral complexes with d^0 to d^{10} metal ion configurations.		
	1.7	Consequences of crystal field splitting on various properties such as ionic radii, hydration energy and enthalpies of formation of metal complexes of the first transition series.		
	1.8	Limitations of CFT: Evidences for covalence in metal complexes (i) intensities of d-d transitions, (ii) ESR spectrum of $[\text{IrCl}_6]^{2-}$ (iii) Nephelauxetic effect.		
	2.0	THEORIES OF THE METAL-LIGAND BOND (II)		
II	2.1	MOLECULAR ORBITAL THEORY FOR COORDINATION COMPOUNDS.		(4L)
		2.1.1	Introduction, Application of MOT to octahedral complexes involving σ -bonding.	
		2.1.2	2.1.2 Examples like $[\text{FeF}_6]^{4-}$, $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{FeF}_6]^{3-}$, $[\text{Fe}(\text{CN})_6]^{3-}$, $[\text{CoF}_6]^{3-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$	
		2.1.3	Effect of π -bonding on complexes.	
	2.2	STABILITY OF METAL-COMPLEXES		(4L)
		2.2.1	Thermodynamic and kinetic perspectives of metal complexes with examples.	
	2.2	2.2.2	Stability constants: stepwise and overall stability constants and their interrelationship.	
		2.2.1	Factors affecting thermodynamic stability.	

	2.3		REACTIVITY OF METAL COMPLEXES.	(4L)
		2.3.1	Introduction, Types of reactions in metal complexes.	
		2.3.2	Ligand substitution reactions: Associative and Dissociative mechanisms.	
		2.3.3	Inert and labile complexes: correlation between electronic configurations and lability of complexes.	
		2.3.4	Acid hydrolysis, base hydrolysis and anation reactions.	
	2.4		ELECTRONIC SPECTRA.	(3L)
		2.4.1	Origin of electronic spectra	
		2.4.2	Types of electronic transitions in coordination compounds: intra- ligand, Charge transfer and intra-metal transitions.	
		2.4.3	Selection rules for electronic transitions.	
		2.4.4	Electronic configuration and electronic micro states, Terms and Term symbols for transition metal ions, rules for determination of ground state term.	
		2.4.5	Determination of Terms for d1 electronic configuration.	
III	3.0		ORGANOMETALLIC CHEMISTRY	
	3.1		ORGANOMETALLIC COMPOUNDS OF MAIN GROUP METAL	(6L)
		3.1.1	General characteristics of various types of organometallic compounds, viz. ionic, σ -bonded and electron deficient compounds.	
		3.1.2	General synthetic methods of organometallic compounds: (i) Oxidative-addition (ii) Metal-metal exchange (transmetallation) (iii) Carbanion-halide exchange (iv) Metal-hydrogen exchange (metallation) and (v) Methylene-insertion reactions.	
		3.1.3	Some chemical reactions of organometallic compounds: (i) Reactions with oxygen and halogens, (ii) Alkylation and arylation reactions (iii) Reactions with protic reagents, (iv) Redistribution reactions and (v) Complex formation reactions.	
	3.2		METALLOCENE'S	(3L)
		3.2.1	Introduction, Ferrocene: Synthesis, properties, structure and bonding on the basis of VBT.	
	3.3		METAL CLUSTERS	(2L)
		3.3.1	δ bonding, bonding in Rhenium and Molybdenum halide complexes.	
	3.4		CATALYSIS	(4L)

		3.4.1	Comparison between homogeneous and heterogeneous catalysis	
		3.4.2	Basic steps involved in homogeneous catalysis	
		3.4.3	Mechanism of Wilkinson's catalyst in hydrogenation of alkenes.	
IV	4.0		SOME SELECTED TOPICS	
	4.1		METALLURGY	(7L)
		4.1.1	Types of metallurgies,	
		4.1.2	General steps of metallurgy; Concentration of ore, calcinations, roasting, reduction and refining.	
		4.1.3	Metallurgy of copper: occurrence, physicochemical principles, Extraction of copper from pyrites & refining by electrolysis.	
	4.2		Chemistry of Group 18	(5L)
		4.2.1	Electronic configuration, General characteristics and trends in physical and chemical properties	
		4.2.2	Compounds of Xenon (oxides and fluorides) with respect to preparation and structure (VSEPR)	
		4.2.3	Uses of noble gases	
	4.3		Introduction to Bioinorganic Chemistry.	(3L)
		4.3.1	Essential and non-essential elements in biological systems.	
		4.3.2	Biological importance of metal ions such as Na ⁺ , K ⁺ , Fe ⁺² /Fe ⁺³ and Cu ⁺² (Role of Na ⁺ and K ⁺ w.r.t ion pump)	

REF
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Unit
-I:
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Wiley & Sons.

2. R. K. Sharma Text Book of Coordination Chemistry Discovery Publishing House
3. R. Gopalan , V. Ramalingam Concise Coordination Chemistry, Vikas Publishing House;
4. Shukla P R, Advance Coordination Chemistry, Himalaya Publishing House
5. Glen E. Rodgers, Descriptive Inorganic, Coordination, and Solid-State Chemistry Publisher: Thomson Brooks/Cole

Unit-II:

1. Ramesh Kapoor and R.S. Chopra, Inorganic Chemistry, R. Chand publishers,
2. Basolo, F, and Pearson, R.C., Mechanisms of Inorganic Chemistry, John Wiley & Sons, NY,
3. Twigg, Mechanisms of Inorganic and Organometallic Reactions
4. Publisher: Springer
5. R.K. Sharma Inorganic Reaction Mechanisms Discovery Publishing House

Unit-III:

- 1 Cotton, Wilkinson, Murillo and Bochmann, Advanced Inorganic Chemistry, 6th Edition.
- 2 H.W. Porterfield, Inorganic Chemistry, Second Edition, Academic Press, 2005
- 3 Purecell, K.F. and Kotz, J.C., Inorganic Chemistry W.B. Saunders Co. 1977.
- 4 Robert H. Crabtree, The Organometallic Chemistry of the Transition Metals, Publication by John Wiley & Sons
- 5 B D Gupta & Anil J Elias Basic Organometallic Chemistry: Concepts, Syntheses and Applications, University press
- 6 Ram Charan Mehrotra, Organometallic Chemistry: A Unified Approach, New Age International.

Unit-IV

- 1 R. Gopalan, Inorganic Chemistry for Undergraduates, Universities Press India.
- 2 D. F. Shriver and P. W. Atkins, Inorganic chemistry, 3rd edition, Oxford University Press
- 3 Cotton, Wilkinson, Murillo and Bochmann, Advanced Inorganic Chemistry, 6th Edition.
- 4 Jack Barrett and Mounir A Malati, Fundamentals of Inorganic Chemistry, Affiliated East west Press Pvt. Ltd., New Delhi.
- 5 R.Gopalan, Chemistry for undergraduates. Chapter 18. Principles of Metallurgy. (567-591)
- 6 Puri, Sharma Kalia Inorganic chemistry. Chapter 10, Metals and metallurgy. (328-339)
- 7 Greenwood, N.N. and Earnshaw, Chemistry of the Elements, Butterworth Heinemann. 1997.
- 8 Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.
- 9 Lippard, S.J. & Berg, J.M. Principles of Bioinorganic Chemistry Panima Publishing Company 1994.
- 10 Satya Prakash, G.D. Tuli, R.D. Madan, Advanced Inorganic Chemistry.S. Chand & Co Ltd

SEMESTER VI (PRACTICAL'S)

COURSE CODE: USC6CP1 CREDITS: 1.50 for USC6CH2 (Inorganic Chemistry)

Sr. No.	TYPE	TITLE
1	Inorganic preparations	Preparation of Tris(acetylacetonato) iron (III)
2		Green synthesis of bis(dimethylglyoximato) nickel (II) complex using nickel carbonate and sodium salt of dmg.
3		Preparation of potassium trioxalato aluminate (III)
4	percentage purity	Determination of percentage purity of the given water-soluble salt and qualitative detection w.r.t added cation and/or anion (qualitative analysis only by wet tests).

(Any three salts of main group metal ions)

REFERENCES

1. Vogel Textbook of Quantitative Chemical Analysis G.H. Jeffery, J. Basset.
2. Advanced experiments in Inorganic Chemistry., G. N. Mukherjee., 1st Edn., 2010., U.N. Dhur & Sons Pvt Ltd.
3. Vogel's. Textbook of. Macro and Semi micro *qualitative inorganic analysis*. Fifth edition.

Draft Syllabus

Syllabus for the T.Y.B.Sc. Chemistry Semester V and VI

Credit Based Semester and Grading System

Course: B.Sc.

To be implemented from the academic year 2021-2022

Paper III (Organic Chemistry)

SEMESTER V

Course Code	Paper No. and Name	Unit	Topics	Credits	L/Week
USC5CH3	Paper III Organic Chemistry	I	Mechanism of Organic Reactions Photochemistry	2.5	4
		II	Stereochemistry I Organometallic Chemistry Heterocyclic Chemistry		
		III	IUPAC Nomenclature Synthesis of Organic Compounds Agrochemicals		
		IV	Spectroscopy		
USC5CP2	Practicals	Separation of Binary solid-solid mixture of organic compounds and identification using micro-scale technique.		1.5	4

SEMESTER VI

Course Code	Paper No. and Name	Unit	Topics	Credits	L/Week
USC6CH3	Paper III Organic	I	Molecular Rearrangements Carbohydrates	2.5	4
		II	Stereochemistry II Amino acids and Proteins		

Chemistry	III	Polymers Catalyst and Reagents		
	IV	Natural Products Nucleic Acids		
USC6CP2	Practicals	<ul style="list-style-type: none"> • Separation of Binary liquid-liquid and liquid- solid mixture using micro-scale technique • Planning of Organic Synthesis 	1.5	4

SEMESTER V (THEORY)

COURSE CODE: USC5CH3

CREDITS: 2.50

LECTURES: 60

Unit			Topics	
I	1.0			(10L)
		1.1	<p>Mechanism of Organic Reactions</p> <p>The basic terms & concepts: bond fission, reaction intermediates, electrophiles & nucleophiles, ligand, base, electrophilicity vs. acidity & nucleophilicity vs basicity</p> <p>Neighbouring group participation in nucleophilic substitution reactions: participation of lone pair of electrons, kinetics and stereochemical outcome.</p> <p>Acyl nucleophilic substitution (Tetrahedral mechanism): Acid catalyzed esterification of carboxylic acids (A_{AC}^2) and base promoted hydrolysis of esters (B_{AC}^2). Pericyclic reactions, classification and nomenclature Electrocyclic reactions (ring opening and ring closing), cycloaddition, sigmatropic rearrangement, group transfer reactions, cheletropic reaction (definition and one example of each type)</p> <p>Pyrolytic elimination: Cope, Chugaev, pyrolysis of acetates</p>	
		1.2	<p>Photochemistry</p> <p>Introduction: Difference between thermal and photochemical reactions. Singlet and triplet states, allowed and forbidden transitions, Jablonski diagram, fate of excited molecules, Photosensitization. Photochemical reactions of olefins: photoisomerization, photochemical rearrangement of 1,4- dienes (di- π methane) Photochemistry of carbonyl compounds: Norrish I, Norrish II cleavages. Photoreduction (e.g. benzophenone to benzpinacol)</p>	(5L)
II	2.0			

		2.1	Stereochemistry-I Molecular chirality and elements of symmetry: Mirror plane symmetry, inversion center, rotation-reflection (alternating) axis. Chirality of compounds without a stereogenic center: cummulenes and biphenyls.	(5L)
		2.2	Organometallic Chemistry Introduction: Carbon-metal bond nature, types, reactivity. Organomagnesium Compounds: Grignard reagent: Preparation, structure, and stability, Reaction with compounds containing acidic hydrogen, carbonyl compounds, cyanides and CO ₂ . Organolithium Compounds: Preparation using alkyl/aryl halides. Reactions with compounds containing acidic hydrogen, alkyl halides, carbonyl compounds, CO ₂ , cyanides and epoxides. Organozinc compounds: Reformatsky reaction and Simmons-Smith reaction with mechanism and applications	(5L)
		2.3	Heterocyclic Chemistry Reactivity of pyridine-N-oxide, quinoline and coumarins. Preparation of pyridine-N-oxide, quinoline (Skraup synthesis) and coumarin (Pechmann synthesis). Reactions of pyridine-N-oxide: halogenation, nitration and reaction with NaNH ₂ /liq.NH ₃ , n-BuLi. Reactions of quinoline; oxidation, reduction, nitration, halogenation and reaction with NaNH ₂ /liq.NH ₃ , n-BuLi. Reactions of coumarin; bromination, nitration, reaction with hydroxide and photochemical reactions.	(5L)
III	3.0			
		3.1	IUPAC Nomenclature IUPAC Systematic nomenclature of the following classes of compounds (including compounds up to two substituents / functional groups): Bicyclic compounds – spiro, fused and bridged (up to 11 carbon atoms) – saturated and unsaturated compounds Biphenyls, Cummulenes with up to 3 double bonds, Quinolines and isoquinolines	(5L)

	3.2	<p>Synthesis of Organic Compounds Introduction: Linear and convergent synthesis, criteria for an ideal synthesis, concept of chemoselectivity and regioselectivity with examples, calculation of yields. Multicomponent Synthesis: Mannich reaction and Biginelli reaction. Synthesis with examples (no mechanism)</p> <p>3.2.3 Green chemistry and synthesis: Introduction: Twelve principles of green chemistry, concept of atom economy and E-factor, calculations and their significance, numerical examples.</p> <ol style="list-style-type: none"> 1. Green reagents: dimethyl carbonate 2. Green starting materials: D-glucose 3. Green solvents : supercritical CO₂ 4. Green catalysts: Bio catalysts. 	(7L)
	3.3	<p>3.3 Agrochemicals General introduction & scope, meaning & examples of insecticides, herbicides, fungicide, rodenticide, pesticides, plant growth regulators. Advantages & disadvantages of agrochemicals Synthesis & application of IAA (Indole Acetic Acid) & EndosulphanBio pesticides – Neem oil & Karanj oil.</p>	(3L)
	4.0	Spectroscopy	(15L)
	4.1	Introduction: Electromagnetic spectrum, units of wavelength and frequency	
	4.2	UV-Visible spectroscopy: Basic theory, solvents, nature of UV-Visible spectrum, concept of chromophore, auxochrome, bathochromic and hypsochromic shifts, hyperchromic and hypochromic effects, chromophore-chromophore and chromophore-auxochrome interactions.	
	4.3	IR spectroscopy: Basic theory, selection rule, fingerprint region and functional group region, characteristic IR peaks for different functional groups.	
	4.4	PMR spectroscopy: Basic theory of PMR, Nature of PMR spectrum, reference standard, solvents, chemical shift, factors affecting chemical shift: Inductive effect and anisotropic effect (with reference to acetylene, benzene and aldehyde), spin-spin coupling and coupling constant, D ₂ O exchange technique. Application of PMR in structure determination	
		Mass spectrometry: Basic theory, Nature of mass spectrum, Importance	

		<p>4.5 of molecular ion peak, base peak and isotopic peaks. Nitrogen rule.</p> <p>General rules for fragmentation. Fragmentation of alkanes and aliphatic carbonyl compounds</p> <p>4.6 Spectral characteristics of following classes of organic compounds, including benzene and monosubstituted benzenes, with respect to IR and PMR: (1) alkanes (2) alkenes (3) alkynes (4) haloalkanes (5) alcohols (6) carbonyl compounds (7) Carboxylic acid, esters and amides (8) amines (broad regions characteristic of different groups are expected).</p> <p>4.7 Problems of structure elucidation of simple organic compounds using individual or combined use of UV-VIS, IR, PMR and Mass spectral data. (Index of Hydrogen Deficiency should be the first step in solving the problems)</p>	<p>REF</p> <p>ERE</p> <p>NC</p> <p>ES:</p> <p>1.</p> <p>guid</p> <p>e to</p> <p>mec</p> <p>hani</p> <p>sm</p> <p>in</p> <p>Orga</p>
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- Advanced Organic Chemistry by J. March, 6th Edition.
- Organic Reaction Mechanism, 4th edition, V. K. Ahluvalia, R. K. Parashar, Narosa Publication.
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- Organic reactions & their mechanisms, third revised edition, P.S. Kalsi, New Age International Publishers.
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- Modern methods of Organic Synthesis, 4th Edition W. Carruthers and Iain Coldham, Cambridge University Press 2004.
- Stereochemistry of Carbon Compounds: Principles and Applications, D, Nasipuri, 3rd edition, New Age International Ltd.
- Stereochemistry of Organic Compounds, Ernest L. Eliel and Samuel H. Wilen, Wiley-India edition
- Stereochemistry, P. S. Kalsi, 4th edition, New Age International Ltd
- Heterocyclic Chemistry, 5th Edition, John A. Joule and Keith Mills, Wiley publication, 2010.

18. Nomenclature of Organic Chemistry: IUPAC recommendations and preferred Names 2013, RSC publication.
19. IUPAC nomenclature by S.C.Pal
20. Green chemistry: V. K. Ahluwalia (Narosa publishing house Pvt. Ltd.)
21. New trends in green chemistry V. K. Ahluwalia, M. Kidwai, Klumer Academic publisher.
22. Green chemistry by V. Kumar.
23. Insecticides & pesticides: Saxena A. B., Anmol publication.
24. Growth regulators in Agriculture & Horticulture: Amarjit Basra, CRC press 2000.
25. Agrochemicals and pesticides: A. Jadhav and T.V. Sathe.
26. Spectroscopy of Organic Compounds, P.S. Kalsi, Fourth Edition, New Age International Ltd.
27. Spectroscopy, Pavia, Lampman, Kriz, Vyvyan
28. Organic spectroscopy (Second edition), Jag Mohan, Narosa publication.
29. Spectral identification of organic molecules by Silverstein.

Semester V: Practical's

Course code: USC5CP2

Separation of Binary solid-solid mixture of organic compounds and identification using micro-scale technique. (2.0 gm mixture to be given)

1. Minimum six mixtures to be completed by the students.
2. Components of the mixture should include water soluble and water insoluble acids (carboxylic acid), water insoluble phenols (2-naphthol, 1-naphthol), water insoluble bases (nitro anilines), water soluble neutral (thiourea) and water insoluble neutral compounds (anilides, amides, m-DNB, hydrocarbons)
3. After correct determination of chemical type, the separating reagent should be decided by the student for separation.
4. Follow separation scheme with the bulk sample of binary mixture.
5. After separation into component A and component B, one component (decided by the examiner) is to be analyzed and identified with m.p.

References for Practicals:

1. Practical organic chemistry – A. I. Vogel
2. Practical organic chemistry – H. Middleton
3. Practical organic chemistry – O.P. Agarwal

4. Laboratory Manual of Organic Chemistry, Fifth edition, R K Bansal, New Age Publishers.

CKT College New Panvel (F.Y.B.Sc, Chemistry Syllabus)
SEMESTER VI (THEORY)

COURSE CODE: USC6CH1

CREDITS 2.50

LECTURES: 60

Unit		Topics	
I	1.0		
		<p>1.1 Molecular Rearrangements</p> <p>Mechanism of the following rearrangements with examples and stereochemistry wherever applicable.</p> <p>Migration to the electron deficient carbon: Pinacol-pinacolone rearrangement, Benzilic acid rearrangement</p> <p>Migration to the electron deficient nitrogen: Beckmann rearrangement.</p> <p>Migration involving a carbanion: Favorski rearrangement. Migration to electron deficient oxygen: Baeyer-Villiger rearrangement</p>	(5L)
		<p>1.2 Carbohydrates Introduction: classification, reducing and non-reducing sugars, DL notation</p> <p>Structures of monosaccharides: Fischer projection (4-6 carbon monosaccharide) and Haworth formula (furanose and pyranose forms of pentoses and hexoses) Interconversion: open chain and Haworth forms of monosaccharide with 5 and 6 carbons. Chair conformation with stereochemistry of D-glucose, Stability of chair form of D-glucose</p> <p>Stereoisomers of monosaccharide: epimers, anomers</p> <p>Mutarotation and its mechanism</p> <p>Chain lengthening & shortening reactions: Modified Kiliani-Fischer synthesis (D-arabinose to D-glucose and D-mannose), Wohl's method (D-glucose to D-arabinose)</p> <p>Reactions of D-glucose and D-fructose: (a) osazone formation (b) reduction: H_2/Ni, $NaBH_4$ (c) oxidation: bromine water, HNO_3, HIO_4 (d) acetylation (e) methylation: (d) and (e) with cyclic pyranose forms Biologically important sugar: 2DG</p>	(10L)

II	2.0	2.1	<p>Stereochemistry-II Stereoselectivity and stereospecificity: Idea of enantioselectivity (ee) and diastereoselectivity (de), Topicity: enantiotopic and diastereotopic atoms, groups and faces. Stereochemistry of- i) Substitution reactions: S_Ni (reaction of alcohol with thionyl chloride) ii) Elimination reactions: E₂-Base induced dehydrohalogenation of 1-bromo-1, 2- diphenylpropane. iii) Addition reactions to olefins: a) bromination (electrophilic anti addition) b) syn-hydroxylation with OsO₄ and KMnO₄ c) epoxidation followed by hydrolysis.</p>	(10L)
		2.2	<p>Amino acids & Proteins α-Amino acids: General Structure, configuration, and classification based on structure and nutrition. Properties: pH dependency of ionic structure, isoelectric point and zwitter ion. Methods of preparations: Strecker synthesis, Gabriel phthalamide synthesis. Polypeptides and Proteins: Nature of peptide bond. Nomenclature and representation of polypeptides (di-and tri-peptides) with examples Merrifield solid phase polypeptide synthesis. Proteins: general idea of primary, secondary, tertiary & quaternary structure</p>	(5L)
III	3.0	3.1	<p>Polymer Introduction: terms monomer, polymer, homopolymer, copolymer, thermo plastics and thermosets. Mechanism of free radical addition polymerization Addition polymers: polyethylene, polypropylene, teflon, polystyrene, PVC, Uses. Condensation polymers: polyesters, polyamides. Uses, Stereochemistry of polymers: Tacticity, mechanism of stereochemical control of polymerization using Ziegler Natta catalysts. Natural and synthetic rubbers: Polymerization of isoprene: 1, 2 and 1, 4 addition (cis and trans), Styrene butadiene Additives to polymers: Plasticizers, stabilizers and fillers. Biodegradable polymers: Classification and uses. polylactic acid structure, properties and use for packaging and medical purposes. Note: Identification of monomer in a given polymer & structure of polymer for a given monomer is expected. condition for polymerization is not expected</p>	8 L

		<p>3.2 Catalyst and Reagents</p> <p>Study of the following catalysts and reagents with respect to functional group transformations and selectivity (no mechanism)</p> <p>Catalysts: Catalysts for hydrogenation:</p> <ol style="list-style-type: none"> Raney Nickel Pt and PtO₂ (C=C, CN, NO₂, aromatic ring) Pd/C: C=C, COCl → CHO (Rosenmund) Lindlar catalyst: alkyne <p>Reagents:</p> <ol style="list-style-type: none"> LiAlH₄ (reduction of CO, COOR, CN, NO₂) NaBH₄ (reduction of CO) SeO₂ (Oxidation of CH₂ alpha to CO) m-CPBA (epoxidation of C=C) <p>5. NBS (allylic and benzylic bromination)</p>	(7L)
VI	4.0	<p>4.1 Natural Products</p> <p>Terpenoids: Introduction, Isoprene rule, special isoprene rule and the gem-dialkyl rule.</p> <p>Citral:</p> <ol style="list-style-type: none"> Structural determination of citral. Synthesis of citral from methyl heptenone <p>Isomerism in citral. (cis and trans form). Alkaloids: Introduction and occurrence. Hofmann's exhaustive methylation and degradation in: simple open chain and N-substituted monocyclic amines.</p>	10 L
		<p>Nicotine:</p> <ol style="list-style-type: none"> Structural determination of nicotine. (Pinner's work included) Synthesis of nicotine from nicotinic acid <p>Harmful effects of nicotine</p> <p>Hormones: Introduction, structure of adrenaline (epinephrine), physiological action of adrenaline. Synthesis of adrenaline from</p> <ol style="list-style-type: none"> Catechol <p>p-hydroxybenzaldehyde (Ott's synthesis)</p>	

		4.2	Nucleic Acids	((5L))	RE FE RE NC
			Controlled hydrolysis of nucleic acids. Sugars and bases in nucleic acids. Structures of nucleosides and nucleotides in DNA and RNA. Structures of nucleic acids (DNA and RNA) including base pairing.		

ES:

1. Advanced Organic Chemistry by J. March, 6th Edition.
2. Organic Reaction Mechanism, 4th edition, V. K. Ahluvalia, R. K. Parashar, Narosa Publication.
3. Organic Chemistry, Part A and B, Fifth edition, 2007, Francis A. Carey and Richard J. Sundberg, Springer.
4. Organic Chemistry, J. Clayden, S. Warren, N. Greeves, P. Wothers, 1st Edition, Oxford University Press (2001)
5. Organic Chemistry, Seventh Edition, R.T. Morrison, R. N. Boyd & S. K. Bhattacharjee, Pearson.
6. Organic reactions & their mechanisms, third revised edition, P.S. Kalsi, New Age International Publishers.
7. Organic Chemistry, W. G. Solomons, C. B. Fryhle, 8th Edition, Wiley India Pvt. Ltd.
8. Modern methods of Organic Synthesis, 4th Edition W. Carruthers and Iain Coldham, Cambridge University Press 2004.
9. Stereochemistry of Carbon Compounds: Principles and Applications, D, Nasipuri, 3rd edition, New Age International Ltd.
10. Stereochemistry of Organic Compounds, Ernest L. Eliel and Samuel H. Wilen, Wiley-India edition
11. Stereochemistry, P. S. Kalsi, 4th edition, New Age International Ltd.
12. Biochemistry, 8th Ed., Jeremy Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto Pub. W. H. Freeman Publishers.
13. Lehninger Principles of Biochemistry 7th Ed., David Nelson and Michael Cox, Publisher W. H. Freeman.
14. Name Reactions – Jie Jack Li, 4th Edition, Springer Pub.
15. Organic Chemistry volume-I & II – I L Finar.
16. Introduction to Organic chemistry, John McMurry
17. S.H. Pine, Organic Chemistry 4th edition. McGraw Hill
18. Polymer chemistry by M.G. Arora, K. Singh
19. Polymer science – a text book by Ahluwalia and Mishra
20. Introduction to polymer chemistry - R. Seymour, Wiley Interscience.
21. Organic chemistry by Francis Carey – McGrawH

Semester VI: (Practicals)

Course code: USC6CP2

Separation of Binary liquid-liquid and liquid- solid mixture of organic compounds using micro-scale technique.

1. Minimum six mixtures to be completed by the students.
2. Components of the liquid-liquid mixture should include volatile liquids like acetone, methyl acetate, ethyl acetate, isopropyl alcohol, ethyl alcohol, EMK and non-volatile liquids like chlorobenzene, bromobenzene, aniline, N, N dimethyl aniline, acetophenone, nitrobenzene, ethyl benzoate.
3. Components of the liquid-solid mixture should include volatile liquids like acetone, methyl acetate, ethyl acetate, ethyl alcohol, IPA, EMK and solids such as water insoluble acids, phenols, bases, neutral.
4. A sample of one ml mixture to be given to the student for detection of the physical type of the mixture.
5. After correct determination of physical type, separation of the binary mixture to be carried out by distillation method using micro-scale technique.
6. After separation into component A and component B, yield and physical constant are to be determined.

Planning of Organic Synthesis: To be recorded in to the journal (minimum four preparations)

Students are expected to know (i) the planning of synthesis, Literature, effect of reaction parameters including stoichiometry and green chemistry aspects ii) the possible mechanism, expected spectral data (IR and NMR) of the starting material and final product.

1. Cyclohexanone to oxime
2. Nitrobenzene to m-dinitrobenzene
3. m-dinitrobenzene to m-nitroaniline
4. Acetanilide to p-bromoacetanilide

5. p-nitroacetanilide to p-nitroaniline
6. Acetanilide to p-nitroacetanilide

References

1. Practical organic chemistry – A. I. Vogel
2. Practical organic chemistry – H. Middleton
3. Practical organic chemistry – O.P. Agarwal
4. Laboratory Manual of Organic Chemistry, Fifth edition, R K Bansal, New Age Publishers.

Draft Syllabus

Syllabus for the T.Y.B.Sc. Chemistry Semester V and VI

Credit Based Semester and Grading System

Course: B.Sc.

To be implemented from the academic year 2021-2022

Paper I (Analytical Chemistry)

SEMESTER V

Course Code	Paper No. and Name	Unit	Topics	Credits	L/Week	
USC5CH4	Paper IV Analytical Chemistry	I	Introduction to quality concepts in industry, chemical calculations and sampling			SEME STER VI
		II	Classical methods of analysis (Titrimetry)	2.5	4	
USC6CH4	Paper IV Analytical Chemistry	III	Separation analytical techniques			SEME STER V (THE ORY)
		II	Methods of separation - II (uv-visible spectroscopy)			
		III	Food cosmetics analysis	2.5	4	
USC5CP2	Practical's	IV	Optical methods and ion exchange chromatography	1.5	4	COUR SE CODE
USC6CP2	Practical's			1.5	4	
: USC5CH4		CREDITS: 2.50		LECTURES: 60		

Unit		Topics	
I	1.0	INTRODUCTION TO QUALITY CONCEPTS IN INDUSTRY, CHEMICAL CALCULATIONS AND SAMPLING	
	1.1	QUALITY IN ANALYTICAL CHEMISTRY	(3L)
	1.1.1	Concepts of Quality, Quality Control and Quality Assurance	
	1.1.2	Importance of Quality concepts in Industry	

		1.1.3	Chemical Standards and Certified Reference Materials; Importance in chemical analysis Quality of material: Various grades of laboratory reagents	
	1.2		CHEMICAL CALCULATIONS (NUMERICALS AND WORD PROBLEMS ARE EXPECTED)	(6L)
		1.2.1	Inter conversion of various concentration units. (Conversion of concentration from one unit to another unit with examples)	
		1.2.2	Percent composition of elements in chemical compounds	
	1.3		SAMPLING	(6L)
		1.3.1	Purpose, significance and difficulties encountered in sampling	
		1.3.2	Sampling of solids: Sample size – bulk ratio, size to weight ratio, multistage and sequential sampling, size reduction methods, sampling of compact solids, equipments and methods of sampling of compact solids, sampling of particulate solids, method sand equipments used for sampling of particulate solids.	
		1.3.3	Sampling of liquids: Homogeneous and heterogeneous, Static and flowing liquids.	
		1.3.4	Sampling of gases: Ambient and stack sampling: Apparatus and methods for sampling of gases.	
		1.3.5	Collection, preservation and dissolution of the sample.	
II	2.0		CLASSICAL METHODS OF ANALYSIS (TITRIMETRY)	
	2.1		REDOX TITRATIONS (Numerical and word Problems are expected)	(8L)
		2.1.1	Introduction	
		2.1.2	Construction of the titration curves and calculation of E_{system} in aqueous medium in case of: One electron system, Multielectron system.	
		2.1.3	Theory of redox indicators, Criteria for selection of an indicator, Use of diphenyl amine and ferroin as redox indicators	
	2.2		COMPLEXOMETRIC TITRATIONS	(7L)
		2.2.1	Introduction, construction of titration curve	
		2.2.2	Use of EDTA as titrant and its standardization, absolute and conditional formation constants of metal EDTA complexes, Selectivity of EDTA as a titrant. Factors enhancing selectivity with examples. Advantages and limitations	

			of EDTA as a titrant.	
		2.2.3	Types of EDTA titrations.	
		2.2.4	Metallochromic indicators, theory, examples and applications	
III	3.0		SEPERATION METHODS-I AND MOLECULAR SPECTROSCOPY (UV-VISBLE SPECTROSCOPY)	
	3.1		SOLVENT EXTRACTION	(9L)
		3.1.1	Introduction, Nernst distribution Law, Distribution Ratio, Partition Coefficient. Conditions of extraction: Equilibration time, Solvent volumes, temperature, pH. Single-step and multi- step extraction, Percentage extraction for single step and multistep extraction. Separation factor.	
		3.1.2	Factors affecting extraction: Chelation, Ion pair formation and Solvation	
		3.1.3	Graph of percent extraction versus pH. Concept of $[pH]_{1/2}$ and its significance (derivation not expected)	
		3.1.4	Batch and continuous extraction, Craig's counter current extraction: Principle, apparatus and applications	
		3.1.5	Solid phase extraction: Principle, process and applications with special reference to water and industrial effluent analysis.	
		3.1.6	Comparison of solid phase extraction and solvent extraction.	
	3.2		BASIC COMPONENTS OF SPECTROSCOPIC INSTRUMENTATION	(2L)
		3.2.1	Sources of Energy, Wavelength Selectors, Detectors, Signal Processors	
	3.3		MOLECULAR SPECTROSCOPY: ULTRA-VIOLET AND VISIBLE SPECTROSCOPY	(4L)
		3.3.1	Instrumentation: Single beam and double beam spectrophotometer; Quantitative Applications (Calibration curve method); Qualitative Applications in Photometric titration, Job's method for study of complexes.	
IV	4.0		OPTICAL METHODS	
	4.1		ATOMIC SPECTROSCOPY: FLAME EMISSION SPECTROSCOPY (FES) AND ATOMIC ABSORPTION SPECTROSCOPY (AAS)	(7L)

	4.1.1	Introduction, Energy level diagrams, Atomic spectra, Absorption and Emission Spectra	
	4.1.2	Flame Photometry – Principle, Instrumentation (Flame atomizers, types of Burners, Wavelength selectors, Detectors)	
	4.1.3	Atomic Absorption Spectroscopy – Principle, Instrumentation (Source, Chopper, Flame and Electrothermal Atomizer)	
	4.1.4	Quantification methods of FES and AAS – Calibration curve method, Standard addition method and Internal standard method.	
	4.1.5	Comparison between FES and AAS	
	4.1.6	Applications, Advantages and Limitations	
4.2		MOLECULAR FLUORESCENCE AND PHOSPHORESCENCE SPECTROSCOPY	(4L)
	4.2.1	Introduction and Principle	
	4.2.2	Relationship of Fluorescence intensity with concentration	
	4.2.3	Factors affecting Fluorescence and Phosphorescence	
	4.2.4	Instrumentation and applications	
	4.2.5	Comparison of Fluorimetry and Phosphorimetry	
	4.2.6	Comparison with Absorption methods	
4.3		TURBIDIMETRY AND NEPHELOMETRY	(4L)
	4.3.1	Introduction and Principle	
	4.3.2	Factors affecting scattering of Radiation: Concentration, particle size, wavelength, refractive index	
	4.3.3	Instrumentation and Applications	
	4.3.4	Introduction and Principle	

- 3000 solved problems in Chemistry, David E. Goldberg, PhD. Schaums Outline
- A guide to Quality in Analytical Chemistry: An aid to accreditation, CITAC and EURACHEM, (2002),
- A premier sampling solids, liquids and gases, Smith Patricia I, American statistical association and the society for industrial and applied mathematics, (2001)
- Analytical Chemistry, Gary. D Christan, 5th edition
- Analytical Chemistry Skoog, West, Holler, 7th Edition:
- Analytical Chromatography, Gurdeep R Chatwal, Himalaya publication
- Basic Concepts of Analytical Chemistry, by S. M. Khopkar, new Age International (p) Limited
- Chemical methods of separation, J A Dean, Van Nostrand Reinhold, 1969

9. Fundamentals of Analytical Chemistry by Skoog and West, 8th Edition
10. Handbook of quality assurance for the analytical chemistry laboratory, 2ndEdn., James P. Dux Van Nostrand Reinhold, 1990
11. Instrumental methods of Analysis, by Dr Supriya S Mahajan, Popular Prakashan Ltd
12. Instrumental methods Of Analysis, by Willard Merritt Dean, 7thEdition, CBS Publisher and distribution Pvt Ltd
13. Instrumental Methods of Chemical Analysis by B.K. Sharma Goel Publishing House
14. Principles of Instrumental Analysis, 5th Edition, By Skoog, Holler, Nieman
15. Quality control and Quality assurance in Analytical Chemical Laboratory, Piotr Konieczka and Jacek Namiesnik, CRC press (2018)
16. Quality in the Analytical Chemistry Laboratory, Elizabeth Prichard, Neil T. Crosby, Florence Elizabeth Prichard, John Wiley and Sons, 1995

SEMESTER V(PRACTICAL'S)

COURSE CODE: USC5CP2 CREDITS: 1.50 for USC5CH4 (Analytical Chemistry)

Sr. No.	TITLE
1	Spectrophotometric estimation of fluoride in given water sample.
2	Estimation of magnesium content in Talcum powder by complexometry, using standardized solution of EDTA
3	Determination of percent extraction of benzoic acid in given sample by solvent extraction.
4	To determine potassium content of a Fertilizer by Flame Photometry (Calibration curve method).
5	To determine the amount of persulphate in the given sample solution by back titration with standard Fe (II) ammonium sulphate solution.
6	To determine the amount of sulphate in given water sample turbidimetrically.

Note: Calculation of percent error is expected for all the experiments.

1. Vogel's Textbook of Quantitative Chemical Analysis, 5thEdn., G. H. Jeffery, J Bassett, J Memdham and R C Denney, ELBS with Longmann (1989).
2. Vogel's Textbook of Quantitative Chemical analysis, Sixth edition, J. Mendham et.al

SEMESTER VI (THEORY)

COURSE CODE: USC6CH4

CREDITS: 2.50

LECTURES: 60

Unit		Topics	
I	1.0	ELECTRO ANALYTICAL TECHNIQUES	
	1.1	POLAROGRAPHY (Numerical and word problems are expected)	(11L)
	1.1.1	Difference between potentiometry and voltammetry, Polarizable and non-polarizable electrodes	
	1.1.2	Basic principle of polarography H shaped polarographic cell, DME (construction, working, advantages and limitations)	
	1.1.3	DC polarogram: Terms involved - Residual current, Diffusion current, Limiting current, Half-Wave Potential Role and selection of supporting electrolyte, Interference of oxygen and its removal, polarographic Maxima and Maxima Suppressors Qualitative aspects of Polarography: Half wave potential $E_{1/2}$, Factors affecting $E_{1/2}$ Quantitative aspects of polarography: Ilkovic equations: various terms involved in it (No derivation)	
	1.1.4	Quantification Wave height – Concentration plots working plots/ calibration Internal standard (pilot ion) method, Standard addition method.	
	1.1.5	Applications advantages and limitations	
	1.2	AMPEROMETRIC TITRATIONS	(4L)
	1.2.1	Principle, Rotating Platinum Electrode (Construction, advantages and limitations)	
	1.2.2	Titration curves with example	
	1.2.3	Advantages and limitations	
II	2.0	METHODS OF SEPARATION - II	

	2.1	GAS CHROMATOGRAPHY (Numerical and word problems are expected) (7L)
	2.1.1	Introduction, Principle, Theory and terms involved
	2.1.2	Instrumentation: Block diagram and components, types of columns, stationary phases in GSC and GLC, Detectors: TCD, FID, ECD
	2.1.3	Qualitative, Quantitative analysis and applications
	2.1.4	Comparison between GSC and GLC
	2.2	HIGH PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC) (5L)
	2.2.1	Introduction and Principle Instrumentation- components with their significance: Solvent Reservoir, Degassing system, Pumps-(reciprocating pumps, screw driven- syringe type pumps, pneumatic pumps, advantages and disadvantages of each pump), Precolumn, Sample injection system, HPLC Columns, Detectors(UV – Visible detector, Refractive index detector)
	2.2.2	Qualitative and Quantitative Applications of HPLC
	2.3	HIGH PERFORMANCE THIN LAYER CHROMATOGRAPHY (HPTLC) (3L)
	2.3.1	Introduction and Principle Stationary phase, Sample application and mobile phase
	2.3.2	Detectors- a) Scanning densitometer- Components. Types of densitometer- Single beam and Double beam, b) Fluorometric Detector
	2.3.3	Advantages, disadvantages and applications
	2.3.4	Comparison of TLC and HPTLC
III	3.0	FOOD AND COSMETICS ANALYSIS
	3.1	INTRODUCTION TO FOOD CHEMISTRY (10L)
	3.1.1	Food processing and preservation:
	3.1.2	Introduction, need, chemical methods, action of chemicals (Sulphur dioxide, boric acid, sodium benzoate, acetic acid, sodium chloride and sugar) and pH control Physical methods (Pasteurization and Irradiation)
	3.1.3	Determination of boric acid by titrimetry and sodium benzoate by HPLC.
	3.1.4	Study and analysis of food products and detection of adulterants Milk: Composition & nutrients, types of milk (fat free, organic and lactose milk) Analysis of milk for lactose by Lane Eynon's Method

		<p>Honey: Composition, Analysis of reducing sugars in honey by Coles Ferricyanide method</p> <p>Tea: Composition, types (green tea and mixed tea) Analysis of Tannin by Lowenthal's method</p> <p>Coffee: Constituents and composition, Role of Chicory Analysis of caffeine by Bailey Andrew method</p>	
	3.2	COSMETICS	(5L)
	3.2.1	Introduction and sensory properties	
	3.2.2	<p>Study of cosmetic products –</p> <p>Face powder: Composition</p> <p>Estimation of calcium and magnesium by complexometric titration</p> <p>Lipstick: Constituents</p> <p>Ash analysis for water soluble salts: borates, carbonates and zinc oxide</p> <p>Deodorants and Antiperspirants: Constituents, properties</p> <p>Estimation of zinc by gravimetry</p>	
IV	4.0	MISCELLANEOUS METHODS OF ANALYSIS AND ION EXCHANGE CHROMATOGRAPHY	
	4.1	THERMAL METHODS	(7L)
	4.1.1	<p>Introduction to various thermal methods</p> <p>Thermogravimetric Analysis (TGA):</p> <p>Principle, Instrumentation, Factors affecting on thermogravimetric analysis, Thermal decomposition profile of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, Applications.</p>	
	4.1.2	<p>Differential Thermal Analysis (DTA):</p> <p>Principle, Instrumentation, and Reference material used, Differential thermogram (DTA curve) of $\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$</p> <p>Applications, Comparison between TGA and DTA.</p>	
	4.2	RADIO-ANALYTICAL METHODS	(3L)
	4.2.1	Introduction to Radio analytical Methods, Classification	
	4.2.2	Introduction to Neutron Activation Analysis, Theory, Advantages, Disadvantages, Applications	
	4.3	ION EXCHANGE CHROMATOGRAPHY	(5L)
	4.3.1	Introduction, Principle.	
	4.3.2	Types of Ion Exchangers, Ideal properties of resin	

		4.3.3	Ion Exchange equilibria and mechanism, selectivity coefficient and separation factor, Factors affecting separation of ions		Note : Con cept of sensi tivity
		4.3.4	Ion exchange capacity and its determination for cation and anion exchangers.		
		4.3.5	Applications of Ion-Exchange Chromatography with reference to Preparation of demineralized water, Separation of amino acids		

y is to be discussed for all techniques and instruments mentioned in the syllabus.

References

1. An Advance Dairy chemistry, V 3, P. F. Fox, P. L. H. Mc Sweeney Springer
2. Analysis of food and Beverages, George Charalambous, Academic press 1978
3. Analytical Chemistry of Open Learning (ACOL), James W. Dodd& Kenneth H. Tonge
4. Analytical chemistry David Harvey The McGraw Hill Companies, Inc.
5. Analytical Chemistry, Gary. D Christan, 5th edition
6. Analytical chemistry, R. K. Dave.
7. Chemical methods of separation, J A Dean, Van Nostrand Reinhold, 1969
8. Egyankosh.ac.in/bitstream/123456789/43329/1/Unit-8
9. Food Analysis, Edited by S. Suzanne Nielsen, Springer
10. Food Analysis: Theory and practice, Yeshajahu Pomeranz, Clifton E. Meloan, Springer
11. Formulation and Function of cosmetics, Sa Jellineck
12. Fundamentals of Analytical Chemistry, D.A. Skoog and D. M. West and F. J. Holler Holt., Saunders 6th Edition (1992)
13. Government of India publications of food drug cosmetic act and rules.
14. Harry's Cosmetology, Longman scientific co.
15. High Performance Thin Layer Chromatography in Food analysis, by Prem kumar, CBS Publisher and distributer
16. Instrumental methods Of Analysis, by Willard Merritt Dean,7thEdition, CBS Publisher and distribution Pvt Ltd
17. Introduction to Polarography and Allied Techniques, By Kamala Zutshi, New Age International, 2006.

18. Modern cosmetics, E. Thomesen Wiley Inter science
19. Principles of Instrumental Analysis, 5th Edition, By Skoog, Holler, Nieman
20. Principles of Polarography by Jaroslav Heyrovský, Jaroslav Kůta, 1st Edition, Academic Press, eBook ISBN:978148326478
21. Solvent extraction and ion exchange, J Marcus and A. S. Kertes Wiley INC 1969
22. High Performance Thin Layer Chromatography by Dr P.D. Sethi, CBS Publisher and Distribution
23. High Performance Thin Layer Chromatography in Food analysis, by Prem kumar, CBS Publisher and distributor

SEMESTER VI (PRACTICAL'S)

COURSE CODE: USC6CP2 CREDITS: 1.50 for USC6CH4 (Analytical Chemistry)

Sr. No.	TITLE
1	Estimation of Chromium in water sample spectrophotometrically by using Diphenyl carbazide.
2	Estimation of reducing sugar in honey by Willstatter method.
3	Separation of Mg (II) and Zn (II) by using anion exchange resin and their estimation by complexometric titration.
4	Estimation of acetic acid in Vinegar sample by using Quinhydrone electrode potentiometrically.
5	Determination of phosphoric acid in cola sample pH metrically.

Note: Calculation of percent error is expected for all the experiments.

References

1. Vogel's Textbook of Quantitative Chemical Analysis, 5thEdn., G. H. Jeffery, J Bassett, J. Memdham and R C Denney, ELBS with Longmann (1989).
2. Vogel's Textbook of Quantitative Chemical analysis, Sixth edition, J. Mendham et.al
3. The chemical analysis of food and food products III edition Morris Jacob
4. The chemical analysis of food by David Pearson and Henry Edward

Draft Syllabus

Syllabus for the T.Y.B.Sc. Chemistry Semester V and VI

Credit Based Semester and Grading System

Course: B.Sc.

To be implemented from the academic year 2021-2022

Paper V (Druga and Dyes)

SEMESTER V

Course Code	Paper No. and Name	Unit	Topics	Credits	L/Week
USC5CH5	Paper V Drugs and Dyes	I	General introduction to Drugs i) Routes of Drug administration ii) Pharmacodynamics agent	2.0	4
		II	Analgesic, antipyretic, antihistaminic, cardiovascular drugs, antidiabetic, antiparkinsonism and Drug for respiratory		
		III	Introduction to Dye stuff industry Types of Dyes and Classification of Dyes		
		IV	Colour and Chemical constitution Unit process and Dyes intermediates		
USC5CP1	Practical's	Estimation and preparation of Drugs	2.0	4	

SEMESTER VI

Course Code	Paper No. and Name	Unit	Topics	Credits	L/Week
USC6CH1	Paper I Physical Chemistry	I	i) Drug discovery desing and Development i) Drug metabolism and Drug intermediates	2.0	4
		II	Antiamoebic drugs, Antitubercular and antileprotic drugs, anti-HIV, Drug intermediates, Nanoparticles in		

CKT College New Panvel (F.Y.B.Sc, Chemistry Syllabus)
medicinal Chemistry and

Environmental Aspects

III Classification and Synthesis of Dyes

.Health and Env. Hazards

IV Non-Textile Use of Dyes

Pigment and Dyestuff Industry

USC6CP1	Practical's	Preparation of Drugs	2.0	4
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SEMESTER V (THEORY)

COURSE CODE: USC5CH5

CREDITS: 02

LECTURES: 60

Unit			Topics	
I	1.1		General Introduction to Drugs	(8L)
		1.1.1	Definition of a drug, sources of drugs, requirements of an ideal drug, classification of drugs (based on therapeutic action),	
		1.1.2	Nomenclature of drugs: Generic name, Brand name, Systematic name	
		1.1.3	Definition of the following medicinal terms: Pharmacon, Pharmacology, Pharmacophore, Prodrug, Half – life efficiency, LD ₅₀ , ED ₅₀ , GI ₅₀ Therapeutic Index.	
		1.1.4	Brief idea of the following terms: Receptors, Agonists, Antagonists, Drug-receptor interaction, Drug Potency, Bioavailability, Drug toxicity, Drug addiction, Spurious Drugs, Misbranded Drugs, Adulterated Drugs, Pharmacopoeia.	
	1.2		Routes of Drug Administration and Dosage Forms	(3L)
		1.2.1	Oral and Parenteral routes with advantages and disadvantages.	
		1.2.2	Formulations & combination formulation, Different dosage forms (including Patches & Adhesives, emphasis on sustained release formulations and enteric coated tablets).	
	1.3		Pharmacodynamic agents: A brief introduction of the following pharmacodynamic agents and the study with respect to their chemical structure, chemical class, therapeutic uses, and side effects.	
		1.3.1	CNS Drugs: Classification based on pharmacological actions: CNS Depressants & CNS Stimulants. Concept of sedation and hypnosis, anaesthesia. <ul style="list-style-type: none"> • Phenytoin (Hydantoin) • Trimethadione (Oxazolinediones) (Synthesis from acetone) • Alprazolam (Benzodiazepines) • Levetiracetam (Pyrrolidines) • Amphetamine (Phenethylamine) (Asymmetric synthesis from phenyl acetic acid) • Chlorpromazine (Phenothiazines) 	(4L)

UNIT-II (Drugs)

2	2.1		Analgesics, Antipyretics and Anti-inflammatory Drugs.	(4L)
		2.1.1	Analgesics and Antipyretics	

			<ul style="list-style-type: none"> • Morphine (Phenanthrene alkaloids) • Tramadol (Cyclohexanols) (Synthesis from salicylic acid) • Aspirin (Salicylates) • Paracetamol (p-Amino phenols) 	
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		2.1.2	Anti-inflammatory Drugs Mechanism of inflammation and various inflammatory conditions. <ul style="list-style-type: none"> • Steroids: Prednisolone, Betamethasone • Sodium Diclofenac, Aceclofenac (N- Aryl anthranilic acids) (Synthesis from 2,6-dichlorodiphenyl amine) 	
	2.2		Antihistaminic Drugs	(2L)
			<ul style="list-style-type: none"> • Diphenhydramine (Ethanol amines) • Cetrizene (Piperazine) (Synthesis from 4-Chlorobenzhydryl chloride) • Chlorpheniramine maleate (Ethyl amines) • Pantoprazole (Benzimidazoles) 	
	2.3		Cardiovascular drugs	(3L)
			Classification based on pharmacological action <ul style="list-style-type: none"> • Isosorbide dinitrate (Nitrates) • Valsartan (Amino acids) (structure not expected) • Atenolol (Aryloxy propanol amines) (Synthesis from 3-Hydroxy phenyl acetamide) • Amlodipine (Pyridines) • Frusemide /Furosemide (Sulfamoyl benzoic acid) • Rosuvastatin (Pyrimidine) 	
	2.4		Antidiabetic Agents	(2L)
			General idea and types of diabetes; Insulin therapy <ul style="list-style-type: none"> • Glibenclamide (Sulphonyl ureas) • Metformin (Biguanides) • Dapagliflozin (Pyranose) • Pioglitazone (Thiazolidinediones) (Synthesis from 2-(5-ethylpyridin-2-yl) ethanol) 	
	2.5		Antiparkinsonism Drugs	(2L)
			Idea of Parkinson's disease. <ul style="list-style-type: none"> • Procyclidine hydrochloride (Pyrrolidines) • Ethopropazine hydrochloride (Phenothiazines) • Levodopa (Amino acids) (Synthesis from Vanillin) 	
	2.6		Drugs for Respiratory System	(2L)
			General idea of: Expectorants; Mucolytes; Bronchodilators; Decongestants; Antitussives)

			<ul style="list-style-type: none">• Ambroxol (Cyclohexanol) (Synthesis from paracetamol)• Salbutamol (Phenyl ethyl amines)• Oxymetazoline (Imidazolines)• Codeine Phosphate (Opiates)	
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Reference Books: (For units I & II)

1. Foye's principles of medicinal chemistry. 6th Edition, Edited by Davis William & Thomas Lemke, Indian edition by B I Publication Pvt Ltd, Lippincott Williams & Wilkins.
2. Text book of organic medicinal & pharmaceutical chemistry. Wilson & Gisovolds, 11th Edition by John H Block, John M Beale Jr.
3. Medicinal chemistry. Ashutosh Kar, New Age International Pvt. Ltd Publisher. 4th edition.
4. Burger's Medicinal Chemistry, Drug Discovery and Development. Abraham and Rotella. Wiley
5. Medicinal chemistry. Ashutosh Kar, New Age International Pvt. Ltd Publisher. 4th edition.
6. Medicinal chemistry. V.K. Ahluwalia and Madhu Chopra, CRC Press.
7. Principle of medicinal chemistry. Vol 1 & 2 S. S. Kadam, K. R. Mahadik, K. G. Bothara
8. The Art of Drug synthesis. Johnson and Li. Wiley, 2007.
9. The organic chemistry of drug design & drug action. 2nd ed. By Richard B Silvermann, Academic Press.
10. The Organic Chemistry of Drug Synthesis. Lednicer and Mitscher, Wiley.

Unit III (Dyes)

3	3.1		Introduction to the dye-stuff Industry	(5L)
		3.1.1	Dyes	
			<p>Definition of dyes, requirements of a good dye i.e. Colour, Chromophore and Auxochrome, Solubility, Linearity, Coplanarity, Fastness, Substantivity, Economic viability.</p> <p>Definition of fastness and its properties and Mordants with examples</p> <p>Explanation of nomenclature or abbreviations of commercial dyes with at least one example suffixes – G, O, R, B, K, L, C, S H, 6B, GK, 6GK,</p> <p>Naming of dyes by colour index (two examples) used in dye industries.</p>	
		3.1.2	Natural and Synthetic Dyes	
			<p>Natural Dyes: Definition and limitations of natural dyes. Examples and uses of natural dyes w.r.t Heena, Turmeric, Saffron, Indigo, Madder, Chlorophyll –names of the chief dyeing material/s in each natural dye [structures not expected],</p> <p>Synthetic dyes: Definition of synthetic dyes, primaries and intermediates. Important milestones in the development of synthetic dyes – Emphasis on Name of the Scientist, dyes and the year of the discovery is required. (structure is not expected)</p>	
	3.2		Substrates for Dyes : Types of fibres	(3L)
		3.2.1	Natural: cellulosic and proteinaceous fibres, examples – wool, silk and cotton structures and names of dyes applied on each of them.	
		3.2.2	Semi – synthetic: definition and examples [structures not expected]	
		3.2.3	Synthetic: Nylon, Polyesters and Polyamides structures and names of dyes applied on each of them	
		3.2.4	Blended fabrics: definition and examples [structures not expected]	
		3.2.5	Binding forces of dyes on substrate: ionic forces, covalent linkages, hydrogen bonding, vander-walls forces	
	3.3		Classification of dyes based on applications and dyeing methods	(7L)
		3.3.1	Dyeing methods	
			<p>Basic Operations involved in dyeing process:</p> <p>i. Preparation of fibres ii. Preparation of dyebath</p> <p>iii. Application of dyes iv. Finishing</p>	
			<p>Dyeing Method of Cotton Fibres:</p> <p>(i) Direct dyeing (ii) Vat dyeing</p> <p>(iii) Mordant dyeing (iv) Disperse dyeing</p>	

		3.3.2	<p>Classification of dyes based on applicability on substrates (examples with structures)</p> <p>(a) Acid Dyes- Orange II, (b) Basic Dyes-methyl violet, (c) Direct cotton Dyes- Benzofast Yellow 5GL (d) Azoic Dyes – Diazo components; Fast yellow G, Fast orange R. Coupling components. Naphthol AS, Naphthol ASG (e) Mordant Dyes-Eriochrome Black A, Alizarin. (f) Vat Dyes- Indanthrene brown RRD, (g) Sulphur Dyes- Sulphur Black T (no structure) (h) Disperse Dyes-Celliton Fast brown 3R, (i) Reactive Dyes- Cibacron Brilliant Red B,</p>	
		3.3.3	<p>Optical Brighteners: General idea, important characteristics of optical brighteners and their classes [Stilbene, Coumarin, Heterocyclic vinylene derivatives, Diaryl pyrazolines, Naphthylamide derivatives] general structure of each class.</p>	

Unit – IV (Dyes)

4	4.1		Colour and Chemical Constitution of Dyes	(4L)
		4.1.1	Absorption of visible light, Colour of wavelength absorbed, Complementary colour.	
		4.1.2	Relation between colour and chemical constitution.	
			(i) Armstrong theory (quinonoid theory) and its limitations. (ii) Witt's Theory: Chromophore, Auxochrome, Bathochromic & Hypsochromic Shift, Hypochromic & Hyperchromic effect (iii) Valence Bond theory, comparative study and relation of colour in the following classes of compounds/dyes: Benzene, Nitrobenzene, Nitroanilines, Nitrophenols, Benzoquinones, Azo, Triphenyl methane, Anthraquinones. (iv) Molecular Orbital Theory.	
	4.2		Unit process and Dye Intermediates	
		4.2.1	A brief idea of Unit Processes	(3L)
			Introduction to primaries and intermediates	
			Unit processes: definition and brief ideas of below unit processes: (a) Nitration (b) Sulphonation (c) Halogenation (d) Diazotization: (3 different methods & its importance) (e) Ammonolysis (f) Oxidation NB: Definition, Reagents, Examples of each unit processes mentioned above with reaction conditions (mechanism is not expected)	

		4.2.2	Preparation of the Following Intermediates	(8L)
			<u>Benzene derivatives</u> : Benzenesulphonic acid; 1,3-Benzenedisulphonic acid; sulphanilic acid; o-, m-, p-chloronitrobenzenes; o-, m-, p-nitroanilines; o-, m-, p-phenylene diamines; Naphthol ASG	
			<u>Naphthalene Derivative</u> : Schaeffer acid; Tobias acid; Naphthionic acid; N.W. acid; cleve-6-acid; H-acid; Naphthol AS	
			<u>Anthracene Derivative</u> : 1-Nitroanthraquinone; 1-Aminoanthraquinone Anthraquinone-2-sulphonic acid; Benzanthrone.	

References (For Units III & IV):

1. Chemistry of Synthetic Dyes, Vol I – VIII, Venkatraman K., Academic Press 1972
2. The Chemistry of Synthetic Dyes and Pigments, Lubs H.A., Robert E Krieger Publishing Company, NY ,1995
3. Chemistry of Dyes and Principles of Dyeing, Shenai V.A., Sevak Publications, 1973

SEMESTER V (PRACTICALS)

(Drugs and Dyes)

COURSE CODE: USC5CH5

CREDITS: 02

1. Estimation of Ibuprofen (back titration method)
2. Estimation of Acid neutralizing capacity of a drug
3. Preparation of Aspirin from salicylic acid.
4. Separation of components of natural pigments by paper chromatography (eg: chlorophyll)

II] Project:

Preparation of Orange II dye (semi-microscale 1.0gms) and its use for dyeing different fabrics

SEMESTER VI (THEORY)

(Drugs and Dyes)

COURSE CODE: USC6CH5

CREDITS: 02

LECTURES: 60

UNIT – I (Drugs)

1	1.1		Drug Discovery, Design and Development	(6L)
		1.1.1	Discovery of a Lead compound: Screening, drug metabolism studies and clinical observation, Lipinski's rule of 5	
		1.1.2	Medicinal properties of compounds from Natural Sources: Anti-infective and anticancer properties of Turmeric (Curcumin)	
		1.1.3	Development of drug: The Pharmacophore identification, modification of structure or functional group, Structure activity relationship (Sulphonamides and Benzodiazepines).	
		1.1.4	Structure modification to increase potency: Homologation, Chain branching and Extension of the structure, Ring chain transformation, Bioisoterism.	
		1.1.5	Computer assisted drug design.	
	1.2		Drug Metabolism: Introduction, Absorption, Distribution, Bio-transformation, Excretion Different types of chemical transformation of drugs with specific examples.	(3L)
	1.3		Chemotherapeutic Agents: Study of the following chemotherapeutic agents with respect to their chemical structure, chemical class, therapeutic uses, side effects and introduction to MDR wherever applicable.	
		1.3.1	Antibiotics and antivirals: Definition, <ul style="list-style-type: none"> • Amoxicillin (β- lactum antibiotics) • Cefpodoxime (Cephalosporins) • Doxycycline (Tetracyclines) • Levofloxacin (Quinolones) (Synthesis from 2,3,4 – Trifluoro -1-nitrobenzene) • Aciclovir/Acyclovir (Purines) 	(2L)
		5.3.2	Antimalarials: Types of malaria; Symptoms; Pathological detection during window period (Life cycle of the parasites not to be discussed) <ul style="list-style-type: none"> • Chloroquine (3-Amino quinolones) • Artemether(Benzodioxepins) Following combination to be discussed:Atremether-Lumefantrine (no structure)	(2L)

	1.3. 3	<p>Anthelmintics and AntiFungal agents Drugs effective in the treatment of Nematodes and Cestodes infestations.</p> <ul style="list-style-type: none"> • Diethyl carbamazine (Piperazines) • Albendazole (Benzimidazoles) (Synthesis from 2-Nitroaniline) • Clotrimazole (Imidazole) • Fluconazole (Triazole) (Synthesis from 1- Bromo – 2,4-difluorobenzene) 	(2L)
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UNIT – II(Drugs)
Chemotherapeutic Agents continued.

2	2.1	<p>Antiamoebic Drugs Types of Amoebiasis</p> <ul style="list-style-type: none"> • Metronidazole, Ornidazole, Tinidazole (Imidazole) <p>Synthesis of Metronidazole from glyoxal by Debus-Radziszewski imidazole synthesis route</p> <p>Following combination therapy to be discussed: Ciprofloxacin-Tinidazole</p>	(1L)
	2.2	<p>Antitubercular and Antileprotic Drugs Types of Tuberculosis; Symptoms and diagnosis of Tuberculosis. Types of Leprosy. General idea of Antibiotics used in their treatment.</p> <ul style="list-style-type: none"> • PAS (Amino salicylates) • Isoniazide (Hydrazides) • Pyrazinamide (Pyrazines) • (+) Ethambutol (Aliphatic diamines) (Synthesis from 1- Nitropropane) • Dapsone(Sulphonamides) (Synthesis from 4- Chloronitrobenzene) • Clofazimine (Phenazines) • Bedaquiline (Quinoline) <p>Following combination therapy to be discussed: (i) Rifampin + Ethambutol + Pyrazinamide (ii) Rifampin + Isoniazide + Pyrazinamide</p>	(3L)
	2.3	<p>Anti-Neoplastic Drugs Idea of malignancy; Causes of cancer Brief idea of Immuno Stimulants &Immuno depressants</p> <ul style="list-style-type: none"> • Lomoustine (Nitrosoureas) • Anastrozole(Triazoles) (Synthesis from 3,5-bis (bromo methyl) toluene) • Cisplatin (Chloro Platinum) • Vincristine, Vinblastine, Vindesine) (Vinca alkaloids) (structure not expected) 	(2L)
	2.4	<p>Anti-HIV Drugs Idea of HIV pathogenicity, Symptoms of AIDS</p> <ul style="list-style-type: none"> • AZT/Zidovudine, Lamivudine,DDI (Purines) 	(1L)
	2.5	<p>Drug Intermediates: Synthesis and uses</p> <p>1. 2,3,6-Triamino-6- hydroxypyrimidine from Guanidine</p>	(2L)

		<p>2. p-[2'-(5-Chloro-2-methoxy benzamido) ethyl]-benzenesulphonamide from Methyl-5-chloro-2-methoxybenzene</p> <p>3. 3-(p-Chlorophenyl)-3-hydroxypiperidine from 3-Chloroacetophenone</p> <p>4. p-Acetyl amino benzenesulphonyl chloride from Aniline</p> <p>5. Epichlorohydrine from propene</p>	
2.6		<p>Nano particles in Medicinal Chemistry Introduction; Carbon nano particles (structures) and Carbon nano tubes:</p> <ul style="list-style-type: none"> • Functionalization for Pharmaceutical applications • Targeted drug delivery • In vaccine (Foot and mouth disease) • Use in Bio-physical treatment. <p>Gold nano particles in treatment of: Cancer; Parkinsonism; Alzheimer. Silver nano particles: Antimicrobial activity.</p>	(4L)
2.7		<p>Drugs and Environmental Aspects</p> <ul style="list-style-type: none"> • Impact of Pharma-industry on environment, • International regulation for human experimentation with reference to: "The Nuremberg Code" and "The Helsinki Declaration". 	(2L)

Reference Books (For Units I & II):

1. Foye's principles of medicinal chemistry. 6th Edition, Edited by Davis William & Thomas Lemke, Indian edition by B I Publication Pvt Ltd, Lippmcolt Williams & Wilkins.
 2. Text book of organic medicinal & pharmaceutical chemistry. Wilson & Gisovolds, 11th Edition by John H Block, John M Beale Jr.
 3. Medicinal chemistry. Ashutosh Kar, New Age International Pvt. Ltd Publisher. 4th edition.
 4. Burger's Medicinal Chemistry, Drug Discovery & Development. Abraham & Rotella. Wiley
 5. Medicinal chemistry. Ashutosh Kar, New Age International Pvt. Ltd Publisher. 4th edition.
 6. Medicinal chemistry. V.K. Ahluwalia and Madhu Chopra, CRC Press.
 7. Principle of medicinal chemistry. Vol 1 & 2 S. S. Kadam, K. R. Mahadik, K. G. Bothara
 8. The Art of Drug synthesis. Johnson and Li. Wiley, 2007.
 9. The organic chemistry of drug design & drug action. 2nd ed. By Richard B Silvermann, Academic Press.
 10. The Organic Chemistry of Drug Synthesis. Lednicer and Mitscher, Wiley.
 11. Text book of drug design and discovery. Povl-Krog-Sgaard-Larsen, Tommy Liljefors and ULF Madsen, 3rd Edition Taylor & Francis.
 12. Bio-applications of nanoparticles. Edited by Warren C.W. Chan, Springer Publication.
 13. Nanoparticle and technology for drug delivery (Drugs and pharmaceutical sciences). Ram B.Gupta & Uday B.Kompella Pub. Informa Healthcare.
 14. Nano forms of carbon and its applications. Edited by Maheshwar Sharon and Madhuri Sharon. MonadNanotech Pvt. Ltd.
 15. Environmental Chemistry. A. K. De
 16. Text Book on Law and Medicine. Chokhani and Ghormade. 2nd Edition. Hind Law House, Pune.
 17. Essentials of Medical Pharmacology. K D Tripathi, Jaypee Brothers Medical publishers Pvt. Ltd.
- Practical organic chemistry, Vogel.

SEMESTER VI

Unit – III (Dyes)

3	3.1		Classification of Dyes based on Chemical Constitution and Synthesis of Selected Dyes (Synthesis of the dyes marked with * is expected)	(12L)
			i) Nitro Dye: Naphthol Yellow S	
			ii) Nitroso Dye: Gambine Y	
			iii) Azo dyes: a) Monoazo dyes: Orange IV *(from sulphanilic acid) & Eriochrome Black T* (from β -naphthol) b) Bisazo dyes: Congo Red* (from nitrobenzene) c) Trisazo Dye: Direct Deep Black EW* (from benzidine)	
			iv) Diphenylmethane dye: Auramine O* (from N,N-dimethyl aniline)	
			v) Triphenylmethane dye: a) Diamine series: Malachite Green* (from benzaldehyde) b) Triamine series: Acid Magenta c) Phenol series: Rosolic acid	
			vi) Heterocyclic Dyes: a) Thiazine dyes: Methylene Blue b) Azine dyes: Safranin T* (from o-toluidine) c) Xanthene Dyes: Eosin* (from phthalic anhydride) d) Oxazine Dyes: Capri Blue e) Acridine Dyes: Acriflavine	
			vii) Quinone Dyes: a) Naphthaquinone: Naphthazarin b) Anthraquinone Dyes: Indanthrene Blue* (from anthraquinone)	
			viii) Indigoid Dyes: Indigo* (from aniline + monochloroacetic acid)	
			ix) Phthalocyanine Dyes: Monastral Fast Blue B	
	3.2		Health and Environmental Hazards of Synthetic Dyes and their Remediation Processes	(3L)
		3.2.1	Impact of the textile and leather dye Industry on the environment with special emphasis on water pollution	
		3.2.2	Health Hazards: Toxicity of dyes w.r.t food colours.	
		3.2.3	Effluent Treatment Strategies: Brief introduction to effluent treatment plants (ETP) Primary Remediation processes: (Physical Processes) Sedimentation, Aeration, Sorption (activated charcoal, fly ash etc.) Secondary Remediation processes: Biological Remediation – Biosorption, bioremediation and biodegradation Chemical Remediation: Oxidation Processes (chlorination), Coagulation-flocculation-Precipitation	

Unit – IV (Dyes)

4	4.1		Non-textile uses of dyes:	(8L)
		4.1.1	Biomedical uses of dyes i) Dyes used in formulations (Tablets, capsules, syrups etc) Indigo carmine, Sunset yellow, Tartrazine ii) Biological staining agents Methylene blue, Crystal violet and Safranin T iii) DNA markers Bromophenol blue, Orange G, Cresol red iv) Dyes as therapeutics Mercurochrome, Acriflavine, Crystal Violet, Prontosil	
		4.1.2	Dyes used in food and cosmetics: i) Properties of dyes used in food and cosmetics ii) Introduction to FDA and FSSAI iii) Commonly used food colours and their limits	
		4.1.3	Paper and leather dyes i) Structural features of paper and leather ii) Dyes applicable to paper and leather	
		4.1.4	Miscellaneous dyes i) Hair dyes ii) Laser dyes iii) Indicators iv) Security inks iv) Coloured smokes and camouflage colours	
	4.2		Pigments	(3L)
			Definition of pigments, examples, properties of pigments, difference between dyes and pigments. Definition of Lakes and Toners	
	4.3		Dyestuff Industry - Indian Perspective	(4L)
		4.3.1	Growth and development of the Indian Dyestuff Industry	
		4.3.2	Strengths, Weaknesses, Opportunities and Challenges of the Dyestuff industry in India	
		4.3.3	Make in India - Future Prospects of the Dye Industry	

References (For Units III & IV)

1. Chemistry of Synthetic Dyes, Vol I – IV, Venkatraman K., Academic Press 1972
2. The Chemistry of Synthetic Dyes and Pigments, Lubs H.A., Robert E Krieger Publishing Company, NY, 1995
3. Chemistry of Dyes and Principles of Dyeing, Shenai V.A., Sevak Publications, 1973
4. Environmental Studies, Joseph Benny, Tata McGraw Hill Education, 2005
5. Fundamental Concepts of Environmental Chemistry, Sodhi. G. S., Alpha Science International, 2009
6. Planning Commission, Niti Aayog, FSSAI and FDA websites
7. Green Chemistry for Dyes Removal from Waste Water- Research Trends and Applications, Ed. Sharma S.K., Wiley, 2015
8. Environmental Pollution- Monitoring and Control, Khopkar S.M., New Age International (P)Ltd, New Delhi, 1982

SEMESTER VI (PRACTICALS)

COURSE CODE: USC5CH5

CREDITS: 02

1. O-Methylation of β -naphthol.
2. Preparation of Paracetamol from p-aminophenol.
3. Preparation of Fluorescein
4. TLC of a mixture of dyes (safranin-T, Indigo carmine, methylene blue)



Jnanardan Bhagat Shikshan Prasarak Sanstha
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW
PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: Masters in Science (M. Sc.)
Total Credits:96

SYLLABUS

(Approved in the Academic council meeting held on /07/2022)

M.Sc.-I
Chemistry
Revised as per
Choice Based Credit System (60:40)
w. e. f. Academic Year 2022-23

MASTERS IN SCIENCE (M. Sc.)
Programme Outcomes

After completion of M.Sc. programme students will acquire

S. N.	After completion of M.Sc. program students will acquire	Graduate Attribute
PO1	An ability to identify and describe broadly accepted methodologies of science, and different modes of reasoning.	Disciplinary knowledge
PO2	An ability to demonstrate proficiency in various instrumentation, modern tools, advanced techniques and ICT to meet industrial expectations and research outputs.	Disciplinary knowledge/Digital literacy
PO3	An ability to identify problems, formulates, and proves hypotheses by applying theoretical knowledge and skills relevant to the discipline.	Problem-solving
PO4	An ability to be articulate thoughts, research ideas, information, scientific outcomes in oral and in written presentation to range of audience.	Communication skills
PO5	A capacity for independent, conceptual and creative thinking, analysis and problem solving through the existing methods of enquiry.	Problem solving
PO6	Skills required for cutting edge research, investigations, field study, documentation, networking, and ability to build logical arguments using scholarly evidence.	Research skills
PO7	An ability to portray good interpersonal skills with ability to work collaboratively as part of a team undertaking a range of different team roles	Teamwork
PO8	The ability to understand ethical responsibilities and impact of scientific solutions in global, societal and environmental context and contribute to the sustainable development	Moral and ethical awareness/ multicultural competence
PO9	An ability to demonstrate leadership, to take action and to get others involved.	Leadership
PO10	An openness to and interest in, life-long learning through directed and self-directed study	Self-directed learning
PO11	An ability to translate the knowledge and demonstrate the skills required to be employed and successful professional development.	Life-long learning

Programme: M.Sc. Organic Chemistry

PSOs No.	After completing the programme in M.Sc. Organic Chemistry, Student will able to:	Graduate Attribute
PSO1	Develop analytical thinking and apply the same for understanding principles, proposing mechanism and logical conclusions, understanding of the interdisciplinary nature of Chemistry and emerging trends in Chemistry.	Disciplinary knowledge Problem solving
PSO2	Get research opportunities in academics as well as employment at R & D in synthetic division of chemical, pharmaceutical, dyestuff and food industries	Research skills
PSO3	Competency in design and planning of synthesis and carry out with Good Laboratory Practices, handling instruments and interpretation of spectral data for structure determination of organic compounds	Research skills

Programme: M.Sc. Analytical Chemistry

PSOs No	After completing the programme in M.Sc. Analytical Chemistry, Student will able to:	Graduate Attribute
PSO1	Understand the principles, methodologies of analytical techniques and their applications in industrial, social, and environmental context.	Disciplinary knowledge/ Multicultural competence
PSO2	Integrate and apply the knowledge of the analytical methods, tools, and ICT facilities to the range of scientific problems using critical thinking and communicate results effectively.	Problem solving
PSO3	Demonstrate research skills in the core and allied areas of chemical sciences, professionalism and ethical conduct.	Research skills/ lifelong learning

Masters in Science (Chemistry) Syllabus for Semester I and II

Preamble:

Master of Science (M.Sc.) in chemistry is a post-graduate course of department of chemistry, Changu Kana Thakur Arts, Commerce & Science College, New Panvel (Autonomous).

There are two P.G. programmes in Chemistry, namely M.Sc. programme in Organic Chemistry and M.Sc. programme in Analytical Chemistry. Both P.G. programmes are equivalent in all respect for employment and higher studies. Each of these two P.G. programmes shall extend over a period of two academic years comprising of four semesters. The syllabi and scheme of examinations of these two programmes are detailed below. The theory and practical's of courses of two Semesters of the two programmes are same. Chemistry is a fundamental science and has contributed immensely to the improvement of the life of human beings by providing many of human requirements and essentialities. Chemistry is important to the world economy as well. The developments in Chemistry during last few decades are phenomenal. It is also seen that these developments are crossing the traditional vertical boundaries of scientific disciplines; the more inclination is seen towards biological sciences. New branches of chemistry are emerging and gaining importance, such as bioorganic chemistry, materials chemistry, computational chemistry, etc.

The practice of Chemistry at industrial scale also is undergoing radical changes and is more or more based on deep understanding the chemical phenomena. The emerging Chemical Technologies are highly science based. The aid of computers has not only accelerated growth in the practice of Chemistry, but revolutionized the entire field. A chemist cannot isolate himself from other disciplines. Thus, after a long span of more and more specialization in graduate and post-graduate syllabi, a symbiotic interdisciplinary approach now seems to be more relevant.

Semester - I (CHEMISTRY)

[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/week	Internal assessment	Semester-end examination	Total	Credits
Physical chemistry	Core	PSC1PC1	4	40	60	100	4
Inorganic chemistry	Core	PSC1IC1	4	40	60	100	4
Organic chemistry	Core	PSC1OC1	4	40	60	100	4
Analytical chemistry	Core	PSC1AC1	4	40	60	100	4
Practical Physical chemistry	Core	PSC1PCP	4	--	50	50	2
Practical Inorganic chemistry	Core	PSC1ICP	4	--	50	50	2
Practical Organic chemistry	Core	PSC1OCP	4	--	50	50	2
Practical Analytical chemistry	Core	PSC1ACP	4	--	50	50	2

Semester - II (CHEMISTRY)

[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/week	Internal assessment	Semester-end examination	Total	Credits
Physical chemistry	Core	PSC2PC2	4	40	60	100	4
Inorganic chemistry	Core	PSC2IC2	4	40	60	100	4
Organic chemistry	Core	PSC2OC2	4	40	60	100	4
Analytical chemistry	Core	PSC2AC2	4	40	60	100	4
Practical Physical chemistry	Core	PSC2PCP	4	--	50	50	2
Practical Inorganic chemistry	Core	PSC2ICP	4	--	50	50	2
Practical Organic chemistry	Core	PSC2OCP	4	--	50	50	2
Practical Analytical chemistry	Core	PSC2ACP	4	--	50	50	2

Examination Scheme

Choice Based Credit System (CBCS)

❖ Revised Scheme of Examination

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below-

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Project 2. Presentation and write up on the selected topics of the subjects / Case studies. 3. Test on Practical Skills 4. Open Book Test 5. Quiz	20 Marks

Question Paper Pattern

(Periodical Class Test for the Courses at Post-Graduate Programmes)

- ❖ Maximum Marks: 20
- ❖ Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

Question Paper Pattern for Semester End Examination

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of $2\frac{1}{2}$ hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be five questions each of 12 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

❖ Passing Standard

The learners shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of grade D in each project wherever applicable to pass a particular semester.

Semester End Practical Examination (50 Marks)

Laboratory Work 40 Marks

Journal 05 Marks

Viva 05 Marks

The practical examination will be held for two days as described below. The candidates will be examined practically and orally on each day.

Day	Session	Paper-I	Paper-II	Paper-III	Paper-IV
Day 1	Morning	A	B	C	D
	Evening	B	A	D	C
Day 2	Morning	C	D	A	B
	Evening	D	C	B	A

Question Paper Pattern for Continuous Assessment

Marks	Group Project*/ Individual Project	Presentation and write-up	Practical Skills	Open book test	Quiz
5	Hypothesis/Topic of the project	Presentation skill	Demonstration of skill	High order thinking questions (HOTS)	Quiz on application of subject in real life
5	Actual laboratory work/Field work	Knowledge	Viva		
5	Result/output	Quality of ppt	Report		
5	Dissertation/Report	Writing skill	Problem solving ability		

SEMESTER-I

Course Description	
Semester	I
Course Name	Physical Chemistry
Course Code	PSC1PC1
Eligibility for Course	T.Y.B.Sc. (Chemistry)
Credit	4
Hours	60

Course Objectives

1. To develop laboratory competence in relating physical aspects in chemistry
2. To demonstrate the ability to synthesize, separate and characterize compounds using published reactions, protocols, standard laboratory equipment, and modern instrumentation.
3. To provide the students with sound preparation for requirement of modern industry and provide competency in basic academic research as well as a cohesive, clearly structured overview of Chemistry

Course Outcomes

After successful completion of this course students will be able to

Sr. No	Course Outcomes	Bloom Taxonomy Level (BLT)
CO1	Prove Maxwell relations and its significance and applications to ideal gases, Joule Thomson experiment, Joule Thomson coefficient and inversion temperature. Apply Third law of Thermodynamics to find out absolute entropy	Understand
CO2	Make use of quantum mechanics for Particle waves and Schrödinger wave equation, wave functions, properties of wave functions, Normalization of wave functions, orthogonality of wave functions. Particle in a one, two- and three-dimensional box	Apply
CO3	Define, understand basic terms of Chemical Dynamics i.e. rate constant, order of reaction, molecularity of reaction also compare Composite Reactions and Polymerization reactions	Evaluate
CO4	Make use of of Colloids and Surface Phenomena in daily applications	Apply

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	Thermodynamics-I				
	<p>1.1. State function and exact differentials. Maxwell equations, Maxwell thermodynamic Relations; its significance and applications to ideal gases, Joule Thomson experiment, Joule Thomson coefficient, inversion temperature, Joule Thomson coefficient in terms of van der Waals constants. [8L]</p> <p>1.2. Third law of Thermodynamics, Entropy change for a phase transition, absolute entropies, determination of absolute entropies in terms of heat capacity, standard molar entropies and their dependence on molecular mass and molecular structure, residual entropy. [7L]</p>	15	1	1,2	2, 11
2.	Quantum Chemistry				
	<p>2.1. Classical Mechanics, failure of classical mechanics: Need for Quantum Mechanics.</p> <p>2.2. Particle waves and Schrödinger wave equation, wave functions, properties of wave functions, Normalization of wave functions, orthogonality of wave functions.</p> <p>2.3. Operators and their algebra, linear and Hermitian operators, operators for the dynamic variables of a system such as, position, linear momentum, angular momentum, total energy, eigen functions, eigen values and eigen value equation, Schrödinger wave equation as the eigen value equation of the Hamiltonian operator, average value and the expectation value of a dynamic variable of the system, Postulates of Quantum Mechanics, Schrodinger's Time independent wave equation from Schrodinger's time dependent wave equation.</p> <p>2.4. Application of quantum mechanics to the following systems:</p> <p>a) Free particle, wave function and energy of a free particle.</p> <p>b) Particle in a one, two and three dimensional box, separation of variables, Expression for the wave function of the system, expression for the energy of the system, concept of quantization, introduction of quantum number, degeneracy of the energy levels.</p>	15	2	1	2,8, 11

	c) Harmonic oscillator, approximate solution of the equation, Hermite polynomials, expression for wave function, expression for energy, use of the recursion formula.				
3.	Chemical Dynamics-I				
	<p>3.1. Composite Reactions: Recapitulation: Rate laws, Differential rate equations Consecutive reactions, Steady state Approximation, rate determining steps, Microscopic Reversibility and Detailed Balanced Chain reactions-chain initiation processes. Some inorganic mechanisms: formation and decomposition of phosgene, decomposition of ozone, Reaction between Hydrogen and Bromine and some general examples Organic Decompositions: Decomposition of ethane, decomposition of acetaldehyde Gas phase combustion: Reaction between hydrogen and oxygen, Semenov – Hinshelwood and Thompson mechanism, Explosion limits and factors affecting explosion limits.</p> <p>3.2. Polymerization reactions: Kinetics of stepwise polymerization, Calculation of degree of polymerization for stepwise reaction. Kinetics of free radical chain polymerization, Kinetic chain length and estimation of average no of monomer units in the polymer produced by chain polymerization.</p> <p>3.3. Reaction in Gas Phase Unimolecular Reactions: Lindeman-Hinshelwood theory, Rice-Ramsperger-Kassel (RRK) theory, Rice-Ramsperger-Kassel Marcus (RRKM) theory.</p>	15	3	1	1,2, 6,10
4.	Colloids and Surface Phenomena				
	Colloidal Systems-Sols, Lyophilic and lyophobic sols, properties of sols, coagulation. Sols of surface-active reagents, surface tension and surfactants, electrical phenomena at interfaces including electrokinetic effects, micelles, reverse micelles, solubilization. Thermodynamics of micellization, critical micelle concentration, factors affecting critical micelle concentration (cmc), experimental methods of cmc determination, Micellar catalysis. Adsorption, adsorption isotherms, methods for determining surface structure and composition, BET equation, surface area determination,	15	4	1	1,2, 3, 6, 8, 11

Gibbs adsorption equation and its verification. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces. Numerical Problems				
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2. K.J. Laidler and J.H. Meiser, Physical Chemistry, 2nd Ed., CBS Publishers and Distributors, New Delhi, 1999.
3. Robert J. Silby and Robert A. Alberty, Physical Chemistry, 3rd Edn., John Wiley and Sons (Asia) Pte.Ltd., 2002.
4. Ira R. Levine, Physical Chemistry, 5th Edn., Tata McGraw-Hill New Delhi, 2002.
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6. S. Glasstone, Text Book of Physical Chemistry, 2nd Edn., McMillan and Co. Ltd., London, 1962
7. B.K. Sen, Quantum Chemistry including Spectroscopy, Kalyani Publishers, 2003.
8. A.K. Chandra, Introductory Quantum Chemistry, Tata McGraw – Hill, 1994.
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11. W.G. Davis, Introduction to Chemical Thermodynamics – A Non – Calculus Approach, Saunders, Philadelphia, 19772.
12. Peter A. Rock, Chemical Thermodynamics, University Science Books, Oxford University Press, 1983.
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15. D.N. Bajpai, Advanced Physical Chemistry, S. Chand 1st Edn., 1992. 16. Bockris, John O'M., Reddy, Amulya K.N., Gamboa-Aldeco, Maria E., Modern Electrochemistry, 2A, Plenum Publishers, 1998.
17. Physical Chemistry by Gurtu and Gurtu
18. A Text book of Physical Chemistry by K L Kapoor Vol5 , 2nd Edn

Physical Chemistry Practical

Course Description	
Semester	I
Course Name	Physical Chemistry
Course Code	PSC1PCP
Eligibility for Course	T.Y. B.Sc. (Chemistry)
Credit	2
Hours	30

After successful completion of this course students will be able to

Sr. No.	Cos	Bloom Taxonomy Level (BLT)
CO1	Know the principles of different instruments like Potentiometry, Conductometry, pH Metry.	Understand

CO2	Determine the heat of solution of sparingly soluble acid and identify the reaction between acetone and iodine.	Apply
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Sr. No.	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	To determine the heat of solution (ΔH) of a sparingly soluble acid (benzoic /salicylic acid) from solubility measurement at three different temperature.	4	1	1,2	1,2,3,8,11
2.	To study the variation of calcium sulphate with ionic strength and hence determine the thermodynamic solubility product of CaSO_4 at room temperature.	4	2	1,2	1,3,4,7,11
3.	To investigate the reaction between acetone and iodine. Or Kinetics of reaction between bromate and iodide. (New expt.)	4	2	1,2	1,3,4,7,10
4.	To study the variation in the solubility of Ca(OH)_2 in presence of NaOH and hence to determine the solubility product of Ca(OH)_2 at room temperature.	4	1	1,2	1,2,4,7,11
5.	Graph Plotting of mathematical functions –linear, exponential and trigonometry and identify whether functions are acceptable or non-acceptable?	4	1	1,2	1,2,4,7,11
6.	To determine the mean ionic activity coefficient of an electrolyte by e.m.f. measurement.	4	1	1,2	1,2,3,7,11
7.	To study the effect of substituent on the dissociation constant of acetic acid conductometrically.	4	1	1,2	1,2,4,7,11
8.	To determine pK_a values of phosphoric acid by potentiometric titration with sodium hydroxide using glass electrode.	4	1	1,2	1,2,4,7,11
9.	To verify Ostwald's dilution law and to determine the dissociation constant of a weak mono-basic acid conductometrically.	4	1	1,2	1,2,3,7,11
10.	Determination of dissociation constant of dibasic acid.		1		

References:

- 1 Practical Physical Chemistry, B. Viswanathan and P.S. Raghavan, Viva Books Private Limited, 2005.
- 2 Practical Physical Chemistry, A.M. James and F.E. Prichard, 3rd Edn., Longman Group Ltd., 1974.
- 3 Experimental Physical Chemistry, V.D. Athawale and P. Mathur, New Age International Publishers, 2001.

Course Description	
Semester	I
Course Name	Inorganic Chemistry
Course Code	PSC1IC1

Eligibility for Course	T.Y.B. Sc.in Chemistry
Credit	4
Hours	60

Course Objectives:

1. To apply theories of bonding, hybridization, MOT for Polyatomic species.
2. To understand preparation, properties and structures of higher boranes, carboranes, metalloboranes and metallocarboranes, metal carbonyls and halide clusters.
3. To understand all elements of symmetry, point group, symmetry classification, symmetry criterion of optical activity, symmetry restrictions on dipole moment.
4. To understand concepts of Groups, Sub-groups, Classes of Symmetry operations, Group Multiplication Tables. Abelian and non-Abelian point groups, Mulliken's notations for irreducible representations. Reduction of reducible representations using reduction formula.
5. To understand concept of band theory, Fermi level, K-Space and Brillouin Zones, Defects in solids.
6. To explain Preparative methods of inorganic solids & nano materials.
7. To explain Electron Paramagnetic Resonance Spectroscopy and its applications, spectral calculations using Orgel and Tanabe-Sugano diagram.
8. To determine of formation constants of metal complexes.

Course Outcomes

Sr.No.	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Explain theories of bonding, hybridization, resonance concept, MOT for diatomic species of first transition Series, Polyatomic species and Higher boranes, carboranes, metalloboranes and metallocarboranes, metal carbonyls and halide clusters.	Understand
CO2	Explain The concept of band theory, Fermi level, K-Space and Brillouin Zones. Structures of Compounds of the type: AB, AB ₂ etc. and Preparative methods of inorganic solids & nano materials.	Understand
CO3	Construct Group Multiplication Tables, Character tables using concept of Molecular Symmetry and Group Theory.	Apply
CO4	Determine electronic parameters such as Δ , B, C, Nephelauxetic ratio, formation constants of metal complexes and Characterize coordination compounds using techniques like thermal studies, Conductivity measurements, electronic spectral and magnetic measurements, IR, NMR and ESR spectroscopic	Evaluate

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	Chemical Bonding:	15h	CO1	PSO1	PO3

1.1	Recapitulation of hybridization Derivation of wave functions for sp, sp ² , sp ³ orbital hybridization types considering only sigma bonding.				
1.2	Discussion of involvement of d orbitals in various types of hybridizations. Concept of resonance, resonance energy derivation expected. Formal charge with examples.				
1.3	Molecular Orbital Theory for Polyatomic species considering σ bonding for SF ₆ , CO ₂ , B ₂ H ₆ , I ₃ -molecular species.				
1.4	Higher boranes, carboranes, metalloboranes and metallocarboranes, metal carbonyls and halide clusters, compounds with metal-metal multiple bonds.				
2.	Molecular Symmetry and Group Theory:	15h	CO3	PSO1	PO5
2.1	Symmetry criterion of optical activity, symmetry restrictions on dipole moment. A systematic procedure for symmetry classification of molecules.				
2.2	Concepts of Groups, Sub-groups, Classes of Symmetry operations, Group Multiplication Tables. Abelian and non-Abelian point groups.				
2.3	Representation of Groups: Matrix representation of symmetry operations, reducible and irreducible representations. The Great Orthogonality Theorem and its application in construction of character tables for point groups C _{2v} , C _{3v} and D _{2h} , structure of character tables.				
2.4	Applications of Group Theory (a) Symmetry adapted linear combinations (SALC), symmetry aspects of MO theory, sigma bonding in AB _n (Ammonia, CH ₄) molecule. (b) Determination of symmetry species for translations and rotations. (c) Mulliken's notations for irreducible representations. (d) Reduction of reducible representations using reduction formula. (e) Group-subgroup relationships. (f) Descent and ascent in symmetry correlation diagrams showing relationship between different groups.				
3.	Materials Chemistry and Nanomaterials:	15h	CO2	PSO2	PO5
3.1	Solid State Chemistry				
3.1.1	Electronic structure of solids and band theory, Fermi level, K Space and Brillouin Zones.				
3.1.2	Crystal Defects and non-stoichiometry: Classification of Defects: subatomic, atomic and lattice defects in solids; Thermodynamics of vacancy in metals; Thermodynamics of Schottky defects in ionic solids; Thermodynamics of Frenkel defects in silver halides; Calculation of number of defects and average energy				

	required for defect.				
3.1.3	Methods of preparation for inorganic solids: sol- gel method (applications in Biosensors), microwave synthesis (discussion on principles, examples, merits and demerits are expected)				
3.2	Nanomaterials				
3.2.1	Preparative methods: Chemical methods, Microwave, Langmuir Blodgett(L-B) method, Biological methods: Synthesis using microorganisms				
3.2.2	Applications in the field of semiconductors, solar cells				
4.	Characterisation of Coordination compounds	15h	CO4	PSO2	PO5
4.1	Electron Paramagnetic Resonance Spectroscopy (EPR): i) Theory and Instrumentation of EPR in brief. ii) Spin Hamiltonian, Isotropic and anisotropic EPR spectra, Magic Pentagon rule. iii) Applications of EPR spectroscopy: Structural determination of Inorganic complexes				
4.2	Spectral calculations using Orgel and Tanabe-Sugano diagram, calculation of electronic parameters such as Δ , B, C, Nephelauxetic ratio.				
4.3	Determination of formation constants of metal complexes (Overall and Stepwise): Comparative studies of Potentiometric and spectral methods.				

References

Unit I

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2. W. W. Porterfield, Inorganic Chemistry-A Unified Approach, 2nd Ed., Academic Press, 1993.
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Unit II

1. F. A. Cotton, Chemical Applications of Group Theory, 2nd Edition, Wiley Eastern Ltd., 1989.
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Unit III

1. Solid State Chemistry Introduction, Lesley E. Smart, Elaine A. Moore, ISBN 0-203-49635-3, Taylor & Francis Group, LLC.
2. Nanomaterials&Nanochemistry, 2007, Catherine Brechignac, Philippe Houdy, Marcel Lahmani, ISBN 978-3-540-72992-1 Springer Berlin Heidelberg New York.
3. Nanomaterials Chemistry, Recent Developments and New Directions C.N.R. Rao, A. Muller, and A.K. Cheetham, ISBN 978-3-527-31664-9, 2007 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.
4. Nano-Surface Chemistry, 2001, Morton Rosoff, ISBN: 0-8247-0254-9, Marcel Dekker Inc. New York.
5. The Chemistry of Nanomaterials, CNR Rao, Muller Cheetham, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, 2004.
6. Semiconductor Nanomaterials, Challa S.S.R. Kumar, ISBN: 978-3-527-32166-7, WILEY- VCH Verlag GmbH & Co. KGaA, Weinheim, 2010.

Unit IV

1. J. E. Huheey, E. A. Keiter and R. L. Keiter; Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Education, 2006.
2. D. Banerjee, Coordination Chemistry
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4. P.W. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong; Shriver & Atkins: Inorganic Chemistry, 4th ed. Oxford University Press, 2006.
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Course Description	
Semester	I
Course Name	Inorganic Chemistry Practical
Course Code	PSC1IC1
Eligibility for Course	T.Y.B.Sc.in Chemistry
Credit	2
Hours	30

Sr. No.	After completing the course, Students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Prepare various inorganic complexes such as Bis-(tetramethylammonium) tetrachloroCuprate (II) $(Me_4 N)_2[CuCl_4]$, Tetramminemonocarbanato Cobalt (III) Nitrate, Bis (ethylenediammine) Copper (II) Sulphate, Hydroniumdichlorobis(dimethylglyoximato) etc.	Understand
CO2	Determine the electrolytic nature of inorganic compounds	Apply
CO3	Apply Slope intercept method for determination of equilibrium constants for Fe^{+3}/SCN^- system.	Apply
CO4	Analyze the inorganic complex for percentage of metal and ligand.	Analyse

Inorganic Preparations (Synthesis and Characterization)

- 1) Bis-(tetramethylammonium) tetrachloroCuprate (II) $(Me_4 N)_2[CuCl_4]$
- 2) Tetramminemonocarbanato Cobalt (III) Nitrate $[Co(NH_3)_4CO_3]NO_3$
- 3) Bis (ethylenediammine) Copper (II) Sulphate $[Cu(en)_2]SO_4$
- 4) Hydronium dichlorobis(dimethylglyoximato) Cobaltate(III) $H[Co(dmgh)_2Cl_2]$

Instrumentation

- 1) Determination of equilibrium constant by Slope intercept method for Fe^{+3}/SCN^- system
- 2) Determination of Electrolytic nature of inorganic compounds by Conductance measurement.

Reference:

1. Advanced experiments in Inorganic Chemistry., G. N. Mukherjee., 1st Edn., 2010., U.N.Dhur& Sons Pvt Ltd

The Synthesis and Characterization of Inorganic Compounds by William L. Jolly 3. Inorganic Chemistry Practical Under UGC Syllabus for M.Sc. in all India Universities By: DrDeepak Pant

Course Description	
Semester	I
Course Name	Organic Chemistry
Course Code	PSC1OC1
Eligibility for Course	T.Y.B.Sc (Chemistry)
Credit	4
Hours	60

Course Objectives

4. To study the basics of addition reactions and their applications.
5. To study stereochemistry in man detail
6. To study the different reagents in the organic transformation.
7. To understand the role of carbon nucleophiles in organic synthesis

Course Outcomes

After successful completion of this course students will be able to

Sr. No.	CO	Bloom Taxonomy Level (BLT)
CO1	Understand the types of reaction and their applications	Remember
CO2	Summarize the various aspects of aromaticity, aliphatic and aromatic nucleophilic substitution reactions with their mechanism and examples.	Understand
CO3	Apply the concept of Configurational descriptors (R,S nomenclature) to chiral centres in Organic compounds	Apply
CO4	Predict the mechanism, selectivity, importance and applications of oxidizing and reducing agent	Apply

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	Addition Reactions: 1.1 Addition reactions to carbon carbon multiple bonds - Mechanism and Stereochemical aspects of addition reaction Involving electrophile	15	1	2	1,2

	<p>1.2 Structural Effect and reactivity: Halogenation, Hydrohalogenation, Hydration, Hydroxylation, Hydroboration, Epoxidation, Carbene addition and Ozonolysis.</p> <p>1.3. Acids and Bases: Factors affecting acidity and basicity: Electronegativity and inductive effect, resonance, bond strength, electrostatic effects, hybridization, aromaticity and solvation. Comparative study of acidity and basicity of organic compounds on the basis of pKa values, Leveling effect and non-aqueous solvents. Acid and base catalysis – general and specific catalysis with examples.</p>				
2.	<p>Nucleophilic substitution reactions and Aromaticity:</p> <p>2.1. Nucleophilic substitution reactions: (9 L) 2.1.1. Aliphatic nucleophilic substitution: SN1, SN2, SNi reactions, mixed SN1 and SN2 and SET mechanisms. SN reactions involving NGP - participation by aryl rings, α- and pi-bonds. Factors affecting these reactions: substrate, nucleophilicity, solvent, steric effect, hard-soft interaction, leaving group. Ambident nucleophiles. SNcA, SN1^o and SN2^o reactions. SN at sp² (vinylic) carbon. 2.1.2. Aromatic nucleophilic substitution: SNAr, SN1, benzyne mechanisms. Ipso, cine, tele and vicarious substitution. 2.1.3. Ester hydrolysis: Classification, nomenclature and study of mechanisms of acid and base catalyzed hydrolysis with suitable examples (Any two). Orientation and Reactivity-Effect of Substrate, Leaving group and attacking nucleophile 2.2. Aromaticity: (6 L) 2.2.1. Structural, thermochemical, and magnetic criteria for aromaticity, including NMR characteristics of aromatic systems. Delocalization and aromaticity. 2.2.2. Application of HMO theory to monocyclic conjugated systems. Frost-Musulin diagrams. Huckel's (4n+2) and 4n rules. 2.2.3. Aromatic and antiaromatic compounds up-to 18 carbon atoms. Homoaromatic compounds. Aromaticity of all benzenoid systems, heterocycles, metallocenes, azulenes, annulenes, aromatic ions and Fullerene (C60)</p>	15	2	1	3,4
3.	<p>Stereochemistry:</p> <p>3.1. Concept of Chirality: Recognition of symmetry elements.</p> <p>3.2. Molecules with two or more chiral centers: Constitutionally unsymmetrical molecules: erythro-threo and syn-anti systems of nomenclature. Interconversion of Fischer, Sawhorse, Newman and Flying wedge projections. Constitutionally symmetrical molecules with odd and even number of chiral centers: enantiomeric and meso forms, concept of stereogenic, chirotopic, and pseudoasymmetric centres. Stereo-descriptors: R, S, for chiral centres in acyclic and cyclic compounds.</p> <p>3.3. Axial and planar chirality: Principles of axial and planar chirality. Stereochemical features and configurational descriptors (R,S) for the following classes</p>	15	3	4	4,5

<p>of compounds: Allenes, Alkylidene cycloalkanes, Spirans, Biaryls (buttressing effect) (including BINOLs and BINAPs), Ansa compounds, Cyclophanes, trans-cyclooctenes.</p> <p>3.4. Prochirality: Chiral and prochiral centres; prochiral axis and prochiral plane. Homotopic, heterotopic (enantiotopic and diastereotopic) ligands and faces. Identification using substitution and symmetry criteria. Nomenclature of stereoheterotopic ligands and faces. Symbols for stereoheterotopic ligands in molecules with i) one or more prochiral centres ii) a chiral as well as a prochiral centre, iii) a prochiral axis iv) a prochiral plane v) propseudoasymmetric centre. Symbols for enantiotopic and diastereotopic faces. E, Z nomenclature</p> <p>Resolution of Racemic mixtures</p>				
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<p>4.</p>	<p>Oxidation and Reduction: 4.1. Oxidation: General mechanism, selectivity, and important applications of the following: 4.1.1. Dehydrogenation: Dehydrogenation of C-C bonds including aromatization of six membered rings using metal (Pt, Pd, Ni) and organic reagents (chloranil, DDQ). 4.1.2. Oxidation of alcohols to aldehydes and ketones: Chromium reagents such as K₂Cr₂O₇/H₂SO₄ (Jones reagent), CrO₃-pyridine (Collin's reagent), PCC (Corey's reagent) and PDC (Cornforth reagent), hypervalent iodine reagents (IBX, Dess-Martin periodinane). DMSO based reagents (Swern oxidation), Corey-Kim oxidation - advantages over Swern and limitations; and Pfitzner-Moffatt oxidation-DCC and DMSO and Oppenauer oxidation. 4.1.3. Oxidation involving C-C bonds cleavage: Glycols using HIO₄; cycloalkanones using CrO₃; aromatic rings using RuO₄ and NaIO₄. 4.1.4. Oxidation involving replacement of hydrogen by oxygen: oxidation of CH₂ to CO by SeO₂, oxidation of arylmethanes by CrO₂Cl₂ (Etard oxidation). 4.1.5. Oxidation of aldehydes and ketones: with H₂O₂ (Dakin reaction), with peroxy acid (Baeyer-Villiger oxidation) 4.2. Reduction: General mechanism, selectivity, and important applications of the following reducing reagents: 4.2.1. Reduction of CO to CH₂ in aldehydes and ketones- Clemmensen reduction, WolffKishner reduction and Huang-Minlon modification. 4.2.2. Metal hydride reduction: Boron reagents (NaBH₄, NaCNBH₃, diborane, 9-BBN, Na(OAc)₃BH, aluminium reagents (LiAlH₄, DIBAL-H, Red Al, L and K- selectrides). 4.2.3. NH₂NH₂ (diimide reduction) and other non-metal based agents including organic reducing agents (Hantzschdihydropyridine). 4.2.4. Dissolving metal reductions: using Zn, Li, Na, and Mg under neutral and acidic conditions, Li/Na-liquid NH₃ mediated reduction (Birch reduction) of aromatic compounds and acetylenes.</p>	<p>15</p>	<p>4</p>	<p>4</p>	<p>7,8</p>
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Organic Chemistry Practical

Course Description	
Semester	I
Course Name	Organic Chemistry

Course Code	PSC10CP
Eligibility for Course	T.Y.B.Sc (Chemistry)
Credit	2
Hours	30

After successful completion of this course students will be able to

Sr. No	Cos	Bloom Taxonomy Level (BLT)
CO1	Plan preparation of organic compounds	Apply
CO2	Demonstrate the skill of purification of organic compounds by recrystallization and sublimation methods.	Understand
CO3	Apply the thin layer chromatography technique to check the purity of the synthesized product.	Apply
CO4	Can Sketch the structure of organic compounds using software Chem Biodraw.	Apply

Sr. No.	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	One step preparations	40			
2.	(1.0 g scale) 1. Bromobenzene to p-nitrobromobenzene		1-3	2	7,8
3.	2. Anthracene to anthraquinone		1-3	3	7,8
4.	3. Benzoin to benzil		1-3	4	2,3
5.	4. Anthracene to Anthracene maleic anhydride adduct		1-3	2	1,2
6.	5. 2-Naphthol to BINOL		1-3	3	5,6
7.	6. p-Benzoquinone to 1,2,4-triacetoxybenzene		1-3	4	7,8
8.	7. Ethyl acetoacetate to 3-methyl-1-phenylpyrazol-5-one		1-3	3	7,8
9.	8. Preparation of benzilic acid from benzil		1-3	1	2,3
10	9. Preparation of p-iodonitrobenzene from p-nitroaniline		1-3	2	1,2
11.	11. Use of Computer - Chem Draw-Sketch, ISI – Draw: Draw the structure of simple aliphatic, aromatic, heterocyclic organic compounds with substituents. Get the correct IUPAC name, Get ¹ HNMR and ¹³ C. Students can able to draw the one name reaction and its reaction mechanism.		4	4	5

1. Organic Chemistry, J. Claydens, N. Greeves, S. Warren and P. Wothers, Oxford University Press.

2. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Part A and B, Plenum Press.

3. Stereochemistry: Conformation and mechanism, P.S. Kalsi, New Age International, New Delhi.
4. Stereochemistry of carbon compounds, E.L Eliel, S.H Wilen and L.N Manden, Wiley.
5. Stereochemistry of Organic Compounds- Principles and Applications, D. Nasipuri. New International Publishers Ltd.
6. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure, Michael B. Smith, Jerry March, Wiley.
7. Advanced Organic Chemistry: Reactions and mechanism, B. Miller and R. Prasad, Pearson Education.
8. Advanced Organic Chemistry: Reaction mechanisms, R. Bruckner, Academic Press.
9. Understanding Organic Reaction Mechanisms, Adams Jacobs, Cambridge University Press.
10. Writing Reaction Mechanism in organic chemistry, A. Miller, P.H. Solomons, Academic Press.
11. Principles of Organic Synthesis, R.O.C. Norman and J.M Coxon, Nelson Thornes.
12. Advanced Organic Chemistry: Reactions and mechanism, L.G. Wade, Jr., Maya Shankar Singh, Pearson Education.
13. Mechanism in Organic Chemistry, Peter sykes, 6th edition onwards.
14. Modern Methods of Organic Synthesis, W. Carruthers and Iain Coldham, Cambridge University Press.
15. Organic Synthesis, Jagdamba Singh, L.D.S. Yadav, Pragati Prakashan.Organic Chemistry Practical

Course Description	
Semester	I
Course Name	Analytical Chemistry
Course Code	PSC1AC1
Eligibility for Course	T.Y.B.Sc (Chemistry)
Credit	4
Hours	60

Course Objectives

1. To develop laboratory competence in relating chemical structure to spectroscopic phenomena.
2. To demonstrate the ability to synthesize, separate and characterize compounds using published reactions, protocols, standard laboratory equipment, and modern instrumentation.
3. To provide the students with sound preparation for requirement of modern industry and provide competency in basic academic research as well as a cohesive, clearly structured overview of Chemistry

Course Outcomes

After successful completion of this course students will be able to

Sr. No	Cos	Bloom Taxonomy Level (BLT)
CO1	Explain the concept of data domain, performance characteristics of an instrument/method, total quality management, quality standards for laboratories, quality audits and quality reviews.	Understand
CO2	Discover the applications of UV-Visible spectroscopy, IR spectroscopy, Differential scanning calorimetry.	Apply
CO3	Identify the need of automation in chemical analysis, safety measures in laboratory, need of accreditation of laboratories and GLP.	Evaluate
CO4	Interpret the data based on calculations and statistical tests.	Evaluate

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	<p>1.1 Concepts of Analytical Chemistry: [5L] 1.1.1 Analytical perspective, Common analytical problems, terms involved in analytical chemistry (analysis, determination, measurement, techniques, methods, procedures and protocol) 1.1.2 An overview of analytical methods, types of instrumental methods, instruments for analysis, data domains, electrical and non-electrical domains, detectors, transducers and sensors, 1.2 Calculations based on Chemical Principles: [5L]</p>	15	1, 4	1,2	1,2,11

	<p>The following topics are to be covered in the form of numerical problems only.</p> <p>a. Concentration of a solution based on volume and mass units.</p> <p>b. Calculations of ppm, ppb and dilution of the solutions, concept of mmol.</p> <p>c. Stoichiometry of chemical reactions, concept of kg mol, limiting reactant, theoretical and practical yield.</p> <p>1.3 Basic Statistical Tools: [5L] Types of errors – determinate and indeterminate errors, Significant figures and propagation of errors. Confidence limit, Test of significance – the F-test and t-test - One sample t-test. Independent, Paired sample t-test. The statistical Q-test for rejection of a result, statistics for small data sets, Errors in instrumental analysis: Calibration curves, line of regression, errors in slope and intercept.</p>				
2.	<p>Quality in Analytical Chemistry:</p> <p>2.1 Quality Management System (QMS): [5L] Quality Management System: Quality management concepts and principles - Traceability, quality control, quality assurance, quality management and quality manual, calibration and test methods TQM in Chemical Industry: Applying Kaizen, Six Sigma approach and 5S to quality in industries. Quality audits and quality reviews, responsibility of laboratory staff for quality and problems.</p> <p>2.2 Good Laboratory Practices: [4L] GLP Principles, Documentation of laboratory work, Preparation of Standard Operating Procedures (SOPs), Validation of methods, reporting and documentation of results.</p> <p>2.3. Accreditation of laboratories: [3L] International organization for standardization, National accreditation board for testing and calibration laboratories. Scope of accreditation.</p> <p>2.4 Safety in Laboratories: [3L] Importance of Safety in Laboratories, classification of Personal Protection Equipment (PPE), Safety and health Standards: Indian Standards & codes for safety & health, OSHA standards, Types of Toxic Hazard (TH), Classification of Chemical Hazards and their control.</p>	15	3	1	1,2,8,11

<p>3.</p>	<p>Optical Methods: 3.1 Recapitulation of basic concepts, Electromagnetic spectrum, Sources, Detectors, sample containers, Laser as a source of radiation, Fibre optics [3L] 3.2 Molecular Ultraviolet and Visible Spectroscopy [6L] 3.2.1 Derivation of Beer- Lambert's Law and its limitations, factors affecting molecular absorption, types of transitions [emphasis on charge transfer absorption], pH, temperature, solvent and effect of substituents. Applications of Ultraviolet and Visible spectroscopy: 1) On charge transfer absorption 2) Simultaneous spectroscopy 3) Derivative Spectroscopy 3.2.2 Dual spectrometry – Introduction, Principle, Instrumentation and Applications 3.3 Infrared Absorption Spectroscopy [6L] 3.3.1 IR Spectroscopy: Principle, Instrumentation: Sources, Sample handling, Transducers, 3.3.2 FTIR Spectroscopy: Principle, instrumentation & its advantages. 3.3.3 Applications of IR spectroscopy: structure analysis of organic compounds, inorganic Molecules e.g. Sulphato, Carbonato, Nitrate & metal chelates - Acetylacetonato Complexes. Analysis of petroleum hydrocarbons, oil and grease contents by EPA method, Quantitative analysis of multi-component mixtures. 3.3.4 Introduction and basic principles of diffuse reflectance spectroscopy and its applications.</p>	<p>15</p>	<p>2</p>	<p>1</p>	<p>1,2,6,11</p>
<p>4.</p>	<p>4.1 Thermal Methods: [5 L] 4.1.1 Introduction, Recapitulation of types of thermal methods, comparison between TGA and DTA. 4.1.2 Differential Scanning Calorimetry-Principle, comparison of DTA and DSC, Instrumentation, Block diagram, Nature of DSC Curve, Factors affecting curves (sample size, sample shape, pressure). 4.1.3 Applications - Heat of reaction, Specific heat, Safety screening, Polymers, liquid crystals, Percentage crystallinity, oxidative stability, Drug analysis, Magnetic transition. e. g. Analysis of Polyethylene for its crystallinity. 4.2 Automation in chemical analysis: [5 L] Need for automation, Objectives of automation, an overview of automated instruments and instrumentation, process control analysis, flow</p>	<p>15</p>	<p>2, 3</p>	<p>1</p>	<p>1,2,6, 8, 11</p>

	<p>injection analysis, discrete automated systems, automatic analysis based on multi-layered films, gas monitoring equipments, Automatic titrators.</p> <p>4.3 Environmental Toxicology: [5] Introduction to Environmental Toxicology, Concepts of Toxicology, Toxic substances in the environment, their sources and entry roots, Transport of toxicants by air and water; Transport through food chain-bio-transformation and bio-magnification. Analysis Methods</p>				
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References

Unit I

1. Modern Analytical Chemistry by David Harvey, McGraw-Hill Higher Education
2. Principles of Instrumental Analysis - Skoog, Holler and Nieman, 5th Edition, Ch: 1.
3. Fundamentals of Analytical Chemistry, By Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, 9th Edition, 2004, Ch: 5.
4. Undergraduate Instrumental Analysis, 6th Edition, J W Robinson, Marcel Dekker, Ch:1.
5. ISO 9000 Quality Systems Handbook, Fourth Edition, David Hoyle. (Chapter: 3 & 4) (Free download).
5. 3000 solved problems in chemistry, Schaums Solved problem series, David E. Goldbers, McGraw Hill international Editions, Chapter 11,15,16,21,22

Unit II

1. Quality in the Analytical Laboratory, Elizabeth Pichard, Wiley India, Ch: 5, Ch: 6 & Ch: 7.
2. Quality Management, Donna C S Summers, Prentice-Hall of India, Ch:3.
3. Quality in Totality: A Manager's Guide To TQM and ISO 9000, ParagDiwan, Deep & Deep Publications, 1st Edition, 2000.
4. Quality Control and Total Quality Management - P.L. Jain-Tata McGraw-Hill (2006) Total Quality Management - Bester field - Pearson Education, Ch:5.
5. Industrial Hygiene and Chemical Safety, M H Fulekar, Ch:9, Ch:11 & Ch:15.
6. Safety and Hazards Management in Chemical Industries, M N Vyas, Atlantic Publisher, Ch:4, Ch:5 & Ch:19.
7. Staff, World Health Organization (2009) Handbook: Good Laboratory Practice (GLP) 13. OECD Principles of Good Laboratory Practice (as revised in 1997)". OECD Environmental Health and Safety Publications. OECD. 1. 1998.
8. Klimisch, HJ; Andrae, M; Tillmann, U (1997). "A systematic approach for evaluating the quality of experimental toxicological and eco-toxicological data". doi:10.1006/rtph.1996.1076. PMID 9056496.

Unit III

1. D. A. Skoog, F. J. Holler, T. A. Nieman, Principles of Instrumental Analysis, 5th Edition, Harcourt

Asia Publisher. Chapter 6, 7.

2. H. H. Willard, L. L. Merritt, J. A. Dean, F. A. Settle, Instrumental Methods of Analysis, 6th Edition, CBS Publisher. Chapter 2.

3. R. D. Braun, Introduction to Instrumental Analysis, McGraw Hill Publisher. Chapter 8.

4. D. A. Skoog, F. J. Holler, T. A. Nieman, Principles of Instrumental Analysis, 5th Edition, Harcourt Asia Publisher. Chapter 13, 14.

5. H. H. Willard, L. L. Merritt, J. A. Dean, F. A. Settle, Instrumental Methods of Analysis, 6th Edition, CBS Publisher. Chapter 2.

6. R. D. Braun, Introduction to Instrumental Analysis, McGraw Hill Publisher. Chapter 5.

7. G. W. Ewing, Instrumental Methods of Chemical Analysis, 5th Edition, McGraw Hill Publisher, Chapter 3.

8. M. Ito, The effect of temperature on ultraviolet absorption spectra and its relation to hydrogen bonding, J. Mol. Spectrosc. 4 (1960) 106-124.

9. A. J. Somnessa, The effect of temperature on the visible absorption band of iodine in several solvents, Spectrochim. Acta. Part A: Molecular Spectroscopy, 33 (1977) 525-528.

10. D. A. Skoog, F. J. Holler, T. A. Nieman, Principles of Instrumental Analysis, 5th Edition, Harcourt Asia Publisher. Chapter 16, 17.

11. R. D. Braun, Introduction to Instrumental Analysis, McGraw Hill Publisher. Chapter 12

12. Z. M. Khoshhesab (2012). Infrared Spectroscopy- Materials Science, Engineering and Technology. Prof. Theophanides Theophile (Ed.). ISBN: 978-953- 51-0537- 4, InTech, (open access)

Unit IV

1. Introduction to instrumental methods of analysis by Robert D. Braun, Mc. Graw Hill (1987): Chapter 27

2. Thermal Analysis-theory and applications by R. T. Sane, Ghadge, Quest Publications

3. Instrumental methods of analysis, 7th Edition, Willard, Merrit, Dean: Chapter 25

4. Instrumental Analysis, 5th Edition, Skoog, Holler and Nieman: Chapter 31

5. Quantitative Chemical Analysis, 6th Edition, Vogel: Chapter 12

6. Analytical Chemistry by Open Learning: Thermal Methods by James W. Dodd & Kenneth H. Tonge

7. Instrumental methods of analysis, 7th Edition, Willard, Merrit, Dean: Chapter 26

8. Instrumental Analysis, 5th Edition, Skoog, Holler and Nieman: Chapter 33

9. Introduction to instrumental methods of analysis by Robert D. Braun, Mc. Graw Hill (1987): Chapter 28

10. Environmental toxicology Kees van Gestel, Vrije Universiteit, Amsterdam

11. Environmental Toxicology III , by V. Popov, Wessex Institute of Technology, UK; C.A. Brebbia, Wessex Institute of Technology, UK

Analytical Chemistry Practical

Course Description	
Semester	I
Course Name	Analytical Chemistry
Course Code	PSC1ACP
Eligibility for Course	T. Y BSc (Chemistry)
Credit	2
Hours	30

After successful completion of this course students will be able to

Sr. No	Cos	Bloom Taxonomy Level (BLT)
CO1	Demonstrate the titration skills for the analysis of samples of a diverse variety	Apply
CO2	Apply the statistical methods for data analysis	Apply
CO3	Analyze the measured data based on Chemical principles	Analyse
CO4	Measure the characteristics of ion exchange resins	Evaluate

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	To carry out assay of the sodium chloride injection by Volhard's method.	4	1	1,2	1,2,4,7,11
2.	a) Statistical method: Application of Q test, t test to the data obtained for calibration of 5 mL pipette. b) Determine mean, deviation, Q value and t value using MS-EXCEL software	4	2	1,2	1,2,4,7,11
3.	To determine (a) the ion exchange capacity (b) exchange efficiency of the given cation exchange resin.	4	1, 4	1,2	1,2,4,7,11
4.	To determine amount of Cr(III) and Fe(II) individually in a mixture of the two by titration with EDTA.	4	1, 3	1,2	1,2,4,7,11
5.	To determine the breakthrough capacity of a cation exchange resin.	4	3, 4	1,2	1,2,4,7,11
6.	To determine the Mg (titrimetrically) and Al (gravimetrically) content of a Magnesium alloy by titration with EDTA.	4	1	1,2	1,2,4,7,11
7.	To determine amount of Cu(II) present in the given solution containing a mixture of Cu(II) and Fe(II).	4	1, 3	1,2	1,2,4,7,11

8.	To determine number of nitro groups in the given compound using $TiCl_3$.	4	1, 3	1,2	1,2,4,7,11
9.	Separation of amino acids in a mixture by TLC using Ninhydrin (Demonstration)	4	3	1,2	1,2,4,7,11

References:

1. Quantitative Inorganic Analysis including Elementary Instrumental Analysis by A. I. Vogels, 3rd Ed. ELBS (1964)
2. Vogel's textbook of quantitative chemical analysis, Sixth Ed. Mendham, Denny, Barnes, Thomas, Pearson education
3. Standard methods of chemical analysis, F. J. Welcher
4. Standard Instrumental methods of Chemical Analysis, F. J. Welcher
5. W. W. Scott. "Standard methods of Chemical Analysis", Vol. I, Van Nostr and Company, Inc., 1939.
6. E.B.Sandell and H.Onishi, "Spectrophotometric Determination of Traces of Metals", Part-II, 4th Ed., Wiley Interscience Publication, New York, 1978.

SEMESTER-II

Course Description	
Semester	II
Course Name	Physical Chemistry
Course Code	PSC2PC2
Eligibility for Course	T. Y BSc (Chemistry)
Credit	4
Hours	60

Course Outcomes

After successful completion of this course students will be able to

Sr. No	Cos	Bloom Taxonomy Level (BLT)
CO1	Explain Bioenergetics, Real solutions and Fugacity of real gases also show graphical representations of BET isotherms	Apply
CO2	Prove expressions for the total wave function for 1s,2s, 2p and 3d orbitals of hydrogen and application of the Schrödinger equation to two electron system	Evaluate
CO3	Explain terms involved in Chemical Kinetics and Molecular Reaction Dynamics. Elementary Reactions in Solution, Kinetics of reactions catalysed by enzymes -Michaelis-Menten analysis, Lineweaver-Burk and Eadie Analyses, Inhibition of Enzyme action.	Apply, Evaluate
CO4	Apply Photochemistry to solve NET, SET GATE Problems.	Apply

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	Chemical Thermodynamics II				
	1.1. Fugacity of real gases, Determination of fugacity of real gases using graphical method and from equation of state. Equilibrium constant for real gases in terms of fugacity.	15	1	1	1,2, 6, 11

	<p>Gibbs energy of mixing, entropy and enthalpy of mixing.</p> <p>1.2. Real solutions: Chemical potential in non ideal solutions excess functions of non ideal solutions calculation of partial molar volume and partial molar enthalpy, Gibbs Duhem Margules equation.</p> <p>1.3. Thermodynamics of surfaces, Pressure difference across curved surface (Laplace equation), vapour pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, BET isotherm (derivations expected).</p> <p>1.4. Bioenergetics: standard free energy change in biochemical reactions, exergonic, endergonic. Hydrolysis of ATP, synthesis of ATP from ADP.</p>				
2.	Quantum Chemistry				
	<p>2.1. Rigid rotor, spherical coordinates Schrödinger wave equation in spherical coordinates, separation of the variables, the phi equation, wavefunction, quantum number, the theta equation, wave function, quantization of rotational energy, spherical harmonics.</p> <p>2.2. Hydrogen atom, the two particle problem, separation of the energy as translational and potential, separation of variables, the R the q * and the f equations, solution of the equation, introduction of the four quantum numbers and their interdependence on the basis of the solutions of the three equations, total wave function, expression for the energy, probability density function, distances and energies in atomic units, radial and angular plots., points of maximum probability, expressions for the total wave function for 1s,2s, 2p and 3d orbitals of hydrogen.</p> <p>expression for the energy, probability density function, distances and energies in atomic units, radial and angular plots., points of maximum probability, expressions for the total wave function for 1s,2s, 2p and 3d orbitals of hydrogen.</p> <p>2.3. Application of the Schrödinger equation to two electron system, limitations of the equation, need for the approximate solutions, methods of obtaining the approximate solution of the Schrödinger wave equation.</p> <p>2.4. Hückel Molecular Orbitals theory for ethylene, 1,3-butadiene and benzene. (Derivation expected)</p>	15	2	1	1,2,6,11
3.	Chemical Kinetics and Molecular Reaction Dynamics				
	<p>3.1. Elementary Reactions in Solution:- Solvent Effects on reaction rates, Reactions between ions- influence of solvent Dielectric constant, influence of ionic strength, Linear free</p>	15	3	1	1,2,6,1

	energy relationships Enzyme action 3.2. Kinetics of reactions catalysed by enzymes -Michaelis-Menten analysis, Lineweaver-Burk and Eadie Analyses. 3.3. Inhibition of Enzyme action: Competitive, Non competitive and Uncompetitive Inhibition. Effect of pH, Enzyme activation by metal ions, Regulatory enzymes. 3.4. Kinetics of reactions in the Solid State:- Factors affecting reactions in solids Rate laws for reactions in solid: The parabolic rate law, The first order rate Law, the contracting sphere rate law, Contracting area rate law, some examples of kinetic studies.				1
4.	Photochemistry				
	4.1: Absorption of light, laws of photochemistry, electronic structure of molecules, molecular orbital, electronically excited singlet states, designation based on multiplicity rule, construction of Jablonski diagram, electronic transition, Frank Condon principle, selection rules, intensity of absorption bands, nature of electronic spectra and primary process, photo-dissociation, pre-dissociation, 4.2 Photo physical phenomena: physical pathways of excited molecular system (radiative and non-radiative), prompt fluorescence, delayed fluorescence, and phosphorescence, fluorescence quenching: concentration quenching, collisional quenching, quenching by excimer and exciplex emission, fluorescence resonance energy transfer between photo-excited donor and acceptor systems. 4.3. Stern-Volmer relation, critical energy transfer distances, energy transfer efficiency, examples and applications in chemical analysis. Photochemical reactions, photo-oxidation, photoreduction, photo-dimerization, photoisomerization and photosensitized reactions. Photochemistry of environment: Greenhouse effect.	15	4	1	1,2,6,11

References:

1. Peter Atkins and Julio de Paula, Atkin's Physical Chemistry, 7th Edn., Oxford University Press, 2002.
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3. Robert J. Silby and Robert A. Alberty, Physical Chemistry, 3rd Edn., John Wiley and Sons (Asia) Pte.Ltd., 2002.
4. Ira R. Levine, Physical Chemistry, 5th Edn., Tata McGraw-Hill New Delhi, 2002.
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7. Principles of Chemical Kinetics, 2nd Ed., James E. House, ELSEVIER, 2007.
8. B.K. Sen, Quantum Chemistry including Spectroscopy, Kalyani Publishers, 2003.
9. A.K. Chandra, Introductory Quantum Chemistry, Tata McGraw – Hill, 1994.
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13. Peter A. Rock, Chemical Thermodynamics, University Science Books, Oxford University Press, 1983.
14. Ira N. Levine, Quantum Chemistry, 5th Edn., Pearson Education (Singapore) Pte.Ltd., Indian Branch, New Delhi, 2000.
15. Thomas Engel and Philip Reid, Physical Chemistry, 3rd Edn., Pearson Education Limited 2013.
16. D.N. Bajpai, Advanced Physical Chemistry, S. Chand 1st Edn., 1992.
17. Solid State Chemistry [An Introduction], 3rd Ed., Lesley E. Smart & Elaine A. Moore, Taylor & Francis, 2010.
18. The Physics and „Chemistry of Solids, Stephen Elliott, Willey India, 2010
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20. Solid State Chemistry, D.K. Chakrabarty, New Age International Publishers, 1996.
21. Principles of physical Chemistry ,Marrown and Prutton 5th edition
22. Essentials of Physical Chemistry ,ArunBahl, B. S Bahl, G. D.Tulli , S Chand and Co. Ltd , 2012 Edition.
23. Introduction of Solids L.V Azaroff , Tata McGraw Hill .
24. A Text book of physical Chemistry ; Applications of thermodynamics vol III, Mac Millan Publishers India Ltd ,2011
25. New directions in solid state Chemistry, C.N.R. Rao and J Gopalkrishnan , Cambridge University Press.

Physical Chemistry Practical

Course Description	
Semester	II
Course Name	Physical Chemistry Practical
Course Code	PSC2PCP
Eligibility for Course	T.Y. B. Sc. (Chemistry)
Credit	2
Hours	30

After successful completion of this course students will be able to

Sr. No	COs	Bloom Taxonomy Level (BLT)
CO1	Know principles of different instruments like Potentiometry, Conductometry, pH Metry and colorimeter	Understand
CO2	Make use of graphical representation to identify Shape of Orbitals.	Apply

Sr. No.	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Polar plots of atomic orbitals such as 1s, 2p _x & 3d _{z²} orbitals by using angular part of hydrogen atom wave functions.	4	1,2,3,4	2	1,2,4,7,11

2	To study the influence of ionic strength on the base catalysed hydrolysis of ethyl acetate.	4	1,2,3,4	2	1,2,4,7,11
3	To study phase diagram of three component system water – chloroform /toluene - acetic acid.	4	1,2,3,4	2	1,2,4,7,11
4	To determine the rate constant of decomposition reaction of diacetone alcohol by dilatometric method.	4	1,2,3,4	2	1,2,4,7,11
5	Graph Plotting of mathematical functions – linear, exponential and trigonometry and identify whether functions are acceptable or non-acceptable?	4	1,2,3,4	2	1,2,4,7,11
6	To determine the formula of silver ammonia complex by potentiometric method. Determination of binary mixture of halides. (New expt.)	4	1,2,3,4	1	1,2,4,7,11
7	To determine CMC of sodium Lauryl Sulphate from measurement of conductivities at different concentrations.	4	1,2,3,4	1	1,2,4,7,11
8	To determine Hammett constant of m- and p-amino benzoic acid/nitro benzoic acid by pH measurement.	4	1,2,3,4	1	1,2,4,7,11
9	To determine the Michaelis – Menten's constant value (Km) of the enzyme Beta Amylase spectrophotometrically.				

References

1. Practical Physical Chemistry, B. Viswanathan and P.S. Raghavan, Viva Books Private Limited, 2005.
2. Practical Physical Chemistry, A.M. James and F.E. Prichard, 3rd Edn., Longman Group Ltd., 1974.
3. Experimental Physical Chemistry, V.D. Athawale and P. Mathur, New Age International Publishers, 2001.

Course Description	
Semester	II
Course Name	Inorganic Chemistry
Course Code	PSC2IC2
Eligibility for Course	T.Y.B.Sc.in Chemistry
Credit	4
Hours	60

Course Objectives:

1. To study and understand Photochemical Reactions, Ligand substitution reactions of octahedral and tetrahedral complexes, Redox reactions: inner and outer sphere mechanisms, stereochemistry of substitution reactions of octahedral complexes
2. To study and understand Organometallic Chemistry of Transition metals, Eighteen and sixteen electron rule, Structure and bonding on the basis of VBT and MOT in organometallic compounds.
3. To study and understand Toxicity of metallic species including case studies. Interaction of radiation in context with the environment: Sources and biological implication of radioactive materials.
4. To study concept of green chemistry, Biomass and biofuels.
5. To study and understand Bioinorganic Chemistry related to Biological oxygen carriers; hemoglobin, hemerythrin and hemocyanin- structure of metal active center and differences in mechanism of oxygen binding, Copper containing enzymes, Nitrogen fixation Metal ion transport and storage Medicinal applications of cis-platin and related compounds.

Course Outcomes

Sr.No.	After completing the course, Student will able to:	Bloom Taxonomy Level (BTL)
CO1	Recall Organometallic Chemistry of Transition metals, Eighteen and sixteen electron rules, Preparation and property's structure and bonding of the Organometallic compounds	Remember
CO2	Explain Photochemical Reactions, Ligand substitution reactions of: Octahedral complexes, Square planar complexes, trans-effect, its theories and applications. Redox reactions: inner and outer sphere mechanisms, stereochemistry of substitution reactions of octahedral complexes	Understand
CO3	Explain Bioinorganic Chemistry related to biological oxygen carriers; hemoglobin, hemerythrin and hemocyanin- structure of metal active center and differences in mechanism of oxygen binding, Copper containing enzymes, Nitrogen fixation Metal ion transport and storage, Medicinal applications of cis-platin and related compounds.	Understand
CO4	Discuss the implication of toxic metallic species radioactive materials on environment and biological system using case studies.	Create

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	Inorganic Reaction Mechanism:	15h	CO2	PSO1	PO2
1.1	Photochemical Reactions: Prompt and delayed reactions, Quantum yield, Recapitulation of fluorescence and phosphorescence. Photochemical				

	reactions by irradiating at d-d and charge transfer bands.				
1.2	Ligand substitution reactions of: a) Octahedral complexes without breaking of metal-ligand bond (Use of isotopic labelling method) b) Square planar complexes, trans-effect, its theories and applications. Mechanism and factors affecting these substitution reactions.				
1.3	Redox reactions: inner and outer sphere mechanisms, complimentary and non-complimentary reactions.				
1.4	Stereochemistry of substitution reactions of octahedral complexes. (Isomerization and racemization reactions and applications.)				
2.	Organometallic Chemistry of Transition metals:	15h	CO1	PSO1	PO2
2.1	Eighteen and sixteen electron rule and electron counting with examples.				
2.2	Preparation and properties of the following compounds (a) Alkyl and aryl derivatives transition metal complexes (b) Carbenes and carbynes of Cr, Mo and W (c) Alkene derivatives of Pd and Pt (d) Alkyne derivatives of Pd and Pt (e) Allyl derivatives of nickel (f) Sandwich compounds of Fe, Cr and Half Sandwich compounds of Cr, Mo.				
2.3	Basic organometallic reactions introduction: Ligand substitution, oxidative reactions, migratory reactions, migratory insertion, extrusion, oxidative addition, reductive elimination mechanism and stereochemistry				
3.	Environmental Chemistry:	15h	CO4	PSO2	PO5
3.1	Toxicity of metallic species: Mercury, lead, cadmium, arsenic, copper and chromium, with respect to their sources, distribution, speciation, biochemical effects and toxicology, control and treatment.				
3.2	Case Studies: (a) Itai-itai disease for Cadmium toxicity, (b) Arsenic Poisoning in the Indo-Bangladesh region.				
3.3	Interaction of radiation in context with the environment: Sources and biological implication of radioactive materials. Effect of low level radiation on cells- Its applications in diagnosis and treatment, Effect of radiation on cell proliferation and cancer.				
3.4	Green Chemistry: Biomass and Biofuels: Issues of Ethanol, Biodiesel from Plant Oils and from Algae Activity. Bio-based Liquid Fuels and Chemicals, Recycling Carbon Dioxide—A Feedstock for the Production of Chemicals and Liquid Fuels, Thermochemical Production of Fuels: Including Methanol and Hydrogen—Fuel of the Future.				

4.	Bioinorganic Chemistry:	15h	CO3	PSO2	PO5
4.1	Biological oxygen carriers; hemoglobin, hemerythrene and hemocyanine- structure of metal active center and differences in mechanism of oxygen binding, Differences between hemoglobin and myoglobin: Cooperativity of oxygen binding in hemoglobin and Hill equation, pH dependence of oxygen affinity in hemoglobin and myoglobin and it's implications.				
4.2	Activation of oxygen in biological system with examples of mono-oxygenases, and oxidases- structure of the metal center and mechanism of oxygen activation by these enzymes.				
4.3	Copper containing enzymes- superoxide dismutase, tyrosinase and laccase: catalytic reactions and the structures of the metal binding site				
4.4	Nitrogen fixation-nitrogenase, hydrogenases				
4.5	Metal ion transport and storage: Ionophores, transferrin, ferritin and metallothionins				
4.6	Medicinal applications of cis-platin and related compounds				

References

UNIT-I

1. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, Inorganic Chemistry, 5thEd., Oxford University Press, 2010.
2. D. Banerjea, Coordination Chemistry, Tata McGraw Hill, 1993.
3. W. H. Malik, G. D./Tuli and R. D. Madan, Selected Topics in Inorganic Chemistry, 8thEd., S. Chand & Company Ltd.
4. M. L. Tobe and J. Burgess, Inorganic Reaction Mechanism, Longman, 1999.
5. S. Asperger, Chemical kinetics and Inorganic Reaction Mechanism, 2nd Ed., KluwerAcademic/ Plenum Publishers, 2002
6. Gurdeep Raj, Advanced Inorganic Chemistry-Vol.II, 12th Edition, Goel publishing house, 2012.
7. B. R. Puri, L. R. Sharma and K. C. Kalia, Principles of Inorganic Chemistry, Milestone Publishers, 2013-2014.
8. F. Basalo and R. G. Pearson, Mechanism of Inorganic Reactions, 2nd Ed., Wiley, 1967.
9. R. Gopalan and V. Ramlingam, Concise Coordination chemistry, Vikas Publishing house Pvt Ltd., 2001.
10. Inorganic reaction mechanism by Jordan & inorganic reaction mechanism by Basolo Pearson
11. Robert B. Jordan, Reaction Mechanisms of Inorganic and Organometallic Systems, 3rdEd., Oxford University Press 2008.

Unit II

1. D. Banerjea, Coordination chemistry. Tata McGraw Hill, New Delhi, 1993.

2. R.C Mehrotra and A.Singh, Organometallic Chemistry- A unified Approach, 2nded, NewAge International Pvt Ltd, 2000.
3. R.H Crabtree, The Organometallic Chemistry of the Transition Metals, 5th edition, Wiley International Pvt, Ltd 2000.
4. B.Doughlas, D.H McDaniel and J.J Alexander. Concepts and Models of InorganicChemistry, 2nd edition, John Wiley and Sons. 1983.
5. Organometallic Chemistry by G.S Sodhi. Ane Books Pvt Ltd.
6. G. Miessler and D. Tarr, Inorganic Chemistry, 3rd Ed., Pearson Education, 2004
7. Organometallic chemistry by B.D.Gupta.
8. Organometallic chemistry by " Crabtree

Unit III

1. Environmental Chemistry 5th edition, Colin Baird Michael Cann, W. H. Freeman and Company, New York, 2012.
2. Environmental Chemistry 7th edition, Stanley E. Manahan, CRC Press Publishers,
3. Environmental Contaminants, Daniel A. Vallero, ISBN: 0-12-710057-1, Elsevier Inc., 2004.
4. Environmental Science 13th edition, G. Tyler Miller Jr. and Scott E. Spoolman, ISBN-10:0-495-56016-2, Brooks/Cole, Cengage Learning, 2010.
5. Fundamentals of Environmental and Toxicological Chemistry 4th edition, Stanley E.Manahan, ISBN: 978-1-4665-5317-0, CRC Press Taylor & Francis Group, 2013.
6. Living in the Environment 17th edition, G. Tyler Miller Jr. and Scott E. Spoolman, ISBN-10: 0-538-49414-X, Brooks/Cole, Cengage Learning, 2011
7. Poisoning and Toxicology Handbook, Jerrold B. Leikin, Frank P. Paloucek, ISBN: 1-4200-4479-6, Informa Healthcare USA, Inc.
8. Casarett and Doull's Toxicology- The Basic Science of Poisons 6th edition, McGraw-Hill, 2001.

Unit IV

1. R. W. Hay, Bioinorganic Chemistry, Ellis Harwood, England, 1984.
2. I. Bertini, H.B.Gray, S. J. Lippard and J.S. Valentine, Bioinorganic Chemistry, First South Indian Edition, Viva Books, New Delhi, 1998.
3. J. A. Cowan, Inorganic Biochemistry-An introduction, VCH Publication, 1993.
4. S. J. Lippard and J. M. Berg, Principles of Bioinorganic Chemistry, University Science Publications, Mill Valley, Caligrionic, 1994.
5. G.N. Mukherjee and A. Das, Elements of Bioinorganic Chemistry, Dhuri& Sons, Calcutta, 1988.
6. J.Chem. Educ. (Special issue), Nov, 1985.
7. E.Frienden, J.Chem. Educ., 1985, 62.
8. Robert R.Crechton, Biological Inorganic Chemistry – An Introduction, Elsevier
9. J. R. Frausto da Silva and R. J. P. Williams The Biological Chemistry of the Elements,

Clarendon Press, Oxford, 1991.

10. JM. D. Yudkin and R. E. Offord A Guidebook to Biochemistry, Cambridge University Press, 1980.

Course Description	
Semester	II
Course Name	Inorganic Chemistry Practical
Course Code	PSC2ICP
Eligibility for Course	T.Y.B.Sc.in Chemistry
Credit	2
Hours	30

Course Outcomes

COs. No.	After completing the course, Students will be able to:	Bloom Taxonomy Level (BTL)
CO1	Analyse ores and alloys using volumetric and gravimetric analysis.	Analyse
CO2	Estimate percentage of metals in the ore and alloy	Evaluate
CO3	Apply the potentiometric method for redox titrations of Fe, Cu etc.	Apply

Ores and Alloys

- 1) Analysis of Devarda's alloy
- 2) Analysis of Cu – Ni alloy
- 3) Analysis of Tin Solder alloy
- 4) Analysis of Brass alloy

Instrumentation

- 1) Estimation of Copper using Iodometric method Potentiometrically.
- 2) Estimation of Fe³⁺ solution using Ce(IV) ions Potentiometrically

Reference:

1. Advanced experiments in Inorganic Chemistry., G. N. Mukherjee., 1st Edn., 2010., U.N.Dhur& Sons Pvt Ltd
2. The Synthesis and Characterization of Inorganic Compounds by William L. Jolly 3. Inorganic Chemistry Practical Under UGC Syllabus for M.Sc. in all India Universities By: DrDeepak Pant

Course Description	
Semester	II
Course Name	Organic Chemistry

Course Code	PSC2OC2
Eligibility for Course	T. Y BSc (Chemistry)
Credit	2
Hours	60

Course Outcomes

After successful completion of this course students will be able to

Sr No.	COs	Bloom Taxonomy Level (BLT)
CO1	Explain the Generation of carbanion, enolate, enamine with their alkylation & acylation reaction and name reactions with their mechanism.	Understand
CO2	Illustrate mechanism, stereochemistry, applications and importance of name reactions and rearrangements.	Understand
CO3	Explain the role of reagents in organic synthesis.	Analyse
CO4	Interpret the structure of organic compounds using combined of spectral techniques.	create

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	<p>1.1. Alkylation of Nucleophilic Carbon Intermediates: 1.1.1. Generation of carbanion, kinetic and thermodynamic enolate formation, Regioselectivity in enolate formation, alkylation of enolates. 1.1.2. Generation and alkylation of dianion, medium effects in the alkylation of enolates, oxygen versus carbon as the site of alkylation. 1.1.3. Alkylation of aldehydes, ketones, esters. 1.1.4. Nitrogen analogs of enols and enolates- Enamines and Imines anions, alkylation of enamines and imines. 1.1.5. Alkylation of carbon nucleophiles by conjugate addition (Michael reaction). 1.2. Reaction of carbon nucleophiles with carbonyl groups: 1.2.1. Mechanism of Acid and base catalyzed Aldol condensation, Mixed Aldol condensation with aromatic aldehydes, regiochemistry in mixed reactions of aliphatic aldehydes and ketones, intramolecular Aldol reaction and Robinson annulation. 1.2.2. Addition reactions with amines and iminium ions; Mannich reaction. 1.2.3. Amine catalyzed condensation reaction: Knoevenagel reaction. 1.2.4. Acylation of carbanions. Asymmetric methodology with enolates and Enamines</p>	15	1	2	4,6
2	<p>Mechanisms, stereochemistry (if applicable) and applications of the following: 2.1. Reactions: Baylis-Hilman reaction, McMurry Coupling, Corey-Fuchs reaction, Nef reaction, Passerini reaction. 2.2. Concerted rearrangements: Hofmann, Curtius, Lossen, Schmidt, Wolff, Bamberger Rearrangements. 2.3. Cationic rearrangements: Tiffeneau-Demjanov, Pummerer, Dienone-phenol, Rupe, Wagner-Meerwein. 2.4. Anionic</p>	15	2	4	5,6

	rearrangements: Brook, Neber, Von Richter, Wittig, Benzylic acid Rearrangements, Payne.				
3	<p>3.1 Elimination Reactions: E1,E2 E1CB, Stereochemistry of elimination, elimination Vs Substitution, Anti and Syn Elimination. Dehydrohalogenation, Dehalogenation, Dehydration, Hoffmann and Saytzeff elimination, Pyrolytic elimination.</p> <p>3.2 Organometallic Chemistry Organolithium, Organomagnesium, Organozinc, Organocopper,</p> <p>3.3 Introduction to Molecular Orbital Theory for Organic Chemistry: Molecular orbitals: Formation of σ- and π-MOs by using LCAO method. Formation of π MOs of ethylene, butadiene, 1, 3, 5-hexatriene, allylcation, anion and radical. Concept of nodal planes and energies of π-MOs</p>	15	3	3	4,6
4	<p>Spectroscopy:</p> <p>4.1. Proton magnetic resonance spectroscopy: Chemical and magnetic equivalence, Chemical shift values and correlation for protons bonded to carbon and other nuclei as in alcohols, phenols, enols, carboxylic acids, amines, amides. Spin-spin coupling, Coupling constant (J), Factors affecting J, geminal, vicinal and long range coupling (allylic and aromatic). First order spectra.</p> <p>4.2. ^{13}C NMR spectroscopy: Theory and comparison with proton NMR, proton coupled and decoupled spectra, off-resonance decoupling. Factors influencing carbon shifts, correlation of chemical shifts of aliphatic, olefin, alkyne, aromatic and carbonyl carbons.</p> <p>4.3. Mass spectrometry: Determination of molecular formula of organic compounds based on isotopic abundance and HRMS. Fragmentation pattern in various classes of organic compounds (including compounds containing hetero atoms), McLafferty rearrangement, Retro-Diels Alder reaction.</p> <p>4.4. Structure determination involving individual or combined use of the above spectral techniques.</p> <p>4.5. Applications of UV and IR spectroscopy: (8 L) 3.2.1. Ultraviolet spectroscopy: Recapitulation, UV spectra of dienes, conjugated polyenes (cyclic and acyclic), carbonyl and unsaturated carbonyl compounds, substituted aromatic compounds. Factors affecting the position and intensity of UV bands – effect of conjugation, steric factor, pH, and solvent polarity. Calculation of absorption maxima for above classes of compounds by Woodward-Fieser rules (using Woodward-Fieser tables for values for substituents). 4.6. Infrared spectroscopy: Fundamental, overtone and combination bands, vibrational coupling, factors affecting vibrational frequency (atomic weight, conjugation, ring size, solvent and hydrogen bonding). Characteristic vibrational frequencies for alkanes,</p>	15	4	3	4,8

alkenes, alkynes, aromatics, alcohols, ethers, phenols, amines, nitriles and nitro compounds. Detailed study of vibrational frequencies of carbonyl compounds, aldehydes, ketones, esters, amides, acids, acid halides, anhydrides, lactones, lactams and conjugated carbonyl compounds.				
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Organic Chemistry Practical

Course Description	
Semester	II
Course Name	Organic Chemistry
Course Code	PSC2OCP
Eligibility for Course	T.Y.B.Sc (Chemistry)
Credit	2
Hours	30

After successful completion of this course students will be able to

Sr. No	COs	Bloom Taxonomy Level (BLT)
CO1	Identify the chemical type of components present in a binary mixture of an organic compound.	Apply
CO2	Apply skills in the separation and qualitative analysis of organic compounds of binary mixtures by microscale technique.	Apply
CO3	Make use of crystallization, sublimation and distillation for purification of the organic compounds.	Apply
CO4	Demonstrate the practical aspects in the preparation of the organic compounds derivatives.	Understand

Sr. No.	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Separation of Binary mixture using micro-scale technique 1. Separation of binary mixture using physical and chemical methods. 2. Characterization of one of the components with the help of chemical analysis and confirmation of the structure with the help of derivative preparation and its physical constant. 3. Purification and determination of mass and physical constant of the second component. The following types are expected: (i) Water soluble/water insoluble solid and water insoluble solid, (ii) Non-volatile liquid-Non-volatile liquid (chemical separation) (iii) Water-insoluble solid-Non-volatile liquid.	30	1-4	1-4	9-11

1. Organic Chemistry, J. Claydens, N. Greeves, S. Warren and P. Wothers, Oxford University Press.
2. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Part A, page no. 713-769, and B, Plenum Press.
3. March's Advanced Organic Chemistry: Reactions, Mechanisms and Structure, Michael B. Smith, Jerry March, Wiley.
4. Organic Chemistry, R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, Pearson Publication (7th Edition)
5. Advanced Organic Chemistry: Reactions and mechanism, B. Miller and R. Prasad, Pearson Education.
6. Advanced Organic Chemistry: Reaction mechanisms, R. Bruckner, Academic Press.
7. Understanding Organic Reaction Mechanisms, Adams Jacobs, Cambridge University Press.
8. Writing Reaction Mechanism in organic chemistry, A. Miller, P.H. Solomons, Academic Press.
9. Principles of Organic Synthesis, R.O.C. Norman and J.M Coxon, Nelson Thornes.
10. Advanced Organic Chemistry: Reactions and mechanism, L.G. Wade, Jr., Maya Shankar Singh, Pearson Education.
11. Mechanism in Organic Chemistry, Peter Sykes, 6th
12. Molecular Orbital and Organic chemical reactions, Ian Fleming Reference Edition, Wiley
13. Introduction to Spectroscopy, Donald L. Pavia, Gary M. Lampman, George S. Kriz, Thomson Brooks.
14. Spectrometric Identification of Organic Compounds, R. Silverstein, G.C Bassler and T.C. Morrill, John Wiley and Sons.
15. Organic Spectroscopy, William Kemp, W.H. Freeman & Company.
16. Organic Spectroscopy-Principles and Applications, Jagmohan, Narosa Publication.
17. Organic Spectroscopy, V.R. Dani, Tata McGraw Hill Publishing Co.
18. Spectroscopy of Organic Compounds, P.S. Kalsi, New Age International Ltd.
19. Organic Reaction Mechanisms, V.K. Ahluwalia, R.K. Parasher, Alpha Science International, 2011.
20. Reactions, Rearrangements and Reagents by S. N. Sanyal

21. Name Reactions, Jie Jack Li, Springer

22. Name Reactions and Reagents in Organic Synthesis, Bradford P. Mundy, M.G. Ellerd, and F.G. Favaloro, John Wiley & Sons.

Course Description	
Semester	II
Course Name	Analytical Chemistry
Course Code	PSC2AC1
Eligibility for Course	T.Y.B.Sc (Chemistry)
Credit	4
Hours	60

Course Outcomes

After successful completion of this course students will be able to

Sr. No	COs	Bloom Taxonomy Level (BLT)
CO1	Translate the theoretical principles of advanced separation techniques, spectroscopic techniques, radioanalytical techniques, electroanalytical techniques into applications.	Understand
CO2	Explain the working principles of surface analytical techniques such as SEM, STM, TEM, ESCA, Auger spectroscopy and ICP-AES	Understand
CO3	Compare the different ion sources and mass analyzers in mass spectroscopy	Analyze
CO4	Determine the electrical quantities such as charge, current, potential using Electroanalytical methods	Evaluate

Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1.	Chromatography				
	1.1 Recapitulation of basic concepts in chromatography: Classification of chromatographic methods, requirements of an ideal detector, types of detectors in LC and GC, comparative account of detectors with reference to their applications (LC and GC respectively), qualitative and quantitative analysis.[2 L] 1.2 Concept of plate and rate theories in chromatography: efficiency, resolution, selectivity	15	1	1	1,2,6, 11

	<p>and separation capability. Van Deemter equation and broadening of chromatographic peaks. Optimization of chromatographic conditions. [5 L]</p> <p>1.3 Gas Chromatography: Instrumentation of GC with special reference to sample injection systems – split/splitless, column types, solid/ liquid stationary phases, column switching techniques, temperature programming, Thermionic and mass spectrometric detector, Applications. [3 L]</p> <p>1.4 High Performance Liquid Chromatography (HPLC): Normal phase and reversed phase with special reference to types of commercially available columns (Use of C8 and C18 columns). Diode array type and fluorescence detector, Applications of HPLC. Chiral and ion chromatography. [5 L]</p>				
2.	X-ray spectroscopy:				
	<p>principle, instrumentation and applications of X-ray fluorescence, absorption and diffraction spectroscopy. [4 L]</p> <p>2.2 Mass spectrometry: recapitulation, instrumentation, ion sources for molecular studies, electron impact, field ionization, field absorption, chemical ionization and fast atom bombardment sources. Mass analyzers: Quadrupole, time of flight and ion trap. Applications. [6 L]</p> <p>2.3 Radioanalytical Methods – recapitulation, isotope dilution method, introduction, principle, single dilution method, double dilution method and applications. [5 L]</p>	15	1,3	1	1,2,6, 11
3.	Surface Analytical Techniques				
	<p>Introduction, Types of surface measurements: Photon probe technique, electron probe technique, Ion probe technique, Scanning probe microscopy</p> <p>3.2 Electron probe techniques:</p> <p>3.1.1 Scanning Electron Microscopy (SEM): Principle, Instrumentation and Application</p> <p>3.1.2 Electron Spectroscopy (ESCA and Auger): Principle, instrumentation and Application</p> <p>3.2 Atomic Spectroscopy [6 L]</p> <p>3.2.1 Recapitulation: Flame AAS and furnace AAS Interferences - chemical and spectral, evaluation methods in AAS, qualitative and quantitative applications</p> <p>3.2.2 AES: Principle of AES, Interferences Inductively Coupled Plasma- Atomic Emission Spectroscopy (ICP-AES) – Introduction, Principle, Instrumentation, applications</p> <p>3.2.3 Applications of AAS and AES in</p>	15	2	1	1,2,6, 11

	environmental analysis				
4.	Electroanalytical Methods				
	<p>(Numericals are Expected)</p> <p>4.1 Ion selective potentiometry and Polarography: [10 L] Ion selective electrodes and their applications (solid state, precipitate, liquid –liquid, enzyme and gas sensing electrodes), ion selective field effect transistors, biocatalytic membrane electrodes and enzyme based biosensors. Polarography: Ilkovic equation, derivation starting with Cottrell equation, effect of complex formation on the polarographic waves.</p> <p>4.2 Electrogravimetry: Introduction, principle, instrumentation, factors affecting the nature of the deposit, applications.[3 L]</p> <p>4.3 Coulometry: Introduction, principle, instrumentation, coulometry at controlled potential and controlled current [2 L]</p>	15	4	1	1,2,6, 11

References:

Unit I

1. Instrumental Analysis, Skoog, Holler & Crouch

2 HPLC Practical and Industrial Applications, 2 nd Ed., Joel K. Swadesh, CRC Press

Unit II 1.Essentials of Nuclear Chemistry, H J Arnika, New Age Publishers (2005) 2. Fundamentals of Radiochemistry D. D. Sood , A. V. R. Reddy and N. Ramamoorthy 3. Principles of Instrumental Analysis - Skoog, Holler and Nieman, 5th Edition, Ch: 12 4. Principles of Instrumental Analysis - Skoog, Holler and Nieman, 5th Edition, Ch: 20

Unit III

1. Instrumental Analysis by Douglas A. Skoog - F. James Holler - Crouch, Publisher: Cengage; Edition, (2003), ISBN-10: 8131505421, ISBN-13: 978-8131505427

2. Physical Principles of Electron Microscopy, An Introduction to TEM, SEM, and AEM

3. Authors: Ray F. Egerton, ISBN: 978-0- 387-25800- 3 (Print) 978-0- 387-26016- 7 (Online)

4. Modern techniques of surface science by D.P. Woodruff, T.A. Delchar, Cambridge Univ. Press, 1994.

5. Introduction to Scanning Tunneling Microscopy by C. J. Chen, Oxford University Press, NewYork, 1993.

6. 5. Transmission Electron Microscopy: A text book for Material Science, David B Williams and C., Barry Carter, Springer

7. Modern Spectroscopy, by J.M. Hollas, 3rd Edition (1996), John Wiley, New York

8. Principles of Instrumental Analysis – Skoog, Holler, Nieman, 5th ed., Harcourt College Publishers, 1998.

9. Instrumental Analysis by Douglas A. Skoog - F. James Holler - Crouch, Publisher: Cengage; Edition (2003), ISBN10: 8131505421, ISBN-13: 978-8131505427

Unit IV

1. Principles of Instrumental Analysis – Skoog, Holler, Nieman, 5th Edition, Harcourt College Publishers, 1998. Chapters - 23, 24, 25.

2. Analytical Chemistry Principles – John H Kennedy, 2nd edition, Saunders College Publishing (1990).

3. Modern Analytical Chemistry David Harvey; McGraw Hill Higher education publishers, (2000).

4. Vogel’s Text book of quantitative chemical analysis, 6th edition, Pearson Education Limited, (2007).

5. Electrochemical Methods Fundamentals and Applications, Allen J Bard and Larry R Faulkner, John Wiley and Sons, (1980).

6. Instrumental Methods of Analysis Willard, Merrit, Dean and Settle, 7th edition, CBS publishers.

Analytical Chemistry Practical

Course Description	
Semester	II
Course Name	Analytical Chemistry
Course Code	PSC2ACP
Eligibility for Course	T. Y. B.Sc (Chemistry)
Credit	2
Hours	30

After successful completion of this course students will be able to

Sr. No.	COs	Bloom Taxonomy Level (BLT)
CO1	Demonstrate the operational skills on the selected instruments and retrieve information	Understand
CO2	Develop a sense of time management, safe use of chemicals and environmental safety	Apply
CO3	Measure the physical property of the samples and relate it with quantity	Evaluate
CO4	Construct the graphs based on the measurements and calculations	Evaluate

Sr. No.	Course Description	Hrs	CO No.	PSO No.	PO No.
1	To determine percent purity of washing soda in terms of sodium carbonate pH metrically.	4	1,2,3,4	1,2	1,2,4,7,11
2	To determine amount of Ti (III) and Fe (II) in a mixture by titration with Ce (IV)	4	1,2,	1,2	1,2,4,7,11

	potentiometrically.		3,4		
3	To determine the amount of nitrite present in the given water sample colorimetrically.	4	1,2, 3,4	1,2	1,2,4, 7,11
4	To determine the amount of Fe (II) and Fe (III) in a mixture using 1,10-phenanthroline spectrophotometrically.	4	1,2, 3,4	1,2	1,2,4, 7,11
5	Simultaneous determination of Cr (VI) and Mn (VII) in a mixture spectrophotometrically.	4	1,2, 3,4	1,2	1,2,4, 7,11
6	To determine the percentage composition of HCl and H ₂ SO ₄ on weight basis in a mixture of two by conductometric titration with NaOH and BaCl ₂ .	4	1,2, 3,4	1,2	1,2,4, 7,11
7	To determine amount of potassium in the given sample of fertilizers using flame photometer by standard addition method.	4	1,2, 3,4	1,2	1,2,4, 7,11
8	Separation of benzene and toluene using gas chromatography and determination of column resolution (Rs). (demonstration)	4	1,2, 3,4	1,2	1,2,4, 7,11

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UNIVERSITY OF MUMBAI



Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

Arts, Commerce and Science College, New Panvel (Autonomous)

Re-accredited A⁺ Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Programme: M.Sc.

(Choice Based Credit System)

Course: Organic Chemistry

Programme Code: MSCOC1018

Syllabus for Semester III and IV

(To be implemented from the Academic Year 2020-2021)

Preamble of the Syllabus:

Master of Science (M.Sc.) in Organic Chemistry is a post-graduate course of Changu Kana Thakur Arts, Commerce and Science College, New Panvel (Autonomous).

The students pursuing this course would have to develop in depth understanding of various aspects of the subject. The new curriculum of M.Sc. Organic Chemistry offers the courses which will prepare the students for critical thinking, understanding of the concepts in depth and skills for employability. The learning outcome based approach is intended to provide a focused and outcome based syllabus with an agenda to structure the teacher-learning experiences in a more student centric manner. The course combines the opportunity for students to acquire knowledge of wide range of cutting-edge fields in chemistry with sessions on theory, practical, presentation and a project supervised by one of the teacher.

Objectives of the Course:

1. Develop analytical thinking and apply the same for understanding principles, proposing mechanism and logical conclusions.
2. Comprehensive understanding of the interdisciplinary nature of Chemistry and emerging trends in Chemistry.
3. Competency in design and planning of synthesis and carry out with Good Laboratory Practices.
4. Access, search and use of chemical literature and acquiring necessary skills to succeed in research and advance studies.
5. Competency in handling instruments and interpretation of spectral data for structure determination of organic compounds.

Janardan Bhagat Shikshan Prasarak Sanstha's

Changu Kana Thakur

Arts, Commerce and Science College, New Panvel (Autonomous)

Draft Syllabus

Syllabus for the M.Sc. Semester III and IV

Credit Based Semester and Grading System

To be implemented from the academic year

2020-2021

SEMESTER III

Course Code	Unit	Topics	Credits	L/Week
PSC3TOC0	I	Organic Reaction Mechanisms	4	1
	II	Pericyclic Reactions		1
	III	Stereochemistry-I		1
	IV	Photochemistry		1
PSC3SOC0	I	Name reactions with mechanism and application	4	1
	II	Radicals in Organic Synthesis		1
	III	Enamines, Ylides and α -C-H functionalization		1
	IV	Metals / Non-metals in organic synthesis		1
PSC3NPS0	I	Natural products-I	4	1
	II	Natural products-II		1
	III	Advanced Spectroscopic Techniques-I		1
	IV	Advanced Spectroscopic Techniques -II		1
PSC3MBG0	I	Drug discovery, design and development	4	1
	II	Drug design, development and synthesis		1
	III	Biogenesis and biosynthesis of natural products		1
	IV	Green chemistry		1
PSC3BIC0	I	Biomolecules-I	4	1
	II	Biomolecules-II		1
	III	Biomolecules-III		1
	IV	Biomolecules-IV		1
PSC3TOP0 & PSC3SOP0		Practicals	4	8
PSC3NPP0 & (PSC3MBP0 or PSC3BIP0)		Practicals	4	8

SEMESTER IV

Course Code	Unit	Topics	Credits	L/Week
PSC4TOC0	I	Physical Organic Chemistry	4	1
	II	Supramolecular Chemistry		1
	III	Stereochemistry-II		1
	IV	Asymmetric Synthesis		1
PSC4SOC0	I	Designing Organic Synthesis-I	4	1
	II	Designing Organic Synthesis-II		1
	III	Electro-organic chemistry and selected methods of organic synthesis		1
	IV	Transition and rare earth metals in organic synthesis		1
PSC4NPH0	I	Natural products-III	4	1
	II	Natural products-IV		1
	III	Heterocyclic compounds-I		1
	IV	Heterocyclic compounds-II		1
PSC4IPR0	I	Introduction to Intellectual Property	4	1
	II	Trade Secrets		1
	III	Introduction to Cheminformatics		1
	IV	Applications		1
PSC4RMT0	I	Print	4	1
	II	Data Analysis		1
	III	Methods of scientific research and writing scientific papers		1
	IV	Chemical Safety & Ethical Handling of Chemicals		1
PSC4TOP0 & PSC4SOP0		Practicals	4	8
PSC4NPP0 & (PSC4IPP0 or PSC4RMP0)		Practicals	4	8

1. Credit based semester and grading system with effect from the academic year 2020-2021.
2. As per the credit system directives each credit will correspond to 15 hours of lectures or 30 hours of practical work.
3. Each student is expected to take 4 credits per theory paper and 2 credits per practical per semester.
4. At the end of each semester each student will be examined both in the theory and in the practical.
5. For the award of first class, the candidate must obtain at least 50% marks in the theory papers at the Semester I, II, III and IV of the M.Sc. examination taken together, in addition to the marks prescribed for the first class and the other rules of passing in the concerned regulation of the standard of passing.
6. The candidate is expected to submit a journal certified by the Head of the Department /institution at the time of the practical examination.
7. A candidate will not be allowed to appear for the practical examination unless he/she produces a certified journal or a certificate from the Head of the institution/department stating that the journal is lost and the candidate has performed the required number of experiments satisfactorily. The list of the experiments performed by the candidate should be attached with such certificate.
8. Use of non-programmable calculator is allowed both at the theory and the practical examination.

Scheme of Examination for M.Sc. Organic Chemistry

Semester III and IV

Internal Theory examination (40 Marks)

1. One class test **20 Marks**
2. One seminar based on curriculum / publication of a research paper/ presentation of a research paper in seminar or conference (to be assessed by teacher of the institution teaching PG learners). **15 Marks**
 - a) Selection of the topic, introduction, write up, references.
 - b) Presentation.
3. Active participation and overall conduct as a responsible learner in routine class, communication, and leadership qualities in organizing departmental academic activities. **05 Marks**

**There will not be any internal examination for
practical.**

External Theory Examination (60 Marks)

Paper	Time allotted in hours	Maximum marks
Paper- I	2.5	60
Paper-II	2.5	60
Paper-III	2.5	60
Paper-IV	2.5	60

It is recommended that a total of five questions be set, based on the syllabus with due weightage to the number of lectures allotted per topic. The candidates are expected to answer all five questions. Question 5 will be based on all four units and the remaining questions will be based on the units as indicated below

Question No.	Semester- III	Semester- III
01	Unit I	Unit I
02	Unit II	Unit II
03	Unit III	Unit III
04	Unit IV	Unit IV
05	From all four units	From all four units

Semester End Practical Examination (50 Marks)

Laboratory Work **40 Marks**

Journal **05 Marks**

Viva **05 Marks**

The practical examination will be held for two days as described below. The candidates will be examined practically and orally on each day.

Paper	Day	Experiments	Time duration in hours	Maximum marks
I	Day-1 Morning	01	3.5	50
II	Day-1 Evening	01	3.5	50
III	Day-2 Morning	01	3.5	50
IV	Day-2 Evening	01	3.5	50

M. Sc. Organic Chemistry Semester III

Course Code - PSC3TOC0

Paper I- Theoretical Organic Chemistry-I

Unit 1	Organic Reaction Mechanisms	15 L
1.1	Organic reactive intermediates: Methods of generation, structure, stability and important reactions involving carbanions, carbocations, nitrenes, carbenes, arynes and ketenes.	7L
1.2	Neighbouring group participation: Mechanism and effects of anchimeric assistance, NGP by unshared/ lone pair electrons, π -electrons, aromatic rings, σ -bonds with special reference to norbornyl and bicyclo[2.2.2]octyl cation systems (formation of non-classical carbocation)	4L
1.3	Role of FMOs in organic reactivity: Reactions involving hard and soft electrophiles and nucleophiles.	1L
1.4	Pericyclic reactions: Recapitulation Explanations for Woodward-Hoffmann Rules <ul style="list-style-type: none"> • The Aromatic Transition structures [Huckel and Mobius] • Frontier Orbitals • Correlation Diagrams, FMO and PMO approach Molecular orbital symmetry, Frontier orbital of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system.	3L
Unit 2	Pericyclic reactions	15L
2.1	Cycloaddition reactions: Supra and antra facial additions, $4n$ and $4n+2$ Systems. Diels-Alder reactions (Diene, Dienophile, FMO approach, stereochemistry, endo rule, Intramolecular Diels-Alder reactions, regioselectivity/effect of substituents, Trapping of reactive intermediates), retro-Diels-Alder reaction. 2+2 Cycloadditions: Photocycloadditions, Ketenes, 1,3-Dipolar cycloadditions and cheletropic reactions	7L
2.2	Electrocyclic reactions: Conrotatory and disrotatory motions, torquoselectivity, $(4n)$ π and $(4n+2)$ π electrons and allyl systems. Synthesis of endiandric acid A from an acyclic polyene.	3L
2.3	Sigmatropic rearrangements: H-shifts and C-shifts, supra and antarafacial migrations, Alder 'ene' Reaction, Cope (including oxy-Cope and aza-Cope), Claisen and Sommelet-Hauser rearrangements. Synthesis of Citral from 3-methylbut -2-en-1-ol and 3-methylbut-2-enal.	5L
Unit 3	Stereochemistry-I	15L
3.1	Conformational analysis of medium rings: Eight to ten membered rings and their unusual properties, I-strain, transannular reactions	3L
3.2	Stereochemistry of fused ring and bridged ring compounds: decalins, hydrindanes, perhydroanthracenes, steroids, and Bredt's rule.	5L
3.3	Anancomeric systems, Effect of conformation on reactivity of cyclohexane derivatives in the following reactions (including mechanism): electrophilic addition, elimination, molecular rearrangements, reduction of cyclohexanones (with LiAlH_4 , selectride and MPV reduction) and oxidation of cyclohexanols.	5L

3.4	Stereospecific and Stereoselective reactions with specific examples	2L
Unit 4	Photochemistry	15L
4.1	Principles of Photochemistry: Recapitulation, Excited states and their properties, modes of dissipation of energy (Jablonski diagram), electronic energy transfer: photosensitization and quenching process, experimental set up for photochemical reactions.	3L
4.2	Photochemistry of carbonyl compounds: $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ transitions, Norrish- I and Norrish-II cleavages, Paterno-Buchi reaction. Photoreduction, calculation of quantum yield, photochemistry of enones, photochemical rearrangements of α , β -unsaturated ketones and cyclohexadienones. Photo Fries rearrangement, Barton reaction.	7L
4.3	Photochemistry of olefins: cis-trans isomerizations, dimerizations, hydrogen abstraction, addition and Di- π - methane rearrangement including oxa- di- π --methane and aza-di- π --methane. Photochemical Cross-Coupling of Alkenes, Photodimerisation of alkenes.	3L
4.4	Photochemistry of arenes: 1, 2-, 1, 3- and 1, 4- additions. Photocycloadditions of aromatic Rings.	1L
4.5	Singlet oxygen and photo-oxygenation reactions. Photochemically induced Radical Reactions	1L

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4. Mechanism and theory in Organic Chemistry, T. H. Lowry and K. C. Richardson, Harper and Row.
5. Organic Reaction Mechanism, 4th edition, V. K. Ahluvalia, R. K. Parashar, Narosa Publication.
6. Reaction Mechanism in Organic Chemistry, S.M. Mukherji, S.P. Singh, Macmillan Publishers, India.
7. Organic Chemistry, Part A and B, Fifth edition, 2007, Francis A. Carey and Richard J. Sundberg, Springer.
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22. Physical Organic Chemistry, N. S. Isaacs, ELBS/Longman
23. Stereochemistry of Carbon Compounds: Principles and Applications, D, Nasipuri, 3rd edition, New Age International Ltd.
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25. Stereochemistry, P. S. Kalsi, 4th edition, New Age International Ltd
26. Organic Stereochemistry, M. J. T. Robinson, Oxford University Press, New Delhi, India edition, 2005
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29. Crown ethers and analogous compounds, M. Hiraoka, Elsevier, 1992.
30. Large ring compounds, J.A. Semlyen, Wiley-VCH, 1997.
31. Fundamentals of Photochemistry, K. K. Rohtagi-Mukherji, Wiley-Eastern
32. Essentials of Molecular Photochemistry, A. Gilbert and J. Baggott, Blackwell Scientific Publication.
33. Molecular Photochemistry, N. J. Turro, W. A. Benjamin.
34. Introductory Photochemistry, A. Cox and T. Camp, McGraw-Hill
35. Photochemistry, R. P. Kundall and A. Gilbert, Thomson Nelson.
36. Organic Photochemistry, J. Coxon and B. Halton, Cambridge University Press.
37. Molecular Orbitals and Organic Chemical Reactions by Ian Fleming (Wiley – A John Wiley and Sons, Ltd., Publication)

Course Code- PSC3SOC0

Paper II - Synthetic Organic Chemistry -I

Unit 1	Name reactions with mechanism and application	15 L
1.1	Mukaiyama esterification, Mitsunobu reaction, Darzen's Glycidic Ester Synthesis, Ritter reaction, Yamaguchi esterification, Peterson olefination.	5L
1.2	Domino reactions: Characteristics; Nazarov cyclization	3L
1.3	Multicomponent reactions: Strecker Synthesis, Ugi 4CC, Biginelli synthesis, Hantzsch synthesis, Pictet-Spengler synthesis	5L
1.4	Click Reactions: Characteristics; Huisgen 1,3-Dipolar Cycloaddition	2L
Unit 2	Radicals in organic synthesis	
2.1	Introduction: Generation, stability, reactivity and structural and stereochemical properties of free radicals, Persistent and charged radicals, Electrophilic and nucleophilic radicals.	3L
2.2	Radical Initiators: azobisisobutyronitrile (AIBN) and dibenzoyl peroxide.	1L
2.3	Characteristic reactions: Free radical substitution, addition to multiplebonds. Radical chain reactions, Radical halogenation of hydrocarbons (Regioselectivity), radical cyclizations, autoxidations: synthesis of cumene hydroperoxide from cumene.	4L
2.4	Radicals in synthesis: Inter and intra molecular C-C bond formation via mercuric hydride, tin hydride, thiol donors. Cleavage of C-X, C-Sn, C-Co, C-S, O-O bonds. Oxidative coupling, C-C bond formation in aromatics: SRNAr reactions	4L
2.5	Hunsdiecker reaction, Pinacol coupling, McMurry coupling, Sandmeyer reaction, Acyloin condensation.	3L
Unit 3	Enamines, Ylides and α-C-H functionalization	15 L
3.1	Enamines: Generation & application in organic synthesis with mechanistic pathways, Stork enamine reaction. Reactivity, comparison between enamines and enolates. Synthetic reactions of enamines including asymmetric reactions of chiral enamines derived from chiral secondary amines.	4L
3.2	Phosphorus, Sulfur and Nitrogen Ylides: Preparation and their synthetic applications along with their stereochemical aspects. Wittig reaction, Horner-Wadsworth-Emmons Reaction, Barton-Kellogg olefination.	6L
3.3	α-C-H functionalization: By nitro, sulfoxide, sulfone and phosphonate groups: generation of carbanions by strong bases (LDA/n-butyl lithium) and applications in C-C bond formation. Bamford-Stevens reaction, Julia olefination and its modification, Seyferth-Gilbert homologation, Steven's rearrangement.	5L
Unit 4	Metals / Non-metals in organic synthesis	15L
4.1	Mercury in organic synthesis: Mechanism and regiochemistry of oxymercuration and demercuration of alkenes, mercuration of aromatics, transformation of aryl mercurials to aryl halides. Organomercurials as carbene transfer reagents.	3L
4.2	Organoboron compounds: Mechanism and regiochemistry of	3L

hydroboration of alkenes and alkynes, asymmetric hydroboration using chiral boron reagents, 9-BBN hydroboration, oxazaborolidine (CBS catalyst) and

- functional group reduction by diborane.
- 4.3 **Organosilicons:** Salient features of silicon governing the reactivity of organosilicons, preparation and important bond-forming reactions of alkyl silanes, alkenyl silanes, aryl silanes and allyl silanes. β -silyl cations as intermediates. Iodotrimethylsilane in organic synthesis. **3L**
- 4.4 **Silyl enol ethers:** Application: As nucleophiles (Michael reaction, Mukaiyama aldol reaction), in ring contraction reactions. **2L**
- 4.5 **Organotin compounds:** Preparation of alkenyl and allyl tin compounds; application in C-C bond formation, in replacement of halogen by H at the same C atom. **2L**
- 4.6 **Selenium in organic synthesis:** Preparation of selenols/selenoxide, selenoxide elimination to create unsaturation, selenoxide and seleno acetals as α -C-H activating groups **2L**

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1. Advanced Organic Chemistry, Part A and Part B: Reaction and Synthesis, Francis A. Carey, Richard J. Sundberg, 5th Edition, Springer Verlag
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13. Name Reactions and Reagents in Organic Synthesis, 2nd Edn., Bradford P. Mundy, Michael G. Ellard, and Frank Favoloro, Jr., Wiley-Interscience
14. Name Reactions, Jie Jack Lie, 3rd Edn., Springer
15. Organic Electrochemistry, H. Lund, and M. Baizer, 3rd Edn., Marcel Dekker.

Course code - PSC3NPS0

Paper III- Natural products and Spectroscopy

Unit 1	Natural products-I	15 L
1.1	Carbohydrates: Introduction to naturally occurring sugars: Deoxysugars, aminosugars, branched sugars. Structure elucidation of lactose and D-glucosamine (synthesis not expected). Structural features and applications of inositol, starch, cellulose, chitin and heparin.	5L
1.2	Natural pigments: General structural features, occurrence, biological importance and applications of: carotenoids, anthocyanins, quinones, flavones, pterins and porphyrins (chlorophyll). Structure elucidation of β -carotene and Cyanin (with synthesis). Synthesis of ubiquinone from 3, 4, 5-trimethoxy methyl benzoate.	5L
1.3	Terpenoids: Occurrence, classification, structure elucidation, Stereochemistry, spectral data and synthesis of zingiberene. Synthesis of cinerolone, jasmolone and allethrolone.	3L
1.4	Alkaloids: Occurrence and physiological importance of morphine and atropine. Structure elucidation, spectral data and synthesis of coniine.	2L
Unit 2	Natural products-II	15L
2.1	Multi-step synthesis of natural products: Synthesis of the following natural products with special reference to reagents used, stereochemistry and functional group transformations: a) Woodward synthesis of Reserpine from benzoquinone b) Corey synthesis of Longifolene from resorcinol c) Gilbert-Stork synthesis of Griseofulvin from phloroglucinol d) Corey's Synthesis of Caryophyllene from 2-Cyclohexenone and Isobutylene e) Synthesis of Juvabione from Limonene f) Woodward synthesis of Strychnine	10L
2.2	Prostaglandins: Classification, general structure and biological importance. Structure elucidation of PGE ₁ .	2L
2.3	Insect Growth Regulators: General idea, structures of JH ₂ and JH ₃ .	1L
2.4	Plant Growth Regulators: Structural features and applications of arylacetic acids, gibberellic acids and triacontanol. Synthesis of triacontanol (synthesis of stearyl magnesium bromide and 12-bromo-1-tetrahydropyranyloxydodecane expected)	2L
Unit 3	Advanced Spectroscopic Techniques-I	15 L
3.1	Proton NMR spectroscopy: Recapitulation, chemical and magnetic equivalence of protons, First order, second order, Spin system notations (A ₂ , AB, AX, AB ₂ , AX ₂ , AMX and A ₂ B ₂ -A ₂ X ₂ spin systems with suitable examples). Long range coupling (Allylic coupling, 'W' coupling and Coupling in aromatic and hetero aromatic systems), Temperature effects, Simplification of complex spectra, nuclear magnetic double resonance, chemical shift reagents.	7L
3.2	¹³C-NMR spectroscopy: Recapitulation, equivalent and non-equivalent carbons (examples of aliphatic and aromatic compounds), ¹³ C- chemical shifts, calculation of ¹³ C- chemical shifts of aromatic carbons, heteronuclear coupling of carbon to ¹⁹ F and ³¹ P.	4L

3.3	Spectral problems based on UV, IR, ¹ HNMR and ¹³ CNMR and Mass Spectroscopy.	4L
Unit 4	Advanced Spectroscopic Techniques-II	15L
4.1	Advanced NMR techniques: DEPT experiment, determining number of Attached hydrogens (methyl/methylene/methine and quaternary carbons), two dimensional spectroscopic techniques, COSY and HETCOR spectra, NOE and NOESY techniques.	10L
4.2	Spectral problems based on UV, IR, ¹ HNMR, ¹³ CNMR (Including 2D technique) and Mass spectroscopy	5L

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3. Organic Chemistry Natural Products Volume-II, O. P. Agarwal, Krishna Prakashan, 2011.
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31. *Spectrometric Identification of Organic compounds*, R.M. Silverstein and others, John Wiley and Sons Inc., 5th ed., 1991
32. *Absorption spectroscopy of organic Molecules*, V.M. Parikh, 1974.
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34. *Organic spectroscopy*, William Kemp, ELBS, 3rd ed., 1987.
35. *Organic structures from spectra*, L. D. Field, S. Sternhell, John R. Kalman, Wiley, 4th ed., . 3122
36. *Introduction to spectroscopy*, Donald L. Pavia, Gary M. Lampman George S. Kriz, James R. Vyvyan, 4th ed., 2009.
37. *Organic spectroscopic structure determination: a problem-based learning approach* Douglass F. Taber, Oxford University Press, 17-Sep-2007.
38. *Organic Spectroscopy: Principles And Applications*, Jag Mohan, Alpha Science International Ltd., 30-Mar-2004
39. *Alkaloids*, V.K. Ahluwalia, Ane Books Pvt. Ltd.
40. *Biotransformations in Organic Chemistry*, 5th Edition, Kurt Faber, Springer
41. *Structure Determination of Organic Compounds*, E Pretsch, P. Buhlmann, C. Affolter, Springer

Course code - PSC3MBG0

Paper IV- Medicinal, Biogenesis and Green Chemistry

Unit 1	Drug discovery, design and development	15 L
1.1	Introduction, important terms used in medicinal chemistry: receptor, therapeutic index, bioavailability, drug assay and drug potency. General idea of factors affecting bioactivity: Resonance, inductive effect, bioisosterism, spatial considerations. Basic pharmacokinetics: drug absorption, distribution, metabolism (biotransformation) and elimination. Physical and chemical parameters like solubility, lipophilicity, ionization, pH, redox potential, H-bonding, partition coefficient and isomerism in drug distribution and drug-receptor binding.	7L
1.2	Procedures in drug design: Drug discovery without a lead: Penicillin, Librium. Lead discovery: random screening, non-random (or targeted) screening. Lead modification: Identification of the pharmacophore, Functional group modification. Structure-activity relationship, Structure modification to increase potency and therapeutic index: Homologation, chain branching, ring-chain transformation, bioisosterism, combinatorial synthesis (basic idea).	8L
Unit 2	Drug design, development and synthesis	15L
2.1	Introduction to quantitative structure activity relationship studies. QSAR parameters: - steric effects: The Taft and other equations; Methods used to correlate regression parameters with biological activity: Hansch analysis- A linear multiple regression analysis	5L
2.2	Introduction to modern methods of drug design and synthesis- computer aided molecular graphics based drug design, drug design via enzyme inhibition (reversible and irreversible), bioinformatics and drug design.	3L
2.3	Concept of prodrugs and soft drugs. (a) Prodrugs: Prodrug design, types of prodrugs, functional groups in prodrugs, advantages of prodrug use. (b) Soft Drugs: concept and properties.	3L
2.4	Synthesis and application of the following drugs: Fluoxetine, cetirizine, esomeprazole, fluconazole, zidovudine, methotrexate, diclofenac, labetalol and Favipiravir Remdesivir: Structure and applications	4L
Unit 3	Biogenesis and biosynthesis of natural products	15 L
3.1	Primary and secondary metabolites and the building blocks, general pathway of amino acid biosynthesis.	3L
3.2	Acetate pathway: Biosynthesis of malonyl CoA, saturated fatty acids, prostaglandins from arachidonic acid, aromatic polyketides	4L
3.3	Shikimic Acid pathway: Biosynthesis of shikimic acid, aromatic amino acids, cinnamic acid and its derivatives, lignin and lignans, benzoic acid and its derivatives, flavonoids and isoflavonoids.	4L
3.4	Mevalonate pathway: Biosynthesis of mevalonic acid, monoterpenes-geranyl cation and its derivatives, sesquiterpenes-farnesyl cation and its derivatives and diterpenes.	4L
Unit 4	Green chemistry	15L
4.1	Introduction, basic principles of green chemistry. Designing a green synthesis: Green starting materials, green reagents, green solvents and	1L

- reaction conditions, green catalysts.
- 4.2 **Use of the following in green synthesis with suitable examples:** 9L
- Green reagents: dimethylcarbonate, polymer supported reagents.
 - Green catalysts: Acid catalysts, oxidation catalysts, basic catalysts, phase transfer catalysts [Aliquat 336, benzyltrimethyl ammonium chloride (TMBA), Tetra-n-butyl ammonium chloride, crown ethers], biocatalysts.
 - Green solvents: water, ionic liquids, deep eutectic solvents, supercritical carbon dioxide.
 - Solid state reactions: solid phase synthesis, solid supported synthesis
 - Microwave assisted synthesis: reactions in water, reactions in organic solvents, solvent free reactions.
 - Ultrasound assisted reactions.
- 4.3 Comparison of traditional processes versus green processes in the syntheses of ibuprofen, adipic acid, 4-aminodiphenylamine, p-bromotoluene and benzimidazole. 3L
- 4.4 **Green Catalysts:** Nano catalyst, Types of Nano catalysts, Advantages and Disadvantages of Nano catalysts, Idea of Magnetically separable Nano catalysts. 2L

Course code - PSC3BIC0 Paper IV- Bioorganic Chemistry

- Unit 1 Biomolecules-I** 15 L
- 1.1 **Amino acids, peptides and proteins:** Chemical and enzymatic hydrolysis of proteins to peptides, amino acid sequencing. Secondary structure of proteins, forces responsible for holding of secondary structures, α - helix, β -sheets, super secondary structure. Tertiary structure of protein: folding and domain structure. Quaternary structure. 2L
- 1.2 **Nucleic acids:** Structure and function of physiologically important nucleotides (c-AMP, ADP, ATP) and nucleic acids (DNA and RNA), replication, genetic code, protein biosynthesis, mutation 3L
- 1.3 Structure: Purine & pyrimidine bases, ribose, deoxyribose, nucleosides and nucleotides (ATP, CTP, GTP, TTP, UTP) formation of polynucleotides strand with its shorthand representation. 3L
- 1.4 RNAs (various types in prokaryotes and eukaryotes) m- RNA and r- RNA– general account, t- RNA-clover leaf model, Ribozymes. 2L
- 1.5 **DNA:** Physical properties – Effect of heat on physical properties of DNA (Viscosity, buoyant density and UV absorption), Hypochromism, Hyperchromism and Denaturation of DNA. Reactions of nucleic acids (with DPA and Orcinol). 2L
- 1.6 **Chemical synthesis of oligonucleotides:** Phosphodiester, Phosphotriester, Phosphoramidite and H- phosphonate methods including solid phase approach 3L
- Unit 2 Biomolecules-II** 15L
- 2.1 **Chemistry of enzymes:** Introduction, nomenclature, classes and general types of reactions catalyzed by enzymes. Properties of enzymes: a) enzyme efficiency/ catalytic power b) enzyme specificity; Fischer's 'lock and key' 6L

	and Koshland 'induced fit' hypothesis. Concept and identification of active site.	
2.2	Factors affecting enzyme kinetics: Substrate concentration, enzyme concentration, temperature, pH, product concentration etc. Reversible and Irreversible inhibition.	4L
2.3	Mechanism of enzyme action: transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Mechanism of chymotrypsin catalyzed hydrolysis of a peptide bond	5L
Unit 3	Biomolecules - III	15 L
3.1	Chemistry of coenzymes. Structure, mechanism of action and bio-modeling studies of the following coenzymes: nicotinamide adenine dinucleotide, flavin adenine dinucleotide, thiamine pyrophosphate, pyridoxal phosphate, Vitamin B12, biotin, lipoic acid, Coenzyme A.	12L
3.2	Oxidative phosphorylation, chemiosmosis, rotary model for ATP synthesis and role of cytochrome in oxygen activation.	3L
Unit 4	Biomolecules – IV	15L
4.1	Role of main enzymes involved in the synthesis and breakdown of glycogen.	2L
4.2	Enzyme catalyzed organic reactions: Hydrolysis, hydroxylation, oxidation and reduction.	6L
4.3	Enzymes in organic synthesis. Fermentation: Production of drugs/drug intermediates by fermentation. Production of chiral hydroxy acids, vitamins, amino acids, β -lactam antibiotics. Synthesis of chemicals via microbial transformation, synthesis of L-ephedrine. Chemical processes with isolated enzymes in free form (hydrocyanation of m-phenoxybenzaldehyde) and immobilized form (production of 6-aminopenicillanic acid).	7L

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3. Voet, D. and J. G. Voet (2004) Biochemistry, 3rd Edition, John Wiley & sons, Inc. USA.
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16. Introduction to Medicinal chemistry. by Graham Patrick
17. Medicinal chemistry-William O. Foye
18. T. B. of Organic medicinal and pharmaceutical chemistry-Wilson and Gisvold's (Ed. Robert F. Dorge)
19. An introduction to medicinal chemistry-Graham L. Patrick, OUP Oxford, 2009.
20. Principles of medicinal chemistry (Vol. I and II)-S. S. Kadam, K. R. Mahadik and K.G. Bothara , Nirali prakashan.
21. Medicinal chemistry (Vol. I and II)-Burger
22. Strategies for organic drug synthesis and design - D. Lednicer Wiley
23. Pharmacological basis of therapeutics-Goodman and Gilman's (McGraw Hill)
24. Enzyme catalysis in organic synthesis, 3rd edition. Edited by Karlheinz Drauz, Harold Groger, and Oliver May, Wiley-VCH Verlag GmbH & Co KgaA, 2012.
25. Biochemistry, Dr U Satyanarayan and Dr U Chakrapani, Books and Allied (P) Ltd.
26. Bioorganic, Bioinorganic and Supramolecular chemistry, P.S. Kalsi and J.P. Kalsi. New Age International Publishers
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32. Concepts in biotechnology by D. Balasubramanian & others
33. Principals of biochemistry by Horton & others.
34. Bioorganic chemistry - A chemical approach to enzyme action by Herman Dugas and Christopher Penney.
35. Medicinal Natural Products: A Biosynthetic Approach by Paul M. Dewick. 3rd Edition, Wiley.
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37. Natural products Chemistry and applications, Sujata V Bhat, B.A. Nagasampagi and S. Meenakshi, Narosa Publishing House.
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39. Chemistry of Natural Products, F. F. Bentley and F. R. Dollish, 1974.
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41. Chemistry of natural products, V.K. Ahluwalia, Vishal Publishing Co.

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43. Organic synthesis in water. By Paul A. Grieco, Blackie.
44. Green chemistry, Theory and Practical, Paul T. Anastas and John C. Warner.
45. New trends in green chemistry By V. K. Ahulwalia and M. Kidwai, 2nd edition, Anamaya Publishers, New Delhi.
46. An introduction to green chemistry, V. Kumar, Vishal Publishing Co.
47. Organic synthesis: Special techniques. V.K.Ahulwalia and Renu Aggarwal.

Semester III: Practicals

Course code: PSC3TOP0 & PSC3SOP0

Separation of a ternary mixture of organic compounds and identification including derivative preparations using micro-scale technique (Minimum 8 experiments)

1. Separation of a ternary mixture (S-S-S, S-S-L, S-L-L and L-L-L) (for solid mixture: water insoluble/ soluble including carbohydrates) based upon differences in the physical and the chemical properties of the components.
2. Identification of the two components (indicated by the examiner) using micro-scale technique.
3. Preparation of derivatives (any one of separated compound).

Single step organic preparation (1.0 g scale) involving purification by Steam distillation / Vacuum distillation or Column chromatography (Minimum 8 experiments)

Course code: PSC3NPP0 & (PSC3MBP0 or PSC3BIP0)

1. Preparation of acetanilide from aniline and acetic acid using Zn dust. (Purification by column chromatography)
2. Preparation of 1-nitronaphthalene from naphthalene. (Purification by steam distillation)
3. Preparation of acetyl ferrocene from ferrocene. (Purification by column chromatography)
4. Preparation of 3-nitroaniline from 1, 3-dinitrobenzene. (Purification by column chromatography)
5. Preparation of benzyl alcohol from benzaldehyde. (Purification by vacuum distillation).
6. Preparation of methyl salicylate from salicylic acid. (Purification by vacuum distillation).
7. Preparation of 4-methylacetophenone from toluene. (Purification by vacuum distillation).
8. Preparation of phenyl acetate from phenol. (Purification by vacuum distillation)
9. Preparation of 2-chlorotoluene from *o*-toluidine. (Purification by steam distillation)
10. Preparation of fluorenone from fluorene. (Purification by column chromatography)
11. Preparation of dimethylphthalate from phthalic anhydride. (Purification by vacuum distillation)

distillation)

Note:

1. Students are expected to know (i) the planning of synthesis, effect of reaction parameters including stoichiometry, and **safety aspects including MSDS** (ii) the possible mechanism, expected spectral data (IR and NMR) of the starting material and final product.
2. Students are expected to purify the product by Steam distillation / Vacuum distillation or Column chromatography, measure its mass or volume, check the purity by TLC, determine physical constant and calculate percentage yield.

References for Practicals:

1. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis- V.K. Ahluwalia and Renu Aggarwal, Universities Press India Ltd., 2000
2. Advanced Practical Organic Chemistry – N. K. Vishnoi, Third Addition, Vikas Publishing House PVT Ltd
3. Systematic Laboratory Experiments in Organic Synthesis- A. Sethi, New Age International Publications
4. Systematic Identification of Organic compounds, 6th edition, R. L. Shriner, R. C. Fuson and D.Y. Curtin Wiley, New York.
5. Vogel's Textbook of Quantitative Analysis, revised, J. Bassett, R. C. Denney, G. H. Jeffery and J. Mendham, ELBS
6. Experiments and Techniques in Organic Chemistry, D. Pasto, C. Johnson and M. Miller, Prentice Hall
7. Macro-scale and Micro-scale Organic Experiments, K. L. Williamson, D. C. Heath.
8. Systematic Qualitative Organic Analysis, H. Middleton, Adward Arnold.
9. Handbook of Organic Analysis- Qualitative and Quantitative, H. Clark, Adward Arnold.
10. Vogel's Textbook of Practical Organic Chemistry, Fifth edition, 2008, B.S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchell, Pearson Education.
11. Laboratory Manual of Organic Chemistry, Fifth edition, R K Bansal, New Age Publishers.
12. Organic structures from spectra, L. D. Field, S. Sternhell, John R. Kalman, Wiley, 4th ed., 2011.

Important Note:

1. The candidate is expected to submit a journal and project certified by the Head of the Department /institution at the time of the practical examination.
2. A candidate will not be allowed to appear for the practical examination unless he/she produces a certified journal or a certificate from the Head of the institution/department stating that the journal is lost and the candidate has performed the required number of experiments satisfactorily. The list of the experiments performed by the candidate should be attached with such certificate.
3. Use of non-programmable calculator is allowed both at the theory and the practical examination.

Semester IV

Course Code - PSC4TOC0

Paper I- Theoretical Organic Chemistry-II

Unit 1	Physical Organic Chemistry	15 L
1.1	Structural effects and reactivity: Linear free energy relationship (LFER) in determination of organic reaction mechanism: The Hammett equation, Substituent constant (σ) and σ values, Reaction constants (ρ), reactions with positive and negative ρ values, Nonlinear Hammett plots (concave upwards and downwards deviations)	9L
1.2	Uses of Hammett equation, deviations from Hammett equation. Dual parameter correlations, Inductive substituent constants, Calculation of k values, Taft equation, Solvent effects, Grunwald-Winstein equation, Dimroth's ET parameter, Spectroscopic correlations, Thermodynamic implications.	6L
Unit 2	Supramolecular chemistry	15L
2.1	Principles of molecular associations and organizations as exemplified in biological macromolecules like nucleic acids, proteins and enzymes.	3L
2.2	Synthetic molecular receptors: receptors with molecular cleft, molecular, tweezers, receptors with multiple hydrogen sites.	3L
2.3	Structures and properties of crown ethers, cryptands, cyclophanes, calixarenes, rotaxanes and cyclodextrins. Synthesis of crown ethers, cryptands and calixarenes	5L
2.4	Molecular recognition and catalysis, molecular self-assembly. Supramolecular Polymers, Gels and Fibers.	4L
Unit 3	Stereochemistry- II	15L
3.1	Racemization and resolution of racemates including conglomerates: Mechanism of racemization, methods of resolution: mechanical, chemical, kinetic and equilibrium asymmetric transformation and through inclusion compounds with stereospecific reactions.	3L
3.2	Determination of enantiomer and diastereomer composition: enzymatic method, chromatographic methods. Methods based on NMR spectroscopy: use of chiral derivatising agents (CDA), chiral solvating agents (CSA) and Lanthanide shift reagents (LSR).	3L
3.3	Correlative method for configurational assignment: chemical, optical rotation, and NMR spectroscopy.	4L
3.4	Molecular dissymmetry and chiroptical properties: Linearly and circularly polarized light. Circular birefringence and circular dichroism. ORD and CD curves. Cotton effect and its applications. The octant rule and the axial α -haloketone rule with applications.	5L
Unit 4	Asymmetric Synthesis	15L
4.1	Principles of asymmetric synthesis: Introduction, the chiral pool in Nature, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions	3L
4.2	Synthesis of L-DOPA [Knowles's Monsanto process]. Asymmetric reactions with mechanism: Aldol and related reactions, Cram's rule, Felkin-Anh model, Sharpless enantioselective epoxidation, hydroxylation,	9L

aminohydroxylation, Diels-Alder reaction, reduction of prochiral carbonyl compounds and olefins.

- 4.3 Use of chiral auxiliaries in diastereoselective reductions, asymmetric amplification. Use of chiral BINOLs, BINAPs and chiral oxazolines asymmetric transformations **3L**

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2. A guide to mechanism in Organic Chemistry, 6th edition, 2009, Peter Sykes, Pearson education, New Delhi.
3. Advanced Organic Chemistry: Reaction Mechanisms, R. Bruckner, Academic Press (2002).
4. Mechanism and theory in Organic Chemistry, T. H. Lowry and K. C. Richardson, Harper and Row.
5. Organic Reaction Mechanism, 4th edition, V. K. Ahluvalia, R. K. Parashar, Narosa Publication.
6. Reaction Mechanism in Organic Chemistry, S.M. Mukherji, S.P. Singh, Macmillan Publishers, India.
7. Organic Chemistry, Part A and B, Fifth edition, 2007, Francis A. Carey and Richard J. Sundberg, Springer.
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12. Organic reactions & their mechanisms, third revised edition, P.S. Kalsi, New Age International Publishers.
13. Organic Chemistry: Structure and Function, P. Volhardt and N. Schore, 5th Edition, 2012
14. Organic Chemistry, W. G. Solomons, C. B. Fryhle, , 9th Edition, Wiley India Pvt. Ltd.,2009.
15. Pericyclic Reactions, S. Sankararaman, Wiley VCH, 2005.
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20. Modern methods of Organic Synthesis, 4th Edition W. Carruthers and Iain Coldham, Cambridge University Press 2004

21. Modern physical chemistry, Eric V Anslyn, Dennis A. Dougherty, University science books, 2006
22. Physical Organic Chemistry, N. S. Isaacs, ELBS/Longman
23. Stereochemistry of Carbon Compounds: Principles and Applications, D, Nasipuri, 3rd edition, New Age International Ltd.
24. Stereochemistry of Organic Compounds, Ernest L. Eliel and Samuel H. Wilen, Wiley-India edit
25. Stereochemistry, P. S. Kalsi, 4th edition, New Age International Ltd
26. Organic Stereochemistry, M. J. T. Robinson, Oxford University Press, New Delhi, India edition, 2005
27. Bioorganic, Bioinorganic and Supramolecular chemistry, P.S. Kalsi and J.P. Kalsi. New Age International Publishers
28. Supramolecular Chemistry; Concepts and Perspectives, J. M. Lehn, VCH.
29. Crown ethers and analogous compounds, M. Hiraoka, Elsevier, 1992.
30. Large ring compounds, J.A. Semlyen, Wiley-VCH, 1997.
31. Fundamentals of Photochemistry, K. K. Rohtagi-Mukherji, Wiley-Eastern
32. Essentials of Molecular Photochemistry, A. Gilbert and J. Baggott, Blackwell Scientific Publication.
33. Molecular Photochemistry, N. J. Turro, W. A. Benjamin.
34. Introductory Photochemistry, A. Cox and T. Camp, McGraw-Hill
35. Photochemistry, R. P. Kundall and A. Gilbert, Thomson Nelson.
36. Organic Photochemistry, J. Coxon and B. Halton, Cambridge University Press.
37. Molecular Orbitals and Organic Chemical Reactions by Ian Fleming (Wiley – A John Wiley and Sons, Ltd., Publication)

Course Code- PSC4SOC0

Paper II- Synthetic Organic Chemistry-II

Unit 1	Designing Organic Synthesis-I	15 L
1.1	Protecting groups in Organic Synthesis: Protection and deprotection of the hydroxyl, carbonyl, amino and carboxyl functional groups and its applications.	3L
1.2	Concept of umpolung (Reversal of polarity): Generation of acyl anion equivalent using 1,3-dithianes, methyl thiomethyl sulfoxides, cyanide ions, cyanohydrin ethers, nitro compounds and vinylated ethers.	3L
1.3	Introduction to Retrosynthetic analysis and synthetic planning: Linear and convergent synthesis; Disconnection approach: An introduction to synthons, synthetic equivalents, disconnection approach, functional group interconversions (FGI), functional group addition (FGA), functional group removal (FGR) importance of order of events in organic synthesis, one and two group C-X disconnections (1,1; 1,2; 1,3 difunctionalized compounds), selective organic transformations: chemoselectivity, regioselectivity, stereoselectivity, enantioselectivity	9L

Unit 2	Designing Organic Synthesis-II	15L
2.1	General strategy: choosing a disconnection-simplification, symmetry, high yielding steps, and recognisable starting material.	3L
2.2	One group C-C Disconnections: Alcohols (including stereoselectivity), carbonyls (including regioselectivity), Alkene synthesis, use of acetylenes and aliphatic nitro compounds in organic synthesis.	6L
2.3	Two group C-C Disconnections: 1,2- 1,3- 1,4- 1,5- and 1,6-difunctionalized compounds, Diels-Alder reactions, α , β -unsaturated compounds, control in carbonyl condensations, Michael addition and Robinson annelation.	6L
Unit 3	Electro-organic chemistry and Selected methods of Organic synthesis	15L
3.1	Electro-organic chemistry: Introduction: Electrode potential, cell parameters, electrolyte, working electrode, choice of solvents, supporting electrolytes. Cathodic reduction: Reduction of alkyl halides, aldehydes, ketones, nitro compounds, olefins, arenes, electro-dimerization. Anodic oxidation: Oxidation of alkylbenzene, Kolbe reaction, Non-Kolbe oxidation, Shono Oxidation	7L
3.2	Selected Methods of Organic synthesis Applications of the following in organic synthesis: <ul style="list-style-type: none"> • Crown ethers, cryptands, micelles, cyclodextrins, catenanes. • Organocatalysts: Proline, Imidazolidinone. • Pd catalysed cycloaddition reactions: Stille reaction, Saegusa-Ito oxidation to enones, Negishi coupling. • Use of Sc(OTf)₃ and Yb(OTf)₃ as water tolerant Lewis acid catalyst in aldol condensation, Michael reaction, Diels-Alder reaction, Friedel – Crafts reaction. 	8L
Unit 4	Transition and rare earth metals in organic synthesis	15L
4.1	Introduction to basic concepts: 18 electron rule, bonding in transition metal complexes, C-H activation, oxidative addition, reductive elimination, migratory insertion.	3L
4.2	Palladium in organic synthesis: π -bonding of Pd with olefins, applications in C-C bond formation, carbonylation, alkene isomerisation, cross-coupling of organometallics and halides. Representative examples: Heck reaction, Suzuki-Miyaura coupling, Sonogashira reaction and Wacker oxidation. Heteroatom coupling for bond formation between aryl/vinyl groups and N, S, or P atoms.	5L
4.3	Olefin metathesis using Grubb's catalyst.	1L
4.4	Application of Ni, Co, Fe, Rh, and Cr carbonyls in organic synthesis.	4L
4.5	Application of samarium iodide including reduction of organic halides, aldehydes and ketones, α -functionalised carbonyl and nitro compounds.	1L
4.6	Application of Ce (IV) in synthesis of heterocyclic quinoxaline derivatives and its role as a de-protecting agent.	1L

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1. Advanced Organic Chemistry, Part A and Part B: Reaction and Synthesis, Francis A. Carey, Richard J. Sundberg, 5th Edition, Springer Verlag
2. Modern Methods of Organic Synthesis, 4th Edition, W. Carruthers and Iain Coldham, Cambridge University Press, 2004.
3. Chem. Rev. 2002, 102, 2227-2302, Rare Earth Metal Triflates in Organic Synthesis, S. Kobayashi, M. Sugiura, H. Kitagawa, and W.W.L. Lam.
4. Organic Chemistry, Clayden Greeves Warren and Wothers, Oxford Press (2001).
5. Modern Organic Synthesis: An Introduction, G.S. Zweifel and M.H. Nantz, W.H. Freeman and Company, (2007).
6. Advanced Organic Chemistry: Reaction Mechanism, R. Bruckner, Academic Press (2002).
7. Principles of Organic Synthesis, R.O.C. Norman & J. M. Coxon, 3rd Edn., Nelson Thornes
8. Organic Chemistry, 7th Edn, R. T .Morrison, R. N. Boyd, & S. K. Bhattacharjee, Pearson
9. Strategic Applications of Name Reactions in Organic Synthesis, L. Kurti & B. Czako (2005), Elsevier Academic Press
10. Advanced Organic Chemistry: Reactions & Mechanisms, 2nd Edn., B. Miller & R. Prasad, Pearson
11. Organic reactions and their mechanisms, 3rd revised edition, P.S. Kalsi, New Age International Publishers
12. Organic Synthesis: The Disconnection Approach, Stuart Warren, John Wiley & Sons, 2004
13. Name Reactions and Reagents in Organic Synthesis, 2nd Edn., Bradford P. Mundy, Michael G. Ellard, and Frank Favoloro, Jr., Wiley-Interscience
14. Name Reactions, Jie Jack Lie, 3rd Edn., Springer
15. Organic Electrochemistry, H. Lund, and M. Baizer, 3rd Edn., Marcel Dekker.

Course Code- PSC4NPH0

Paper III- Natural products and Heterocyclic Chemistry

Unit 1	Natural products-III	15 L
1.1	Steroids: General structure, classification. Occurrence, biological role, important structural and stereochemical features of the following: corticosteroids, steroidal hormones, steroidal alkaloids, sterols and bile acids.	5L
1.2	Synthesis of 16-DPA from cholesterol and plant sapogenin.	2L
1.3	Synthesis of the following from 16-DPA: androsterone, testosterone, oestrone, oestriol, oestradiol and progesterone.	5L
1.4	Insect pheromones: General structural features and importance. Types of pheromones (aggregation, alarm, releaser, primer, territorial, trail, sex pheromones etc.), advantage of pheromones over conventional pesticides. Synthesis of bombykol from acetylene, disparlure from 6-methylhept-1-ene, grandisol from 2-methyl-1, 3-butadiene.	3L

Unit 2	Natural products-IV	15L
2.1	Vitamins: Classification, sources and biological importance of vitamin B ₁ , B ₂ , B ₆ , folic acid, B ₁₂ , C, D ₁ , E (α -tocopherol), K ₁ , K ₂ , H (β - biotin). Synthesis of the following: Vitamin A from β -ionone and bromoester moiety. Vitamin B ₁ including synthesis of pyrimidine and thiazole moieties Vitamin B ₂ from 3, 4-dimethylaniline and D(-) ribose Vitamin B ₆ from: 1) ethoxyacetylacetone and cyanoacetamide, 2) ethyl ester of N-formyl-DL-alanine (Harris synthesis) Vitamin E (α -tocopherol) from trimethylquinol and phytyl bromide Vitamin K ₁ from 2-methyl-1, 4-naphthaquinone and phytol	6L
2.2	Antibiotics: Classification on the basis of activity. Structure elucidation, spectral data of penicillin-G and chloramphenicol. Synthesis of chloramphenicol (from benzaldehyde and β -nitroethanol) penicillin-G and phenoxymethylpenicillin from D-penicillamine and t-butyl phthalimide malonaldehyde (synthesis of D-penicillamine and t-butyl phthalimide malonaldehyde expected).	6L
2.3	Naturally occurring insecticides: Sources, structure and biological properties of pyrethrums (pyrethrin I), rotenoids (rotenone). Synthesis of pyrethrin I.	2L
2.4	Synthesis of exaltone and muscone.	1L
Unit 3	Heterocyclic compounds-I	15L
3.1	Heterocyclic compounds: Introduction, classification, Nomenclature of heterocyclic compounds of monocyclic (3-6 membered) (Common, systematic (Hantzsch-Widman) and replacement nomenclature)	3L
3.2	Structure and nucleophilic ring opening reactions of aziridines, oxiranes, oxetanes and azetidines	2L
3.3	Structure, reactivity, synthesis and reactions of pyridine, pyridine N-oxide, pyridazine, pyrimidine, pyrazine, pyrrole, pyrazoles, Imidazoles, thizoles and oxazoles	10L
Unit 4	Heterocyclic compounds-II	15L
4.1	Nomenclature of heterocyclic compounds of bicyclic/tricyclic (5-6 Membered) fused heterocycles (up to three hetero atoms). (Common, systematic (Hantzsch-Widman) and replacement nomenclature)	3L
4.2	Structure, reactivity, synthesis and reactions of quinoline, isoquinoline, indole, coumarines, purines, benzimidazoles, benzthiazoles, quinoxaline, cinnoline and quinazoline	12 L

REFERENCES:

1. Natural product chemistry, A mechanistic, biosynthetic and ecological approach, Kurt B.G. Torszell, Apotekarsocieteten –Swedish Pharmaceutical Press.
2. Natural products chemistry and applications, Sujata V. Bhat, B.A. Nagasampagi and S. Meenakshi, Narosa Publishing House, 2011.
3. Organic Chemistry Natural Products Volume-II, O. P. Agarwal, Krishna Prakashan, 2011.
4. Chemistry of natural products, F. F. Bentley and F. R. Dollish, 1974

- Natural Product Chemistry Vol.1 and 2, K. Nakanishi J. Goto. S. Ito Majori and S. Nozoo, Academic Press, 1974.
- Chemistry of natural products, V.K. Ahluwalia, Vishal Publishing Co. 2008.
- Heterocyclic chemistry, 3rd edition, Thomas L. Gilchrist, Pearson Education, 2007.
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- Principles of Modern Heterocyclic Chemistry, L.A. Paquette, W.B. Benjamin, Inc., 1978.
- An Introduction to the Chemistry of Heterocyclic Compounds, 2nd edition, B.M. Acheson, 1975.
- Natural Products: Chemistry and Biological Significance Interscience, J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Banthrope and J. B. Harborne, Longman, Essex, 1994.
- Organic Chemistry, Vol 2, I.L. Finar, ELBS, 6th edition, Pearson.
- Stereoselective Synthesis: A Practical Approach, M. Nogradi, Wiley-VCH, 1995.
- Rodd's Chemistry of Carbon Compounds, Ed. S. Coffey, Elsevier.
- Chemistry, Biological and Pharmacological Properties of Medicinal Plants from the Americas, Ed. Kurt Hostettmann, M.P. Gupta and A. Marston, Harwood Academic Publishers.
- Introduction to Flavonoids, B.A. Bohm, Harwood Academic Publishers, 1998.
- New Trends in Natural Product Chemistry, Atta-ur-Rahman and M.I. Choudhary, Harwood Academic Publishers, 1998.
- Insecticides of Natural Origin, Sukh Dev, Harwood Academic Publishers.
- Comprehensive Organic Chemistry by Barton and Ollis, Pergamon Press, Oxford, 1979.
- Medicinal Natural Products, a Biosynthetic Approach, Derick Paul, John Wiley and Sons, 2002.
- Biosynthesis of Natural Products, Mannitto Paolo, Ellis Horwood Limited, 1981.
- Selected Organic synthesis, Ian Fleming, John Wiley and Sons, 1973.

Course Code- PSC4IPR0

Paper IV- Intellectual Property Rights & Cheminformatics

Unit 1	15 L
1.1 Introduction to Intellectual Property: Historical Perspective, Different types of IP, Importance of protecting IP.	2L
1.2 Patents: Historical Perspective, Basic and associated right, WIPO, PCT system, Traditional Knowledge, Patents and Health care-balancing promoting innovation with public health, Software patents and their importance for India.	5L
1.3 Industrial Designs: Definition, How to obtain, features, International design registration.	2L

1.4	Copyrights: Introduction, How to obtain, Differences from Patents.	2L
1.5	Trade Marks: Introduction, How to obtain, Different types of marks— Collective marks, certification marks, service marks, trade names etc.	2L
1.6	Geographical Indications: Definition, rules for registration, prevention of illegal exploitation, importance to India.	2L
Unit 2		15L
2.1	Trade Secrets: Introduction and Historical Perspectives, Scope of Protection, Risks involved and legal aspects of Trade Secret Protection.	2L
2.2	IP Infringement issue and enforcement: Role of Judiciary, Role of law enforcement agencies-Police, Customs etc.	2L
2.3	Economic Value of Intellectual Property: Intangible assets and their valuation, Intellectual Property in the Indian context – Various Laws in India Licensing and Technology transfer.	5L
2.4	Different International agreements:	6L
	a. World Trade Organization (WTO):	
	1. General Agreement on Tariffs and Trade (GATT), Trade Related Intellectual Property Rights (TRIPS) agreement	
	2. General Agreement on Trade Related Services (GATS) Madrid Protocol.	
	3. Berne Convention	
	4. Budapest Treaty	
	b. Paris Convention	
	WIPO and TRIPS, IPR and Plant Breeders Rights, IPR and Biodiversity.	
Unit 3		15L
3.1	Introduction to Cheminformatics: History and evolution of cheminformatics, Use of Cheminformatics, Prospects of cheminformatics, Molecular modeling and structure elucidation.	5L
3.2	Representation of molecules and chemical reactions: Nomenclature, Different types of notations, SMILES coding, Matrix representations, Structure of Molfiles and Sdfiles, Libraries and toolkits, Different electronic effects, Reaction classification.	5L
3.3	Searching Chemical Structures: Full structure search, sub-structure search, basic ideas, similarity search, three dimensional search methods, basics of computation of physical and chemical data and structure descriptors, data visualization.	5L
Unit 4	Applications:	15L
	Prediction of Properties of Compound, Linear Free Energy Relations, Quantitative Structure – Property Relations, Descriptor Analysis, Model Building, Modeling Toxicity, Structure – Spectra correlations, Prediction NMR, IR and Mass spectra, Computer Assisted Structure elucidations, Computer assisted Synthesis Design, Introduction to drug design, Target Identification and Validation, Lead Finding and Optimization, analysis of HTS data, Virtual Screening, Design of Combinatorial Libraries, Ligand based and Structure based Drug design, Application of Cheminformatics in Drug Design.	

REFERENCES:

1. Andrew R. Leach & Valerie J. Gillet (2007) *An Introduction to Cheminformatics*. Springer: The Netherlands.
2. Gasteiger, J. & Engel, T. (2003) *Cheminformatics: A textbook*. Wiley–VCH
3. Gupta, S. P. *QSAR and Molecular Modeling*. Springer-Anamaya Pub.: New Delhi.

Course Code- PSC4RMT0
Paper IV- Research Methodology

Unit 1		15 L
1.1	Print: Primary, Secondary and Tertiary sources. Journals: Journal abbreviations, abstracts, current titles, reviews, monographs, dictionaries, text-books, current contents, Introduction to Chemical Abstracts and Beilstein, Subject Index, Substance Index, Author Index, Formula Index, and other Indices with examples.	5L
1.2	Digital: Web sources, E-journals, Journal access, TOC alerts, Hot articles, Citation Index, Impact factor, H-index, E-consortium, UGC infonet, E-books, Internet discussion groups and communities, Blogs, preprint servers, Search engines, Scirus, Google Scholar, ChemIndustry, Wiki-databases, ChemSpider, Science Direct, SciFinder, Scopus.	5L
1.3	Information Technology and Library Resources: The Internet and World wide web, Internet resources for Chemistry, finding and citing published information.	5L
	Unit 2 DATA ANALYSIS	15L
	The Investigative Approach: Making and recording Measurements, SI units and their use, Scientific methods and design of experiments. Analysis and Presentation of Data: Descriptive statistics, choosing and using statistical tests, Chemometrics, Analysis of Variance (ANOVA), Correlation and regression, curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals, general polynomial fitting, linearizing transformations, exponential function fit, r and its abuse, basic aspects of multiple linear regression analysis	
Unit 3	METHODS OF SCIENTIFIC RESEARCH AND WRITING	15L
3.1	SCIENTIFIC PAPERS: Reporting practical and project work, Writing literature surveys and reviews, organizing a poster display, giving an oral presentation.	
3.2	Writing Scientific Papers: Justification for scientific contributions, bibliography, description of methods, conclusions, the need for illustration, style, publications of scientific work, writing ethics, avoiding plagiarism	
Unit 4	CHEMICAL SAFETY & ETHICAL HANDLING OF CHEMICALS	15L
	Safe working procedure and protective environment, protective apparel, emergency procedure, first aid, laboratory ventilation, safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards, procedures for working with gases at pressures above or below atmospheric pressure, safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory	

chemicals, procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system, incineration and transportation of hazardous chemicals.

REFERENCES:

1. Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J., & Jones, A., (2011), *Practical skills in Chemistry*, 2nd Ed., Prentice Hall, Harlow.
2. Hibbert, D. B. & Gooding, J. J. (2006) *Data Analysis for Chemistry* Oxford University Press.
3. Topping, J., (1984) *Errors of Observation and their Treatment* 4th Ed., Chapman Hill London.
4. Harris, D. C. (2007) *Quantative Chemical Analysis* 6th Ed., Freeman Chapters 3-5
5. Levie, R. De. (2001) *How to use Excel in Analytical Chemistry and in general scientific data analysis* Cambridge University Press.
6. Chemical Safety matters – IUPAC-IPCS, (1992) Cambridge University Press.
7. OSU Safety manual 1.01

Semester IV: Practicals

Course code: PSC4TOP0 & PSC4SOP0

Two steps preparations (Minimum 8 experiments)

1. Acetophenone → Acetophenone phenyl hydrazine → 2-phenyl indole.
2. 2-naphthol → 1-phenyl azo-2-naphthol → 1-amino-2-naphthol.
3. Cyclohexanone → cyclohexanone oxime → Caprolactum.
4. Hydroquinone → hydroquinone diacetate → 2,5-dihydroxyacetophenone.
5. 4-nitrotoluene → 4-nitrobenzoic acid → 4-aminobenzoic acid.
6. *o*-nitroaniline → *o*-phenylene diamine → Benzimidazole.
7. Benzophenone → benzophenone oxime → benzanilide.
8. *o*-chlorobenzoic acid → N-phenyl anthranilic acid → acridone.
9. Benzoin → benzil → benzilic acid.
10. Phthalic acid → phthalimide → anthranilic acid.
11. Resorcinol → 4-methyl-7-hydroxy coumarin → 4-methyl-7-acetoxy Coumarin
12. Anthracene → anthraquinone → anthrone

Note:

1. Students are expected to know (i) the planning of synthesis, effect of reaction parameters including stoichiometry, and **safety aspects including MSDS** ii) the possible mechanism, expected spectral data (IR and NMR) of the starting material and final product.
2. Students are expected to purify the product by recrystallization, measure its mass or volume, check the purity by TLC, determine physical constant and calculate percentage yield.

Course code: PSC4NPP0 & (PSC4IPP0 or PSC4RMP0)

Combined spectral identification: Interpretation of spectral data of organic compounds (UV, IR, PMR, CMR and Mass spectra).

A student will be given UV, IR, PMR, CMR, and Mass spectra of a compound from which preliminary information should be reported within first half an hour of the examination without referring to any book/reference material. The complete structure of the compound may then be elucidated by referring to any standard text-book/reference material etc.

(Minimum 8 spectral analysis)

Session-II: Project evaluation OR Internship

References for Practicals:

1. Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis- V. K. Ahluwalia and Renu Aggarwal, Universities Press India Ltd., 2000
2. Advanced Practical Organic Chemistry – N. K. Vishnoi, Third Addition, VikasPublishing House PVT Ltd
3. Systematic Laboratory Experiments in Organic Synthesis- A. Sethi, New AgeInternational Publications
4. Systematic Identification of Organic compounds, 6th edition, R. L. Shriner, R. C.Fuson and D.Y. Curtin Wiley, New York.
5. Vogel's Textbook of Quantitative Analysis, revised, J. Bassett, R. C. Denney, G. H.Jeffery and J. Mendham, ELBS
6. Experiments and Techniques in Organic Chemistry, D. Pasto, C. Johnson and M.Miller, Prentice Hall
7. Macro-scale and Micro-scale Organic Experiments, K. L. Williamson, D. C. Heath.
8. Systematic Qualitative Organic Analysis, H. Middleton, Adward Arnold.
9. Handbook of Organic Analysis- Qualitative and Quantitative, H. Clark, AdwardArnold.
10. Vogel's Textbook of Practical Organic Chemistry, Fifth edition,2008, B.S.Furniss, A. J.Hannaford, P. W. G. Smith, A. R. Tatchell, Pearson Education.
11. Laboratory Manual of Organic Chemistry, Fifth edition, R K Bansal, New AgePublishers.
12. Organic structures from spectra, L. D. Field, S. Sternhell, John R. Kalman, Wiley, 4thed., 2011.

Important Note:

1. The candidate is expected to submit a journal and project certified by the Head of the Department /institution at the time of the practical examination.
2. A candidate will not be allowed to appear for the practical examination unless he/she produces a certified journal or a certificate from the Head of the institution/department stating that the journal is lost and the candidate has performed the required number of experiments satisfactorily. The list of the experiments performed by the candidate should be attached with such certificate.
3. Use of non-programmable calculator is allowed both at the theory and the practical examination.



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)
Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Programme: M.Sc.
Course: M.Sc.-II
Analytical Chemistry
Choice Based Credit, Grading and Semester System (60:40)
w.e.f. Academic Year 2020-2021

M. Sc. Analytical Chemistry

For the subject of analytical chemistry there shall be four papers for 60 lectures each comprising of four units of 15 L each.

Semester-III

1. Paper-I / Quality in Analytical Chemistry
2. Paper-II / Advanced Instrumental Techniques
3. Paper- III / Bio-analytical Chemistry and Food Analysis
4. Paper- IV (Elective course-1)/ Environmental and Certain Industrially Important
Materials
(Elective course-2)/ Pharmaceutical and Organic Analysis

Semester-II

1. Paper-I / Quality in Analytical Chemistry
2. Paper-II / Advanced Instrumental Techniques
3. Paper- III/ Selected Topics in Analytical Chemistry
4. Paper- IV (Optional course-1)/ Intellectual Property Rights & Cheminformatics
(Optional course-2)/ Research Methodology

Choice Based Credit ,Grading and Semester System (CBCGS)

To be implemented from the Academic year 2020-2021

M.Sc.-II Analytical Chemistry

Semester- III

Course Code	Unit	Topics	Credits	L / Week
PSC3QAC	I	Quality in Analytical Chemistry-I	4	1
	II	Quality in Analytical Chemistry-II		1
	III	Chromatographic Techniques-I		1
	IV	Chromatographic Techniques-II		1
PSC3AIT	I	Spectral Methods -I	4	1
	II	Spectral Methods -II		1
	III	Electroanalytical Methods		1
	IV	Miscellaneous Techniques		1
PSC3BCF	I	Bio-analytical Chemistry	4	1
	II	Immunological Methods		1
	III	Food analysis-I		1
	IV	Food analysis-II		1
PSC3ENC	I	Air Pollution	4	1
	II	Water Quality Standards		1
	III	Other Types of Pollution		1
	IV	Industrial Materials		1
PSC3POA	I	Pharmaceutical Analysis	4	1
	II	Drugs		1
	III	Forensic Analysis		1
	IV	Cosmetics Analysis		1
PSC3QAP PSC3AIP PSC3BCP PSC3ENP/ PSC3POP	-	Practical Course	8	16

**Choice Based Credit ,Grading and Semester System (CBCGS)
To be implemented from the Academic year 2020-2021
M.Sc.-II Analytical Chemistry
Semester- IV**

Course Code	Unit	Topics	Credits	L / Week
PSC4QAC	I	Separation Science	4	1
	II	Separation, Analysis and Standardization of Herbal based products		1
	III	Green Chemistry		1
	IV	Advanced Techniques		1
PSC4AIT	I	Spectral Methods -III	4	1
	II	Spectral Methods -IV		1
	III	Radiochemical and Thermal Methods		1
	IV	Hyphenated Techniques		1
PSC4STA	I	Effluent Treatment	4	1
	II	Solid Waste Management		1
	III	Plastics and Polymers		1
	IV	Metallurgy		1
PSC4IPR	I	Introduction to Intellectual Property Rights-I	4	1
	II	Introduction to Intellectual Property Rights-II		1
	III	Introduction to Chemoinformatics		1
	IV	Application of Chemoinformatics		1
PSC4REM	I	Resources	4	1
	II	Data Analysis		1
	III	Methods of Scientific Research and Writing		1
	IV	Chemical Safety and Ethical Handling of Chemicals		1
PSC4QAP PSC4AIP PSC4STP	-	Practical Course	8	16
PSC4IPP/ PSC3REP		Project Evaluation / Industrial Internship		

Choice Based Credit, Grading and Semester System (CBCGS)
(To be implemented from the Academic year 2020-2021)

	M.Sc. ANALYTICAL CHEMISTRY SEMESTER – III PSC3QAC Quality in Analytical Chemistry	
UNIT I	Quality In Analytical Chemistry - I	
	<p>1.1 Sampling: Definition, types of sample, sampling plan, quality of sample, subsampling, Sampling of raw materials, intermediates and finished products. Sample preparations – dissolution technology and decomposition, storage of samples. Pre-treatment of samples: soil, food and cosmetics. (8L)</p> <p>1.2 Selection of the Method: sources of methods, factors to consider when selecting a method, performance criteria for methods used, reasons for incorrect analytical results, method validation, and quality by design (PAT).(7L)</p>	
UNIT II	Quality In Analytical Chemistry - II	15
	<p>2.1 Measurement of uncertainty: Definition and evaluation of uncertainty, putting uncertainty to use, interpretation of results and improving the quality of results. (4L)</p> <p>2.2 Signal to noise: Signal to noise ratio, sources of noise in instrumental analysis. Signal to noise enhancement, hardware devices for noise reduction, software methods for noise reduction. (6L)</p> <p>2.3 Pharmaceutical Legislation: introduction to drug acts, drug rules (schedules), concept of regulatory affairs in pharmaceuticals, review of GLP and GMP and their regulations for analytical labs, roles and responsibilities of personnel, appropriate design and placement of laboratory equipment, requirements for maintenance and calibration. (5L)</p>	
UNIT III	Chromatographic Techniques –I	15
	<p>3.1 Ion exchange chromatography: Ion exchange equilibria, breakthrough capacity, inorganic ion exchangers, synthetic ion exchangers, chelating resins and their applications for separation of inorganic and organic compounds. (8L)</p> <p>3.2 Ion chromatography: Principle, instrumentation with special reference to separation and suppressor columns, applications. (2L)</p> <p>3.3 Exclusion chromatography: Theory, instrumentation and applications of gel permeation chromatography, retention behavior, inorganic molecular sieves, determination of molecular weight of polymers, (5L)</p>	
UNIT IV	Chromatographic Techniques –II	15
	<p>4.1 Supercritical fluid Chromatography: Theory, concept of critical state of matter and supercritical state, types of supercritical fluids, instrumentation, applications to environmental, food, pharmaceuticals and polymeric analysis.</p>	

(8L)

CKT College New Panvel (F.Y.B.Sc, Chemistry Syllabus)

4.2 Affinity Chromatography: principle, instrumentation and applications (4L)

Optimum pressure liquid chromatography (OPLC) (3L)

SEMESTER-III

PSC3AIT

Advance Instrumental Techniques

UNIT I	Spectral Methods I	15
	<p>1.1 Surface Analytical Techniques: Preparation of the surface, difficulties involved in the surface analysis. (1L) Principle, instrumentation and applications of Transmission Electron Microscopy (TEM)</p> <p>1.2 Principle, instrumentation and applications of the following:</p> <ol style="list-style-type: none">Secondary Ion mass spectroscopy. (4L)Low-Energy Ion Scattering and Rutherford Backscattering (5L)Atomic Emission Spectroscopy- electrical discharge sources (2L)	
UNIT II	Spectral Methods – II	15
	<p>Principle, Instrumentation, and Applications of</p> <p>2.1 Electron Spin Resonance Spectroscopy (ESR) (5L)</p> <p>2.2 Mossbauer's Spectroscopy (5L)</p> <p>2.3 Particle-Induced X-Ray Emission (5L)</p>	
UNIT III	Electroanalytical Methods	15
	<p>Advanced Electroanalytical Techniques:-</p> <p>3.1 Current Sampled (TAST) Polarography, Normal and Differential Pulse Polarography (3L)</p> <p>3.2 Potential Sweep methods- Linear Sweep Voltammetry and Cyclic voltammetry. (3L)</p> <p>3.3 Potential Step method- Chronoamperometry (2L)</p> <p>3.4 Controlled potential technique- Chronopotentiometry (2L)</p> <p>3.5 Stripping Voltammetry- anodic, cathodic, and adsorption (2L)</p> <p>3.6 Chemically and electrolytically modified electrodes and ultra-microelectrodes in voltammetry (3L)</p>	
UNIT IV	Miscellaneous Techniques	15
	<p>Principle, Instrumentation and Applications of:</p> <p>4.1 Chemiluminescence techniques(3L)</p> <p>4.2 Chiroptical Methods : ORD, CD (5L)</p> <p>4.3 Photoacoustic spectroscopy (3L)</p> <p>4.4 Spectroelectrochemistry (4L)</p>	

Bioanalytical Chemistry and Food Analysis

UNIT I	Bioanalytical chemistry	15
	<p>1.1 Body Fluids</p> <p>1.1.1 Composition of body fluids and detection of abnormal levels of glucose, creatinine, uric acid in blood, protein, ketone bodies and bilirubin in urine leading to diagnosis of diseases. (5L)</p> <p>1.1.2 Physiological and nutritional significance of vitamins (water soluble and fat soluble) and minerals. (5L)</p> <p>1.1.3 Analytical techniques (including microbiological techniques) for vitamins. (5L)</p>	
UNIT II	Immunological Methods	15
	2.1 General processes of immune response, antigen-antibody reactions, precipitation reactions, radio, enzyme and fluoro-immuno assays.(8L)	
	2.2 Human Nutrition: Biological values and estimation of enzymes, carbohydrates, proteins, essential amino acids and lipids.(7L)	
UNIT III	Food Analysis - I	15
	3.1 Fuel value of food and importance of food nutrients (2L)	
	<p>3.2</p> <p>3.2.1 General idea about Food processing and preservation;</p> <p>3.2.2 Food Additives: Legislation, Chemical preservatives, fortifying agents, emulsifiers, texturizing agents, flavours, colours, artificial sweeteners, enzymes.</p> <p>3.2.3 Analysis of food for additives: Determination of SO₂, nitrate and nitrites; determination of ascorbic acid; identification and determination of saccharine and identification of colors in food, natural colours (5L)</p>	
	3.3 Food Contaminants– Trace metals and pesticide residues, contaminants from industrial wastes (polychlorinated biphenyls, dioxins), toxicants formed during food processing (aromatic hydrocarbons, nitrosamines), veterinary drug residues and melamine contaminants. (8L)	
UNIT IV	Food Analysis - II	15
	<p>4.1</p> <p>4.1.1 Food packaging – Introduction, types of packing materials, properties and industrial requirements.(2L)</p> <p>4.1. 2 Processing and Quality requirements of Milk and milk products (cheese, butter and ice cream), vegetables and fruits, meat and meat products. (6L)</p>	
	4.2. Analysis of Milk – Fat content, proteins, acidity, bacteriological quality and milk adulterants.(2L)	
	4.3 Analysis of Oils and Fats – acid value, sap value, iodine value. Determination of rancidity and antioxidants.(2L)	
	4.4 Analysis of spices (cloves, cinnamon, pepper, mustard) Determination of volatile oils and fixed oils.(3L)	

SEMESTER-III

PSC3ENC

Environmental and Certain Industrially Important Materials

UNIT I	Air Pollution	15
	1.1 Sources, classification, pollutants and permissible limits.(2L) 1.2 Sampling methods for air, flew gas ,Industrial Exhaust, stag samples etc. (2L) 1.3 Importance of automobile exhaust control and its limits(2L) 1.4 Sampling and analysis of: Particulate matter, aerosols, ammonia and organic vapors. (3L) 1.5 Carbon credit and global issues related to air pollution.(3L) 1.6 Greenhouse gases and their substitutes. (1L) 1.7 Environmental Legislation: role of pollution control boards, article 48A and 51A, Motor Vehicle Act and method of analysis with respect to PUC. (2L)	
UNIT II	Water Quality Standards	15
	2.1 Water: quality and requirements of potable water, direct and indirect pollutants for potable water reservoirs, quality of potable water from natural sources. (6L) 2.2 Bore well water quality and analytical parameters. Quality of bottled mineral water (3L) 2.3 Process of purification of bore well water to bottled mineral water. (2L) 2.4 Regulatory requirements for packaged drinking water (4L)	
UNIT III	Other Types Of Pollution	15
	3.1 Soil pollution and Soil Analysis : sources of soil pollution and their control, sampling of soil, determination of water holding capacity, determination total nitrogen, ammonia and nitrates, fertility of soil and effect of pollution on it, synthetic fertilizers and their long term effect on soil quality. (6L) 3.2 Noise Pollution : sources, effects, methods of measurements and control measures.(2L)	

	<p>3.3 Thermal Pollution: definition, source, impact, control measures, working of cooling towers and cooling ponds, involved economy. (3L)</p> <p>3.4 Radioactive pollutants: source, exposure hazards, precautions in handling and safety, Long term effects. (2L)</p> <p>3.5 Environmental Audits: concept of audit, authorities, evaluation methodology, benefits and certification (2L)</p>	
UNIT IV	Industrial Materials	15
	<p>4.1 Insecticides, Pesticides: definition, classification of insecticides pesticides. Biodegradation of insecticides and pesticides (5L).</p> <p>4.2 Soaps and Detergents: classification and composition, qualitative analysis, quantitative analysis of detergents- alkalinity, active ingredients and oxygen releasing capacity. Biodegradable detergents (5L)</p> <p>4.3 Petrochemical products: crude oils, fuels, and calorific values, fractional distillation process and fractions, properties of fuel, composition of fuel, flashpoint, fire point, corrosion test, carbon residue and impact on environment. (5L)</p>	

PSC3POA

Pharmaceutical and Organic Analysis

UNIT I	Pharmaceutical Analysis	15
	<p>1.1 General idea regarding the Pharmaceutical Industry, definition and classification of drugs, introduction to pharmaceutical formulations and novel drug delivery system, classification of dosage forms. Role of FDA in pharmaceutical industries.(7L)</p> <p>Standardization and quality control of raw material and finished product Assay as per IP i) adrenaline, ii) Cephalexin, iii) ferrous fumarate, iv) paracetamol. (8L)</p>	
UNIT II	Drugs	15
	<p>2.1 Analysis of compounds based on functional groups, instrumental methods for analysis of drugs, proximate assays, assays of enzyme containing substances, biological and microbiological assays and tests. (8L)</p> <p>2.2 Limit tests, Sources of impurities and impurity profiling solubility tests, disintegration tests, stability studies, bioequivalence and bioavailability studies.(7L)</p>	
UNIT III	Forensic Science	15
	3.1 Analytical Chemistry in Forensic Science: General idea.(2L)	

	<p>3.2 Forensic Analysis: <i>CKT College New Panvel (F.Y.B.Sc, Chemistry Syllabus)</i></p> <p>3.2.1 Blood: Blood preservation blood stain analysis.)</p> <p>3.2.2 DNA profiling DNA typing procedures-RFLP, PCR, MVRPCR, Dot-blot, AMP-FLP, STR, other methods, paternity testing,</p> <p>3.2.3 Hair analysis: Structure and composition of hair, morphological examination, Chemical analysis of hair components and components remaining on or in hair.)</p> <p>3.2.4 Alcohol in body fluids: Sampling and sample preservation, analysis - GC, IR, enzymatic and other methods (5L)</p> <p>3.3 Analytical Toxicology: Isolation, identification and determination of:</p> <p>3.3.1 Narcotics: Heroin, morphine and cocaine.</p> <p>3.3.2 Stimulants: Amphetamines and caffeine.</p> <p>3.3.3 Depressants: Benzodiazepines, Barbiturates.</p> <p>3.3.4 Hallucinogens: LSD and Cannabis.</p> <p>3.3.5 Metabolites of drugs in blood and urine of addicts.</p> <p>3.3.6 Viscera, stomach wash, vomit and postmortem blood for poisons like – cyanide, arsenic, mercury, insecticides and pesticides. (8L)</p>	
UNIT IV	Cosmetic Analysis	15
	4.1 Cosmetics: Introduction. Evaluation of cosmetic materials, raw materials and additives. Formulation, standards and methods of analysis.(2L)	
	4.2 Deodorants and antiperspirants: Al, Boric acid, chlorides, sulphates, and methanamine. (3L)	
	4.3 Face powder: Ti, Fe, oxides of Ti, Fe and Al (total).(2L)	

	<p>4.4 Hair tonic: 2,5-diaminotoluene, potassium borates, sodium perborate, pyrogallol, resorcinol, salicylic acid, dithioglycollic acid (in permanent wavers)(4L)</p>	<p><i>CKP College New Panvel (F. Y. B. Sc, Chemistry Syllabus)</i></p>
	<p>4.5 Creams and Lotions: Types of emulsions, chloroform soluble materials, glycerol, pH emulsion, ash analysis, nonvolatile matter (IR spectroscopy) (3L)</p>	
	<p>4.6 Lipsticks: General analysis, lakes and fillers, trichloroethylene-acetone soluble contents.(1L)</p>	

SEMESTER-III PRACTICALS
PSC3QAP

1. Determination of the pK value of an indicator.
2. Determination of copper and bismuth in mixture by photometric titration.
3. Estimation of strong acid, weak acid and salt in the given mixture conductometrically.
4. Analysis of mixture of carbonate and bicarbonate (present in ppm range) using pHmetry.
5. Determination of copper by extractive photometry using diethyldithiocarbamate.

PSC3AIP

1. Estimation of drugs by non aqueous titration: Pyridoxine hydrochloride, Sulphamethoxazole.
2. Determination of percentage purity of methylene blue indicator.
3. Estimation of cholesterol and Uric acid in the given sample of blood serum
4. Estimation of fluoride in a tooth paste.
5. Determination of silica by molybdenum blue method.

PSC3BCP

1. Total reducing sugars before and after inversion in honey using: (a) Cole's Ferricyanide (b) Lane - Eynon method.
2. Analysis of lactose in milk
3. Estimation of Caffeine in tea
4. Estimation of Vitamin C in lemon Juice/squash by Dichlorophenol-indophenol method
5. Iodine value of oil / fat
6. Estimation of micronutrient from food by AAS (any two elements such as Fe, Cu, Zn, Mo, B, Mn)

PSC3ENP/ PSC3POP

1. To analyze Pyrolusite for: Fe by colorimetry and / or Mn by volumetry.
2. Analysis of Nicrome alloy for Ni (complexometry)
3. Analysis of Bauxite for Ti by colorimetry / Al by gravimetry / Fe (volumetry)
4. Analysis of water sample: Total hardness and salinity.
5. Analysis of water sample: Acidity and sulphate(Benzidine method).

NOTE:

1. The candidate is expected to submit a journal certified by the Head of the Department / institution at the time of the practical examination.
2. A candidate will not be allowed to appear for the practical examination unless he / she produces a certified journal or a certificate from the Head of the institution/department stating that the journal is lost and the candidate has performed the required number of experiments satisfactorily.
3. The list of the experiments performed by the candidate should be attached with such certificate.
4. Use of non-programmable calculator is allowed both at the theory and the practical examination.

SEMSTER-IV

PSC4QAC

Quality In Analytical Chemistry

UNIT I	Separation Science	15
	<p>1.1 Membrane separation processes: operating principles and applications of microfiltration, ultra-filtration, reverse osmosis, dialysis and electro-dialysis. (8L)</p> <p>1.2 Applications of Solvent extraction in Analytical Chemistry- recapitulation of solvent extraction, roles of solvent extraction in analytical chemistry, solvent extraction in sample preparation and pretreatment steps, solvent extraction as a means of analytical determination (7L)</p>	
UNIT II	Separation, Analysis and Standardization of Herbal based products.	15
	<p>2.1 Herbs as a raw material: Definition of herb, herbal medicine, herbal Medicinal products, herbal drug preparation. Sources of herbs. Selection, identification and authentication of herbal materials, drying and processing of herbal raw materials, drying and processing of herbal raw material.(6L)</p> <p>2.2 Extraction of herbal materials: Choice of solvent for extraction, methods used for extraction and principles involved in extraction.(3L)</p> <p>2.3 Standardization of herbal formulation and herbal extracts: Standardization of herbal extract as per WHO cGMP guidelines, Physical, Chemical, Spectral and toxicological standardization, qualitative and quantitative estimations.(6L)</p>	

UNIT III	Green Chemistry	15
	<p>3.1 Principle and concepts of green chemistry: sustainable development and green chemistry, atom economy, examples of atom economic and atom uneconomic reactions, reducing toxicity (4L)</p> <p>3.2 Organic solvents: environmentally benign solutions, solvent free systems, supercritical fluids (only introduction) Ionic liquids as catalysts and solvents (4L)</p> <p>3.3 Emerging Green Technologies: photochemical reactions (advantages and challenges), examples. Chemistry using microwaves, sonochemistry and electrochemical synthesis. (4L)</p> <p>3.4 Designing Greener Processes: Inherently Safer Designs (ISD), Process intensification (PI) in-process monitoring. (3L)</p>	
UNIT IV	Advanced Techniques	15
	<p>4.1 Electrophoresis: introduction, factors affecting migration rate, supporting media (gel, paper, cellulose, acetate, starch, polyacrylamide, agarose, sephedax and thin layers) (2L)</p> <p>4.2 Techniques of Electrophoresis: low and high voltage, sds-page, continuous electrophoresis, capillary electrophoresis, zone, gel, isoelectric focusing, isotaechophoresis and miceller electro kinetic capillary chromatography, instrumentation, detection and applications. (8L)</p> <p>4.3 Introduction to Nanotechnology: One dimensional nano materials (nanofilms, nanolayers), two dimensional nanomaterials (nanotubes, nanowires), three dimensional nanomaterials (nanoparticles and quantum dots); consequences of the nanoscale, (morphology, electronic structure, optical properties), Applications of UV-Vis, IR and Raman, X-ray diffraction, SEM, TEM and XPS, probe analysis (AFM) in characterization of nanomaterials. (5L)</p>	

SEMESTER-IV

PSC4AIT

Advanced Instrumental Techniques

UNIT I	Spectral Methods III	15
	<p>NMR Spectroscopy 1.1 Theory and Instrumentation- recapitulation, FTNMR, 2D NMR,- FID signal generation mechanism, Techniques in 2D NMR- homo nuclear correlation spectroscopy (COSY), total correlation spectroscopy (TOCSY), heteronuclear correlation (HETCOR) (9L) 1.2 Radio waves in imaging- principle instrumentation and applications of MRI (3L) 1.3 Application of NMR to other nuclei C¹³, P³¹ and F¹⁹ spectroscopy (3L)</p>	
UNIT-II	Spectral Methods IV	15
	<p>2.1 Mass spectrometry: recapitulation, correlation of mass spectra with molecular structure- interpretation of mass spectra, analytical information derived from mass spectra- molecular identification, metastable peaks, Fragmentation Reactions (9L) 2.2 Raman spectroscopy: Principle Theory Instrumentation , techniques(SERS and Resonance Raman) and Applications of Raman spectroscopy (6L)</p>	
UNIT III	Radiochemical And Thermal Methods	15
	<p>3.1 Activation analysis- NAA ,radiometric titrations and radio-release methods(7L) 3.2 Thermal analysis- Principle, Interfacing , instrumentation and Applications of (a) Simultaneous Thermal Analysis- TG-DTA and TG-DSC (b) Evolved gas analysis- TG-MS and TG-FTIR (8L)</p>	
UNIT IV	Hyphenated Techniques	15
	<p>4.1 concept of hyphenation, need for hyphenation, possible hyphenations. (2 L) 4.2 Interfacing devices and applications of GC – MS, ICP -MS, GC - IR, Tandem Mass Spectrometry, LC – MS: HPLC-MS, CE-MS. (13L)</p>	

SEMESTER – IV

PSC3STA

Selected Topics in Analytical Chemistry

UNIT I	Effluent Treatment	15
	1.1 Effluent treatment plant general construction and process flow charts(3L) 1.2 Treatment and disposal of Sewage.(3L) 1.3. Effluent parameters for metallurgical industry.(2L) 1.4 Permissible limits for metal (example Cr, As, Pb, Cd etc) traces in the effluent.(2L) 1.5 Recovery of metals from effluent, modern methods – Electrodialysis, Electrodeposition and Ion Exchange etc.(3L) 1.6 Recycle and reuse of process and treated (effluent) water(2L)	
UNIT – II	Solid Waste Management	15
	2.1 Solid waste management: objectives, concept of recycle, reuse and recovery (3L) 2.2 Methods of solid waste disposal.(2L) 2.3 Treatment and disposal of sludge / dry cake (3L) 2.4 Managing non-decomposable solid wastes(2L) 2.5 Bio- medical waste : Introduction , Classification and methods of disposal (5L)	
UNIT – III	Plastics and Polymers	15
	3.1 Classification of plastic, determination of additives, molecular weight distribution, analysis of plastic and polymers based on styrene, vinyl chloride, ethylene, acrylic and cellulosic plastics. (5L) 3.2 Metallic impurities in plastic and their determination, (2L) 3.3 Impact of plastic on environment as pollutant.(2L) 3.4 Paints and pigments: Types of paints pigments, determination of volatile and non - volatile components, Flash point (significance and method of determination), separation and analysis of pigments, binders and thinners.(3L) 3.5 Role of Organo silicones in paints and their impact on environment.(3L)	
UNIT – IV:	Metallurgy	15
	4.1 Ores and minerals: Dressing of ores, pollution due to metallurgical processes (ore dressing, calcination, smelting) (3L) 4.2 Chemical analysis of ores for principal constituents : Galena, Pyrolusite, Bauxite, Hematite, Monazite (4L) 4.3 Alloys: definition, analysis of Cupronickel, Magnesium, Steel And Stainless Steel, Bronze, Gun metal.(4L) 4.4 Techniques of purification: Zone refining, analysis of high purity materials like silicon , vacuum fusion and extraction techniques. (4L)	

SEMESTER – IV

PSC4IPR

Intellectual Property Rights & Cheminformatics

UNIT I	Introduction to Intellectual Property-I	15
	<p>1.1 : Historical Perspective, Different types of IP, Importance of protecting IP.(2L)</p> <p>1.2: Patents: Historical Perspective, Basic and associated right, WIPO, PCT system, Traditional Knowledge, Patents and Health care-balancing promoting novation with public health, Software patents and their importance for India (5L)</p> <p>1.3: Industrial Designs: Definition, How to obtain, features, International design registration.(2L)</p> <p>1.4: Industrial Designs: Definition, How to obtain, features, International design registration.(2L)</p> <p>1.5: Trade Marks: Introduction, How to obtain, Different types of marks – Collective marks, certification marks, service marks, trade names etc. (2L)</p> <p>1.6: Geographical Indications: Definition, rules for registration, prevention of illegal exploitation, importance to India. (2L)</p>	
UNIT – II	Introduction to Intellectual Property-II	15
	<p>2.1 Trade Secrets: Introduction and Historical Perspectives, Scope of Protection, Risks involved and legal aspects of Trade Secret Protection.[2L]</p> <p>2.2 IP Infringement issue and enforcement: Role of Judiciary, Role of law enforcement agencies – Police, Customs etc. [2L]</p> <p>2.3 Economic Value of Intellectual Property: Intangible assests and their valuation, Intellectual Property in the Indian context – Various Laws in India Licensing and Technology transfer. [5L]</p> <p>2.4 Different International agreements: (a) World Trade Organization (WTO): [5L] (i) General Agreement on Tariffs and Trade (GATT), Trade Related Intellectual Property Rights (TRIPS) agreement (ii) General Agreement on Trade Related Services (GATS); Madrid Protocol. (iii) Berne Convention (iv) Budapest Treaty (b) Paris Convention [6L] WIPO and TRIPS, IPR and Plant Breeders Rights, IPR and Biodiversity</p>	
UNIT – III	Introduction to Chemoinformatics	15
	<p>3.1 History and evolution of cheminformatics, Use of Cheminformatics, Prospects of cheminformatics, Molecular modeling and structure elucidation.[5L]</p> <p>3.2 Representation of molecules and chemical reactions: Nomenclature, Different types of notations, SMILES coding, Matrix representations, Structure of Molfiles and Sdfiles, Libraries and toolkits, Different electronic effects, Reaction classification. [5L]</p> <p>3.3 Searching Chemical Structures: Full structure search, sub-structure search, basic ideas, similarity search, three dimensional search methods,</p>	

	basics of computation of physical and chemical data and structure descriptors, data visualization. [5L]	
UNIT – IV	Applications of Chemoinformatics	15
	Prediction of Properties of Compound, Linear Free Energy Relations, Quantitative Structure – Property Relations, Descriptor Analysis, Model Building, Modeling Toxicity, Structure – Spectra correlations, Prediction NMR, IR and Mass spectra, Computer Assisted Structure elucidations, Computer assisted Synthesis Design, Introduction to drug design, Target, Identification and Validation, Lead Finding and Optimization, analysis of HTS data, Virtual Screening, Design of Combinatorial Libraries, Ligand based and Structure based Drug design, Application of Cheminformatics in Drug Design.	

SEMESTER – IV
PSC4REM
Research Methodology

UNIT I	Resources	15
	<p>1.1 Print: Primary, Secondary and Tertiary sources.</p> <p>1.2 Journals: Journal abbreviations, abstracts, current titles, reviews, monographs, dictionaries, text-books, current contents,</p> <p>1.3 Introduction to Chemical Abstracts and Beilstein, Subject Index, Substance Index, Author Index, Formula Index, and other Indices with examples.[5L].</p> <p>1.4 Digital: Web sources, E-journals, Journal access, TOC alerts, Hot articles, Citation Index, Impact factor, H-index, E-consortium, UGC infonet, E-books,</p> <p>Internet discussion groups and communities, Blogs, preprint servers, Search engines, Scirus, Google Scholar, ChemIndustry, Wiki-databases, ChemSpider, Science Direct, SciFinder, Scopus. [5L]</p> <p>Information Technology and Library Resources: Internet and World wide web, Internet resources for Chemistry, finding and citing published information. [5L]</p>	
UNIT – II	Data Analysis	15
	<p>2.1 The Investigative Approach: Making and recording Measurements, SI units and their use, Scientific methods and design of experiments.</p> <p>2.2 Analysis and Presentation of Data: Descriptive statistics, choosing and using statistical tests, Chemometrics, Analysis of Variance (ANOVA), Correlation and regression, curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals, general polynomial fitting, linearizing transformations, exponential function fit, r and its abuse, basic aspects of multiple linear regression analysis.</p>	
UNIT – III	Methods of Scientific Research and Writing	15
	<p>3.1 Scientific papers: Reporting practical and project work, Writing literature surveys and reviews, organizing a poster display, giving an oral presentation.</p> <p>3.2 Writing Scientific Papers: Justification for scientific contributions, bibliography, description of methods, conclusions, the need for illustration, style, publications of scientific work, writing ethics, avoiding plagiarism.</p>	
UNIT – IV	Chemical Safety & Ethical Handling of Chemicals	15
	<p>Safe working procedure and protective environment, protective apparel, emergency procedure, first aid, laboratory ventilation, safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards, procedures for working with gases at pressures above or below atmospheric pressure, safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals, procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system, incineration and transportation of hazardous chemicals..</p>	

PRACTICALS

PSC4QAP

1. Determination of pK value of H_3PO_4 potentiometrically
2. Estimation of Na^+ in dairy whitener by flame photometry
3. Spectrophotometric determination of pH of buffer solution.
4. Estimation of Fe^{3+} and Fe^{2+} spectrophotometrically by H_2O_2 method
5. To analyze Bronze for Zn by complexometric method

PSC4AIP

1. Analysis of Aspirin/paracetamol as per IP with respect to identification, ash and assay
2. Analysis of detergents: Active detergent matter, alkalinity and Oxygen releasing capacity
3. Determination of the purity of crystal violet
4. Estimation of Ca in Ca-pentathionate/calcium lactate tablets
5. Canned food: Limits test for tin/zinc

PSC4STP

1. Analysis of Calcium, Iron and phosphorous in milk.
2. Determination of SAP value of oil.
3. Estimation of Aldehyde in lemon grass oil / Cinnamon oil
4. Estimation of Glucose by Folin-Wu method
5. Analysis of water sample : Mn^{2+}

PSC4IPP/PSC4REP

Project Evaluation/ Industrial Internship



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW
PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: Post-Graduate Diploma in
Analytical Instrumentation
Total Credits: 20

SYLLABUS

(Approved in the Academic council meeting held on-----)

Post-Graduate Diploma in
Analytical Instrumentation

as per
Choice Based Credit & Grading System (60:40)
w. e. f. Academic Year 2022-23

Preface

Post Graduate Diploma in Advanced Analytical Instrumentation Programme is offered by Changu Kana Thakur Arts, Commerce and Science College, New Panvel is the initiative towards the “Skill India” and “Make in India” campaign by Hon. Prime Minister Narendra Modi. This programme is designed to cater the needs of the qualified trained analytical personnel working in Industries, laboratories, R & D centres and academic institutions. Specifically, it is useful for all the science graduates of our institute and the other institutes aspiring to get employment in industries and pursuing research as well. The chemists working in the industry need to be academically revitalised for total quality management, good laboratory practices and modern analytical instrumentation. The course will bridge the gaps and differences between industry and academic institutions. As the course is based on practical aspects of analysis including handling of highly sophisticated analytical instruments it would be able to accomplish all these targets envisaged.

The participants of this course will have knowledge sample testing, laboratory management, analysis methods, record keeping, technical writing and related activities. They will have job opportunities in Quality control, Quality assurance and R & D, Analytical Development departments / sections in the industries and onsite labs. Those who are already working in these areas will be benefitted by the programme in terms of career enhancement and growth within the organisation or at the time of switching their organisations.

Course Details

✚ **Course type** : P G Diploma course

✚ **Course Title** : Post Graduate Diploma in Advanced Analytical Instrumentation

✚ **Course Objectives:**

- To Provide thorough knowledge and hands- on experience of highly sophisticated analytical instruments and laboratory techniques
- To familiarize the students with Quality control processes, GMP, GLP etc.
- To provide Practice based learning and improvements.
- To train the students with skills, that can meet the requirements of industry.

✚ **Course Outcomes**

After completing the program, students will be able to

- Prepare solutions of various strength, reagents used for Instrumental analysis
- Analyze real sample on sophisticated analytical instruments using SOPs
- Demonstrate handling of troubleshooting abilities on the instruments during actual analysis.
- Intreprete of chromatographic and spectroscopic analytical data

✚ **Eligibility:** B.Sc. in the discipline of Chemistry; Microbiology; Biotechnology, Candidates appearing for the final year of Bachelor's degree or awaiting their results, are also eligible.

✚ **Intake capacity:** 20

✚ **Duration:** 1 Y

✚ **Fees:** Rs. 20000/-

✚ **Course coordinator:**

Email:

✚ **Career opportunities:** Quality control, Quality assurance and R&D/Analytical Development departments/sections of food, pharma API/Formulation Mfg, chemical industries and onsite labs. Those who are already working in these areas will be benefitted by the programme in terms of career enhancement and growth within the organisation or at the time of switching their organisations.

 COURSE STRUCTURE:

SEMESTER I					
Course	Course Name	Contact hrs.	Marks allotted		Credits allotted
			CIE	final	
Course1	Fundamentals of Chemical and Pharmaceutical analysis	30	40	60	02
Course 2	Advanced Spectroscopic Techniques	30	40	60	02
Laboratory 1	Practical in Spectroscopic techniques	30	50		02
Laboratory 2	Spectral analysis and Interpretation of data	30	50		02
Project	Dissertation	30	50		02
Total			350		10
SEMESTER II					
Course	Course Name	Contact hrs.	Marks allotted		Credits allocated
			CIA	Final	
Course1	Quality Management system, sample management and safety in industry	30	40	60	02
Course 2	Advanced Chromatographic techniques	30	40	60	02
Laboratory 1	Practical in chromatographic techniques	30	50		02
Laboratory 2	Practical in method development and method validation	30	50		02
Industrial Training (1 to 3 months) (Report)		30	50		02
Total			350		10

SEMESTER I

Course I : Basic Understanding of Chemical and Pharmaceutical analysis

Course No.	Course name	Course code
I	Basic Understanding of Chemical and Pharmaceutical analysis	PDAI1BCP
Module	Description	Teaching hours
	<ul style="list-style-type: none"> The foundation module is designed to provide a background in analytical techniques and introduce new concepts in Quality Control and Statistics. A crucial component of the foundation module is the introduction of Industrial Ethics and Law, which prepares students for dealing with Industrial Regulatory issues and compliance. 	
1.1	Basic Understanding of Chemical and Pharmaceutical analysis	03
1.2	Evaluation of Method of Analysis, Pharmacopoeias Monographs, Routine Testing, and Verification studies, Method Development and Method Validation. - ICH guidelines for Analytical Method Validation Q2A	08
1.3	- Specialized Analytical Techniques: Karl Fischer Titrator, digital M.P./B.P. meter, Kjeldahl apparatus.	04

Course II : Advanced Spectroscopic Techniques

Course No.	Course name	Course code
II	Advanced Spectroscopic techniques	PDAI1AST
Module	description	Teaching hours
2.1	Spectroscopic Methods	

	<ul style="list-style-type: none"> - UV-VIS spectroscopy, - FTIR spectroscopy, - Flame photometry - Atomic absorption spectroscopy - Mass Spectroscopy 	15
	<ul style="list-style-type: none"> - Principle behind Spectroscopy. - Operation, Cleaning and Calibration of Spectroscopy Instruments. - Safety Measurements - Maintenance of instruments 	

Laboratory1

Course No.	Course name	Course code
III	Practical in Spectroscopic techniques	PDAI1PST
Module	description	Teaching hours
Practical Training will be provided in Analytical Techniques, Project based Techniques, Utilization of wide range of Lab Instrumentation including Spectroscopy and Chromatography.		
2.1	<ol style="list-style-type: none"> 1. Determination of Paracetamol Tablet by UV-visible spectrophotometry 2. Determination of Metformin hydrochloride tablet by UV-visible Spectrophotometry 3. Recording of the UV Scan of the Ibuprofen compound by UV Spectrophotometry 4. Determination of P₂O₅ content in given sample of phosphatic fertilizers. 5. Study of the FT-IR spectrum of Salicylic acid on FT-IR Spectrophotometer. 6. Study of the FT-IR spectrum of caffeine by FT-IR spectrophotometer. 7. Determination of Copper content in given water sample by AAS 8. Determination of Calcium in milk sample 	30

Laboratory 2

Course No.	Course name	Course code
IV	Practical in Spectral analysis and Interpretation of Data	PDAI1PSI
Module	description	Teaching hours
Practical Training will be provided in spectral analysis and interpretation of spectral data.		
2.1	1. Spectral analysis and Interpretation of Spectral Data	30

SEMESTER II

Course I : Quality Management system, sample management and safety in industry

Course No.	Course name	Course code
I	Quality Management system, sample management and safety in industry	PDAI2QMS
Module	Description	Teaching hours
<ul style="list-style-type: none"> The foundation module is designed to provide a background in analytical techniques and introduce new concepts in Quality Control and Statistics. A crucial component of the foundation module is the introduction of Industrial Ethics and Law, which prepares students for dealing with Industrial Regulatory issues and compliance. 		
1.1	Quality Management System- <ul style="list-style-type: none"> Quality Assurance, Documentation- SOPs, Manuals, Log Books, Test Reporting Graphs/ Spectra/ Chromatographs, Raw data interpretation. 	15
1.1	Sample Management <ul style="list-style-type: none"> Guidelines for maintenance for reference standards and 	

	working standards - Flow - Storage - Destruction	
1.3	Understanding Basic Safety Rules - Use of Primary Protective Equipment - Environment, Safety & Hazard - Importance of Good Laboratory Practices (GLP) while working in the Laboratory.	

Course II : Advanced Chromatographic techniques

Course No.	Course name	Course code
II	Advanced Chromatographic techniques	PDAI2ACT
Module	description	Teaching hours
Practical Training will be provided in Analytical Techniques, Project based Techniques, Utilization of wide range of Lab Instrumentation including Spectroscopy and Chromatography.		
2.1	Chromatography Methods	15
	- Gas chromatography, - High performance liquid chromatography, - High Performance Thin Layer Chromatography - Principle behind Chromatography. - Operation, Cleaning and Calibration of Chromatographic Instruments. - Safety Measurements - Theoretical knowledge of IQ/OQ/PQ of Instrument - Maintenance of instruments	

Laboratory 1

Course No. III	Course name Practical in chromatographic techniques	Course code PDAI1PST
Module	description	Teaching hours
Practical Training will be provided in Analytical Techniques, Project based Techniques, Utilization of wide range of Lab Instrumentation including Spectroscopy and Chromatography.		
	<ol style="list-style-type: none"> 1. Separation of mixture of Benzene & Toluene by GC and study of chromatogram 2. Determination of percentage purity of Methyl Alcohol using GC 3. Assay of methyl paraben using HPLC 4. Determination of alcohol in beer sample by using GC 5. Estimation of nitrogen from given fertilizer by Kjeldahl method 6. Moisture content in pharmaceutical/food sample by Karl Fischer titration method 7. Calibration of Gas chromatography 8. Assay of Vitamin D3 by HPLC 	30

Practical 2

Course No. IV	Course name Method validation	Course code PDAI1PSI
Module	description	Teaching hours
Practical Training will be provided in spectral analysis and interpretation of spectral data.		
2.1	<ol style="list-style-type: none"> 1. Preparation of Mobile Phase for HPLC.& Preparation of Std Caffeine Sol'n 2. Determination of System Precision Test for Caffeine 3. To determine the linearity of a given solvent or mixture of solvents 4. Study to develop analytical method for determination of assay of pharmaceutical API by UV spectrophotometry 5. Determine the precision of chloroquine phosphate by using UV spectrophotometry 	30

Industrial Visit: One industrial visit is mandatory (Pharma industry(API & Formulations), Speciality Chemicals/Pesticide/Fertilizers effluent treatmentplant, forensic lab.): 6 Hrs per visit

Industrial training: Students will send to industry for actual industrial training at least for 1 to 3 months, i.e. total 30 To 90 days.

|| Students have to prepare a brief report on industrial visit with inputs from industrial personnel. The report will be assessed for internal evaluation

|| **Reference Books**

- 1. Inorganic quantitative analysis by Vogel.**
2. Practical HPLC analysis by Veronica Meyer
- 3. Instrumental methods of Analysis by Skoog, Holler and Nieman**



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW
PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: B.Sc

Revised Syllabus of F.Y.B.Sc. Microbiology
Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2019-20

Choice Based Credit Grading and Semester System (CBCGS)
F.Y.B.Sc Microbiology Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	F.Y.B.Sc.
2	Eligibility for Admission	12 th Science of all recognised Board
3	Passing marks	40%
4	Ordinances/Regulations (if any)	-
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2019-2020

Preamble of the Syllabus:

With the introduction of Academic autonomy by the esteemed Changu Kana Thakur Arts ,Commerce and Science College, New Panvel from the academic year 2019-2020, the existing syllabus of F.Y.B.Sc. Microbiology is restructured according to the CBCGS pattern for its implementation from 2019-2020. This syllabus is prepared to make students more knowledge oriented in Microbiology subject. The new and updated syllabus is based on interdisciplinary approach with vigour and depth taking care of the syllabus which is not heavy for the F.Y.BSc. students. The contents have been drawn to accommodate the widening horizons of the Microbiology discipline. It reflects the changing needs of the students, pertaining to the fields of Bio-Chemistry and Molecular Biology. The well-organized curriculum including basic as well as advanced concepts progressively from first year to the third year and shall inspire the students for pursuing higher studies in Microbiology and for becoming an entrepreneur and also enable students to get employed in the Microbiology subject based industries.

Objectives of the Course:

- To enrich students knowledge and train them in the subject of Microbiology.
- To introduce the concepts of application and research in Microbiology.
- To inculcate sense of scientific responsibilities and social and environment awareness.
- To help students build-up a progressive and successful career.

Course Outcome: By the end of the course:

- Students will get the basic knowledge of microbiology at F.Y.B.Sc.
 - Research mind with social approach of Microbiology subject among the students will be inculcated.
 - Students will set their career objectives in the field of Microbiology.
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F. Y. B. Sc. Microbiology:

For the subject of Microbiology there shall be two papers for 45 lectures each comprising of three units of 15 L each.

Semester-I

1. Paper-I FUNDAMENTALS OF MICROBIOLOGY.
2. Paper- II BASIC TECHNIQUES IN MICROBIOLOGY.

Semester-II

1. Paper-I BASICS OF MICROBIOLOGY.
2. Paper-II EXPLORING MICROBIOLOGY.

Scheme of Examination for Each Semester:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

I. Theory:		
Each theory paper shall be of two and half hour duration. All questions are compulsory and will have internal options.		
Q-1	From Unit – I (having internal options.)	20 M
Q-2	From Unit – II (having internal options.)	20M
Q-3	From Unit – III (having internal options.)	20M
Q-4	Questions from all the THREE Units with equal weightage of marks allotted to each Unit.	15 M

II Practical:

The External examination per practical course will be conducted as per the Following scheme.

Sr.No.	Particulars	Marks	Total
1.	Laboratory work (Section-I + Section-II)	35 + 35 =	70
2.	Journal	05 + 05 =	10
3.	Viva	05 + 05 =	10
4.	Assignment/Visit report/Case study/SOP writing/Quiz	05 + 05 =	10

Choice Based Credit Grading and Semester System (CBCGS)

F.Y.B.Sc Microbiology Syllabus

To be implemented from the Academic year 2019-20

SEMESTER I		
Course Code	Title	Credits
USC1MI 1 Theory	FUNDAMENTALS OF MICROBIOLOGY.	2 Credits (45 lectures)
Unit-I	History, Introduction & Scope Of Microbiology, Biosafety In Microbiology	15 lectures.
Unit-II	Prokaryotic Cell Structure & Eukaryotic Cell Structure	15 lectures.
Unit-III	Macromolecules	15 lectures.
USC1MI 2 Theory	BASIC TECHNIQUES IN MICROBIOLOGY.	2 Credits (45 lectures)
Unit-I	Microscopy & Staining	15 lectures.
Unit-II	Microbial Nutrition, Cultivation, Isolation & Preservation	15 lectures.
Unit-III	Control Of Microorganisms	15 lectures.
USC1MI P	PRACTICALS	2 Credits
	SECTION-1 FUNDAMENTALS OF MICROBIOLOGY. (Practicals Based On Unit-I, II & III Of USMB-101)	1 Credit (45 lectures)
	SECTION-2 BASIC TECHNIQUES IN MICROBIOLOGY. (Practicals Based On Unit-I, II & III Of USMB-102)	1 Credit (45 Lectures)
SEMESTER II		
USC2MI-1 Theory	BASICS OF MICROBIOLOGY.	2 Credits (45 Lectures)
Unit-I	Study Of Different Groups Of Microbes-I	15 lectures.
Unit-II	Study Of Different Groups Of Microbes-II	15 lectures.
Unit-III	Microbial Growth	15 lectures.
USC2MI-2 Theory	EXPLORING MICROBIOLOGY.	2 Credits (45 Lectures)
Unit-I	Microbial Interactions	15 lectures.
Unit-II	Microbes & Human Health	15 lectures.
Unit-III	Advance Techniques In Microbiology & Instrumentation	15 lectures.
USC2MIP	PRACTICALS	2 Credits
	SECTION-1 BASICS OF MICROBIOLOGY. (Practicals Based On Unit-I, II & III Of USMB-201)	1 Credit (45 Lectures)
	SECTION-2 EXPLORING MICROBIOLOGY. (Practicals Based On Unit-I, II & III Of USMB-202)	1 Credit (45 Lectures)

F.Y.B.Sc Microbiology: Detail Syllabus
Revised for Credit Based Semester & Grading System
To be implemented from the academic year 2019-20

Bachelor of Science in Microbiology Duration: Six Semesters			
SEMESTER I			
Course Code	Title	Credits	Notional Periods
USC1MI-1 Theory	FUNDAMENTALS OF MICROBIOLOGY.	2 Credits (45 lectures)	Self Study (45)
Unit-I	<p>1.1 History, Introduction & Scope Of Microbiology:</p> <ul style="list-style-type: none"> a. Discovery of microorganisms b. Conflict over spontaneous generation c. Golden Age Of Microbiology-Koch Postulate, Medical Microbiology, Immunology d. Development of industrial microbiology and microbial ecology e. Scope and relevance of microbiology f. Future of microbiology <p>1.2 Biosafety In Microbiology:.</p> <ul style="list-style-type: none"> a. Means of laboratory infection b. Potentially hazardous procedures c. Responsibility d. Risk Assessment e. Restricted access f. Safety equipments g. Immunization and medical records h. Training of personnel i. Laboratory procedures j. Levels of Containment <p style="text-align: right; color: blue;">SKILL DEVELOPMENT</p>	<p>15 lectures.</p> <p>(10 Lec.)</p> <p>(05 Lec.)</p>	15

Unit-II	<p>2.1 Prokaryotic Cell Structure and functions:</p> <ol style="list-style-type: none"> Cell wall Cell membrane Components external to cell wall-Capsule, Slime layer, Flagella, Pili, Fimbriae Cytoplasmic matrix-Inclusion bodies, magnetosomes, Ribosomes, gas vesicles Nucleoid, Plasmids Bacterial endospores and their formation <p>2.2 Eukaryotic Cell Structure and functions:</p> <ol style="list-style-type: none"> Overview of Eucaryotic cell structure The plasma membrane and membrane Structure Cytoplasmic matrix, microfilaments, intermediate filaments, and microtubules Organelles of the Biosynthetic-secretory and endocytic pathways –Endoplasmic reticulum & Golgi apparatus. Definitions of Lysosome, Endocytosis, Phagocytosis, Autophagy, proteasome, Eucaryotic ribosomes Mitochondria Chloroplasts Nucleus –Nuclear Structure External Cell Coverings: Cilia And Flagella Comparison Of Prokaryotic And Eukaryotic Cells 	<p>15 lectures. (07 Lec.) (08 Lec.)</p>	<p>15</p>
Unit-III	<p>Macromolecules</p> <p>3.1 Chemical foundations:</p> <ol style="list-style-type: none"> Biomolecules as compounds of carbon with a variety of functional groups. Universal set of small molecules. Macromolecules as the major constituents of cells. Configuration and Conformation with definitions and suitable examples only. Types of Stereoisomers and importance of stereoisomerism in biology. Types of bonds and their importance: Electrovalence, covalent, ester, phosphodiester, thioester, peptide, glycosidic <p>3.2 Water- Structure, properties in brief.</p> <p>3.3 Carbohydrates: Definition, Classification, Biological role. Monosaccharides, oligosaccharides (maltose, cellobiose, sucrose, lactose) and polysaccharide (starch, glycogen, peptidoglycan, cellulose)</p> <p>3.4 Lipids: Fatty acids as basic component of lipids and their classification (Lehninger), nomenclature, storage lipids and structural lipids. Types of lipids with general structure of each and mention examples.</p>	<p>15 lectures.</p>	<p>15</p>

	<p>3.5 Amino acids & proteins: General structure and features of amino acids (emphasis on amphoteric nature) Classification by R-group, Uncommon amino acids and their functions Peptides and proteins- Definition and general features and examples with biological role. Primary, secondary, tertiary, quaternary structures of proteins- Brief outline.</p> <p>3.6 Nucleic acids: Nitrogenous bases- Purines, Pyrimidines Pentoses-Ribose, Deoxyribose, Nomenclature of Nucleosides and nucleotides, N-β-glycosidic bond, polynucleotide chain to show bonding between nucleotides (Phosphodiester bonds). Basic structure of RNA and DNA.</p>		
USC1MI-2 Theory	BASIC TECHNIQUES IN MICROBIOLOGY.	2 Credits (45 lectures)	Notional Periods Self Study (45)
Unit-I	Microscopy & Staining	15 lectures.	15
	<p>1.1 Microscopy: History of microscopy, Optical spectrum, Lenses and mirrors: Simple and compound light microscope, Dark field Microscopy, Phase contrast</p> <p>1.2 Staining procedures</p> <ol style="list-style-type: none"> Dyes and stains: Types, Physicochemical basis Fixatives, Mordants, Decolorizers Simple and differential staining Special staining (Cell wall, Capsule, Lipid granules, Spores, Metachromatic granules & Flagella) 	08 Lectures 07 Lectures	EMPLOYABILITY
Unit-II	Microbial Nutrition, Cultivation, Isolation & Preservation	15 lectures.	15
	<p>2.1 Nutritional requirements – Carbon, Oxygen, Hydrogen, Nitrogen, Phosphorus, Sulfur and growth factors.</p> <p>2.2 Nutritional types of microorganisms</p> <p>2.3 Types of Culture media with examples</p> <p>2.4 Isolation of microorganisms and pure culture Techniques</p>		

	<p>2.5 Preservation of microorganisms</p> <p>2.6 Culture Collection Centres</p>		
Unit-III	Control Of Microorganisms	15 lectures.	15
	<p>2.1 Definition of frequently used terms & Rate of microbial death, Factors affecting the effectiveness of antimicrobial agents & Properties of an ideal disinfectant</p> <p>2.2 Evaluation of disinfectant –Tube dilution & Agar plate techniques, Phenol coefficient , Tissue toxicity index</p> <p>2.3 Physical methods of microbial control</p> <ol style="list-style-type: none"> a. Dry & moist heat – mechanisms, instruments used and their operations b. Electromagnetic radiations – Ionizing radiations, mechanisms –advantages & disadvantages c. Bacteria proof filters d. Low temperature e. Osmotic pressure f. Desiccation <p>2.4 Chemical methods of microbial control - mechanism & advantages & disadvantages (if any) applications.</p> <ol style="list-style-type: none"> a. Phenolics b. Alcohols c. Heavy metals and their compounds d. Halogens e. Quaternary ammonium compounds f. Halogens g. Dyes h. Surfactant active agents/Detergents i. Aldehydes j. Peroxygens k. Sterilizing gases 		

	2.5 Chemotherapeutic agents - List types of agents active against various groups & mention the site of action(Detailed mode of action not to be done)		
USC1MIPR1	PRACTICALS	2 Credits	Notional Periods
	SECTION-1 FUNDAMENTALS OF MICROBIOLOGY.	1 Credit (45 lectures)	Self Study (45)
Unit-I	<ol style="list-style-type: none"> 1. Assignment : Contribution of Scientists in the field of Microbiology 2. Special staining: Cell wall, capsule, endospore, flagella, lipid, metachromatic granules. 		
Unit-II	<ol style="list-style-type: none"> 3. Handling corrosive chemical using rubber teat method for pipetting. Prevention of mouth pipetting and use of auto-pipettes. 4. Discard of highly infectious pathogenic samples like T.B, sputum etc. 5. Explain safety inoculation hood for infection inoculations and laminar air flow. 6. On accidental spillage of/ breakage of culture containers-precautions to be taken. 7. Demonstration of microbes in air, cough, on table surface, finger tips. 8. Permanent slides of Eukaryotes & its organelles: 		SKILL DEVELOPMENT
Unit-III	<ol style="list-style-type: none"> 9. Qualitative detection : 10. Carbohydrates- Benedicts, Molisch's test. 11. Proteins, amino acids- Biuret, Ninhydrin. 		
	SECTION-2 BASIC TECHNIQUES IN MICROBIOLOGY.	1 Credit (45 lectures)	Self Study (45)
Unit-I	<ol style="list-style-type: none"> 1. Parts of a microscope. 2. Monochrome and differential staining procedures, Gram staining& Negative Staining. 		

Unit-II	<ul style="list-style-type: none"> 3. Introduction to Laboratory equipments, disinfection & discarding techniques in laboratory 4. Methods of preparation of glassware for Sterilization 5. (Pipettes, Petri Plates, Plastic wares, Flasks, Micropipettes, microtitre plates) & Control of micro organisms using moist heat & dry heat sterilization (Sterilization of Dry powders, Rubber gloves, Bandages, Screw capped tubes, Sterilizable plasticwares) 6. Effect of UV Light, Desiccation, surface tension, Osmotic Pressure, heavy metals(Oligodynamic action) 7. Effect of dyes, phenolic compounds and chemotherapeutic agents(disc inhibition method) 8. Evaluation of Disinfectant by Coupon Method 		
Unit-III	<ul style="list-style-type: none"> 9. Preparation of Culture Media: <ul style="list-style-type: none"> a. Liquid medium(Nutrient Broth) b. Solid Media(Nutrient agar,Sabourauds agar) c. Preparation of slant ,butts & plates 10. Inoculation techniques and Study of Growth: <ul style="list-style-type: none"> a. Inoculation of Liquid Medium b. Inoculation of Solid Media(Slants, Butts and Plates) c. Study of Colony Characteristics of pigment & non- pigment producing bacteria. d. Study of Motility (Hanging Drop Preparation) 11. Use of Differential & Selective Media: (MacConkey , Salt Mannitol Agar & Cetrimide agar) 12. Determination of Optimum growth conditions: a)Temperature, b) pH 	SKILL DEVELOPMENT	

SEMESTER II			
Course Code	Title	Credits	Notional Periods
USC2MI-1 Theory	BASICS OF MICROBIOLOGY.	2 Credits (45 lectures)	Self Study (45)
Unit-I	<p>Study Of Different Groups Of Microbes-I:</p> <p>1.1 Viruses: a) Historical highlights, General properties of viruses, prions, viroids b) Structure of viruses-capsids, envelopes, genomes, c) Cultivation of viruses- overview d) Bacteriophages: Lytic cycle. Lysogeny, Structure and Life cycle of T4 phage.</p> <p>1.2 Rickettsia, Coxiella, Chlamydia, Mycoplasma: general features, medical significance</p> <p>1.3 Actinomycetes: General features of Nocardia and Streptomyces Importance: ecological, commercial and medical</p> <p>1.4 Archaea: Introduction- Major Archaeal physiological groups, Archaeal cell wall, lipids and membranes, Ecological importance</p>	15 lectures. 07 Lectures 03 Lectures 02 Lectures 03 Lectures	15
Unit-II	<p>Study Of Different Groups Of Microbes-II: Classification, Morphological characteristics, cultivation, reproduction and significance</p> <p>2.1 Protozoa- Major Categories of Protozoa Based on motility, reproduction. Medically important Protozoa Life cycle of Entamoeba</p> <p>2.2 Algae - Characteristics of algae: morphology, Pigments, reproduction Cultivation of algae. Major groups of Algae –an overview. Biological, Medical and economic importance of Algae. Differences between Algae and Cyanobacteria</p> <p>2.3 Fungi and Yeast- Characteristics: structure, Reproduction. Cultivation of fungi and yeasts. Major fungal divisions- overview. Life cycle of yeast, Biological and economical importance</p> <p>2.4 Slime molds and Myxomycetes</p>	15 lectures. 04 Lectures 05 Lectures 05 Lectures 01 Lecture	15
Unit-III	<p>Microbial Growth:</p> <p>3.1 a. Definition of growth, Mathematical Expression, Growth curve b. Measurement of growth c. Direct microscopic count – Breed’s count ,Petroff – Hausser counting chamber- Haemocytometer. d. Viable count – Spread plate and Pour plate technique e. Measurements of cell constituents. f. Turbidity measurements – Nephelometer and spectrophotometer techniques g. Synchronous growth, Continuous growth (Chemostat</p>	15 lectures. SKILL DEVELOPMENT	15

	and Turbidostat) h. Influence of environmental factors on growth. i. Microbial growth in natural environment. j. Counting viable non-culturable organisms-Quorum sensing techniques		
USC2MI-2 Theory	EXPLORING MICROBIOLOGY.	2 Credits (45 lectures)	Self Study (45)
Unit-I	Microbial Interactions:	15 lectures.	15
	1.1 Types of Microbial Interactions : Mutualism, Cooperation, Commensalisms, Predation Parasitism, Amensalism, Competition 1.2 Human Microbe Interactions . a) Normal flora of the human body : Skin, Nose & Nasopharynx, Oropharynx, Respiratory tract, Eye, External ear, Mouth, Stomach, Small intestine, Large intestine, Genitourinary tract . b) Relationship between microbiota& the host . c) Symbiotic animals 1.3 Microbial associations with vascular plants a) Phyllosphere		
	b) Rhizosphere & Rhizoplane c) Mycorrhizae d) Nitrogen fixation : Rhizobia, Actinorhizae, Stem Nodulating Rhizobia e) Fungal & Bacterial endophytes f) Agrobacterium & other plant pathogens		
Unit-II	Microbes & Human Health:	15 lectures.	15
	2.1 Difference between infection & disease. Important terminology: Primary infection, secondary infection.Contagious infection, occupational disorder, clinical infection,subclinical infection, Zoonoses,genetic disorder, vector borneinfection,virulence,pathogen & herd immunity. 2.2 Factors affecting infection: Microbial factors: adherence, invasion, role of virulence factors in invasion,microbial enzymes & toxins, bacterial colonization & its effects. Host factors: natural resistance, species resistance, racial resistance. 2.3 Individual resistance: Factors influencing individual resistance: Age, nutrition, personal hygiene, stress, hormones, Addiction to drugs/ alcohol. Interaction between Microbes & host is dynamic. 2.4 Host defense against infection: Overview i) First line of Defence: for skin, respiratory tract, gastrointestinal tract, genitourinary tract, eyes. ii) Second line of defence: Biological barriers: Phagocytosis,Inflammation		

	iii) Third line of defence: Brief introduction to antibody mediated & cell mediated immunity.		
Unit-III	Advance Techniques In Microbiology & Instrumentation:	15 lectures.	15
	3.1 Electron Microscope:TEM,SEM, 3.2 Contrast enhancement for electron microscope 3.3 Fluorescent Microscope, Confocal Microscope 3.4 pH meter ,pH meter Validation and calibration 3.5 Colorimeter 3.6 Validation and calibration of Autoclave & Hot air Oven 3.7 Concepts :Laminar air flow systems, Biosafety cabinets , Walk in Incubators, Industrial autoclaves,Cold Room.		
USC2MIPR2	PRACTICALS	2 Credits	
	SECTION-1 BASICS OF MICROBIOLOGY.	1 Credit (45 lectures)	Self Study (45)
Unit-I	1. Spot assay and plaque assay of Bacteriophage (Demonstration) 2. Slide Culture technique (Actinomycetes & Fungal Culture)		
Unit-II	3. Isolation of yeast, cultivation of other fungi Cultivation on Sabourauds agar		
	4. Static & Shaker Cultures. 5. Fungal Wet mounts & Study of Morphological Characteristics : <i>Mucor</i> , <i>Rhizopus</i> , <i>Aspergillus</i> , <i>Penicillium</i> . 6. Permanent slides of Algae, Protozoa		
Unit-III	7. Growth curve (Demonstration) only in complex media. 8. Breed's Count 9. Haemocytometer 10. Viable count: Spread plate and pour plate 11. Brown's opacity 12. Effect of pH and temperature on growth 13. Measurement of cell dimensions-Micrometry		
	SECTION-2 EXPLORING MICROBIOLOGY.	1 Credit (45 lectures)	Self Study (45)
Unit-I	1. Normal flora of the Skin & Saliva 2. Wet Mount of Lichen 3. Bacteroid Staining & Isolation of <i>Rhizobium</i> 4. <i>Azotobacter</i> isolation & staining		
Unit-II	6. Study of virulence factors – Enzyme Coagulase 7. Study of virulence factors – Enzyme Hemolysin 8. Study of virulence factors – Enzyme Lecithinase		

<p>Unit-III</p>	<p>9. Use of standard buffers for calibration and determination of pH of a given solution</p> <p>10. Determination of λ_{\max} & Verification of Beer Lambert's law</p> <p>11. Determination & efficiency of Autoclave, Hot air oven, LAF</p> <p>12. Writing of SOP's for Instruments</p> <p>13. Visit to a Central Instrumentation laboratory of college.</p>	<p>SKILL DEVELOPMENT</p>	<p>EMPLOYABILITY</p>
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REFERENCES: USC1MI-1 & USC1MI-2

1. Prescott ,Hurley.Klein-Microbiology, 7th edition, International edition McGraw Hill.
2. Kathleen Park Talaro& Arthur Talaro - Foundations in Microbiology International edition 2002,| McGraw Hill.
3. Michael T.Madigan & J.M.Martin,Brock ,Biology of Microorganisms 12th Ed. Internationaledition 2006, Pearson Prentice Hall.
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5. Stanier.Ingraham et al ,General Microbiology 4th & 5th Ed. 1987, Macmillan Education Ltd
6. Microbiology TMH 5th Edition by Michael J.Pelczar Jr., E.C.S. Chan ,Noel R. Krieg
7. BIS:12035.1986: Code of Safety in Microbiological Laboratories
8. Outlines of Biochemistry 5/E, Conn P. Stumpf, G. Bruening and R. Doi. John Wiley & Sons. New York 1995
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10. Microbiology An Introduction. 6th Edition. Tortora, Funke and Case. Adisson Wesley Longman Inc. 1998.

REFERENCES: USC2MI-1 & USC2MI-2

1. Microbiology TMH 5th Edition by Michael J.Pelczar Jr., E.C.S. Chan ,Noel R. Krieg
2. A.J.Salle, Fundamental Principles of Bacteriology,McGraw Hill Book Company Inc.1984
3. Cruikshank, Medical Microbiology , Vol -II
4. Prescott ,Hurley.Klein-Microbiology, 5th & 6th edition, International edition 2002 & 2006, McGraw Hill.
5. Michael T.Madigan & J.M.Martin,Brock ,Biology of Microorganisms 11th Ed. International edition ,2006, Pearson Prentice Hall.
6. Ananthanarayan And Paniker, Textbook Of Microbiology,10th edition ,2013,University Press Hyderabad.

PRACTICAL BOOK/JOURNAL

Semester I:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department ; failing which the student will not be allowed to appear for the practical examination.

Semester II:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department ; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern

Semester I

Course	USC1MI-1	USC1MI-2	Grand Total
Theory	100 02 Credits	100 02 Credits	200 04 Credits
Practicals	50 02 Credits	50 02 Credits	100 04 Credits
Total Marks	150	150	300
Total Credits	04 Credits	04 Credits	08 Credits

Semester II

Course	USC2MI-1	USC2MI-2	Grand Total
Theory	100 02 Credits	100 02 Credits	200 04 Credits
Practicals	50 02 Credits	50 02 Credits	100 04 Credits
Total Marks	150	150	300
Total Credits	04 Credits	04 Credits	08 Credits



Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

**ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Re-accredited 'A⁺' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Program: B. Sc.

Revised Syllabus of S.Y.B.Sc. Microbiology

Choice Based Credit, Grading and Semester System

w.e.f. Academic Year 2020-21

PREAMBLE OF THE SYLLABUS

With the introduction of Academic autonomy by the esteemed Changu Kana Thakur Arts ,Commerce and Science College, New Panvel from the academic year 2020-2021, the existing syllabus of S.Y.B.Sc. Microbiology is restructured according to the CBCS pattern for its implementation from 2020-2021. This syllabus is prepared to make students more knowledge oriented in Microbiology subject. The new and updated syllabus is based on interdisciplinary approach with vigour and depth taking care of the syllabus which is not heavy for the S.Y.B.Sc. learners. The contents have been drawn to accommodate the widening horizons of the Microbiology discipline. It reflects the changing needs of the learners, pertaining to the fields of Bio-Chemistry, Molecular Biology, Bio-Statistics, Medical Microbiology, Immunology, Fermentation technology, Bioinformatics, Research methodologies and presentation skills. The well-organized curricula including basic as well as advanced concepts in the Microbiology shall inspire the students for pursuing higher studies in Microbiology and for becoming an entrepreneur and also enable learners to get employed in the Microbiology subject based industries.

OBJECTIVES TO BE ACHIEVED:-

- To enrich learners' knowledge and train them in the pure microbial sciences.
- To introduce the concepts of application and research in Microbiology.
- To inculcate sense of scientific responsibilities and social and environment awareness.
- To help learners build-up a progressive and successful career.

**S.Y.B.Sc Microbiology Syllabus (General Outline) Revised
for Choice Based Credit System
To be implemented from the Academic year 2020-21**

SEMESTER I		
Course Code	Title	Credits
USc3 Mi1 Theory	Estimation of Biomolecules and Introduction Bioenergetics and Biostatistics	2 Credits (45 lectures)
Unit-I	Extraction and analysis of Biomolecules	15 lectures.
Unit-II	Introduction to Bioenergetics, Thermodynamics and Biostatistics	15 lectures.
Unit-III	Preparation of solutions and Biochemical Calculations	15 lectures.
USc3 Mi2 Theory	Introduction to fermentation technology and Applied Microbiology	2 Credits (45 lectures)
Unit-I	Introduction to fermentation Technology	15 lectures.
Unit-II	Introduction to Food and Dairy Microbiology	15 lectures.
Unit-III	Fresh Water and Sewage Microbiology	15 lectures.
USc3 Mi 3 Theory	Introduction to Microbial Genetics and Molecular Biology	2 Credits (45 lectures)
Unit-I	Nucleic acid chemistry, Electrophoresis and Sequencing	15 lectures.
Unit-II	Prokaryotic DNA replication, mutation and DNA repair mechanism	15 lectures.
Unit-III	Prokaryotic transcription and translation	15 lectures.
USc3 Mi P	PRACTICALS	3 Credits
	SECTION-1 Estimation of Biomolecules and Introduction Bioenergetics and Biostatistics (Practicals Based On Unit-I,II & III Of USC3 MI 1)	1 Credit (45 lectures)
	SECTION-2 Introduction to Fermentation Technology and Applied Microbiology (Practicals Based On Unit-I,II & III Of USC3 MI 2)	1 Credit (45 Lectures)
	SECTION-3 Introduction to Microbial Genetics and Molecular Biology (Practicals Based On Unit-I,II & III Of USC3 MI 3)	1 Credit (45 lectures)
SEMESTER II		
USc4 Mi-1 Theory	Introduction to Metabolism and Enzymology	2 Credits (45 Lectures)

Unit-I	Introduction to metabolism	15 lectures.
Unit-II	Enzyme Kinetics	15 lectures.
Unit-III	Membrane Transport	15 lectures.
USc4Mi-2 Theory	Introduction to Medical Microbiology and immunology	2 Credits (45 Lectures)
Unit-I	Common infectious diseases, Epidemiology and Public Health Awareness	15 lectures.
Unit-II	Host defence and public health (Epidemiology of infectious diseases)	15 lectures.
Unit-III	Introduction to Physiological sampling, Diagnostic techniques and Vaccines	15 lectures.
UcC4Mi-3 Theory	Advances Analytical Techniques, Soft Skills and Applications of Microbiology	2 Credits (45 Lectures)
Unit-I	Introduction to Bioinformatics, Nano biotechnology, Biofilm and Biosensor	15 lectures.
Unit-II	Analytical Techniques: Chromatography, Spectroscopy and Basic centrifugation	15 lectures.
Unit-III	Research Fundamentals, Hypothesis Writing, Study designs, Report writing and presentation	15 lectures.
USc2MiP	PRACTICALS	3 Credits
	SECTION-1 Introduction to Metabolism and Enzymology (Practicals Based On Unit-I,II & III Of USC4 MI 1)	1 Credit (45 Lectures)
	SECTION-2 Introduction to Medical Microbiology and immunology (Practicals Based On Unit-I,II & III Of USC4 MI 2)	1 Credit (45 Lectures)
	SECTION-3 Advances Analytical Techniques, Soft Skills and Applications of Microbiology (Practicals Based On Unit-I,II & III Of USC4 MI 3)	1 Credit (45 Lectures)

PRACTICAL EXAMINATION PATTERN

**(A) External (Semester end practical examination) :- 50 Marks Per Section
(Section-I based on course-1 & Section-II based on course-2)**

Sr.No.	Particulars	Marks	Total
1.	Laboratory work (Section-I + Section-II+ Section III)	30 + 30+30	= 90
2.	Report / Quiz	05 + 05+05	= 15
3.	Viva	05 + 05+05	= 15
4.	Assignment/ /Case study/	05 + 05 +05	= 15
	Journal	05 + 05+05	= 15

PRACTICAL BOOK/JOURNAL

Semester III:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

The practical examination will be conducted in two days with 4.5 hrs of work each day.

Two examiners and one expert will be appointed from college for each batch by the principal / Head of the department.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-coordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

Semester IV

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

The practical examination will be conducted in two days with 4.5 hrs of work each day.

Two examiners and one expert will be appointed for each batch by the principal / Head of the department.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern

Semester III

	Section I/paper I USc3Mi-1			Section II/Paper II USC3Mi-2			Section III/Paper III USc3Mi-3		
	Internal	External	Total	Internal	External	Total	Internal	External	Total
Theory	25	75	100	25	75	100	25	75	100
Practicals	00	50	50	00	50	50	00	50	50

Semester IV

	Section I/paper I USc4Mi-1			Section II/Paper II USc4 Mi-2			Section III/Paper III USc4 Mi-3		
	Internal	External	Total	Internal	External	Total	Internal	External	Total
Theory	25	75	100	25	75	100	25	75	100

Practicals	00	50	50	00	50	50	00	50	50
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C.K.Thakur ACS College, New Panvel (Autonomous)
S.Y.B.Sc. Microbiology

Sem III Theory

Paper/ Unit	Title	Lecture/ Week	Total lectures
Paper I	Estimation of Biomolecules and Introduction to Bioenergetics and Biostatistics	03	45
U1	a) Extraction and analysis of Biomolecules		15
	b) Macromolecular composition of a microbial cell (Revision with Definition of atom, molecule, macromolecule, supramolecular, and biological application of each type of molecule.		01
	c) Methods of elemental analysis: i. Carbon: Manometer (Introduction) ii. Nitrogen: Micro Kjeldahl Method (Principle and Assembly) iii. Phosphorus: Fiske Subbarao Method (Principle and Procedure)		03
	d) Estimation of Proteins and amino acids i. Proteins by Biuret method ii. Protein estimation by Lowry's method iii. Amino acids by Ninhydrin method	EMPLOYABILITY	03
	e) Estimation of Carbohydrates i. Total carbohydrates by Anthrone method ii. Total carbohydrates by Pheno-Sulphuric acid method iii. Reducing Sugars by DNSA method	EMPLOYABILITY	03
	f) Extraction of Lipids by Soxhlet method (Principle and Assembly)		01
	g) General principles and extraction of nucleic acids i. RNA ii. DNA h) Estimation of Nucleic acids i. DNA by DPA method ii. RNA by Orcinol method	EMPLOYABILITY	04
U2	Introduction to Bioenergetics, Thermodynamics and Biostatistics		15
	2.1 Introduction to Bioenergetics and Thermodynamics		(10L)
	a) Biological Energy Transformations Obey the Laws of Thermodynamics		01
	b) Gibbs free energy, Enthalpy, Entropy		01

	c) The Standard Free-Energy Change Is Directly Related to the Equilibrium Constant		02
	d) Standard Free-Energy Changes Are Additive		01
	e) Structure of ATP,		01
	f) phosphoryl group transfer and ATP,		01
	g) Types of energy-rich compounds,		01
	h) Assembly of Informational Macromolecules Requires Energy		02
	Introduction to Biostatistics		(05)
	a) Definition of terms: Biostatistics, Sample and Population, Types of sampling techniques		01
	b) Data presentation: Dot diagram, Bar diagram, Histogram, Frequency curve, pie diagram		01
	c) Central Tendency: Definition, Notation, Formula and Problems: Mean, Median, Mode		02
	d) Measures of Dispersion Definition, Notation and Formula of Variance, Standard Deviation and Standard Error		01
U3	Preparation of solutions and Biochemical Calculations		1
	3.1 Various units of expressing and inter-converting concentration of solutions: molarity, moles, normality, osmolarity, molality, mole fraction		05
	3.2 Bronsted Concept of conjugate acid –conjugate base pairs, ionization of solutions, pH, titration curves, buffers: preparation, action and their use in Biology		05
	3.3 Henderson-Hasselbalch equation , buffer capacity, polyproteic acids, amphoteric salts, ionic strengths (problem solving under all heads)		05

Paper/ Unit	Title	Lecture/ Week	Total lectures
Paper II	Introduction to fermentation technology and Applied Microbiology	03	(45)
U1	Introduction to fermentation Technology		(15)
	A. Screening a. Primary screening- i. crowded plate technique ii. Auxanography iii. Enrichment culture techniques. iv. Use of indicator dye b. Secondary screening.	SKILL DEVELOPMENT	03
	B. Fermentation media a. Characteristics of ideal fermentation medium. b. Types of fermentation media c. Raw material i. Carbon source ii. Nitrogenous material iii. Growth factors iv. Precursors v. Buffers vi. Antifoam d. Media sterilization and contamination e. Screening for production media.		04
	C. Preparation of inoculum		01
	D. Types of fermentation- Aerobic, anaerobic, surface submerged, solid substrate, Batch, continuous.		04
	E. Fermenter design 1. Factors involve in fermenter design 2. Parts of fermenter a. Material used for fermenter b. Impeller, baffles, inoculum port, sparger, sampling point, pH control device, temperature control system, foam control device, bottom drainage system. 3. Fermenter configuration a. Batch fermenter b. Continuous fermenter		03
U2	Introduction to Food and Dairy Microbiology		(15)
	A. Important Microorganisms in Food Microbiology: General characteristics of the enlisted organisms to be studied wrt spoilage and transmission of infection/intoxication (no clinical features and structural details) a. Spoilage -causing microorganisms a. Yeast & Molds: <i>Saccharomyces</i> , <i>Aspergillus</i> & <i>Penicillium</i>		04

	<p>b. Bacteria: <i>Bacillus, Clostridium, Flavobacterium, Pseudomonas</i></p> <p>b. Food-borne Illness associated Microorganisms: Classification of Food-borne diseases (Schematic).</p> <p>Bacteria responsible for food -borne intoxication and infections-overview/tabulation. Examples of non-bacterial food-borne pathogens</p> <p>Details of :</p> <p>a) Staphylococcus food intoxication (organism, enterotoxin, incidence, foods involved, prevention of outbreaks)</p> <p>b) Salmonellosis (organism, source, incidence, foods involved, outbreak-conditions & prevention)</p>		
	<p>B. General Principles of Food Preservation:</p> <p>a. Preservation using High temperature (including TDT, D, F, Z values, 12D concept), principle of canning</p> <p>b. Low temperature</p> <p>c. Drying</p> <p>d. Food preservatives (organic acids & their salts, Sugar & salt)</p> <p>e. Ionizing radiations</p>		03
	<p>C. Microbial flora of milk, normal and abnormal flora, their sources and changes induced them.</p> <p>Milk borne pathogens.</p>		02
	<p>D. Microbiological Quality of Milk & Milk Products: SPC, coliform count, LPC, thermophilic, psychophilic counts and RPT (RRT, MBRT, DMC)</p>		03
	<p>E. Milk product-</p> <p>a) Butter,</p> <p>b) Cheese (types and production of cheddar cheese and cottage cheese),</p> <p>c) Yogurt (Types and production).</p> <p>d) Other milk products and names of organisms associated with them.</p>		03
U3	Fresh Water and Sewage Microbiology	1	(15)
	<p>A. Fresh water environments and micro-organisms found in Springs, rivers and streams, Lakes , marshes and bogs</p>		3
	<p>B. Potable water: Definition, water purification ,water quality standards and pathogens transmitted through water</p>		2
	<p>C. Microbiological analysis of water:</p> <p>Indicator organisms and their detection in water- Total Coliforms, Fecal Coliforms and <i>E. coli</i>, Fecal <i>Streptococci, Clostridium perfringens</i></p>		2
	<p>D. Modern Waste Water treatment: Primary, Secondary and Tertiary Treatment</p>		1
	<p>E. The nature of wastewater and Monitoring of waste water treatment process(BOD,COD)</p>		2
	<p>F. Removal of Pathogens by Sewage treatment Processes.</p>		1

	G. Oxidation Ponds and Septic tanks			1
	H. Sludge Processing			1
	I. Disposal of treated waste water and biosolids.			02
Paper/ Unit	Title	Credits	Lecture/ Week	Total lectures
Paper III	Introduction to Microbial Genetics and Molecular Biology	02		
U1	Nucleic acid chemistry, Electrophoresis and Sequencing		1	
	A. Nucleic Acid Structure DNA stores genetic information DNA molecules have distinctive base composition DNA is a double helix DNA can occur in different 3D forms DNA sequences adopt unusual structures Many RNAs have complex 3D structures			06
	B. Nucleic acid chemistry Denaturation of double helical DNA and RNA Nucleic acid from different species can form hybrids Nucleotides and nucleic acids undergo non enzymatic transformations, DNA methylation			06
	C. Separation of nucleic acids by Agarose gel electrophoresis			01
	D. DNA sequencing			02
U2	Prokaryotic DNA replication, mutation and DNA repair mechanism		1	
SHIFT ED FROM USMB 501 UNIT 1	A. Historical perspective— conservative, dispersive, semi-conservative, Bidirectional and semi-discontinuous			04
	B. Prokaryotic DNA replication – Details of molecular mechanism Involved in Initiation, Elongation and Termination			04
SHIFT ED FROM USMB 501 UNIT 3	C. Mutation-Terminology: alleles, homozygous, heterozygous, genotype, phenotype, Somatic mutation, Germline mutation, Gene mutation, Chromosome mutation, phenotypic lag, hotspots and mutator genes			01
	D. Types of mutations: Point mutation, frameshift mutation, base pair substitution, transition, transversion, missense mutation, nonsense mutation, silent mutation, neutral mutation			01
	E. DNA Repair 2.5.a. Mismatch repair, 2.5.b. Light repair			05

	2.5.c. Repair of alkylation damage 2.5.d. Base excision repair 2.5.e. Nucleotide excision repair 2.5.f. SOS repair			
U3	Prokaryotic transcription and translation		1	
SHIFT ED FROM USMB 402 (2012- 13)	Transcription ,Translation A. RNA Synthesis a. RNA Metabolism:DNA dependent synthesis of RNA RNAPolymerase, Promoters, Regulation of transcription at various levels. b. Specific sequences signal termination of RNA synthesis. c. RNA polymerases in Eukaryotic cells. d. Protein factors required for RNA polymerase II. e. Inhibition of DNA dependent RNA polymerase f. RNA dependent synthesis of RNA			(7 L)
	B. Protein synthesis Stages of Protein synthesis:- a. Activation of amino acids b. Initiation c. Elongation d. Termination and release e. Folding and post translational processing			(8L)

Paper 1

1. Methods In Microbiology, Vol.5B, Ed. Norris & Ribbon, Academic Press
2. Lehninger: Principles Of Biochemistry, 4th Ed., D. Nelson & M. Cox, W.H. Freeman & Co., New York 2005.
3. Outlines Of Biochemistry, 5/E, Conn P. Stumpf, G. Bruening & R. Doi, John Wiley & Sons, New York 1995.
4. Enzymes: Biochemistry, Biotechnology & Clinical Chemistry, T. Palmer, East West Press Ltd., New Delhi 2004.
5. An Introduction to Practical Biochemistry, David Plummer, 3rd Edition (2003), Tata McGraw-Hill Publishing Co. Ltd.
6. Biochemical Methods, S. Sadasivam & A. Manickam, 2nd Edition (1996), New Age International (P) Ltd.
7. Laboratory Manual in Biochemistry, J. Jayraman.
8. Fundamental of biostatistics Khan and Khanum, ukaaz publications, Hyderabad.
9. Biochemical calculation: 2nd edition, Irwin H. Segel.

Paper 2

1. Environmental Microbiology, R. M. Maier, I.L. Pepper & C.P. Gerba (2010), Academic Press
2. A Textbook of Microbiology by RC Dubey and DK Maheshwari, Revised Edition (2013).
3. Introduction to Environmental Microbiology-By Barbara Kolawzan, Adamiak et al (2006)
4. Casida L. E., "Industrial Microbiology" 2009 Reprint, New Age International (P) Ltd, Publishers, New Delhi.
5. Stanbury P. F., Whitaker A. & Hall--S. J., 1997, "Principles of Fermentation, Technology", 2nd Edition, Aditya Books Pvt. Ltd, New Delhi.
6. Prescott and Dunn's "Industrial Microbiology". 1982 4th Edition, McMillan Publishers
7. H. A. Modi, 2009. "Fermentation Technology" Vol 2, Pointer Publications, India
8. Industrial Microbiology. A.H. Patel. MacMillan. New Delhi. 1984.
9. Modern Food Microbiology. James Jay. 5th Ed,
10. Frazier and Westhoff, Food Microbiology, Tata McGraw Hill, 4th Edition
11. Microbiology By Prescott, Harley, Klein's 7th Edn
12. Outlines Of Dairy Technology, Sukumar De, Oxford University Press

Paper 3

1. Lehninger: Principles Of Biochemistry, 4th Ed., D. Nelson & M. Cox, W.H. Freeman & Co., (LPE).
2. Prescott's Microbiology, J.M. Willey, L.M. Sherwood, C.J. Woolverton, (2011) 8th edition, McGraw-Hill International edition.
3. Prescott, Harley and Klein's Microbiology, Willey, Sherwood, Woolverton (2008) 7th edition, McGraw-Hill International edition
4. Brock Biology of Microorganisms, Madigan, Martinko, Dunlap and Clark (2009) 12th edition, Pearson Education

Practicals based on Sem III

Paper/Unit	S.N.	Title	Credits	Lecture/Week
Paper I		Estimation of Biomolecules and Introduction to Bioenergetics and Biostatistics	1	3
U1	1	Extraction of Lipids	SKILL DEVELOPMENT	
	2	Estimation of Proteins by Biuret method		
U2	3	Estimation of RNA		
	4	Estimation of Carbohydrates		
U3	5	Problems on thermodynamics		
	6	Use of Excel for determination of Mean, Standard Deviation, Standard error, Plotting of error bar graph.		
Paper II				
U1	7	Screening of antibiotic producer	SKILL DEVELOPMENT	
	8	Screening of organic acid producer		
	9	Basic design and operation features of the bioreactor (Demonstration from Vlab.co.in)	ENTREPRENEURSHIP	
U2	10	Selective isolation of food spoilage organisms; Proteolytic, Lipolytic, amylase producing and coliforms.		
	11	Determination of TDT and TDT	EMPLOYABILITY	
	12	MIC of Sugar and Salt tolerance		
	13	Dye reduction test: RRT, MBRT		
14	Microbial quality of Milk: SPC, LPC, Thermophilic count, Pshychrophilic count, coliform count			
U3	15	MPN	EMPLOYABILITY	
	16	Routine Microbial analysis of water: SPC		
	17	Determination of BOD, COD Visit to Effluent treatment plant.		
PIII				
U1	18	Extraction of Nucleic Acids	SKILL DEVELOPMENT	
	19	Estimation of DNA		
	20	Separation and visualization of nucleic acids by Agarose gel electrophoresis		
U2			1	3
	21	UV mutagenesis		
	22	Assignment on Various types of DNA mutation and Repair		
U3	23	Extraction of RNA		
	24	Estimation of Proteins by Lowry's method		

C.K.Thakur ACS College, New Panvel (Autonomous)

S.Y.B.Sc. Microbiology

Sem IV Theory

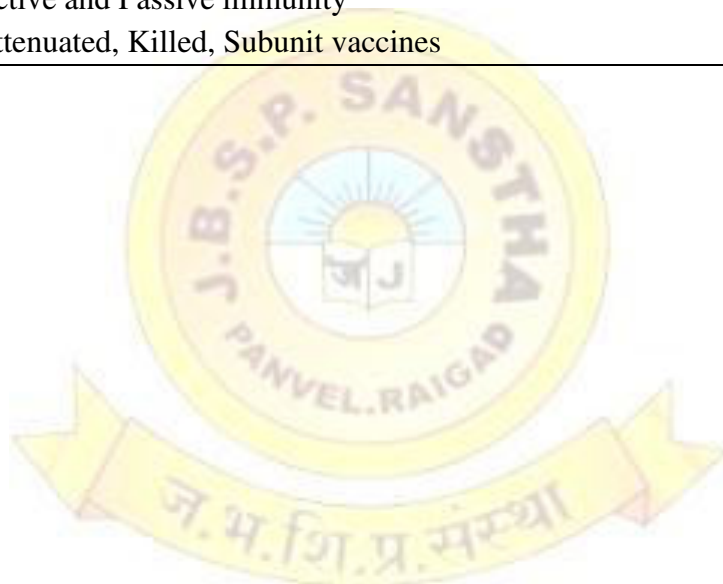
Paper/Unit SEM IV	Title	Lecture/ Week	Total lectures
Paper I	Introduction to Metabolism and Enzymology		
U1	Introduction to metabolism	1	
	1a Introduction to metabolism, Metabolic pathways		03
	1b EMP pathway and TCA cycle		03
	1c Experimental approaches to study metabolism SKILL DEVELOPMENT		04
	1d Thermodynamics of Phosphate compounds 1e Oxidation-reduction reactions 1f Thermodynamics of life		05
U2	Enzyme Kinetics	1	
	a. Introduction of Enzymes: <ul style="list-style-type: none"> • General properties of enzymes • How do enzymes accelerate reaction • Rate law for a simple catalysed reaction, Michaelis-Menten equation and it's derivation • Lineweaver Bruck plot • Classification of enzymes 		6
	b. Overview of Coenzyme: <ul style="list-style-type: none"> • Coenzymes: Different types and reactions catalyzed by coenzymes (in tabular form) • Nicotinic acid: structure, occurrence & biochemical function 		2
	c. Enzyme Kinetics: <ul style="list-style-type: none"> • Saturation kinetics • Effect of temperature and pH • Effect of Inhibitors- Reversible and irreversible, competitive, Non competitive and uncompetitive inhibitors • Multisubstrate reactions- Ordered, Random and pingpong reactions • Allosteric effects in enzyme catalysed reactions- Koshland-Nemethy and Filmer model & Monod, Wyman and Changeux model 	SKILL DEVELOPMENT	7
U3	Membrane Transport	1	
	A. Composition and architecture of membrane <ul style="list-style-type: none"> • Lipids and properties of phospholipid membranes • Integral & peripheral proteins & interactions with lipids • Permeability • Aquaporins • Mechanosensitive channels 		02

	B. Methods of studying solute transport <ul style="list-style-type: none"> • Use of whole cells • Liposomes • Proteoliposomes 	02
	C. Solute transport across membrane <ul style="list-style-type: none"> • Passive transport and facilitated diffusion by membrane proteins • Co-transport across plasma membrane - (Uniport, Antiport, Symport) • Active transport & electrochemical gradient • ATPases and transport (only Na-K ATPase) • Shock sensitive system – Role of binding proteins • Histidine uptake (Diagram and description) • Phosphotransferase system • Schematic representation of various membrane transport systems in bacteria. 	08
	D. Other examples of solute transport: <ul style="list-style-type: none"> • Iron transport: A special problem • Assembly of proteins into membranes and protein export • Bacterial membrane fusion central to many biological processes 	03

Paper/Unit	Title	Lecture/Week	Total lectures
SEM IV Paper II	Introduction to Medical Microbiology and immunology	03	
U1	Common infectious diseases, Epidemiology and Public Health Awareness	01	(15)
SHIFTED FROM USMB 303 OPTION A	Part A: Common infectious diseases		(10)
	a. Skin Infections: Study of structure and functions of skin Study of skin infections caused by <i>Pseudomonas</i> , Acne & Measles		3
	b. Infections of Nervous system Study of structure and functions of nervous system Study of Tetanus & Rabies		2
	c. Infections of Respiratory systems Study of structure and function of respiratory system Study of pharyngitis, laryngitis, Sinusitis (learn terms only), Diphtheria and common cold		2
	d. Infections of Digestive system Study of structure and function of Digestive system		3

	Study of Typhoid fever, <i>E. coli</i> gastroenteritis, Hepatitis A, Rotavirus and Amoebiasis		
	Part B: Epidemiology and Public Health Awareness (5 Lectures)		
	e. The Epidemiology of Infectious Diseases and Their Control Epidemiological terminology: Epidemiology, sporadic diseases, endemic diseases, Hyperendemic Diseases, Epidemic Diseases, Index Case, Pandemic Disease, Outbreak		1
	f. The Spread of Infection: Reservoirs of infection - Human reservoir, Animal reservoir, non-living reservoir Transmission of Disease- Contact transmission, Vehicle Transmission and vectors		2
	g. Public Health Measures For Control Of Disease: Control directed against reservoir, Transmission of the pathogens. Immunisation, Quarantine, Surveillance and pathogen eradication	SKILL DEVELOPMENT	2
Practicals			
U2	Host defence and public health (Epidemiology of infectious diseases)	1	(15)
SHIFTED FROM USMB 402 UNIT 1	Innate immunity and immune system		(11)
	a. Classification of immune system (innate immunity & acquired immunity)		2
	b. Physical barriers in non specific innate resistance revision. Chemical barriers (Complement: principle & significance (no pathway), Cytokines: interferon, antimicrobial peptides, bacteriocins		4
	c. Cells of immune system: Haematopoiesis, lymphocytes, monocytes & macrophages, granulocytes, mast cells, dendritic cells & NK cells		2
	d. Phagocytosis & Inflammation		3
	Epidemiology of infectious diseases		(4)
	e. Tools of epidemiology, recognition of an infectious disease in population		2
	f. Spread of infection: Reservoirs and transmissions. Nosocomial infections: Micro organism in hospital, compromised host, chain of transmission, control of nosocomial infection.		2

U3	Introduction to Physiological sampling, Diagnostic techniques and Vaccines	1	(15)
	A. Introduction to Physiological sampling <ul style="list-style-type: none"> • Types of specimens • Sample collection • Processing • Transportation and storage 		04
	B. Diagnostic techniques <ul style="list-style-type: none"> • Microscopic and Culturing techniques • Biochemical Identification • Molecular Biology Techniques (Western blotting, ELISA, PCR) • Immunological Tests (VDRL, Widal, SRID) 	EMPLOYABILITY	08
	C. Vaccines Active and Passive immunity Attenuated, Killed, Subunit vaccines		03



Paper/ Unit	Title	Credits	Lecture/ Week	Total lectures
Paper III SEM IV	Advances Analytical Techniques, Soft Skills and Applications of Microbiology	02		
U1	Introduction to Bioinformatics, Nano biotechnology, Biofilm and Biosensor		1	
	<p>A. Introduction to Bioinformatics</p> <ul style="list-style-type: none"> • Definition, aims, tasks and applications of Bioinformatics. • Database, tools and their uses - • Nucleic acid sequence databases- EMBL, DDBJ, GenBank, • Protein sequence databases-PIR, SWISS-PROT, TrEMBL • Different terminologies – Transcriptomics, Metabolomics, Pharmacogenomics, Phylogenetic tree, Annotation, • Sequence alignment—(global, local), FASTA, BLAST. • Genomics, Proteomics 			05 SKILL DEVELOPMENT
	<p>B. Nano biotechnology</p> <p>Introduction of Nano biotechnology & application in drug and gene delivery</p> <p>Types of nanomaterials- nanoparticles, nanocapsules, nanotubes, liposomes, nanogels, Dendrimers, Gold nanoparticles.(Definition and applications)</p>			05 EMPLOYABILITY
	<p>C. Biofilms and biosensors with applications:</p> <p>Biosensors: Introduction, design, working and applications of biosensors</p> <p>Biofilms: Introduction of biofilms, Types of biofilms, Mechanism of formation of biofilms and applications of biofilms.</p>			05
U2	Analytical Techniques: Chromatography, Spectroscopy and Basic centrifugation		1	
	<p>A.Chromatography</p> <ul style="list-style-type: none"> • Introduction to chromatography, • Types of chromatography <ul style="list-style-type: none"> ○ Paper chromatography: Principle, circular, ascending and descending Paper Chromatography, ○ Separation of amino acids by Paper Chromatography. 			08 SKILL DEVELOPMENT

	<ul style="list-style-type: none"> ○ Thin layer chromatography: principle, preparation of TLC plates, procedure for TLC, preparative TLC, 2D TLC [one paragraph], HPTLC-[1 page], Separation of sugars by TLC. ● Column chromatography : Introduction & principle ● Exclusion chromatography, gel chromatography 			
	B. Spectroscopy <ul style="list-style-type: none"> ● Properties of light ● Beer's and Lambert's law ● UV-visible spectroscopy <ul style="list-style-type: none"> ○ Principal ○ Working ○ Construction 			04
	C. Centrifugation <ul style="list-style-type: none"> ● Basic principles of sedimentation, ● types of rotors, ● Types of centrifuge and its applications. ● Care, maintainance and safety aspects of centrifuges 			03
U3	Research Fundamentals, Hypothesis Writing, Study designs, Report writing and presentation		1	
	A. Perception of Research Meaning of research P M Cook's definition of Research General characteristics of research Functions of research Specific characteristics of research Objectives of research Classification of research Steps of action research Characteristics of an investigator Difference between action research and fundamental research			05
	B. Hypothesis Writing			02
	C. Scientific Writing The research report Need of research report General format of research report Mechanics of report writing Writing research abstract: Need of an Abstract Format of an abstract and Characteristics of a good abstract Writing research papers: Format of a research paper, Advantages of a research paper			05
	D. Presentation skills (Poster and Oral)			03

SKILL DEVELOPMENT

References:

Paper 1

1. Lehninger: Principles Of Biochemistry, 4th Ed., D. Nelson & M. Cox, W.H. Freeman & Co., (LPE)
2. Principles of Biochemistry- G. Zubay, W.W. Parson, D.E. Vance. Wm.C. Brown Publishers.
3. Fundamentals of Biochemistry. D. Voet and J. Voet Publisher Wiley plus Edition 5th.
4. Gottschalk, G., (1985), Bacterial Metabolism, 2nd edition, Springer Verlag
5. White, D., (1995), The Physiology and Biochemistry of Prokaryotes, 3rd edition, Oxford, University Press.
6. Rose, A.H. (1976) Chemical Microbiology, 3rd edn Butterworth-Heinemann

Paper 2

1. Microbiology, An Introduction by Tortora, Funke & Case 9th and 10th edition, Pearson education.
2. Bailey and Scott's Diagnostic Microbiology, 11th edition Publ: Mosby
3. Anantnarayan & Paniker's Textbook of Microbiology, 8th Ed.
4. Mackie and McCartney Practical medical microbiology 14th edition. Publ: Churchill Livingstone
5. Brock biology of microorganism by Michael T Madigan. & John M Martinco. Pearson education.
6. Prescott, Harley Klein. Mc Graw, Text Book of Microbiology, international edition, 7th Ed
7. Anantnarayan & Paniker's edtn 10th. University press
8. Kanai Mukherjee, Swarajit Ghosh 'Medical Laboratory Technology: Procedure manual for routine diagnostic tests, 3rd Edition.

Paper 3

1. Bionanotechnology - Andrew and Waqar, One Central Press Ltd, UK., November, 2014.
2. Text book of Biotechnology by R C Dubey. 4th edition
3. Current Research, Technology & Education Topics in Applied Microbiology & Microbial Biotechnology. A Mendez Vilas Edition
4. Periodicum Biologorum., Vol 109., No 2, 2007. Characteristics and Significance of Microbial Biofilm Formation Biofilms Importance and Applications. Indian Journal of Biotechnology, Vol8, April 2009, pp159-169.
5. Research Methodology, Yogesh Kumar Singh, New age International Publisher
6. Instrumental Methods of chemical analysis, V.K. Ahluwalia, Ane Books Pvt.Ltd; 2015.
7. Principles & techniques of Biochemistry & Mol biology 6th ed, Keith Wilson & John Walker, Cambridge University press, 2006
8. Laboratory manual in Biochemistry- J. Jayaraman
9. Research Methodology, Yogesh Kumar Singh, New age International Publisher

Modality of Assessment

Internal assessment

a) Theory 25 Marks

Sr.No.	Evaluation type	Marks
1	One class test (multiple choice questions/objective and subjective /long answers)	20
2	Active participation in routine class instructional deliveries(case studies/seminar/presentation)	05

B) External examination-75%

Semester End Theory Assessment -75% 75 marks

Duration – These examinations shall be of two and half hours duration.

Theory question paper pattern:-

1. There shall be four questions. Three questions each of 20 marks and one question for 15 marks. On each unit there will be one questions & fourth one will be based on all the three units.
2. All question shall be compulsory with internal choice within the questions. Question number 1, 2 & 3 will be of 39 – 40 marks and question no. 4 will be 30 marks with internal options.
3. Questions may be subdivided into subquestions.
4. The allocation of marks depends on the weightage of the topic.

Practical Examination pattern

Semester III:

Course : USc3 Mi P	Total
Section -I	50 Marks
Section –II	50 Marks
Section -III	50 Marks

Semester IV:

Course : USc4 Mi P	Total
Section -I	50 Marks
Section –II	50 Marks
Section -III	50 Marks

Overall examination pattern

	Section I /paper I			Section II/Paper II			Section III/Paper III		
	Internal	External	Total	Internal	External	Total	Internal	External	Total
Theory	25	75	100	25	75	100	25	75	100
Practicals	00	50	50	00	50	50	00	50	50
Practical examination –Semester III									
USc3 Mi P									
Section -I				50 Marks					
Section –II				50 Marks					
Section -III				50 Marks					
Practical examination –Semester IV									
USc4 Mi P									
Section -I				50 Marks					
Section –II				50 Marks					
Section -III				50 Marks					

External examination pattern

Semester –III

USc3 Mi P

Sr.no.	Section - I	Marks
1	Chemical assay (Estimation of Proteins /RNA /Carbohydrate)	20
2	Qualitative test	10
	Biostatics problem/ Problems on thermodynamics/Quiz	05
3	Assignment/Report	05
	Section- II	
1	Major techniques (Determination of TDT and TDT/MIC of Sugar and Salt tolerance/Microbial quality of Milk: SPC, LPC, Thermophilic count, Psychophilic count, coliform count/MPN/Routine Microbial analysis of water: SPC.)	20
2	Minor techniques (antibiotic producer/ organic acid producer/isolation of food spoilage organisms; Proteolytic, Lipolytic, amylase producing and coliforms/ Dye reduction test: RRT, MBRT/ Determination of BOD, COD)	10
3	Assignment/Report	05
4	quiz	05

Section- III		
1	Major techniques (Estimation of DNA / Estimation of Proteins by Lowry's method /Separation and visualization of nucleic acids by Agarose gel electrophoresis)	20
2	Minor techniques –(Extraction of Nucleic Acids/ / Extraction of RNA/UV mutagenesis)	10
3	Assignment on Various types of DNA mutation and Repair	05
4	Quiz	05

Semester –IV

USc4 Mi P

Sr.no.	Section - I	Marks
1	Major techniques (Effect of [S] on enzyme activity Determination of Km and Vmax (MM and LB plot) Effect of pH on enzyme activity Effect of temperature on enzyme activity)	30
2	Problem/quiz	05
3	Assignment/Report	05
Section II		
1	Major techniques (Biochemical tests IMViC, Sugar Fermentation, TSI, Oxidase, Catalase, Lysine decarboxylase, PPA, gelatinase/ Acid fast staining).	20
2	Minor Techniques (Isolation of <i>Pseudomonas</i> , <i>Escherichia coli</i> and <i>S. typhi</i> / Differential staining: Blood staining/ Metachromatic granules staining/ Isolation of pathogens on specific media XLD, SS agar, SIBA, Cetrinide agar/ Permanent slides of <i>Entamoeba histolytica</i> / VDRL and SRID.)	10
3	Assignment on: i. Normal flora of - skin/ respiratory system/ nervous system / digestive system, ii. Immunization programs in India (role of CDC, WHO, ICMR, NICD, NAARI)	05
4	Quiz/Report	05
Section III		
1	Major techniques (Preparation of Silver Nano particles and study of its antimicrobial activity/ Thin layer chromatography – carbohydrate separation/Column chromatography – separation of plant pigments)	20
2	Minor techniques (Preparation and study of biofilm/ Paper chromatography – amino acids separation/ Sizing of yeast/ Isolation of photosynthetic/ N-fixing/ Sulphate reducing bacteria)	10
3	Report	05
4	Assignment/quiz	05



CHANGU KANA THAKUR ARTS, COMMERCE & SCIENCE COLLEGE (AUTONOMOUS)



T. Y. B. Sc. Microbiology Syllabus

Janardan Bhagat Shikshan Prasarak Sanstha's



Changu Kana Thakur



Arts, Commerce & Science College, New Panvel
(Autonomous)

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

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Program: T. Y. B. Sc.

Revised Syllabus of T. Y. B. Sc.

Course: Microbiology

Choice Based Semester Grading System (75:25)

With effect from Academic Year 2021-22



T. Y. B. Sc. Microbiology Syllabus

Choice Based Credit, Grading and Semester System (CBCGS)

T. Y. B. Sc. Microbiology Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	T. Y. B. Sc.
2	Course Code for Theory and Practical Semester I	USc5Mi1, USc5Mi2, USc5Mi3, USc5Mi4, USc5Mi5 USc5MiPR1, USc5MiPR2, USc5MiPR3, USc5MiPR4, USc5Mi PAC
3	Course Code for Theory and Practical Semester II	USc6Mi1, USc6Mi2, USc6Mi3, USc6Mi4, USc6Mi5 USc6MiPR1, USc6MiPR2, USc6MiPR3, USc6MiPR4, USc6Mi PAC
3	Eligibility for Admission	S. Y. B. Sc. Microbiology
4	Passing marks	40%
5	Ordinances/Regulations (if any)	-
6	No. of Semesters	Two
7	Level	U. G.
8	Pattern	Semester (75:25)
9	Status	Revised
10	To be implemented from Academic year	2021-2022



T. Y. B. Sc. Microbiology Syllabus

Preamble of the Syllabus

With the introduction of Autonomy in the Choice Based Credit, Grading and Semester System, the syllabus in Microbiology has been revised for T. Y. B.Sc. Semester - V and Semester - VI. This syllabus is implemented with effect from 2021-22. The revised syllabus has been approved by the concerned authorities of the Autonomous College, Committees formed by the college, BOS members and Head/ senior teachers from Department of Microbiology. B. Sc. Microbiology Programme is of THREE years with three parts F. Y. B. Sc, S. Y. B. Sc and T. Y. B. Sc . Each part has two semesters. Each semester will have four theory papers of 75 Marks and practical paper based on theory paper of 250 Marks (including applied component). The syllabus has been designed in such a theory is related with the practicals thus enabling students to develop professional skillsets of a Microbiologist. The topics included will give hands on practice of microbiology experiments. Each paper has been designed emphasizing the need to develop Critical thinking/reasoning in the students. This will aid the students in their specific area of their interest/ specialization in particular. This revised syllabus is aimed at equipping students with theoretical foundations and practical techniques required in genetics, biochemistry, medical, R & D, quality control, advances in Molecular Biology. Areas covered in Semester V & Semester VI will boost employability of students. As mentioned in the syllabus, all the courses of theory & practical's are compulsory to T. Y. B. Sc. microbiology.



T. Y. B. Sc. Microbiology Syllabus

Objectives of the Course

- To help the learners understand the depth of microbiology
- To provide base for the students them succeed in competitive examination (NET, SET)
- To help them opt job and develop career in the field of microbiology

Course Outcome: By the end of the course

- The learners will have hands training of various microbiology techniques which will be helpful for them to opt job in industries and research related to microbiology.
- The theory syllabus will provide a basement and is also related to various competitive examination like CSIR NET, SET, GATE, PET and it will be helpful for them to acquaint with these examination in future
- Learners will gain knowledge about genetics, immunology, medical microbiology, cancer immunology, advance techniques in diagnostics, emerging infections, pathways of biochemistry, industrial microbiology.
- Plant, animal and marine biotechnology as well as human and animal health care concepts covered in applied component (Paper V) boosts the knowledge of the students.



T. Y. B. Sc. Microbiology Syllabus

T. Y. B. Sc. Microbiology

For the subject of Microbiology there shall be five papers for 60 lectures each comprising of four units of 15 L each.

Semester-V	
Paper-I	Microbial Genetics
Paper- II	Medical Microbiology & Immunology: Part - I
Paper- III	Microbial Biochemistry: Part - I
Paper- IV	Bioprocess Technology: Part - I
Semester-VI	
Paper-I	rDNA Technology, Bioinformatics & Virology
Paper- II	Medical Microbiology & Immunology: Part - II
Paper- III	Microbial Biochemistry: Part - II
Paper- IV	Bioprocess Technology: Part - II



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Choice Based Semester Grading System (CBSGS)
T. Y. B. Sc. Microbiology Syllabus
To be implemented from the Academic year 2021-22

T. Y. B. Sc. Microbiology Semester V Theory

Course Code : USc5Mi-1 Title of the Paper : Microbial Genetics
 Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	DNA Replication
II	Transcription, Genetic Code & Translation
III	Mutation and Repair
IV	Genetic Exchange & Homologous Recombination

Course Code : USc5Mi-2 Title of the Paper: Medical Microbiology & Immunology: Part - I
 Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Bacterial Strategies for Evasion and Study of a Few Diseases
II	Study of a Few Diseases with Emphasis on Cultural Characteristics of the Etiological agent, Pathogenesis, Laboratory Diagnosis and Prevention
III	General Immunology – I
IV	General Immunology - II

Course Code : USc5Mi-3 Title of the Paper : Microbial Biochemistry: Part - I
 Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Biological Membranes & Transport
II	Bioenergetics & Bioluminescence
III	Methods of Studying Metabolism & Catabolism of Carbohydrates
IV	Fermentative Pathway & Anabolism of Carbohydrates



T. Y. B. Sc. Microbiology Syllabus

Course Code : USc5Mi-4 Title of the Paper : Bioprocess Technology: Part - I
Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Upstream Processing - I
II	Upstream Processing - II
III	Fermentation Modes, Equipments and Instruments
IV	Traditional Industrial Fermentations

T. Y. B. Sc. Microbiology Semester V Practical

Paper Code	Title of the Paper	Practical/Week	Credits
USc5MiPR1	Microbial Genetics	01	1.5
USc5MiPR2	Medical Microbiology & Immunology: Part - I	01	1.5
USc5MiPR3	Microbial Biochemistry: Part - I	01	1.5
USc5MiPR4	Bioprocess Technology: Part - I	01	1.5



T. Y. B. Sc. Microbiology Syllabus

T. Y. B. Sc. Microbiology Semester VI Theory

Course Code : USc6Mi1 Title of the Paper : rDNA Technology, Bioinformatics & Virology
Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Recombinant DNA Technology
II	Applications of rDNA Technology & Bioinformatics
III	Regulation & Basic Virology
IV	Advanced Virology

Course Code : USc6Mi2 Title of the Paper : Medical Microbiology & Immunology: Part - II
Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Study of a Few Diseases with Emphasis on Cultural Characteristics of the Etiological Agent, Pathogenesis, Laboratory Diagnosis and Prevention
II	Chemotherapy of Infectious Agents
III	Immunology - I
IV	Immunology - II

Course Code : USc6Mi3 Title of the Paper : Microbial Biochemistry: Part - II
Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Lipid Metabolism & Catabolism of Hydrocarbons
II	Metabolism of Proteins and Nucleic Acids
III	Metabolic Regulation
IV	Prokaryotic Photosynthesis & Inorganic Metabolism



T. Y. B. Sc. Microbiology Syllabus

Course Code : USc6Mi1 Title of the Paper : Bioprocess Technology: Part - II
Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Downstream Processing
II	Advances in Bioprocess Technology
III	Quality Assurance, Quality Control, Instrumentation and Bioassay
IV	Industrial Fermentations

Semester II Practical

Paper Code	Title of the Paper	Practical/Week	Credits
USc6MiPR1	rDNA Technology, Bioinformatics & Virology	01	1.5
USc6MiPR2	Medical Microbiology & Immunology: Part - II	01	1.5
USc6MiPR3	Microbial Biochemistry: Part - II	01	1.5
USc6MiPR4	Bioprocess Technology: Part - II	01	1.5

N.B.

I. Each theory period shall be of 48 minutes duration. Theory component shall have 240 instructional periods plus 240 notional periods per semester which is equal to 384 learning hours. For theory component the value of One Credit is equal to 38.40 learning hours.

II. Each practical period shall be of 48 minutes duration. Practical component shall have 240 instructional periods plus 60 notional periods per semester which is equal to 240 learning hours. For practical component the value of One Credit is equal to 40 learning hours.



T. Y. B. Sc. Microbiology Syllabus
T. Y. B. Sc. (Semester – V & Semester - VI)

**Microbiology Syllabus Revised According To Choice Based Semester Grading System to be implemented
from the Academic year 2021-2022**

T. Y. B. Sc. Semester V Syllabus

USc5Mi1 (Microbial Genetics)

Course Code : USc5Mi1	Title of the Paper : Microbial Genetics
No. of Lectures : 60	Credits : 2.5

Learning Objectives:

The learning objectives include the following:

1. DNA Replication: The learner will understand the events occurring in both Prokaryotic and Eukaryotic DNA replication, with a focus on the involvement of Proteins and Enzymes at the cellular level. The topic will also include the assembly of Eukaryotic chromosome.
2. Transcription, Genetic Code and Translation: This module aims at the learner understanding the basis of gene expression and the Central Dogma and the molecular basis of protein synthesis in Prokaryotes and Eukaryotes. The module deals with the structure and properties of different forms of RNA, maturation of RNA and RNA splicing.
3. Mutation and DNA repair: The molecular basis and types of mutation, their cause, effect and DNA repair is studied. The basic concepts related to molecular biology are explained.
4. Genetic exchange: This module includes the study of various mechanisms of gene transfer in bacteria. It also provides insight into the mechanisms of genetic recombination. The module deals with the Genetics of bacteria and bacteriophages, development of new strains and genetic mapping.
5. Practicals The laboratory techniques and experiments based on these topics will give students hands on competence in fundamental molecular biology experiments.

Learning Outcomes:

DNA Replication: The learner will understand the concept of genome organization as well as the sequence of fidelity, events, mechanism, enzymes and proteins involved in replication of DNA in eukaryotes.

Transcription, Genetic Code and Translation: The student will know the genetic code and central dogma of biology its two-step transcription and translation, types and maturation of RNA in both prokaryotes and eukaryotes.

Mutation and DNA repair: The learner will know the concept of mutation, its types, causes and their effects. This module will also make them understand types of mutagens, damage to DNA due to mutagenesis, various mechanisms of DNA repair as well as the mechanisms leading to oncogenesis



T. Y. B. Sc. Microbiology Syllabus

Genetic exchange: The student shall understand the various mechanisms of gene transfer in bacteria and genetic recombination.

Practicals: The students will acquire skill to perform the laboratory techniques and experiments based on the above topics.

Title	Lectures/ Semester	Notional Periods
Unit I: DNA Replication	(Total 15 L)	15L
1.1 Over view of DNA replication (Fundamental rules and prokaryotic replication)	02L	
1.2 Structural organization of <i>E. coli</i> chromosome - Folded Fibre model and its genetic map.	02L	
1.3 Processivity and fidelity of DNA replication		
1.4 Enzymes and proteins associated with DNA replication- Primase, Helicase, Topoisomerase and their type, SSB, DNA polymerases, Ligases, Telomerases, Ter and Tus proteins.	01L	
1.5 Chromosome characteristics :- Chromosome structure, Euchromatin and Heterochromatin, Coding and Non-coding sequences.	03L 02L	
1.6 Eukaryotic DNA replication – Molecular details of DNA synthesis, replicating the ends of the chromosomes assembling newly replicated DNA into nucleosome.	04L	
1.7 Rolling circle mode of DNA replication	01L	



T. Y. B. Sc. Microbiology Syllabus

Unit II: Transcription, Genetic Code and Translation	(Total 15 L)	15
2.1 Central Dogma: An Overview, Transcription process, Transcription in bacteria - Initiation of transcription at promoters, elongation of an RNA chain, termination of an RNA chain	03L	
2.2 Brief introduction about types of RNA	01L	
2.3 One gene –One polypeptide hypothesis	01L	
2.4 Transcription in Eukaryotes – Eukaryotic RNA polymerase and types, Transcription of protein-Coding genes by RNA polymerase II, Transcription initiation, The structure and production of Eukaryotic mRNAs, Production of mature mRNA in Eukaryotes, Processing of Pre-mRNA to mature mRNA. Self-splicing of Introns, RNA editing	04L	
2.5 Genetic code - Nature of genetic code and characteristics of genetic code.	02L	
2.6 Translation process - Transfer RNA, structure of tRNA, tRNA genes, Recognition of the tRNA anticodon by the mRNA codon, Adding of amino acid to tRNA , Ribosomal RNA and Ribosomes, Ribosomal RNA Genes, Initiation of translation, Initiation in Bacteria, Initiation in eukaryotes, Elongation of the polypeptide chain, termination of translation, protein sorting in the cell.	04L	



T. Y. B. Sc. Microbiology Syllabus

<p>Unit III: Mutation and Repair</p> <p>3.1 Brief over view onto DNA mutation</p> <p>3.2 Fluctuation test</p> <p>3.3 Expression of mutations – a) Time course of phenotypic expression. b) Conditional expression of mutation.</p> <p>3.4 Causes of mutation: Natural/spontaneous mutation-- replication error, depurination, deamination. Induced mutation: principle and mechanism with illustrative diagrams for: 3.4.1 Chemical mutagens - base analogues, nitrous acid, hydroxyl amine, intercalating agents and alkylating agents. 3.4.2 Physical mutagen 3.4.3 Biological mutagen (only examples)</p> <p>3.5 Ames test</p> <p>3.6 Detection of mutants</p> <p>3.7 Molecular mechanism and sequence of changes leading to oncogenesis- 3.7.1 Mutations, 3.7.2 Activation of proto-oncogenes, 3.7.3 Loss of function of tumour suppressor (anti-cancer) genes</p>	<p>(Total 15L)</p> <p>02L</p> <p>01L</p> <p>03L</p> <p>04L</p> <p>01L</p> <p>02L</p> <p>02L</p>	<p>15</p>
<p>Unit IV: Genetic Exchange & Homologous Recombination</p> <p>4.1 Genetic analysis of Bacteria</p> <p>4.2 Gene transfer mechanisms in bacteria</p> <p>4.2.1 Transformation 4.2.1.1 Introduction and History 4.2.1.2 Types of transformation in prokaryotes-- Natural transformation in <i>Streptococcus pneumoniae</i>, <i>Haemophilus influenzae</i>, and <i>Bacillus subtilis</i>. 4.2.1.3 Mapping of bacterial genes using transformation. 4.2.1.4 Problems based on transformation.</p> <p>4.2.2 Conjugation 4.2.2.1 Discovery of conjugation in bacteria 4.2.2.2 Properties of F plasmid/Sex factor 4.2.2.3 The conjugation machinery</p>	<p>(Total 15 L)</p> <p>01L</p> <p>03L</p> <p>05 L</p>	<p>15</p>



T. Y. B. Sc. Microbiology Syllabus

4.2.2.4	Hfr strains, their formation and mechanism of conjugation	03L	
4.2.2.5	F' factor, origin and behavior of F' strains, Sexduction		
4.2.2.6	Mapping of bacterial genes using conjugation (Wolman and Jacob experiment).		
4.2.2.7	Problems based on conjugation		
4.2.3	Transduction	03L	
4.2.3.1	Introduction and discovery		
4.2.3.2	Generalized transduction		
4.2.3.3	Use of Generalized transduction for mapping genes		
4.2.3.4	Specialized transduction		
4.2.3.5	Problems based on transduction		
4.3	Recombination in bacteria		
4.3.1	General/Homologous recombination		
4.3.2	Molecular basis of recombination		
4.3.3	Holliday model of recombination (Single strand DNA break model only)		
4.3.4	Enzymes required for recombination		
4.3.5	Site –specific recombination		

Paper Code	Title of the Paper	Practical/Week	Credits
USc5Mi1	Microbial Genetics	1	1.5

Sr. No.	Name of the Practical
1	UV survival curve – determination of exposure time leading to 90% reduction
2	Isolation of mutants using UV mutagenesis
3	Gradient plate technique (dye resistant mutant)
4	Replica plate technique for selection & characterization of mutants – auxotroph & antibiotic resistant
5	Isolation and detection of plasmid DNA

SKILL DEVELOPMENT



T. Y. B. Sc. Microbiology Syllabus

Reference: Course Code: USc5Mi1

Text books:

1. Peter J. Russell (2006), "Genetics-A molecular approach", 2nd edition.
2. Benjamin A. Pierce (2008), "Genetics a conceptual approach", 3rd edition, W. H. Freeman and company.
3. R. H. Tamarin, (2004), "Principles of genetics", Tata McGraw Hill.
4. D., Nelson and M.Cox, (2005), "Lehninger's Principles of biochemistry", 4th edition, Macmillan worth Publishers.
5. M.Madigan, J.Martinko, J.Parkar, (2009), "Brock Biology of microorganisms", 12th edition, Pearson Education International.
6. Fairbanks and Anderson, (1999), "Genetics", Wadsworth Publishing Company.
7. Prescott, Harley and Klein, "Microbiology", 7th edition Mc Graw Hill international edition.
8. Robert Weaver, "Molecular biology", 3rd edition. Mc Graw Hill international edition.
9. Nancy Trun and Janine Trempy, (2004), "Fundamental bacterial genetics", Blackwell Publishing
10. Snustad, Simmons, "Principles of genetics", 3rd edition. John Wiley & sons, Inc.
11. Roger Y. Stanier, (1987) "General Microbiology", 5th edition, Macmillan Publishing.

Reference books:

1. Benjamin Lewin, "Genes IX", Jones and Bartlett publishers.
2. JD Watson, "Molecular biology of the gene", 5th edition.
3. Molecular Biology of the Cell by Alberts and others, Garland Publishing, NY.
4. Molecular Biology by P. C. Turner and others, Bioscientific Publishers.



T. Y. B. Sc. Microbiology Syllabus

USc5Mi2 (Medical Microbiology and Immunology Part I)

Course Code	: USc5Mi2	Title of the Paper	: Medical Microbiology and Immunology Part I
No. of Lectures	: 60	Credits	: 2.5

Learning Objectives:

The course in medical microbiology has been designed to help students to understand the mechanism of various diseases. The study of Etiology, transmission, pathogenesis, clinical manifestations, laboratory diagnosis, prophylaxis, and treatment of various diseases tells us about the detailed insight of pathogen. The course also includes one of the most important areas of modern medical microbiology that -understands genetic modification and pathogen evolution.

The students have achieved a basic understanding of Innate Immunity and Host Defense mechanisms in their lower classes and Immunology that forms an integral part of Medical Microbiology has been designed to help to understand the ability of our immune system to defend against invading pathogens in a logical fashion. The study of structure and classifications of antibodies, role of cytokines, and function of MHC complex will clear the concepts of formation of immune response and ability of our body to defend against pathogens.

Learning Outcomes:

The students will be able to:

- Give details of the virulence factors and other features of the pathogen.
- Understand modern alternatives to Koch's Postulates, Genetic modification and pathogen evolution.
- Correlate these virulence factors with the pathogenesis and clinical features of the disease.
- Comment on the mode of transmission, diagnosis, prophylaxis and treatment of various diseases.
- Understand the structure & functions of immunoglobulin and its role in immune response.
- Understand the importance of cytokines, MHC, APCs, and its mechanism in formation of adaptive immunity.
- Explain the mechanism of antigen –antibody reactions and its application in diagnosis of various infections.



T. Y. B. Sc. Microbiology Syllabus

Title & Content	Lectures/ Semester	Notional Periods
<p>Unit I: Bacterial Strategies for Evasion and Study of a Few Diseases</p> <p>1.1. Study of virulence mechanisms in bacteria 1.1.1. Pathogenicity islands 1.1.2. Bacterial virulence factors: Adherence factors, Invasion of host cells and tissues 1.1.3. Toxins: Exotoxins, Endotoxin 1.1.4. Enzymes : Tissue degrading enzymes, IgA1proteases 1.1.5. Antiphagocytic factors 1.1.6. Intracellular pathogenicity 1.1.7. Antigenic heterogeneity 1.1.8. The requirement for iron</p> <p>1.2 Study of A Few Infectious Diseases of the Respiratory Tract (wrt. Cultural Characteristics of the etiological agent, pathogenesis & clinical features, laboratory diagnosis, treatment and prevention only) 1.2.1.S. <i>pyogenes</i> infections 1.2.2 Influenza 1.2.3 Tuberculosis 1.2.4 Pneumonia caused by <i>K. pneumoniae</i> 1.2.4 Emerging infection –COVID-19</p> <p>1.3 Study of urinary tract infections</p>	<p>15L</p> <p>4 L</p> <p>8L</p> <p>2L</p>	<p>15</p>
<p>Unit II: Study of few diseases (wrt. Cultural characteristics of the etiological agent, pathogenesis & clinical features, laboratory diagnosis, treatment and prevention only)</p> <p>2.1 Study of skin infections 2.1.1. Pyogenic skin infections caused by <i>Pseudomonas</i> and <i>S. aureus</i> 2.1.2. Leprosy 2.1.3 Fungal infections-Candidiasis 2.1.4 Viral Infections- Herpes simplex</p> <p>2.2. Study of gastrointestinal tract infections 2.2.1.Infections due to Entero-pathogenic <i>E.coli</i> strains 2.2.2.Enteric fever-<i>Salmonella</i> 2.2.3Shigellosis 2.2.4.Rotavirusdiarrhoea 2.2.5 Dysentery due to <i>Entamoeba histolytica</i></p>	<p>15</p> <p>7L</p> <p>8L</p>	<p>15</p>

EMPLOYABILITY



T. Y. B. Sc. Microbiology Syllabus

Unit III: General Immunology – I	15L	15
3.1 Organs and tissues of the immune system:		
3.1.1 Primary lymphoid organs - structure and function of Thymus and Bone marrow		
3.1.2 Secondary lymphoid organs – structure and function of Spleen, Lymph node, Mucosa associated lymphoid tissues, Bronchus associated lymphoid tissue, Gut associated lymphoid tissue, Cutaneous associated lymphoid tissue	4L	
3.2 Antigens		
3.2.1. Immunogenicity versus antigenicity: Concepts - Immunogenicity, Immunogen, Antigenicity, Antigen, Haptens: Haptens as valuable research and diagnostic tools		
3.2.2 Factors that influence immunogenicity - Foreignness, Molecular size, Chemical composition, Heterogeneity, Susceptibility of antigen to be processed and presented, Contribution of the biological system to immunogenicity Genotype of the recipient, Immunogen dosage, Route of administration		
3.2.3 Epitopes / antigen determinants - General concept, Characteristic properties of B - cell epitopes, concepts of sequential and non-sequential epitopes (with only one example each). Properties of B - cell and T - cell epitopes. Comparison of antigen recognition by T cells and B cells		
3.2.4 Types of antigens – heterophile antigens, isophile antigens, sequestered antigens, super antigens, bacterial and viral antigens		
3.3 Immunoglobulins		
3.3.1. Immunoglobulins –Basic structure of Immunoglobulins, heterodimer; types of heavy and light chains; constant and variable regions, Immunoglobulin domains-hinge region. Basic concepts - hypervariable region, complementarity - determining regions (CDRs), framework regions (FRs) and their importance.		
3.3.2. Immunoglobulin classes and biological activities - Immunoglobulin G, Immunoglobulin M, Immunoglobulin A, Immunoglobulin E, Immunoglobulin D, (including diagrams)	4 L	
3.3.3 Monoclonal antibodies	2L	



T. Y. B. Sc. Microbiology Syllabus

Unit IV: General Immunology – I	15 L	15
4.1 Cytokines		
4.1.1. Concepts cytokines, lymphokines, monokines, interleukines, chemokines.	2 L	
4.1.2 Properties of cytokines		
4.1.3. Attributes of cytokines		
4.1.4 Biological functions of cytokines		
4.2 Major histocompatibility complex	3 L	
4.2.1 Introduction		
4.2.2 Three major classes of MHC encoded molecules		
4.2.3 The basic structure and functions of Class I and Class II MHC Molecules		
4.2.4 Peptide binding by Class I and Class II MHC molecule	3 L	
4.3 Antigen presenting cells		
4.3.1 Types of APC's		
4.3.2 Endogenous antigens: The Cytosolic pathway		
4.3.3. Exogenous antigens: The Endocytic pathway		
4.4 Antigen Antibody reactions	7 L	
4.4.1. Precipitation reaction –Immuno-electrophoresis		
4.4.2. Agglutination reaction hemagglutination, bacterial agglutination, passive agglutination, agglutination inhibition.		
4.4.3. Radioimmunoassay (RIA),		
4.4.4. Enzyme Linked Immunosorbent Assay indirect, competitive and sandwich ELISA		
4.4.5. Immunofluorescence- Direct and indirect.		
4.4.6 Western blotting.		

EMPLOYABILITY



T. Y. B. Sc. Microbiology Syllabus

Paper Code	Title of the Paper	Practical/Week	Credits
USc5Mi2	Medical Microbiology and Immunology Part I	1	1.5

Sr. No.	Name of the Practical
1	Acid fast staining
2	Identification of <i>Candida</i> species using the germ tube test and growth on Chrom agar
3	Study of standard cultures <i>E. coli</i> , <i>Klebsiella spp.</i> , <i>Proteus spp.</i> , <i>Pseudomonas spp.</i> , <i>Salmonella typhi</i> , <i>S. paratyphi A</i> , <i>S. paratyphi B</i> , <i>Shigella spp.</i> , <i>S. pyogenes</i> , <i>S. aureus</i>
4	Identification of isolates obtained from pus, sputum, stool and urine by morphological, cultural and biochemical properties
5	Antigen preparation "O and H antigen preparation of Salmonella. Confirmation by slide agglutination test
6	Demonstration of ELISA test

SKILL DEVELOPMENT

Reference: Course Code: USc5Mi2

Text books:

1. Jawetz, Melnick and Adelberg's Medical Microbiology, 26th Edition, Lange publication
2. Ananthanarayan and Panicker's, Textbook of Microbiology, 10th edition
3. Ananthanarayan and Panicker's, Textbook of Microbiology, 9th edition
4. Ananthanarayan and Panicker's, Textbook of Microbiology, 8th edition
5. Kuby Immunology, 6th Edition, W H Freeman and Company
6. Pathak & Palan, Immunology: Essential & Fundamental, 1st & 3rd Edition, Capital Publishing Company
7. Fahim Khan, Elements of Immunology, Pearson Education

Reference books / Internet references:

1. Kuby Immunology, 7th edition, W H Freeman and Company
2. Ananthanarayan and Panicker's, Textbook of Microbiology, 8th edition
3. Baron Samuel, Medical Microbiology, 4th edition
4. <http://www.ncbi.nlm.nih.gov/books/NBK7627/>
<http://www.macmillanlearning.com/catalog/static/whf/kuby>



T. Y. B. Sc. Microbiology Syllabus

USc5Mi3 (Microbial Biochemistry: Part-I)

Course Code	: USc5Mi3	Title of the Paper	: Microbial Biochemistry: Part-I
No. of Lectures	: 60	Credits	: 2.5

Learning Objectives:

This course is designed for T. Y .B. Sc. students who choose to major in Microbiology. Biochemistry is the branch of science that explores the chemical processes that take place inside all living things, from bacteria to plants and animals. It is a laboratory-based science that brings together biology and chemistry, by using chemical knowledge and techniques to help understand and solve biological problems. Microbial physiology is best understood with knowledge of biochemistry.

The course thus focuses on the need to study various intermediary metabolic processes and methods to study metabolism both invitro as well as in vivo. The course is designed to expose students to carbohydrate and lipid metabolism as also understand the principles of energy generation by different physiological groups of organisms. The advanced area of bioenergetics unfolds the universal mechanisms of energy generation by using electron transport systems and gaining knowledge of energy conservation. The student is also learning anabolic processes through concepts of biosynthesis, and polymerization namely glycogen and peptidoglycan biosynthesis.

Course specific objective: (CSO USc5Mi3)

1. Learners will understand mechanism of oxidative phosphorylation
2. Learners will be able to differentiate between bacterial and mitochondrial etc
3. Learners will understand various modes of generation of electrochemical energy
4. Learners will understand pathways for degradation of carbohydrates
5. Learners will understand pathways for synthesis of carbohydrates
6. Learners will understand regulation and energetics of carbohydrate metabolism pathways
7. Learners will understand catabolism and anabolism of fatty acids and PHB
8. Learners will understand catabolism of hydrocarbons
9. Learners will understand biosynthesis of phosphoglycerides
10. Learners will understand various methods of studying metabolism
11. Learners will understand mechanism of various fermentative pathways



T. Y. B. Sc. Microbiology Syllabus

Title & Content		Lectures/ Semester	Notional Periods
Unit I: Bioenergetics & Bioluminescence		15	15
1.1	Biochemical mechanism of generating ATP: Substrate-Level Phosphorylation, Oxidative Phosphorylation & Photophosphorylation	01L	
1.2	Electron transport chain 1.2.1 Universal Electron acceptors that transfer electrons to E.T.C. 1.2.2 Carriers in E.T.C. 1.2.2.1 Hydrogen carriers – Flavoproteins, Quinones 1.2.2.2 Electron carriers – Iron Sulphur proteins, Cytochromes. 1.2.3 Mitochondrial ETC 1.2.3.1 Biochemical anatomy of mitochondria 1.2.3.2 Complexes in Mitochondrial ETC 1.2.3.3 Schematic representation of Mitochondrial ETC.	03L	
1.3	Prokaryotic ETC 1.3.1 Organization of electron carriers in bacteria 1.3.1.1 Generalized electron transport pathway in bacteria 1.3.1.2 Different terminal oxidases 1.3.2 Branched bacterial ETC 1.3.3 Pattern of electron flow in E. coli - aerobic and anaerobic 1.3.4 Pattern of electron flow in Azotobacter vinelandii	03L	
1.4	ATP synthesis 1.4.1 Explanation of terms – Proton motive force, Proton pump, Coupling sites, P:O ratio, Redox potential (definition of Standard reduction potential) 1.4.2 Free energy released during electron transfer from NADH to O ₂ 1.4.3 Chemiosmotic theory (only explanation) 1.4.4 Structure & function of Mitochondrial ATP synthase 1.4.5 Structure of bacterial ATP synthase 1.4.6 Mechanism by Rotational catalysis 1.4.7 Inhibitors of ETC, ATPase and uncouplers	04L	
1.5	Other modes of generation of electrochemical energy 1.5.1 ATP hydrolysis 1.5.2 Oxalate formate exchange 1.5.3 End product efflux, Definition, Lactate efflux 1.5.4 Bacteriorhodopsin: - Definition, function as proton pump and significance	02L	
1.6	Bioluminescence 1.6.1 Brief survey of bioluminescent systems 1.6.2 Biochemistry of light emission 1.6.3 Schematic diagram 1.6.4 Significance / Application	02L	



T. Y. B. Sc. Microbiology Syllabus

Title & Content		Lectures/ Semester	Notional Periods
Unit II: Carbohydrate metabolism and energetics of pathways		15L	15L
2.1	Breakdown of polysaccharides – Glycogen, Starch, Cellulose	01L	
2.2	Breakdown of oligosaccharides - Lactose, Maltose, Sucrose, Cellobiose.	01L	
2.3	Utilization of monosaccharides - Fructose, Galactose	01L	
2.4	Major pathways – (with structure and enzymes) 2.4.1 Glycolysis (EMP) 2.4.2 HMP Pathway - Significance of the pathway 2.4.3 ED pathway 2.4.4 TCA cycle - Action of PDH, Significance of TCA 2.4.5 Incomplete TCA in anaerobic bacteria 2.4.6 Anaplerotic reactions 2.4.7 Glyoxylate bypass	05L	
2.5	Amphibolic role of EMP; Amphibolic role of TCA cycle	01L	
2.6	Energetics of Glycolysis, TCA and ED pathway – Balance sheet only. Format as in Lehninger (2.5 ATP/NADH and 1.5 ATP /FADH ₂) (Based on this format make balance sheet for Glycolysis -Lactic acid and Alcohol fermentation and for ED pathway)	02L	
2.7	2.7.1 General pattern of metabolism leading to synthesis of a cell from glucose 2.7.2 Sugar nucleotides 2.7.3 Gluconeogenesis (only bacterial) 2.7.3 Biosynthesis of glycogen 2.7.4 Biosynthesis of Peptidoglycan	04L	



T. Y. B. Sc. Microbiology Syllabus

Title & Content		Lectures/ Semester	Notional Lectures
Unit III: Lipid Metabolism & Catabolism of Hydrocarbons		15L	15L
3.1	Introduction to lipids 1.1.1 Lipids –Definition, classification & functions 1.1.2 Types and role of fatty acids found in bacteria 1.1.3 Common phosphoglycerides in bacteria 1.1.4 Action of lipases on triglycerides /tripalmitate	02L	
3.2	Catabolism of Fatty Acids 3.2.1 Oxidation of saturated fatty acid by β oxidation pathway 3.2.2 Energetics of β oxidation of Palmitic acid 3.2.3 Oxidation of propionyl CoA by acrylyl- CoA pathway and methyl citrate pathway	04L	
3.3	Anabolism of fatty acids 3.3.1 Biosynthesis of straight chain even carbon saturated fatty acid (palmitic acid)	02L	
3.4	PHB metabolism 3.4.1 PHB as a food reserve and its degradation 3.4.2 Biosynthesis of PHB	02L	
3.5	1.3.2 Biosynthesis of phosphoglycerides in bacteria	02L	
3.6	Catabolism of aliphatic hydrocarbons 3.6.1 Organisms degrading aliphatic hydrocarbons 3.6.2 Hydrocarbon uptake mechanisms 3.6.3 Omega oxidation pathway 3.6.3.1 Pathway in Corynebacterium and yeast 3.6.3.2 Pathway in Pseudomonas	03L	



T. Y. B. Sc. Microbiology Syllabus

Title & Content		Lectures/ Semester	Notional Lectures
Unit IV: Methods of Studying Metabolism & Fermentative Pathway		15L	15L
4.1	Experimental Analysis of metabolism 4.1.1 Goals of the study 4.1.2 Levels of organization at which metabolism is studied 4.1.3 Metabolic probes. 4.1.4 Use of radioisotopes in biochemistry 4.1.4.1 Pulse labelling 4.1.4.2 Assay and study of radio respirometry to differentiate EMP & ED 4.1.5 Use of biochemical mutants 4.1.6 Sequential induction	05L	ENTREPRENEURSHIP
4.2	Fermentative pathways (with structures and enzymes) 4.1.1 Lactic acid fermentation 4.1.1.1 Homo-fermentation 4.1.1.2 Hetero-fermentation 4.1.2 Bifidum pathway 4.1.3 Alcohol fermentation 4.1.3.1 By ED pathway in bacteria 4.1.3.2 By EMP in yeasts	05L	
4.3	Other modes of fermentation in microorganisms 4.2.1 Mixed acid 4.2.2 Butanediol 4.2.3 Butyric acid 4.2.4 Acetone-Butanol 4.2.5 Propionic acid (Acrylate and succinate propionate pathway)	05L	

**T. Y. B. Sc. Microbiology Syllabus**

Paper Code	Title of the Paper	Practical/Week	Credits
USc5Mi3	Microbial Biochemistry: Part-I	1	1.5

Sr. No.	Name of the Practical
1	Isolation and study of Bioluminescent organisms
2	Study of oxidative and fermentative metabolism
3	Qualitative and Quantitative assay of Phosphatase
4	Study of Homo & Hetero-fermentations
5	Isolation and detection of Mitochondria
6	Glucose detection by GOD/POD
7	Detection of PHB producing bacteria
8	Qualitative detection of Lipase

Reference: Course Code: USc5Mi3

1. Stanier, R. Y., M. Doudoroff and E. A. Adelberg. General Microbiology, 5th edition, The Macmillan press Ltd
2. Conn, E.E., P. K. Stumpf, G. Bruening and R. Y. Doi. 1987. Outlines of Biochemistry, 5th edition, 1987. John Wiley & Sons. New York.
3. Gottschalk., (1985), Bacterial Metabolism, 2nd edition, Springer Verlag
4. White, D., (1995), The Physiology and Biochemistry of Prokaryotes, 3rd edition, Oxford University Press
5. Nelson, D. L. and M.M. Cox (2005), Lehninger, Principles of biochemistry. 4th edition, W. H. Freeman and Company
6. Rose, A.H. (1976) Chemical Microbiology, 3rd edition. Butterworth-Heinemann
7. Zubay, G. L (1996), Biochemistry, 4th edition, Wm. C. Brown publishers
8. Mathews, C.K., K.E. van Holde, D.R. Appling, S, J, Anthony-Cahill (2012) Biochemistry, 4th edition. Pearson
9. Wilson and Walker, 4th edition Principles and Techniques of Biochemistry and Molecular Biology. Cambridge University press.
10. Cohen, G.N. (2011). Microbial Biochemistry. 2nd edition, Springer



T. Y. B. Sc. Microbiology Syllabus

USc5Mi4 (Bioprocess Technology: Part-I)

Course Code	: USc5Mi4	Title of the Paper	: Bioprocess Technology: Part-I
No. of Lectures	: 60	Credits	: 2.5

Learning Objectives:

Bioprocess Technology Part I course is designed to develop the learner's ability to study the techniques used in the different phases of industrial microbiology such as strain improvement, basic fermentation equipment & its sterilization aspects. A bioprocess technology is a specific process that uses complete living cells or their components to obtain desired products. It gives an in depth focus of the different types of fermenters used in industry for production of different products and emphasizes its process parameters. It includes the principles and describes the main steps and processes in the industrial production of beverages and enzymes. The downstream process and the environmental aspects of the final product are also included.

Industrial microbiology becomes an important application-based paper covering microbial fermentations. Thus, it becomes a laboratory to market scenario where the entire products reach. Bioprocess Technology I is designed to develop the learner's ability to study the techniques use in the downstream process used for the final product and industrial effluent treatment. The learner is provided with the details of productions of important products like antibiotics, vitamins, organic acid, and enzymes. Thus, this paper readies the learner to understand and apply the knowledge of fermentation technology.

This course aims to enable graduates to enter industry with an appropriate level of understanding of the need for both the science and business aspects to be achievable to make a viable product and enhance their entrepreneur skills.

Learning Outcomes:

At the end of the course, learner will be able to

1. Describe the applications of microbes and its strain improvement in Industrial Microbiology.
2. Describe the design of bioreactors for different applications and its process parameters.
3. Recognize the importance of monitoring and control of parameters during a fermentation and correlate the same with the entire process.
4. Explain methods of heat and filter sterilization.
5. Design media, growth conditions and techniques for producing and recovering different types of products of commercial value.
6. Connect downstream processing with upstream processing and explain the various processes used in the recovery and purification of industrial products.
7. Understand the actual process involved in fermentations of important products.



T. Y. B. Sc. Microbiology Syllabus

Title & Content		Lectures/ Semester	Notional Lectures
Unit I: Upstream Processing – I		15L	15L
1.1	Introduction 1.1.1. An introduction to fermentation processes 1.1.2. The range of fermentation processes 1.1.3. The Component parts of a fermentation process	03L	
1.2	Strain improvement SKILL DEVELOPMENT 1.2.1 Objective of strain improvement 1.2.2 The improvement of industrial microorganisms 1.2.3 Methods for strain improvement: 1.2.3.1 Selection of different types of mutants a) The selection of induced mutants synthesizing improved levels of primary metabolites b) The isolation of induced mutants producing improved yields of secondary metabolites. c) The improvement of strains by modifying properties other than the yield of product d) Application of rDNA technology for strain improvement	06L	
1.3	Preservation of cultures SKILL DEVELOPMENT 1.3.1 Preservation of industrially important organisms 1.3.2 Quality control of preserved stock 1.3.3 Key Criteria's 1.3.4 Development of a master culture bank (MCB) 1.3.5 Variability test to ensure reproducibility of the MCB.	03L	
1.4	The development of inocula for industrial fermentations 1.4.1. Introduction 1.4.2. Development of inocula for unicellular bacterial process 1.4.3. Development of inocula for mycelial process	03L	



T. Y. B. Sc. Microbiology Syllabus

Title & Content		Lectures/ Semester	Notional Lectures
Unit II: Upstream Processing – II		15L	15L
2.1	<p>Sterilization and achievement of aseptic conditions</p> <p>2.1.1. Introduction SKILL DEVELOPMENT</p> <p>2.1.2. Medium sterilization (concept of nabla factor)</p> <p>2.1.3. Methods of batch sterilization</p> <p>2.1.4. The design of continuous sterilization process</p> <p>2.1.5. Sterilization of the Fermenter</p> <p>2.1.6. Sterilization of the Feeds</p> <p>2.1.7. Sterilization of the liquid wastes</p> <p>2.1.8. Filter Sterilization</p> <p style="padding-left: 20px;">2.1.8.1. Filter sterilization of fermentation media,</p> <p style="padding-left: 20px;">2.1.8.2. Filter sterilization of air</p> <p style="padding-left: 20px;">2.1.8.3. Filter sterilization of fermenter exhaust air</p> <p>2.1.9. Achievement of aseptic conditions</p>	06L	
2.2	<p>2.2 Scale up and scale down of fermentation.</p> <p>2.2.1. Objective of scale-up</p> <p>2.2.2. Levels of fermentation (laboratory, pilot-plant and production levels)</p> <p>2.2.3. Criteria of scale-up for critical parameters (aeration and agitation, broth rheology and sterilization)</p> <p>2.2.4. Scale-down</p>	02L	
2.3	<p>Design of fermenter ENTREPRENEURSHIP</p> <p>2.3.1. Basic functions</p> <p>2.3.2. Aseptic operation & Containment</p> <p>2.3.3. Body construction</p> <p>2.3.4. Agitator (impeller) – function, types, mechanical seal, and magnetic drive</p> <p>2.3.5. Baffles</p> <p>2.3.6. The aeration system (sparger) - function and types</p> <p>2.3.7. Valves (Globe, piston & needle)</p> <p>2.3.8. Steam traps</p> <p>2.3.9. Examples of fermenters - Stirred Tank Reactor, Air Lift, Deep Jet, Photobioreactor</p>	07L	



T. Y. B. Sc. Microbiology Syllabus

Title & Content		Lectures/ Semester	Notional Lectures
Unit III: Instrumentation control and Downstream processing		15L	15L
3.1	Instrumentation and control 3.1.1. Introduction to sensors and its types SKILL DEVELOPMENT Measurement and control of pH, temperature, pressure, foam sensing, dissolved oxygen, inlet and exit gas analysis.	05L	
3.2	Downstream Processing-Recovery SKILL DEVELOPMENT Recovery and purification 3.2.1 Introduction 3.2.2 Methods of Downstream processing a) Precipitation, Filtration, Centrifugation b) Cell Disruption c) Liquid-Liquid Extraction d) Solvent Recovery e) Chromatography f) Membrane Processes g) Drying h) Crystallization i) Whole Broth Processing	10L	



T. Y. B. Sc. Microbiology Syllabus

Title & Content		Lectures/ Semester	Notional Lectures
Unit IV: Traditional Fermentations EMPLOYABILITY		15L	15L
1.1	Wine – Red, White, Champagne and Sherry: Alcoholic fermentation, composition of grape juice, Sulphur dioxide addition, factors affecting wine fermentation, examples and role of yeasts involved in fermentation, malolactic fermentation, technological aspects of wine making- red, white, champagne, sherry, examples of aroma compounds of wine, types and examples of wine.	03	
1.2	Beer – Ale and Lager: Elements of brewing process, process details, use of cylindro-conical vessel, primary fermentation, continuous fermentation, aging and finishing, yeasts involved in fermentation.	03	
1.3	Alcohol from Molasses: Introduction, biosynthesis of ethanol, production process- preparation of nutrient solution, fermentation, recovery by distillation.	03	
1.4	Vinegar (acetic acid): Introduction, biosynthesis, production using generator, production using submerged fermenter, recovery.	02	
1.5	Baker's yeast: Outline of production, yeast strains and their properties, factors important in production-oxygen requirement and aeration, concentration of sugar, pH, temperature, preparation of substrate, fermentation, harvesting of yeast cells, production of compressed and active dry yeast.	02	
1.6	Fungal amylase production: amylase- production from bacteria and fungi, amylase and glucoamylase, concentration and purification.	02	



T. Y. B. Sc. Microbiology Syllabus

Paper Code	Title of the Paper	Practical/Week	Credits
USc5Mi4	Bioprocess Technology: Part-I	1	1.5

Sr. No.	Name of the Practical
1	Alcohol Fermentation 1. Preparation and standardization of yeast inoculums for alcohol fermentation 2. Laboratory Alcohol fermentation using jaggery medium, calculation of efficiency of fermentation
2	Determine the alcohol tolerance for yeast
3	Determine the sugar tolerance for yeast.
4	Chemical estimation of sugar by Cole's ferricyanide method
5	Chemical estimation of alcohol
6	Production of amylase- detection, shake flask or solid substrate cultivation and detection (Qualitative).
7	Determination of antibiotic spectrum using agar strip / streak method.
8	Industrial Visit

Reference: Course Code: USc5Mi4

Textbooks

1. Casida L. E., "Industrial Microbiology" (2009) Reprint, New Age International (P) Ltd, Publishers, New Delhi.
2. Stanbury P. F., Whitaker A. & Hall S. J., (1997), "Principles of Fermentation Technology", 2nd edition, Aditya Books Pvt. Ltd, New Delhi.
3. Stanbury P. F., Whitaker A. & Hall S. J 3rd edition (2017) "Principles of Fermentation Technology"
4. Peppler, H. J. and Perlman, D. (1979), "Microbial Technology". Vol. 1 & 2, Academic Press
5. A. Modi, (2009). "Fermentation Technology" Vol. 1 & 2, Pointer Publications, India.
6. Okafor Nduka (2007) "Modern Industrial Microbiology and Biotechnology", Science Publications Enfield, NH, USA.
7. Crueger W. and Crueger A. (2000) "Biotechnology -"A Textbook of Industrial
8. Microbiology", 2nd edition, Panima Publishing Corporation, New Delhi.
9. Prescott and Dunn's "Industrial Microbiology"(1982) 4th edition, McMillan Publishers

Reference books

1. R. C. Dubey, 2005 A Textbook of "Biotechnology" S. Chand and Company, New Delhi.
2. A. Modi, 2009. "Fermentation Technology" Vol: 1 & 2, Pointer Publications, India
3. Practical Fermentation Technology by Brian Mcneil & Linda M. Harvey (2008).



T. Y. B. Sc. Microbiology Syllabus

T. Y. B. Sc. Semester VI Syllabus

Course Code : USc6Mi1 Title of the Paper : rDNA Technology, Bioinformatics & Virology
Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Recombinant DNA Technology
II	Applications of rDNA Technology & Bioinformatics
III	Regulation & Basic Virology
IV	Advanced Virology

Course Code : USc6Mi2 Title of the Paper : Medical Microbiology & Immunology: Part - II
Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Study of a Few Diseases with Emphasis on Cultural Characteristics of the Etiological Agent, Pathogenesis, Laboratory Diagnosis and Prevention
II	Chemotherapy of Infectious Agents
III	Immunology - I
IV	Immunology - II

Course Code : USc6Mi3 Title of the Paper : Microbial Biochemistry: Part - II
Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Lipid Metabolism & Catabolism of Hydrocarbons
II	Metabolism of Proteins and Nucleic Acids
III	Metabolic Regulation
IV	Prokaryotic Photosynthesis & Inorganic Metabolism

**T. Y. B. Sc. Microbiology Syllabus**

Course Code : USc6Mi1 Title of the Paper : Bioprocess Technology: Part - II
Credits : 2.5 Lectures/Week : 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Downstream Processing
II	Advances in Bioprocess Technology
III	Quality Assurance, Quality Control, Instrumentation and Bioassay
IV	Industrial Fermentations

T. Y. B. Sc. Microbiology Semester VI Practical

Paper Code	Title of the Paper	Practical/Week	Credits
USc6MiPR1	rDNA Technology, Bioinformatics & Virology	01	1.5
USc6MiPR2	Medical Microbiology & Immunology: Part - II	01	1.5
USc6MiPR3	Microbial Biochemistry: Part - II	01	1.5
USc6MiPR4	Bioprocess Technology: Part - II	01	1.5



USc6Mi1 (rDNA Technology, Bioinformatics & Virology)

Course Code : USc6Mi1 Title of the Paper: rDNA Technology, Bioinformatics & Virology

No. of Lectures : 60 Credits : 2.5

Learning Objectives:

1. The rDNA technology: This module deals with the basic steps in gene cloning, vectors, model organisms, methods of transformation and screening and identification of recombinant cells.
2. Application of rDNA technology and Bioinformatics: This module will empower the student to understand the basic techniques in Recombinant DNA technology along with their applications. Bioinformatics is the basic tool in understanding Cells at the genomic and proteomic levels. Inclusion of Bioinformatics in this module will empower the learner with insilico analytical techniques.
3. Gene Regulation and Basic Virology: This module will make the students understand the genetic basis of regulation and operon control through the involvement of regulatory proteins. The study of Basic Virology will emphasise on the structure, classification and general modes of replication of viruses.
4. Advanced Virology: This module deals with basic structure and life cycle of different viruses and cultivation of viruses. It also comprises of basic study on Prions, Viriods and viruses causing cancer.

Learning Outcomes:

Recombinant DNA technology: This module will make the student understand the methods to construct recombinant DNA molecules, also know the tools required like vectors, restriction enzymes and model organism etc.

Application of rDNA technology and Bioinformatics: The learner will know about applications of r DNA technology, through bioinformatics the student will understand the use of databases and software tools for understanding biological data.

Gene Regulation and Basic Virology: The student will know about gene expression in prokaryotes, operon as a unit of gene regulation, regulation of gene expression in prokaryotes and bacteriophages. The student will also understand about general structure, life cycle and classification of viruses.

Advanced Virology: The learner will understand the basic structure and life cycle of different viruses and their cultivation. The student will get basic knowledge on Prions, Viriods and cancer causing viruses.

Practicals: The students will acquire skill to perform the laboratory techniques and experiments based on the above topics. The students will understand computational biology and In-Silico analytical techniques.



T. Y. B. Sc. Microbiology Syllabus

Title & Content	Lectures / Semester	Notional Periods
Unit I: Recombinant DNA Technology	(Total 15 L)	15
1.1 Branches of Genetics EMPLOYABILITY	01L	
1.1.1 Transmission genetics		
1.1.2 Molecular genetics		
1.1.3 Population genetics		
1.1.4 Quantitative genetics		
1.2 Model Organisms	02L	
1.2.1 Characteristics of a model organism		
1.2.2 Examples of model organisms used in study		
1.2.3 Examples of studies undertaken using prokaryotic and eukaryotic model organisms		
1.3 Plasmids	02L	
1.3.1 Physical nature		
1.3.2 Detection and isolation of plasmids		
1.3.3 Plasmid incompatibility and Plasmid curing		
1.3.4 Cell to cell transfer of plasmids		
1.3.5 Types of plasmids		
1.3.6 Resistance Plasmids, Plasmids encoding Toxins and other Virulence characteristics, Col factor, Degradative plasmids		
1.4 Transposable Elements in Prokaryotes	02L	
1.4.1 Insertion sequences		
1.4.2 Transposons: Types, Structure and properties, Mechanism of transposition, Integrons		
1.5 Basic steps in Gene Cloning.	01L	
1.6 Cutting and joining DNA molecules - Restriction and modification systems, restriction endonucleases, DNA ligases	03L	
1.7 Vectors	03L	
1.7.1 Plasmids as cloning vectors. plasmid vectors, pBR322 vector		
1.7.2 Cloning genes into pBR322		
1.7.3 Phage as cloning vectors, cloning genes into phage vector		
1.7.4 Cosmids		
1.7.5 Shuttle vectors		
1.7.6 YAC		
1.7.7 BAC		
1.8 Methods of transformation	01L	

**T. Y. B. Sc. Microbiology Syllabus**

Unit II: Applications of rDNA Technology & Bioinformatics	(Total 15L)	15
2.1 PCR- Basics of PCR technique and different types of PCR (Reverse transcriptase PCR, Real time quantitative PCR)	02L	
2.2 Basic techniques 2.2.1 Southern, Northern and Western blotting. 2.2.2 Autoradiography (explain the term)	02L	
2.3 Screening and selection methods for identification and isolation of recombinant cells	02L	
2.4 Applications of recombinant DNA technology:- Site specific mutagenesis of DNA, Uses of DNA polymorphism, STRS and VNTRS, DNA molecular testing for human genetic diseases (Only RFLP), DNA typing, gene therapy, Genetic Engineering of plants and animals.	04L	
2.5 Bioinformatics 2.5.1 Introduction 2.5.2 Definition, aims, tasks and applications of Bioinformatics. 2.5.3 Database, tools and their uses – 2.5.3.1 Importance, Types and classification of databases 2.5.3.2 Nucleic acid sequence databases- EMBL, DDBJ, GenBank, GSDB, Ensembl and specialized Genomic resources. 2.5.3.3 Protein sequence databases-PIR, SWISS-PROT, TrEMBL NRL-3D. Protein structure databases- SCOP, CATH, PROSITE, PRINTS and BLOCKS. KEGG. 2.5.4 Explain the terms:- Transcriptome, Metabolomics, Pharmacogenomics, Phylogenetic analysis, Phylogenetic tree, Annotation, Genomics- structural, functional and comparative genomics, Proteomics - structural and functional proteomics, Sequence alignment - global v/s local alignment, FASTA, BLAST (Different types of BLAST)	05L	



T. Y. B. Sc. Microbiology Syllabus

Unit III: Regulation & Basic Virology		(Total 15 L)	15
3.1 A) Lac operon and problems on Lac operon		06L	
B) Trp operon			
3.2 Regulation of lytic and lysogenic pathway of lambda phage		03L	
3.3 Viral architecture - Capsid, Viral genome and Envelope		02L	
3.4 Viral classification (Baltimore classification)		01L	
3.5 Viral replication cycle – Attachment, Penetration, Uncoating, Types of viral genome, their Replication, Assembly, Maturation & Release.		03L	
Unit IV: Advanced Virology		(Total 15 L)	
4.1 Structure of TMV, T4, Influenza virus.		02 L	
4.2 Life cycle of T4 phage, TMV, Influenza Virus in detail.			
4.3 Cultivation of viruses- Cell culture techniques, Embryonated egg, Laboratory animals, Cell culture methods: Equipment required for animal cell culture, Isolation of animal tissue.		03 L	
4.4 Visualization and enumeration of virus particles		03 L	
4.4.1 Measurement of infectious units			
4.4.1.1 Plaque assay			
4.4.1.2 Fluorescent focus assay			
4.4.1.3 Infectious center assay			
4.4.1.4 Transformation assay			
4.4.1.5 Endpoint dilution assay.			
4.4.2 Measurement of virus particles and their components		03 L	
4.4.2.1 Electron microscopy			
4.4.2.2 Atomic force microscopy			
4.4.2.3 Haemagglutination			
4.4.2.4 Measurement of viral enzyme activity.			
4.5 Role of viruses in Cancer: Important definitions, characteristics of cancer cell, Human DNA tumor viruses- EBV, Kaposi sarcoma virus, Hepatitis B and C virus, Papiloma Virus.		02 L	
4.6 Prions: Definition, Examples of diseases caused by prions, Kuru, PrP protein and protein only hypothesis		01 L	
4.7 Viroids		01 L	



T. Y. B. Sc. Microbiology Syllabus

Paper Code	Title of the Paper	Practical/Week	Credits
USc6Mi1	rDNA Technology, Bioinformatics & Virology	1	1.5

Sr. No.	Name of the Practical
1	Isolation of genomic DNA of <i>E. coli</i> and measurement of its concentration by UV-VIS
2	Enrichment of coliphages, phage assay (pilot & proper). SKILL DEVELOPMENT
3	Restriction digestion of lambda phage /any plasmid DNA (Demo) SKILL DEVELOPMENT
4	Beta galactosidase assay
5	Bioinformatics Online Practical's:- SKILL DEVELOPMENT 1. Visiting NCBI and EMBL websites & list services available, software tools available and databases maintained. 2. Visiting & exploring various databases mentioned in syllabus and i. Using BLAST and FASTA for sequence analysis. ii. Fish out homologs for given specific sequences (by teacher – decide sequence of some relevance to their syllabus and related to some biological problem e.g. evolution of a specific protein in bacteria, predicting function of unknown protein from a new organism based on its homology) iii. Six frame translation of given nucleotide sequence iv. Restriction analysis of given nucleotide sequence v. Pair-wise alignment and multiple alignment of a given protein sequences vi. Formation of phylogenetic tree
6	Animal cell culture (Demo)



T. Y. B. Sc. Microbiology Syllabus

Reference: Course Code: USc6Mi1

Text books:

1. Peter J. Russell (2006), "Genetics-A molecular approach", 2nd edition.
2. Benjamin A. Pierce (2008), "Genetics a conceptual approach", 3rd edition, W. H. Freeman and company.
3. R. H. Tamarin, (2004), "Principles of genetics", Tata McGraw Hill.
4. M. Madigan, J. Martinko, J. Parkar, (2009), "Brock Biology of microorganisms", 12th edition, Pearson Education International.
5. Fairbanks and Anderson, (1999), "Genetics", Wadsworth Publishing Company.
6. Prescott, Harley and Klein, "Microbiology", 7th edition Mc Graw Hill international edition.
7. Edward Wagner and Martinez Hewlett, (2005) "Basic Virology", 2nd edition, Blackwell Publishing
8. Teri Shors. (2009), "Understanding viruses", Jones and Bartlett publishers.
9. S. Ignacimuthu, (2005), "Basic Bioinformatics", Narosa publishing house.
10. Robert Weaver, (2008), "Molecular biology", 3rd edition, Mc Graw Hill international edition.
11. Primrose and Twyman, (2001), "Principles of gene manipulation and genomics", 6th edition, Blackwell Publishing
12. Arthur Lesk, (2009), "Introduction to Bioinformatics", 3rd Edition, Oxford University Press
13. Snustad, Simmons, "Principles of genetics", 3rd edition. John Wiley & sons, Inc.
14. A textbook of biotechnology R. C. Dubey 4th edition. S. Chand.

Reference books:

1. Flint, Enquist, Racanillo and Skalka, "Principles of virology", 2nd edition. ASM press.
2. T. K. Attwood & D. J. Parry-Smith, (2003), "Introduction to bioinformatics", Pearson education
3. Benjamin Lewin, (9th edition), "Genes IX", Jones and Bartlett publishers.
4. JD Watson, "Molecular biology of the gene", 5th edition.



T. Y. B. Sc. Microbiology Syllabus

USc6Mi2 (Medical Microbiology & Immunology: Part - II)

Course Code : USc6Mi2 Title of the Paper: Medical Microbiology & Immunology: Part - II

No. of Lectures : 60 Credits : 2.5

Learning Objectives:

Medical microbiology covers etiology, transmission, pathogenesis, clinical manifestations, laboratory diagnosis, prophylaxis, and treatment of various diseases that are most common to humans, through which the students can build on the basic information of various diseases. . An separate unit on chemotherapy explains the drugs available for treating infectious agent and the misuse of antibiotic which gives rises to occurrence of multiple resistance strains

Immunology is an integral part of Medical Microbiology and this course is designed for T. Y. B. Sc. Microbiology students on the assumption that the students have achieved a basic understanding of Innate Immunity and Host Defense mechanisms. The course has been designed to help understand the ability of our immune system to defend against invading pathogens in a logical fashion. This includes our innate ability to defend against microorganisms (innate immunity); should this first line of defense fail, how we can fight infections (acquired immunity); the role of immune hematology in blood transfusion and very importantly, can we prevent pathogens from infecting us (vaccination).

Learning Outcomes:

The students will be able to :

- Comment on the mode of transmission, and modes of prophylaxis of these diseases.
- Comment on the methods of diagnosis of the disease.
- Understand the structure and role of T and B cells in generating adaptive immunity and thereby study effector responses in both Humoral & Cell Mediated Immunity. Acquire an understanding of the role of immune system in disease:
- Understand the activation of complement system.
- Describe the importance and role of vaccine in disease prevention
- Understand the concept of Clinical research and drug development.



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Title & Content	Lectures / Semester	Notional Periods
<p>Unit I: Study of a Few Diseases with Emphasis on Cultural Characteristics of the Etiological Agent, Pathogenesis, Laboratory Diagnosis and Prevention EMPLOYABILITY</p> <p>1.1 Study of vector-borne infections -Malaria</p> <p>1.2 Study of sexually transmitted infectious diseases</p> <p>1.2.1 Syphilis</p> <p>1.2.2 AIDS</p> <p>1.2.3 Gonorrhoea</p> <p>1.3 Study of central nervous system infectious diseases</p> <p>1.3.1.Tetanus</p> <p>1.3.2 Polio</p> <p>1.3.3.Meningococcalmeningitis</p>	<p>15L</p> <p>2L</p> <p>8L</p> <p>5L</p>	<p>15</p>
<p>Unit II: Chemotherapy of Infectious Agents</p> <p>2.1 Attributes of an ideal chemotherapeutic agent - Selective toxicity, Bioavailability of drug, routes of drug administration, LD50, MBC, etc.</p> <p>2.2. Mode of action of antibiotics on-</p> <p>Cell wall (Beta-lactams- Penicillin and Cephalosporins, Carbapenems)</p> <p>Cell Membrane (Polymyxin and Imidazole)</p> <p>Protein Synthesis (Streptomycin, Tetracycline and Chloramphenicol)</p> <p>Nucleic acid (Quinolones, Nalidixic acid, Rifamycin)</p> <p>Enzyme inhibitors (Sulfa drugs, Trimethoprim)</p> <p>2.3 List of common antibiotics - used for treating viral, fungal and parasitic diseases.</p> <p>2.4 Mechanisms of drug resistance - Its evolution, pathways and origin for ESBL, VRE, MRSA</p> <p>2.5 Selection and testing of antibiotics for bacterial isolates by Kirby-Bauer method</p> <p>(ii) Methods that detect <i>S. aureus</i> resistance to methicillin, and determination of ESBL strains</p>	<p>15L</p> <p>2 L</p> <p>7 L</p> <p>1 L</p> <p>3 L</p> <p>2 L</p>	<p>15</p>



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<p style="text-align: center;">Unit III: Immunology – I</p> <p>3.1 T cells</p> <p>3.1.1 T Cell Receptor-structure (alpha-beta, gamma-delta TCR)</p> <p>3.1.2 TCR-CD₃ complex - structure and functions. Accessory molecules</p> <p>3.1.3 T cell activation</p> <p style="padding-left: 40px;">TCR mediated signaling –Overview</p> <p style="padding-left: 40px;">Co-stimulatory signals</p> <p style="padding-left: 40px;">T cell differentiation (Memory and Effector cells)</p> <p>3.2 Cell mediated effector response</p> <p>3.2.1 General properties of effector T-cells</p> <p>3.2.2 Cytotoxic T Cells and destruction of target cell by perforin/granzyme pathway and Fas pathway</p> <p>3.2.3 Killing mechanism of NK cells</p> <p>3.2.4 Antibody mediated cell cytotoxicity (ADCC)</p> <p>3.3 B Cells</p> <p>3.3.1 B cell receptor and co-receptor-structure and function</p> <p>3.3.2 B cell activation and Differentiation</p> <p style="padding-left: 40px;">3.3.3 Thymus dependent and independent antigens</p> <p>3.3.4.Signal transduction pathway activated by BCR- overview</p> <p>3.3.5.Role T_H cell in B cell response-Formation of T-B conjugates, CD40/CD40L interaction, T_H cells cytokine signals</p>	<p style="text-align: center;">15L</p> <p style="text-align: center;">4L</p> <p style="text-align: center;">3L</p> <p style="text-align: center;">4L</p>	<p style="text-align: center;">15</p>
<p style="text-align: center;">3.4 Humoral Response</p> <p>3.4.1 Primary and secondary responses</p> <p>3.4.2 In vivo sites for induction of Humoral response</p> <p>3.4.3.Germinal centers and antigen induced B cell Differentiation</p> <p style="padding-left: 40px;">3.4.4.Cellular events within germinal centers- Overview</p> <p>3.4.5.Affinity maturation, somatic hyper-mutation and class switching</p> <p style="padding-left: 40px;">Generation of plasma cells and memory cells</p>	<p style="text-align: center;">4L</p>	



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<p>Unit IV: Immunology – II</p> <p>4.1 Vaccines EMPLOYABILITY</p> <p>4.1.1 Active and passive immunization</p> <p>4.1.2 Types of Vaccine- Killed, attenuated , whole organism, Purified macromolecules as vaccine, recombinant vaccine, DNA vaccine</p> <p>4.1.3 Use of Adjuvants as vaccine</p> <p>4.1.4 New Strategies of vaccine</p> <p>4.1.5 Ideal vaccine</p> <p>4.1.6 Route of vaccine administration, Vaccination schedule</p> <p>4.2 Immuno-hematology</p> <p>4.2.1 Human blood group systems, ABO, secretors and non-secretors, Bombay Blood group. Rhesus system and list of other blood group systems</p> <p>4.2.2 Hemolytic disease of new born, Coombs test.</p> <p>4.3 Complement System</p> <p>4.3.1 Functions and components of complement</p> <p>4.3.2 Complement Activation—classical, alternative and lectin pathway</p> <p>4.3.3 Biological consequences of complement activation</p> <p>4.4 Clinical Research</p> <p>4.4.1 Introduction to Clinical research: Definition, types and scope of clinical research, good clinical practices, careers in clinical research</p> <p>4.4.2 Ethics in clinical research: Ethical theories and foundations, Integrity and misconduct in clinical research</p>	<p>15L</p> <p>7L</p> <p>3L</p> <p>3L</p> <p>2L</p>	<p>15</p>
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Paper Code	Title of the Paper	Practical/Week	Credits
USc6Mi2	Medical Microbiology & Immunology: Part - II	1	1.5

Sr. No.	Name of the Practical
1	Demonstration of malaria parasite in blood films(Demo)
2	Selection and testing of antibiotics using the Kirby-Bauer method SKILL DEVELOPMENT
3	Determination of MBC of an antibiotic.
4	Demonstration of E test
5	Blood grouping – Direct & Reverse typing
6	Coomb's Direct test
7	Determination of Isoagglutinin titre
8	Demonstration experiments –VDRL Test

Reference: Course Code: USc6Mi2

Text books:

1. Jawetz, Melnick and Adelberg's Medical Microbiology, 26th Edition, Lange publication
2. Ananthanarayan and Panicker's, Textbook of Microbiology, 10th edition 2017
3. Ananthanarayan and Panicker's, Textbook of Microbiology, 9th edition
4. Ananthanarayan and Panicker's, Textbook of Microbiology, 8th edition
5. Introduction to diagnostic microbiology for lab Science Maria Danna Delost 2015
6. Prescott's microbiology 10th edition 2017
7. Kuby Immunology, 4th and 6th edition, W H Freeman and Company
8. Pathak & Palan, Immunology: Essential & Fundamental, 1st & 3rd edition, Capital Publishing Company
9. Fahim Khan, Elements of Immunology, Pearson Education
10. R. S. Satoskar, S. D. Bhandarkar, 2007. Pharmacology and Pharmaco-therapeutics, Popular Prakashan, 20th edition

Reference books / Internet references:



T. Y. B. Sc. Microbiology Syllabus

1. Baron Samuel , Medical Microbiology, 4th edition <http://www.ncbi.nlm.nih.gov/books/NBK7627/>
2. Kuby Immunology, 7th Edition, W H Freeman and Company
<http://www.macmillanlearning.com/catalog/static/whf/kuby/>

USc6Mi3 (Microbial Biochemistry: Part-II)

Course Code	: USc6Mi3	Title of the Paper: Microbial Biochemistry: Part-II
No. of Lectures	: 60	Credits : 2.5

Learning Objectives:

Having studied many aspects of microbial physiology in the earlier semester, contents of this semester is designed to understand how myriad organic compounds such as lipids, carbohydrates, proteins and nucleic acids can be utilized by the living cells. These life mechanisms also reveal how biomolecules are synthesized. Since all biosynthetic pathways are denovo or salvage, the vital regulatory role played by enzymes is understood. Various levels and mechanisms of regulation are dealt to make the learner aware of coordinated mechanisms of metabolism in the living cell. Photosynthesis is studied to understand the diversity in mechanism of its electron transfer, pigments and localization of photosynthetic apparatus, although the energy conservation mechanism is not different. Microorganisms are diverse with respect to their metabolism and the field of lithotrophy explains how some universal inorganic compounds can be used to make constituents of cell biomass yet others use them as electron acceptors or reduced compounds as source of energy.

Learning Outcomes:

1. Learners will understand general reactions of amino acid degradation
2. Learners will understand fermentation of single and pair of amino acids
3. Learners will understand biosynthesis of amino acids
4. Learners will learn biosynthesis of nucleotides
5. Learners will understand degradation of nucleotides
6. Learners will learn factors affecting catalytic efficiency of enzymes
7. Learners will understand regulation of enzymatic activity
8. Learners will learn regulation of metabolism by DNA binding proteins
9. Learners will learn about global regulatory mechanisms
10. Learners will learn about prokaryotic photosynthesis

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11. Learners will learn about inorganic metabolism
12. Learners will learn about lithotrophs

Title & Content		Lectures/ Semester	Notional Periods
Unit I: Metabolism of Proteins and Amino acids		15L	15
1.1	Protein metabolism 1.1.1 Overview of protein synthesis 1.1.2 Enzymatic degradation of proteins	02L	
1.2	General reactions of amino acids catalyzed by 1.2.1 Amino acid decarboxylases 1.2.2 Amino acid deaminases 1.2.3 Amino acid transaminases 1.2.4 Amino acid racemases	03L	
1.3	Metabolic fate of amino acids - Glucogenic and ketogenic amino acids	01L	
1.4	Fermentation of single amino acid - Glutamic acid by <i>Clostridium tetanomorphum</i>	01L	
1.5	Fermentation of pair of amino acids -Stickland reaction (include enzymes)	01L	
1.6	Anabolism of amino acids 1.6.1 Schematic representation of amino acid families 1.6.2 Biosynthesis of amino acids of Serine family (Serine, Glycine and Cysteine) 1.6.3 Biosynthesis of amino acids of aspartate family	07L	
1.7	Urea cycle	01L	



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Unit II: Metabolism of Nucleic acids and Catalytic efficiency of enzymes		15L	15
2.1	Catabolism of Nucleotides 2.1.1 Degradation of purine nucleotides up to uric acid formation 2.1.2 Salvage pathway for purine and pyrimidine nucleotides	03L	
2.2	Biosynthesis of nucleotides 2.2.1 Nomenclature and structure of nucleotides 2.2.2 Role of nucleotides (high energy triphosphates) 2.2.3 Biosynthesis of pyrimidine nucleotides 2.2.4 Biosynthesis of purine nucleotides 2.2.5 Biosynthesis of deoxyribonucleotides 2.2.6 Mechanism of ribonucleotide reductase	07L	
2.3	Factors affecting catalytic efficiency of enzymes- i) Proximity and orientation, ii) Strain and distortion, iii) Acid base catalysis, iv) Covalent catalysis	05	

ENTREPRENEURSHIP

Unit III: Unit III: Metabolic Regulation		15L	15
3.1	Definition of terms and major modes of regulation	02L	
3.2	Regulation of enzyme activity 3.2.1 Noncovalent enzyme inhibition 3.2.1.1 Allosteric enzymes and feedback inhibition 3.2.1.2 Patterns of FBI, combined activation and inhibition 3.2.2 Covalent modification of enzymes 3.2.2.1 Monocyclic cascades 3.2.2.2 Examples of covalent modification (without structures) 3.2.2.3 Regulation of Glutamine synthetase	05L	
3.3	DNA binding proteins and regulation of transcription by positive & negative control 3.3.1 DNA binding proteins 3.3.2 Negative control of transcription: Repression and Induction 3.3.3 Positive control of transcription: Maltose catabolism in E. coli	04L	
3.4	Global regulatory mechanisms	02	



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	3.4.1 Global control & catabolite repression 3.4.2 Stringent response		
3.5	Regulation of EMP and TCA cycle - (Schematic and Regulation of Pyruvate dehydrogenase Complex)	02	
Unit IV: Prokaryotic Photosynthesis & Inorganic Metabolism		15L	15
4.1	Photosynthesis 4.1.1 Definition of terms in photosynthesis (light and dark reactions, Hill reaction & reagent, Photophosphorylation) 4.1.2 Photosynthetic pigments 4.1.3 Location of photochemical apparatus 4.1.4 Photochemical generation of reductant	04L	
4.2	Light reactions in: 4.2.1 Purple photosynthetic bacteria 4.2.2 Green sulphur bacteria 4.2.3 Cyanobacteria (with details)	03L	
4.3	Dark reaction 4.3.1 Calvin Benson cycle 4.3.2 Reductive TCA cycle	02L	
4.4	Inorganic Metabolism 4.4.1 Assimilatory pathways: 4.4.1.1 Assimilation of nitrate, 4.4.1.2 Ammonia fixation – Glutamate dehydrogenase, Glutamine synthetase, GS-GOGAT, Carbamoyl phosphate synthetase 4.4.1.3 Biological nitrogen fixation (Mechanism for N ₂ fixation and protection of nitrogenase) 4.4.1.4 Assimilation of sulphate 4.4.2 Dissimilatory pathways: 4.4.2.1 Nitrate as an electron acceptor (Denitrification in <i>Paracoccus denitrificans</i>) 4.4.2.2 Sulphate as an electron acceptor	05L	
4.5	Lithotrophy —Enlist organisms and products formed during oxidation of Hydrogen, carbon monoxide, Ammonia, Nitrite, Sulphur, Iron.	01L	



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Paper Code	Title of the Paper	Practical/Week	Credits
USc6Mi3	Microbial Biochemistry: Part-II	1	1.5

Sr. No.	Name of the Practical
1	To study catabolite repression by diauxic growth curve.
2	Protein estimation by Lowry's method
3	Estimation of uric acid
4	Qualitative and Quantitative assay of Protease
5	Study of breakdown of amino acids – Lysine decarboxylase and Deaminase activity
6	Study of Lithotrophs – Nitrosification and Nitrification

Reference: Course Code: USc6Mi3

Text books:

1. Stanier, R. Y., M. Doudoroff and E. A. Adelberg. General Microbiology, 5th edition, The Macmillan press Ltd
2. Conn, E.E., P. K. Stumpf, G. Bruening and R. Y. Doi. 1987. Outlines of Biochemistry, 5th edition, 1987. John Wiley & Sons. New York.
3. Gottschalk., (1985), Bacterial Metabolism, 2nd edition, Springer Verlag
4. White, D., (1995), The Physiology and Biochemistry of Prokaryotes, 3rd edition, Oxford University Press
5. Nelson, D. L. and M.M. Cox (2005), Lehninger, Principles of biochemistry. 4th edition, W. H. Freeman and Company
6. G. Moat, J.W. Foster, M,P. Spector.(2002), Microbial Physiology, 4th edition, WILEYLISS
7. Madigan, M.T. and J.M. Martinko 2006. [11th edition] Brock Biology of Microorganisms. Pearson Prentice Hall.
8. Zubay, G. L (1996), Biochemistry, 4th edition, Wm. C. Brown publishers
9. Zubay, G. L (1996), Principles of Biochemistry, Wm. C. Brown publishers
10. Principles of Biochemistry, Lehninger, 5th edition, W. H. Freeman and Company



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USc6Mi4 (Bioprocess Technology: Part II)

Course Code	: USc6Mi4	Title of the Paper: Bioprocess Technology: Part II
No. of Lectures	: 60	Credits : 2.5

Learning Objectives:

Bioprocess technology II becomes an important application-based paper covering microbial fermentations as well as applying the techniques of molecular biology to enzyme technology, animal tissue culture as well as plant tissue culture. Thus, it becomes a laboratory to market scenario where the entire products reach. The learner is provided with the details of productions of important products like antibiotics, vitamins, organic acid, amino acids, and mushrooms along with the analysis techniques using various instruments and bioassays.

The learner is provided with the details of productions of important traditional fermentation products like wine, beer, vinegar, and enzymes.

Thus, this paper readies the learner to understand and apply the knowledge of fermentation technology and related products.

The learner is expected to learn the need of Quality management and regulatory bodies as the products need to fulfill these requirements. The learners expected to learn biosafety and therapeutic production of different products like vaccine, biosensors etc.

Thus, this paper readies the learner to understand and apply the knowledge of fermentation technology and related products. This course aims to enable graduates to enter industry with an appropriate level of understanding of the need for both the science and business aspects to be achievable to make a viable product and enhance their entrepreneurial skills.

Course Specific Objectives:

1. Learners will be able to study production of bacterial biotechnological products such as biofertilizer, bioinsecticide and biopolymers.
2. Learners will be able to study to study algal biotechnological products such as biofuels, biodiesel, and other products.
3. Learners will be able to study production of yeasts for important products.
4. Learners will be able to study the applications of animal and plant tissue culture



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techniques.

5. Learners will understand the principles of quality assurance, quality control, GMP and sterility assurance in pharmaceutical industry.
6. Learners will understand the methods for immobilization of enzymes and their applications.
7. Learners will understand different types of bioassay.
8. Learners will understand the actual process involved in fermentations of important products.

Learning Outcomes:

- Understand the actual process involved in fermentations of important products.
- To apply the knowledge of applications of animal and plant tissue culture techniques.
- Learn the applications of immobilized enzymes in various fields.
- Learn the salient features of quality management and regulatory procedures.
- Explain the basic principles of quality assurance, quality control, GMP and sterility assurance in pharmaceutical industry.

At the end of the course the learner will also acquire the following practical skills

- Techniques involved in running a bioassay, immobilization of cells & sterility testing.
- Preliminary techniques in animal & plant tissue culture.

Title & Content		Lectures/ Semester	Notional Periods
Unit I: Biotechnological Products		15L	15
1.1	Bacterial Biotechnology 1.1.1 Bioinsecticides 1.1.2 Bacterial Biofertilizer- Production of bacterial biofertilizer, Rhizobium, Phosphate solubilizing bacteria. 1.1.3 Biopolymers- Microbial production of Xanthan gum, Melanin, Alginate, PHAs and PHBs	05L ENTREPRENEURSHIP	
1.2	Algal Biotechnology 1.2.1 Important products produced by Algae 1.2.1.1 Biofuels, Bio-Oil, Biohydrogen, Biomethane, Bioethanol, Biobutanol, Biodiesel 1.2.1.2 Pigments and other important compound	06L SKILL DEVELOPMENT	
1.3	Yeast Biotechnology 1.3.1 Production of carotenoid from yeast	04L	



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1.3.2 Lipid production by Oleaginous yeast		
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Unit II: Advances in Bioprocess Technology		15L	15
2.1	<p>Animal biotechnology</p> <p>2.2.1 Primary cell culture and established cell lines: Basic principles</p> <p>2.2.3 Growth media: Cell viability</p> <p>Scale up of cultured cells and tissue.</p> <p>Applications of cell culture: Vaccines, somatic cell fusion, valuable products</p>	05L	
2.2	<p>Plant tissue culture SKILL DEVELOPMENT</p> <p>2.2.1 Introduction</p> <p>2.2.2 Requirements for in vitro culture, Methods of plant cell and tissue culture</p> <p>2.2.3 Types of cultures of plant materials: explants, callus, organogenesis, root culture, shoot culture, micropropagation, suspension culture, protoplast culture, protoplast fusion and somatic hybridization.</p> <p>2.2.4 Applications: production of disease resistant plants, production of virus free plant, In vitro selection of cell lines for disease resistance, micropropagation, secondary metabolites from cell culture, transgenic plants for crop improvement</p>	05L	
2.3	<p>Immobilized enzyme and cells SKILL DEVELOPMENT</p> <p>2.3.1 Introduction and Definitions</p> <p>2.3.2 Methods</p> <p>2.3.3 Immobilized Enzyme Reactors</p> <p>2.3.4 Applications</p>	05L	



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Unit III: Quality Assurance, Quality Control, Bioassay, and Intellectual property rights		15L	15
3.1	Quality assurance and quality control Definitions, Chemical and pharmaceutical products Variables of batch process Q.A and Q.C w. r. t. - Raw materials, method of manufacturing, in process items, finished products, label and labeling, packaging materials Control of microbial contamination during manufacturing	04L	
3.2	Sterilization control and assurance	02L	
3.3	Bioassay Introduction Types: Diffusion, End Point, Turbidimetric, Metabolic Response, Enzymatic	03L	
3.4	Intellectual property rights Genesis, Role of WTO and TRIPS Overview of patent system Requirements for patentability Patent Categories Preliminary steps for patent applications Patent Procedures For biotech and microbiological products	05L	
3.5	Overview of Effluent environmental aspect Effluent treatment- Introduction The strength of fermentation effluents	01L	



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EMPLOYABILITY

Unit IV: Industrial Fermentations		15L	15
4.1	Penicillin and semisynthetic Penicillin: Introduction, biosynthesis and regulation, strain development, production methods. Semisynthetic penicillin: Examples, production, advantages	03L	
4.2	Aminoglycoside: Streptomycin: Aminoglycoside antibiotics, biosynthesis, regulation of biosynthesis, strain development, production method, recovery.	04L	
4.3	Vitamin B 12: Occurrence and economic significance, structure, biosynthesis, production based on media containing carbohydrates by- <i>Propionibacterium</i> and <i>Pseudomonas</i> , recovery.	02L	
4.4	Citric acid: Introduction, strains used for production, biosynthesis, nutrient media, production processes- surface and submerged, product recovery.	04L	
4.5	Glutamic acid: Production strains, biosynthesis, effect of permeability on production, conditions of manufacturing, production process and recovery.	02L	
4.6	Mushroom cultivation (<i>Agaricus</i>): Edible mushroom species, preparation of substrate- composting- phase I and phase II, Factors affecting composting, preparation of spawn, casing, induction of fruiting body formation, harvesting	02L	

Paper Code	Title of the Paper	Practical/Week	Credits
USc6Mi4	Bioprocess Technology: Part II	1	1.5

Sr. No.	Name of the Practical
1	Cultivation of algae, lipid detection by staining
2	Isolation of carotenoid producing marine red yeast.
3	Bioburden estimation of pharmaceutical finished products
4	Sterility testing of injectable
5	Chemical estimation of Penicillin
6	Bioassay of an antibiotic (Penicillin).



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7	Bioassay of Cyanocobalamin
8	Citric acid Efficiency and estimation by titration.

Reference: Course Code: USc6Mi4

Text books:

1. Casida L. E., "Industrial Microbiology" (2009) Reprint, New Age International (P) Ltd, Publishers, New Delhi.
2. Stanbury P. F., Whitaker A. & Hall S. J., (1997), "Principles of Fermentation Technology", 2nd Edition, Aditya Books Pvt. Ltd, New Delhi.
3. Stanbury P. F., Whitaker A. & Hall S. J 3rd Edition (2017) "Principles of Fermentation Technology"
4. H. K. Das., "Text book of Biotechnology", 2nd and 3rd edition.
5. A textbook of biotechnology R.C.Dubey 4th edition. S.Chand.
6. H. A. Modi, (2009). "Fermentation Technology" Vol. 1 & 2, Pointer Publications, India
7. Okafor Nduka (2007) "Modern Industrial Microbiology and Biotechnology", Science Publications Enfield, NH, USA.
8. Crueger W. and Crueger A. (2000) "Biotechnology -"A Textbook of Industrial
9. Microbiology", 2nd Edition, Panima Publishing Corporation, New Delhi.
10. Prescott and Dunn's "Industrial Microbiology" (1982) 4th Edition, McMillan Publishers.
11. Veerakumari L. "Bioinstrumentation", MJP Publisher
12. Pharmaceutical Microbiology, Hugo and Russell, 7th edition, Blackwell Science.

Reference books:

1. Pepler, H. J. and Perlman, D. (1979), "Microbial Technology". Vol 1 & 2, Academic Press.
2. Williams, Bryan L; Wilson, 2nd edition." A Biologist's guide to principles and techniques of practical biochemistry" Baltimore: University Park Press, 1981.
3. Wilson, Keith, 1936-; Goulding, Kenneth H, 3rd edition., A Biologist's guide to principles and techniques of practical biochemistry" London ; Baltimore : E. Arnold, 1986.
4. Wilson and Walker, "Principles and techniques of practical biochemistry" 5th edition.
5. Awasthi, Mamta and Singh, Rajiv Kumar .2011. Development of algae for the production of bioethanol, biomethane, biohydrogen and biodiesel. Indian Journal of Current Science.1:14-23.
6. Sharma, Nivedita and Sharma, Poonam. 2017. Industrial and biotechnological Applications of algae: A review. Journal of Advances in Plant Biology, Vol 1, issue 1.
7. Dhaliwal. M.K. 2016. Isolation of carotenoids producing marine red yeasts. Indian journal of Geo-marine Science. Vol 45(8). 1029-1034



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Modality of Assessment

Assessment pattern for theory

Scheme of Examination

The learner's Performance shall be assessed by conducting the Semester End Examinations with 100% marks. Semester End Theory Assessment - 100% (75/25 marks)

Scheme of Examination for Each Semester:

Internal Evaluation: 25 Marks (20 marks internal test and 05 marks for overall conduct)

Semester End Examination: 75 Marks

I. Theory

Each theory paper shall be of two and half hour duration
All questions are compulsory and will have 100% internal options

Q-1	From Unit – I	15 Marks
Q-2	From Unit – II	15 Marks
Q-3	From Unit – III	15 Marks
Q-4	From Unit – IV	15 Marks
Q-5	From Unit I– IV Objective questions from all the FOUR Units with equal weightage of marks allotted to each Unit. Question can be split into: a. Define b. Significance c. Example	15 Marks

II. Practical

The External examination per practical course will be conducted as per the Following scheme

Sr. No.	Particulars	Marks	Total
1.	Laboratory work (Each Paper- Major & Minor)	30	120
2.	Journal (Each Paper)	05	20
3.	Viva (Each Paper)	05	20



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4.	Quiz (Each Paper)	10	40
TOTAL		50 Marks/Paper	200 Marks

Semester V:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and / or Report, a Lost Certificate should be obtained from the Head of the Department / Co-ordinator of the department; failing which the student will not be allowed to appear for the practical examination.

Semester VI:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from the Head of the Department/ Co-ordinator of the department; failing which the student will not be allowed to appear for the practical examination. Overall Examination and Marks Distribution Pattern

Semester V

Course	USc5Mi1	USc5Mi2	USc5Mi3	USc5Mi4	Grand Total
Theory	100	100	100	100	400
Practical	50	50	50	50	200

Semester VI

Course	USc6Mi1	USc6Mi2	USc6Mi3	USc6Mi4	Grand Total
Theory	100	100	100	100	400
Practical	50	50	50	50	200



T. Y. B. Sc. Microbiology Syllabus

COURSE WISE CREDIT ASSIGNMENT UNDER THE FACULTY OF SCIENCE

Course wise credit assignments under the faculty of science Type of Courses / Credits Assigned	First Year (Credit x No. of Courses)		Second Year (Credit x No. of Courses)		Third Year (Credit x No. of Courses)		Total Credit Value
	First Semester	Second Semester	Third Semester	Fourth Semester	Fifth Semester	Sixth Semester	
Core Courses (Theory)	04x03	04x03	06x02	06x02	2.5x04	2.5x04	68
Core Courses (Practicals)	02x03	02x03	03x02	03x02	1.5x04	1.5x04	36
Foundation course	02x01	02x01	02x01	02x01			08
Applied Component Courses (Theory)					02x01	02x01	04
Applied Component Courses (Practical)					02x01	02x01	04
Total	20	20	20	20	20	20	120



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.Sc.

**Revised Syllabus of T.Y.B.Sc. (Applied Component
Biotechnology) Microbiology
Choice Based Credit, Grading and Semester System
w.e.f. Academic Year 2020-21**

PREAMBLE OF THE SYLLABUS

With the introduction of Academic autonomy by the esteemed Changu Kana Thakur Arts, Commerce and Science College, New Panvel from the academic year 2019-2020, the existing syllabus of T.Y.B.Sc. (Applied Component Biotechnology) Microbiology is restructured according to the CBCS pattern for its implementation from 2019-2020. This syllabus is prepared to make students more skilled in the applied aspects of microbiology and biotechnology. The new and updated syllabus is based on interdisciplinary approach with vigour and depth. The contents have been drawn to accommodate the widening horizons of the microbial techniques. It reflects the changing needs of the students, pertaining to the fields of Plant biotechnology, Bioremediation, Animal Biotechnology, Industrial biotechnology, Marine Biotechnology, Bioenergy, Healthcare biotechnology and Molecular Techniques. The well-organized curricula including basic as well as advanced concepts in the Microbiology shall inspire the students for pursuing higher studies in Microbiology and for becoming an entrepreneur and also enable students to get employed in the Microbiology subject based industries.

OBJECTIVES TO BE ACHIEVED:-

- To enrich students' knowledge and train them in the microbial sciences.
- To introduce the concepts of application and research in Microbiology.
- To inculcate sense of scientific responsibilities and social and environment awareness.
- To enhance the employability of learners.
- To help students build-up a progressive and successful care

T. Y. B. Sc.
Choice Based credit system
Biotechnology (Applied Component) Syllabus for B. Sc degree
in Microbiology
(To be implemented from the academic year 2020-2021)
Semester V

Introduction to Biotechnology				
Semester V				
Course code	Unit	Topic	Credits	Lectures/ Week
USc5Mi5	I	Basic Techniques in biotechnology	2	4
	II	Bioremediation in Biotechnology		
	III	Animal Biotechnology		
	IV	Industrial and Marine Biotechnology		
USc5Mi PAC		Practical Based on USc5Mi5	2	4

SEMESTER VI

Applied Biotechnology				
Semester VI				
Course code	Unit	Topic	Credits	Lectures/ Week
USc6Mi5	I	Role of Biotechnology in Society	2	4
	II	Bioenergy and Biofuels		
	III	Plant Biotechnology		
	IV	Healthcare Biotechnology		
USc6 Mi PAC		Practical based on USc6Mi5	2	4

N.B.

I. Each theory period shall be of 48 minutes duration. Theory component shall have 60 instructional periods plus 60 notional periods per semester which is equal to 96 learning hours. For theory component the value of one credit is equal to 48 learning hours.

II. Each practical period shall be of 48 minutes duration. Practical component shall have 60 instructional periods plus 15 notional periods per semester which is equal to 60 learning hours. For Practical component the value of one credit is equal to 30 learning hours.

LEARNING OBJECTIVES:

Topics included in this semester aim:

- To revise and impart to the students, knowledge of the basic techniques of biotechnology with respect to gene cloning and cloning vectors.
- To give the students an overview of bioremediation of soil, water and the different methods of using genetically engineered microbes and plants.
- To provide a basic insight into the methods of generating transgenic animals and study their applications.
- To give an insight into the role of microorganisms in industrial and marine biotechnology.

Learning outcome:

- Students will become competent by gaining knowledge of bioremediation, industrial production and animal biotechnology which will enhance their chances for employment and for further education.
- The students will acquire knowledge to carry out techniques in biotechnology and will understand the applications of transgenic animals and the methods used for obtaining transgenic animals.



Introduction to Biotechnology			
Course code : USc5Mi5 (2 Credits)			
Semester V			
Unit	Topic	Lec/ topic	Lecture/ Sem
I	Basic Techniques in Biotechnology Biophysical techniques A. Principle and application of SKILL DEVELOPMENT 1. Electrophoretic techniques: Agarose Gel Electrophoresis, Polyacrylamide Gel Electrophoresis, 2-D, PFGE 2. Spectrophotometric Techniques (Principle, Ray diagram, Applications): UV/Visible, AAS, NMR, ESR, X-ray diffraction B. Molecular Techniques: a. DNA sequencing methods b. Microarray c. GISH and FISH	05 06 04	15L
II	Bioremediation in Biotechnology : SKILL DEVELOPMENT 2.1 Introduction and Types of reaction in Bioremediation. 2.2 Biodegradation of pesticides and herbicide 2.3 Bioremediation of contaminated soil and waste water. EMPLOYABILITY 2.4 Bioremediation using genetically engineered microbes(GEM) 2.5 Higher plants in Bioremediation : Phytoremediation 2.6 Transgenic plants for phytoremediation 2.7 Bioremediation market	02 03 02 02 02 02 02	15L
III	Animal Biotechnology : 3.1 Transgenic Mice : Methodology: The retroviral Vector method, The DNA microinjection method, The engineering embryonic stem cell method, Genetic modification with the Cre-lox P recombination system , RNA interference, , Transgenesis with high capacity vectors. 3.2 Transgenic mice applications: Transgenic disease models: Alzheimer disease, Using Transgenic mice as test systems, Conditional regulation of transgene expression, Conditional control of cell death. EMPLOYABILITY	07 08	15L
IV	Industrial and Marine Biotechnology: 4.1 Industrial Biotechnology: <ul style="list-style-type: none"> • Synthesis of Novel Antibiotics – Engineering polykatid antibiotics, peptide antibiotics • Production of SCP – Yeast, Spirulina, Mushroom • Production of Biopolymers – Biogums, Biopolysaccharides, Bioplastic. 4.2.4.2 Marine Biotechnology: <ul style="list-style-type: none"> • Bio-prospecting, Marine Microbial Habitats and Their Biotechnologically relevant Microorganisms • Methods for Microbial Bio-prospecting in Marine Environments. Biotechnological Potential of Marine Microbes • Bioactive compounds from other Marine Organisms: fungi, Microalgae, Seaweeds, Actinomycetes, sponges • Marine Bio-resources, Marine Secondary Metabolites, Marine Proteins, Marine Lipids, Cosmetics from Marine Sources, Marine Drugs, Marine Microbial Enzymes, Marine Drugs as Pharmaceuticals. 	7 L 8L	15L

References:

- Banwell, C.N. and McCash, E.M., 2012, *Fundamentals of Molecular Spectroscopy*, 4th Ed., New Delhi, Tata McGraw Hill Education Pvt. Ltd.
- Upadhyay, Upadhyay and Nath, 2012, *Biophysical Chemistry: Principles and Techniques*, Mumbai, Himalaya Publishing House
- *Analytical Chemistry by Open Learning Series*, 2008, New York, John Wiley and Sons.
- Braun R. , Introduction to Instrumental Analysis, New York, McGraw Hill Book Company
- Skoog, Holler and Nieman, Principles of Instrumental Analysis, 5th Ed. Australia, Thomson Brock/Cole
- Elements of Biotechnology: 2009 PK Gupta, Rastogi Publications Edition 2nd ,
- Bernard R Glick and Jack J Pasternak. Molecular Biotechnology: Principles and Applications of recombinant DNA. 4th Edition.
- Primrose and others. Principles of Gene manipulations. 7th edition. 2004 Blackwell Science.
- Peter J. Russell 2006, “Genetics-A molecular approach”, 3rd edition.
- R. C. Bubey. A Taxy book of Biotechnology. 2006 S. Chand and Company Ltd.
- B. D. Singh. Biotechnology. Kalyani Publishers.
- Prescott and Dunn's „Industrial Microbiology““1982 4th Edition, McMillan Publishers
- Marine biotechnology in the twenty-first century-Problems, promise, and products, National academy press •

PRACTICALS BASED ON USc5Mi PAC

1. Gel electrophoresis of DNA
2. Isolation of genomic DNA (bacterial / yeast or onion)
3. Enrichment and isolation of Sulphate reducing bacteria
4. Isolation and identification of *Bacillus thuringensis*
5. **Determination of COD and BOD of sewage sample /Industrial Effluent**
6. Production of Biopesticide
7. Production of Microbial polysaccharide and determination of yield.
8. Cultivation of Edible mushroom
9. Isolation of marine microbial flora

SEMESTER VI
LEARNING OBJECTIVES:

- Aims at imparting knowledge on recent trends in plant and healthcare biotechnology.
- Aims at highlighting the significance of bioenergy and biofuel
- Create awareness of the importance of Biotechnology in society

LEARNING OUTCOME:

- Students will be trained to address issues of Bioenergy and Bio fuels
- They will be skilled to respond to issues related to genetic engineering in plant biotechnology.
- The learner will be able to comprehend details of the role of biotechnology in society

Applied Biotechnology Course code : USc6Mi5 Credits 02			
Semester VI			
Unit	Topic	Lec/ topic	Lecture /sem
I	Role of Biotechnology in Society 1.1 Benefits of Biotechnology. 1.2 ELSI of Biotechnology 1.3 Recombinant therapeutic product for human healthcare 1.4 Genetic modification and food consumption 1.5 Recombinant food and religious beliefs 1.6 Are Genetically Modified Food is safe? 1.7 Release of genetically engineered organisms 1.8 Application of Human genetic r-DNA research 1.9 Human embryonic stem cell research 1.10 Organ cloning 1.11 Biotechnology and the developing countries 1.12 Patenting Biotechnology Invention	15	15L
II	Bioenergy and Biofuel 2.1 Bioenergy a) Energy consumption Worldwide b) Energy consumption in India c) Solid biomass resources and dedicated energy crops d) Greenhouse gases and Kyoto protocol e) Bioenergy for Sustainable Development 2.2 Biofuel ENTREPRENEURSHIP a) Liquid biofuels: Bio-diesel, Bio-ethanol, Bio-oils b) Gaseous Biofuels: Biogas, Bio hydrogen c) Fossil fuels: The nonrenewable sources of energy d) Renewable and C-Neutral bioenergy e) Biomass production and its utilization for bioenergy 2.3 Benefits and problems a) - in production and use of biofuels	07L 07L	15L

III	Plant Biotechnology		15L
	3.1 Genetic engineering of Plants a) Plant transformation with Ti plasmids of <i>A.tumefaciens</i> , b) Ti plasmid derived vector systems, c) physical methods of transferring genes to plants.	06L 09L	
	3.2 Uses of genetically engineered plants: a) To overcome Biotic and abiotic stress: b) Insect resistance: Increasing expression of the <i>B.thuringiensis</i> protoxin, other strategies for protecting plants against insects, c) preventing the development of <i>Bacillus thuringiensis</i> resistant insects, d) Herbicide resistant plants e) Oxidative stress, f) Salt and drought stress, g) Modification of plant nutritional content: Vitamin A		
IV	Healthcare Biotechnology EMPLOYABILITY a) Branches within healthcare biotechnology b) Animal and human health care c) Genetic Counseling d) Forensic medicine	03 04 04 04	15L

References:

- Bernard R Glick and Jack J Pasternak. Molecular Biotechnology: Principles and Applications of recombinant DNA. 4th Edition.
- Bioenergy and biofuels: Ozcan Konur, CRC Press, Edition 1st 2018
- Elements of Biotechnology, 2009 P K Gupta, Second Revised Edition , Rastogi Publications .
- Vault Career guide to Biotechnology (E-Book)
- Biotechnology 2004 U. Satyanarayana , Books and Allied (P) Ltd.

PRACTICALS BASED ON USc6Mi PAC

1. Test for reducing sugars.
2. Bioethanol production from biomass.
3. Isolation of Cellulase producing microorganisms and determination of Cellulase activity
4. Plant tissue culture Callus formation. SKILL DEVELOPMENT
5. Immobilization of *Sacchromyces cerevisiae* using alginate and invertase assay
6. Visit to PTC and ATC Facility
7. Case Studies

XX

XXXXXX

Modality of Assessment

Internal assessment

a) Theory

25 Marks

No.	Evaluation type	Marks
1	One class test (multiple choice questions/objective and subjective /long answers)	20
2	Active participation in routine class instructional deliveries(case studies/seminar/presentation)	05

B) External examination-75%

Semester End Theory Assessment -75%

75 marks

Duration – These examinations shall be of two and half hours duration.

Theory question paper pattern:-

1. There shall be five questions of 15 marks each.
2. On each unit there will be one questions & fifth question will be based on all the four units.
3. All questions shall be compulsory with internal choice within the questions.
4. All questions will be of 30 marks with internal options.
5. Questions 1, 2, 3, and 4 will be subdivided into a) Subjective question (2 out of 4) for 10 marks and b) Objective questions (5 out of 10) for 5 Marks.
6. Question no. 5 will be subjective (3 out of 6) for 15 marks.
7. The allocation of marks depends on the weightage of the topic.

Practical Examination pattern

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

The practical examination will be conducted in one day with 6 hrs of work or in two days with 3 hrs of work each day.

One examiner and one expert will be appointed from college for each batch by the principal / Head of the department.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-coordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

Semester V:

Course : USc5 Mi PAC	Marks Assigned
Lab work Major practical (30 Marks) Minor Practical (20 Marks)	50
Assignment on Bio-pesticide production	10
Case study on Mushroom cultivation	10
Quiz	10
Viva-voce	10
Journal	10
Total Marks	100

Semester VI:

Course : USc6 Mi PAC	Marks Assigned
Lab work Major practical (30 Marks) Minor Practical (20 Marks)	50
Visit Report	10
Case study Report	10
Quiz	10
Viva-voce	10
Journal	10
Total Marks	100





M. Sc. I Microbiology Syllabus



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Program: M. Sc. I

**Revised Syllabus of M. Sc. I Microbiology
Choice Based Semester Grading System (60:40)
w.e.f. Academic Year 2019-20**

Choice Based Semester Grading System (CBSGS)

M. Sc. I Microbiology Syllabus



M. Sc. I Microbiology Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	M.Sc.I
2	Course Code for Theory and Practical Semester I	PSC1MI1, PSC1MI2, PSC1MI3, PSC1MI4, PSC1MIPR1
3	Course Code for Theory and Practical Semester II	PSC2MI1, PSC2MI2, PSC2MI3, PSC2MI4, PSC2MIPR2
3	Eligibility for Admission	B. Sc. Microbiology of all recognised Boards
4	Passing marks	40%
5	Ordinances/Regulations (if any)	-
6	No. of Semesters	Two
7	Level	P. G.
8	Pattern	Semester (60:40)
9	Status	Revised
10	To be implemented from Academic year	2019-2020



M. Sc. I Microbiology Syllabus

Preamble of the Syllabus

With the introduction of Autonomy in the Credit Based Semester and Grading system, the syllabus in Microbiology has been revised for M.Sc. Semester -I and Semester- II. This syllabus is implemented with effect from 2019-20. The revised syllabus has been approved by the concerned authorities of the Autonomous College, Committees formed by the college, BOS members and Head/ senior teachers from Department of Microbiology. MSc Microbiology Programme is of two years with two parts Part I and Part II. Each part has two semesters. Each semester will have four theory papers of 60 Marks and practical paper based on theory paper of 200 Marks. The syllabus has been designed in such a theory is related with the practicals thus enabling students to develop professional skillsets of a Microbiologist. The topics included will give hands on practice of microbiology experiments. Each paper has been designed emphasizing the need to develop research skills and Critical thinking/reasoning in the students. This will aid the students in their specific area of their interest/ specialization in particular. Syllabus covers various topics enlisted for entrance exams i.e. CSIR NET, SET, GATE, PET & entrance tests for other Research Institutes. This revised syllabus is aimed at equipping students with theoretical foundations and practical techniques required in R & D, quality control, regulatory function in pharmaceuticals, environmental sciences, Pharmaceutical Microbiology, Advances in Molecular Biology, Applied & Environmental Microbiology and Applied and Environmental monitoring and management. Areas covered in Semester I & Semester II will boost employability of students. As mentioned in the syllabus, all the courses of theory & practicals are compulsory to M.Sc microbiology.



M. Sc. I Microbiology Syllabus

Objectives of the Course

- To help the learners understand the depth of microbiology
- To help them succeed in competitive examination (NET, SET)
- To help them opt job and develop career in the field of microbiology

Course Outcome: By the end of the course:

- The learners will have hands training of various microbiology techniques which will be helpful for them to opt job in industries and reasearch related to microbiology.
- The thoery syllabus is related to various competitive examination like CSIR NET, SET, GATE, PET and it will be helpful for them to acquaint with these examination
- Learners will gain knowledge about virology, tissue culture techniques, cancer immunology, advance tachniues in diagnoatics , emerging infections, pathways of biochemistry

M. Sc. I Microbiology

For the subject of Microbiology there shall be four papers for 60 lectures each comprising of four units of 15 L each.

Semester-I	
Paper-I	Cell Biology
Paper- II	Microbial Genetics
Paper- III	Microbial Biochemistry
Paper- IV	Medical Microbiology & Immunology
Semester-II	
Paper-I	Virology
Paper- II	Microbial Genetics
Paper- III	Microbial Biochemistry
Paper- IV	Medical Microbiology & Immunology



M. Sc. I Microbiology Syllabus

Scheme of Examination for Each Semester:

Internal Evaluation: 25 Marks (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks

I. Theory

Each theory paper shall be of two and half hour duration

All questions are compulsory and will have 100% internal options

Q-1	From Unit – I	12 M
Q-2	From Unit – II	12M
Q-3	From Unit – III	12M
Q-4	From Unit – IV	12M
Q-5	From Unit I– IV Objective questions from all the FOUR Units with equal weightage of marks allotted to each Unit. Question can be split into: a. Define b. Significance c. Example	12M

II. Practical

The External examination per practical course will be conducted as per the Following scheme

Sr.No.	Particulars	Marks	Total
1.	Laboratory work (Each Paper) Major Minor	20/30 10	120
2.	Journal (Each Paper)	05	20
3.	Viva (Each Paper)	05	20
4.	Virtual problem/Quiz (Each Paper)	10	40
TOTAL			200 Marks



M. Sc. I Microbiology Syllabus

Choice Based Semester Grading System (CBSGS)

M. Sc. I Microbiology Syllabus

To be implemented from the Academic year 2019-20

Semester I Theory

Course Code	: PSC1MI-1	Title of the Paper	: Cell Biology
Credits	: 4	Lectures/Week	: 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Cell Biology (Membrane Structure & Transport)
II	Cell Biology(Respiratory & Photosynthetic Organelle)
III	Cell Biology (Cell division and Cell cycle)
IV	Cell Biology (Cell Communication)

Course Code	: PSC1MI-2	Title of the Paper	: Microbial Genetics
Credits	: 4	Lectures/Week	: 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Gene expression and regulation
II	Replication, recombination, mutation and repair
III	Cytoplasmic Inheritance & Chromosomal Rearrangements
IV	Molecular tools for genetics, Population genetics

Course Code	: PSC1MI-3	Title of the Paper	: Microbial Biochemistry
Credits	: 4	Lectures/Week	: 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Aqueous Solutions and Acid – Base Chemistry
II	Bioorganic Molecules
III	Metabolism of one & two carbon compounds
IV	Transfer of biomolecules



M. Sc. I Microbiology Syllabus

Course Code	: PSC1MI-3	Title of the Paper	: Medical Microbiology & Immunology
Credits	: 4	Lectures/Week	: 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Advances in Medical Microbiology: Part I
II	Epidemiology of infectious diseases
III	Immune System and Health : Part I
IV	Recent advances in Immunology: Immunobiology

Semester I Practical

Paper Code	Title of the Paper	Practical/Week	Credits
PSC1MIPR-1	Cell Biology	2	04
PSC1MIPR -2	Microbial Genetics	2	04
PSC1MIPR -3	Microbial Biochemistry	2	04
PSC1MIPR -4	Medical Microbiology & Immunology	2	04



M. Sc. I Microbiology Syllabus

Semester II

Course Code	: PSC2MI-1	Title of the Paper	: Virology
Credits	: 4	Lectures/Week	: 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Virology(Animal Viruses)
II	Virology in relation to human health
III	Virology(Bacterial Viruses)
IV	Virology(Plant Viruses)

Course Code	: PSC2MI-2	Title of the Paper	: Microbial Genetics
Credits	: 4	Lectures/Week	: 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Viral Genetics, Gene transfer
II	Transposable Genetic Elements, Genetic basis of Cancer.
III	Developmental Genetics
IV	Applications and Ethics of Genetic Technology

Course Code	: PSC2MI-3	Title of the Paper	: Microbial Biochemistry
Credits	: 4	Lectures/Week	: 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Analytical Biochemistry
II	Enzymology
III	Signalling and stress
IV	Microbial degradation



M. Sc. I Microbiology Syllabus

Course Code	: PSC2MI-4	Title of the Paper	: Medical Microbiology & Immunology
Credits	: 4	Lectures/Week	: 01 (On each unit)

UNIT	TOPIC HEADINGS
I	Advances in Medical Microbiology: Part II
II	Clinical Research and Modern diagnostics
III	Immune system and Health : Part II
IV	Challenges in Immune System

Semester II Practical

Paper Code	Title of the Paper	Practical/Week	Credits
PSC2MIPR-1	Virology	2	04
PSC2MIPR -2	Microbial Genetics	2	04
PSC2MIPR -3	Microbial Biochemistry	2	04
PSC2MIPR -4	Medical Microbiology & Immunology	2	04

**M. Sc. I Microbiology Syllabus****M. Sc. (Semester – I & Semester - II)**

Microbiology Syllabus Revised According To Credit Based Semester Grading System to be implemented from the Academic year 2019-2020

Semester I Syllabus**PSC1MI-1 (Cell Biology)****Course Code : PSC1MI-1****Title of the Paper : Cell Biology****No. of Lectures : 60****Credits : 04****Unit I: Membrane structure and transport**

Concepts	Lectures Allotted
1.1 Cell membrane structure A. Lipid bilayer B. Membrane proteins C. Spectrins D. Glycophorin E. Multipass membrane proteins F. Bacteriorhodopsin	04
1.2 Membrane Transport A. Principles of membrane transport B. Ion channels and electrical properties of membranes	03
1.3 Intracellular compartments and protein sorting A. Compartmentalization of cells B. Transport of molecules between the nucleus and cytosol C. Peroxisomes D. Endoplasmic reticulum E. Transport of proteins into mitochondria and chloroplasts	05
1.4 Intracellular vesicular traffic A. Endocytosis B. Exocytosis, C. Transport from the ER through the Golgi apparatus	03

**M. Sc. I Microbiology Syllabus****Unit II: Respiratory & Photosynthetic organelle**

Concept	Lectures Allotted
2.1 Mitochondria A. Structure B. Electron-transport chains and C. Proton pump	03
2.2 Chloroplast A. Structure B. Energy capture from sunlight C. Genetic system	03
2.3 Cytoskeleton A. Cytoskeletal filaments B. Microtubules C. Actin regulation D. Molecular motors E. Cell behavior	05
2.4 Cell study : Study of cells under the microscope A. Phase contrast microscopy B. Fluorescence microscopy C. Confocal microscopy D. Electron microscopy	04

Unit III: Cell division & Cell Cycle

Concept	Lectures Allotted
3.1 Mechanism of cell division A. M-phase B. Mitosis C. Cytokines	03
3.2 Cell cycle and Programmed cell death A. Control system B. intracellular control of cell cycle events C. Apoptosis D. extracellular control of cell growth and apoptosis	05
3.3 Cell Junctions and cell adhesion A. Anchoring B. Adherence junctions	03



M. Sc. I Microbiology Syllabus

C. Desmosomes D. Gap junctions E. Cell-cell adhesion F. Cadherins	
3.4 Development of multicellular organisms A. Animal cell development B. Caenorhabditis elegans C. Drosophila signaling genes D. Gradient of nuclear gene regulatory protein E. Dpp and Sog set up F. Neural development	04

Unit IV: Cell Communication

Concept	Lectures Allotted
4.1 Germ cells and fertilization A. Meiosis, sex determination in mammals B. Eggs C. Sperm D. Fertilization	04
4.2 Cell communication A. Extracellular signal molecules B. Nitric oxide gas signal C. Classes of cell-surface receptor proteins	05
4.3 Signaling through enzyme linked cell surface receptors A. Docking sites B. Ras C. MAP kinase D. Pl-3 kinase E. TGF	03
4.4 Signaling in plants A. Serine / Threonine kinases B. Role of ethylene C. Phytochromes	03

**M. Sc. I Microbiology Syllabus****PSC1MIPR1 Practical**

Paper Code	Title of the Paper	Practical/Week	Credits
PSC1MIPR-1	Cell Biology	2	04

Sr. No.	Name of the Practical
1.	Study of Mitosis
2.	Study of Meiosis
3.	Study of Phagocytosis using bacterial culture / yeast cells
4.	Study of Cell membrane integrity using uptake of neutral red
5.	Estimation of NO (Nitric Oxide) produced by Macrophages
6.	Cultivation of macrophage cell lines and study of cell viability
7.	Preparation of protoplast using Lysozyme
8.	Isolation of lysozyme from egg white
9.	Isolation of Chloroplasts
10.	Isolation of Mitochondria from the cell
11.	Demonstration phase contrast microscopy to study of cell cytology
12.	Demonstration of fluorescence microscopy to study cell structure
13.	Writing Research Paper –w.r.t. Techniques used to study cell cycle
14	Review on Cell – Cell communication

REFERENCES

1. Molecular Biology of the Cell – Albert, Johnson, Lewis, Raff, Roberts &Walter.
2. Molecular Cell Biology. Lodish, Birk, and Zipursky. Freeman
3. The Structure and Dynamics of Cell Membrane. – Lipowsky and Sackmann, Elsevier.
4. Cell Movements: from Molecules to Motility- Bray Garland Pub. NY.



M. Sc. I Microbiology Syllabus

PSC1MI-2 (Microbial Genetics)

Course Code : PSC1MI-1

Title of the Paper : Microbial Genetics

No. of Lectures : 60

Credits : 04

Unit I: Gene Expression

Concept	Lectures Allotted
<p>1.1 Gene Expression</p> <p>A. Concept of Gene (allele, Multiple alleles), B. Mendelian genetics (principle, co-dominance, incomplete dominance)</p> <p>Transcription</p> <p>A. Transcription process in prokaryotes B. Transcription process in eukaryotes</p>	05
<p>1.2 RNA molecules and processing</p> <p>A. Post transcriptional processing</p> <ol style="list-style-type: none"> i. structure of mRNA ii. pre- mRNA processing iii. addition of 5'cap iv. addition of Poly(A) tail v. RNA splicing vi. RNA editing <p>B. Small RNA molecules-</p> <ol style="list-style-type: none"> i. RNA interference ii. Types & Processing iii. Function of microRNAs 	
<p>1.3 Regulation of gene expression</p> <p>Control of gene expression in prokaryotes-</p> <ol style="list-style-type: none"> i. Genes & regulatory element ii. Levels of gene regulation iii. DNA binding proteins iv. Antisense RNA molecules v. Riboswitches 	10
<p>Control of gene expression in eukaryotes</p> <ol style="list-style-type: none"> i. Regulation through modification of gene structure- Dnase I hypersensitivity, histone modifications, chromatin remodeling, DNA methylation. ii. Regulation through transcriptional activators, Co- activators & repressors, enhancers and insulators iii. Regulation through RNA processing & degradation iv. Regulation through RNA interference 	

EMPLOYABILITY

**M. Sc. I Microbiology Syllabus****Unit II: Replication, recombination, mutation and repair**

Concept	Lectures Allotted
<u>2.1. Regulation of replication</u> i. Bacterial replication and cell cycle	03
<u>2.2 Recombination</u> i. Models for homologous recombination ii. Homologous recombination protein machines iii. Homologous recombination in eukaryotes iv. Mating type switching v. Genetic consequences of the mechanism of Homologous recombination	06
<u>2.3 Mutation</u> i. Mutation: Basic features of the process ii. Mutations: a. Phenotypic effects b. Mutations in humans and their effects c. Conditional lethal mutations iii. Molecular basis of mutation (Types, mutations induced by chemicals, radiation and transposable genetic elements; expanding trinucleotide repeats and inherited human diseases) iv. Screening chemicals for mutagenicity (Ame's test)	03
<u>2.4 DNA repair mechanisms</u> A. Types of repair mechanisms i. Direct repair ii. Light dependent repair iii. Excision repair in E. coli and mammalian cells iv. Mismatch repair, controlling the direction of mismatch repair v. Base flipping by methylases and glycosylases vi. Recombination repair in E. coli, recombination as a mechanism to recover from replication errors vii. SOS repair viii. Conserved repair systems in eukaryotic cells ix. Non-homologous end joining (NHEJ) pathway for repairing double stranded breaks B. Inherited human diseases with defects in DNA repair	03



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Unit III: Cytoplasmic Inheritance & Chromosomal Rearrangements

Concept	Lectures Allotted
3.1 Cytoplasmic Inheritance (Organelle Genetics) A. mt-DNA i. Mitochondrial genome structure ii. Ancestral and derived mitochondrial genome iii. Mitochondrial DNA of Human, yeast and flowering plants iv. Endosymbiotic theory v. Mitochondrial DNA replication, transcription & translation vi. Codon usage in Mitochondria vii. Damage to Mitochondrial DNA and aging viii. Evolution of Mitochondrial DNA ix. mt DNA analysis for study of evolutionary relationships	10
B. cp DNA i. Gene structure and organization ii. General features of replication, transcription and translation of cpDNA iii. Comparison of nuclear, eukaryotic, eubacterial mitochondrial and chloroplast DNA iv. Examples of extra nuclear inheritance- v. Leaf Variegation, vi. Poky mutant of Neurospora, vii. Yeast petite mutant, viii. Human genetic diseases ix. Maps of mt DNA and cp DNA	
3.2 Chromosomal Rearrangements and effects on gene expression i. Amplification and deletion of genes ii. Inversions that alter gene expression iii. Transpositions that alter gene a. Expression antigenic variation in Trypanosomes b. Mating type switching in yeast c. Phase variation in <i>Salmonella</i>	EMPLOYABILITY 05

**M. Sc. I Microbiology Syllabus****Unit IV: Molecular tools for genetics, Population genetics**

Concept	Lectures Allotted
<p><u>4.1 Molecular tools for genetics</u></p> <ul style="list-style-type: none">i. Molecular tools for studying genes and gene activityii. Use of recombinant DNA technology to identify human genes (Huntington's diseases, Cystic fibrosis), molecular diagnosis of human diseases, human gene therapy)iii. Labeled tracers (autoradiography, phosphorimaging, liquid scintillation counting, non-radioactive tracers)iv. Nucleic acid hybridization (Southern blots, DNA fingerprinting & DNA typing with their forensic applications, Northern blots, in situ hybridization), DNA sequencing (Sanger's chain termination method, Maxam Gilbert's sequencing), Restriction mapping, Site directed mutagenesisv. Mapping and quantifying transcripts (S1 mapping, primer extension, run-off transcription)vi. Measuring transcription rates in vivo (Nuclear run – on transcription, reporter gene transcription), Assaying DNA –protein interactions (filter binding, gel mobility shift, DNAase and DMS footprinting, knockouts)	09
<p><u>4.2 Population genetics</u></p> <ul style="list-style-type: none">i. Population and gene poolii. Genotypic and Allelic frequenciesiii. Calculation of Genotypic frequencies and Allelic frequencies for autosomal and X linked lociiv. Problems –calculation of allelic and genotypic frequenciesv. Hardy-Weinberg Law, genotypic frequencies at HWE,vi. Implications of the H-W Law ,vii. H-W proportions for multiple alleles,viii. X-linked allelesix. Testing for H-W proportions and problemsx. Genetic ill effects of in-breedingxi. Changes in the genetic structure of populations:<ul style="list-style-type: none">a. Mutation,b. Migration and gene flow,c. Genetic drift,d. Natural selectione. Simple problems based on the natural forces	06



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xii. Measuring genetic variation : a.RFLP, DNA sequencing b.Protein electrophoresis	
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PSC1MIPR2 Practical

Paper Code	Title of the Paper	Practical/Week	Credits
PSC1MIPR -2	Microbial Genetics	2	04

Sr. No.	Name of the Practical
1.	β galactosidase assay
2.	UV mutagenesis
3.	Acridine orange mutagenesis
4.	Isolation of mutants by Replica plate technique
5.	Penicillin enrichment technique
6.	Ames test
7.	Southern hybridization technique [Demonstration]
8.	Northern Blotting technique [Demonstration]
9.	Restriction mapping
10.	Design of primer & PCR
11.	Protein electrophoresis
12.	Problems on population genetics



M. Sc. I Microbiology Syllabus

References

Unit	Title of the Reference	Page No.
I	Genetics: A Conceptual Approach, 3 rd Edition by Benjamin Pierce	353-362, 373-380 386-387, 407- 417 427-428, 445-447 454-461
II	Gene X – Lewin	409-424
	Molecular biology of the gene Vth edition by Watson	259-292
	Snustad	
	Gene IX- Lewin	256-293, 300-325 331, 609-667
III	Genetics: A Conceptual Approach, 3rd Edition by Benjamin Pierce	579, 584-588, 593-595
	Genetics- Russel	681-704, 216, 217, 169, 170
	Gene X – Lewin	488-491
IV	Molecular Biology by R. F. Weaver (chapter 5)	96-133
	Snustad	548-559
	Pierce [Chapter 25]	
	Russel [Chapter 22]	
	Klug	639-650



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Course Code : PSC1MI-3

Title of the Paper : Microbial Biochemistry

No. of Lectures : 60

Credits : 04

Unit I: Aqueous solutions and acid base chemistry

Concept	Lectures Allotted
1.1. Various units of expressing and inter-converting concentration of solutions: i. Molarity ii. Moles iii. Normality iv. Osmolarity v. Molality vi. Mole Fraction SKILL DEVELOPMENT	05
1.2. Bronsted Concept of conjugate acid i. Conjugate base pairs ii. Ionization of solutions iii. pH iv. Titration curves v. Buffers- preparation, action and their use in Biology	05
1.3 Henderson-Hasselbalch equation , buffer capacity, polyprotic acids, amphoteric salts, ionic strengths (problem solving under all heads)	05

Unit II: Bioorganic Molecules

Concept	Lectures Allotted
2.1. Amino acids: Classification and stereochemistry, biochemical information from amino acid sequence, derivative, ionization	02
2.2. Structure and function a. Proteins: Structure of peptide bond, stability of formation of peptide bond, Ramchandran plot, protein structure, factors determining secondary , tertiary structures: amino acid sequence, thermodynamics of folding, role of disulfide bonds, dynamics of globular protein folding, chaperonins and prions motifs and domains, protein families, protein stability prediction of secondary and tertiary structure, protein-protein interactions	07

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b. Glycobiology: Carbohydrates, stability of glycosidic bond, glycoconjugates, proteoglycans, glycoproteins, glycolipids, homopolysaccharide folding, functions of oligosaccharides	03
c. Lipids: Lipid classification, structure of lipids in membranes-glycerolipids, ether lipids, galactolipids, sulfolipids, lipids in archaeobacteria, sphingolipids, terpenes, isoprenoids, Functions of lipids-signals, cofactors, pigments	03

Unit III: Metabolism of one and two carbon compounds

Concept	Lectures Allotted
3.1. Metabolism of one carbon compounds i. Methylotrophs: Oxidation of methane, methanol, methylamines and carbon assimilation in methylotrophic bacteria and yeasts ii. Methanogens: Methanogenesis from H_2 , CO_2 , CH_3OH , $HCOOH$, methylamines, energy coupling and biosynthesis in methanogenic bacteria iii. Acetogens: autotrophic pathway of acetate synthesis and CO_2 fixation, iv. Carboxidotrophs: Biochemistry of chemolithoautotrophic metabolism v. Cyanogens and cyanotrophs: cyanogenesis and cyanide degradation	11
3.2. Metabolism of two carbon compounds i. Acetate-TCA and Glyoxylate cycle, modified citric acid cycle, carbon monoxide dehydrogenase pathway and disproportionation to methane ii. Ethanol-acetic acid bacteria iii. Glyoxylate and glyoxylate-dicarboxylic acid cycle, glycerate pathway, beta hydroxyaspartate pathway iv. Oxalate as carbon and energy source	04

Unit IV: Transfer of biomolecules

Concept	Lectures Allotted
4.1. Protein transport: extracellular protein secretion, drug export system	05
4.2. Biological membranes and transport	05
4.3. Folding of periplasmic proteins, translocation of folded proteins,	05



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PSC1MIPR3 Practical

Paper Code	Title of the Paper	Practical/Week	Credits
PSC1MIPR -3	Microbial Biochemistry	2	04

Sr. No.	Name of the Practical
1.	Preparation of buffers
2.	Determination of pK and PI value for an amino acid
3.	Extraction of total lipids
4.	Isolation of cholesterol and lecithin from egg yolk
5.	Identification of fatty acids and other lipids by TLC
6.	Determination of degree of unsaturation of fats and oils
7.	Isolation of lactose from bovine milk
8.	Estimation of total sugars by phenol sulphuric acid method
9.	Isolation of glutamic acid from gluten
10.	Determination of molar absorption coefficient (ϵ) of L-tyrosine
11.	Determination of the isoelectric point of the given protein
12.	Estimation of polyphenols/ tannins by Folin-Denis method
13.	Metabolism of one and two carbon compounds : Enrichment, isolation and identification of Methylobacterium
14.	Transfer of biomolecules: Diffusion studies of molecules across sheep RBCs
15.	Preparation of liposomes

References

Unit	Title of the Reference
I	Biochemical calculations , Segel I.R., John Wiley and Sons, 1995
II	Biochemistry 3rd edition, Mathew, Van Holde and Ahern , Pearson Education
	Principles of Biochemistry, 4th edition, Zubay, G., Wm.C. Brown Publishers, 1998
	Principles of Biochemistry, Lehninger A.L., Cox and Nelson, CBS publishers and Distributors Pvt. Ltd. 1994



M. Sc. I Microbiology Syllabus

III	Microbial Biochemistry by GN Cohen-2011, Springer
	Biotechnology H.J. Rehm and G. Reed (ed.), Volume 6a. Biotransformations, Verlag and Chemie, 1984
	Bacterial metabolism by Gottschalk, Springer-Verlag, 1985
IV	Biochemistry , 4th edition , Voet D. and Voet J.G., John Willey and Sons Inc., 1995

Practical Reference:

- Laboratory manual in biochemistry by Jayaraman J. , New Age International Publishers
- An introduction to practical biochemistry 3rd edition, David T Plummer, Tata McGraw Hill edition 1998
- Experimental biochemistry –A student companion, Rao Beedu, S. Deshpande, IK international Pvt. Ltd.
- Laboratory manual in biochemistry, Immunology and Biotechnology, Nigam A and Ayyagiri A. Tata McGraw Hill edition
- Source of Experiments for teaching Microbiology, Primrose and Wardlaw
- Microbial Physiology and Biochemistry Laboratory manual: A quantitative approach , David White
- Principles and techniques of practical biochemistry, 4th edition, Wilson K. and Walker J. (Ed.) Cambridge University Press, 1994

Course Code : PSC1MI-4

Title of the Paper : Medical Microbiology & Immunology

No. of Lectures : 60

Credits : 04

Unit I: Advances in medical microbiology

Concept	SKILL DEVELOPMENT	Lectures Allotted
<p>Emerging Diseases Detailed Study of following infections including <u>Etiology</u>, <u>Transmission</u>, <u>Pathogenesis</u>, <u>Clinical Manifestations</u>, <u>Lab. diagnosis</u>, <u>Prophylaxis</u>, and <u>Treatment</u>:</p> <ol style="list-style-type: none"> Ebola Virus, Zika Virus, MOTT (mycobacteria other than TB) Legionellosis, Chicken guenica, Cholera caused by V.cholerae 0139, Conditions caused by Helicobactor pyolari, SARS 		15



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Unit II: Epidemiology of infectious diseases

Concept	EMPLOYABILITY	Lectures Allotted
2.1 Historical aspects-definition		02
2.2 Descriptive Epidemiology-aims and uses		
2.3 Host parasite interactions in the cause of diseases		02
2.4 Epidemiological principals in prevention and control of Diseases		02
2.5 Measures of risks: frequency measures, morbidity frequency measures, mortality frequency measures natality (birth) measures, measures of association and measures of public health impact.		04
2.6 Public health surveillance: purpose and characteristics, identifying health problems for surveillance, collecting data for surveillance, analyzing and interpreting data, disseminating data and interpretation, evaluating and improving surveillance.		05

Unit III: Immune system and health part I

Concept	Lectures Allotted
3.1 Immune response to infectious diseases Immune response to Prions <u>Immune response to viral infections</u> HIV/AIDS-HIV and the immunesystem-Influenza- Avian H5N1 <u>Immune response to Bacterial diseases</u> Difference in the Immune response to extracellular and intracellular bacteria : Diphtheria, Tuberculosis Microbial ways of evading immune system	15

Unit IV: Recent advances in immunology: Immunobiology

Concept	Lectures Allotted
4.1 Recent advances in Innate immunity including receptors involved and signaling system. Physiological & immunological barriers 4.2 Lymphocytes, Maturation of Lymphocytic Cells	15



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<p>4.3 The innate immune response: Inflammation, Acute Phase Reaction</p> <p>4.4 Molecular basis of diversity of immunoglobulin molecules</p> <p>4.5 Multigene organization of Ig genes</p> <p>4.6 Variable-Region Gene Rearrangement</p> <p>4.7 Mechanim of Variable-Region DNA Rearrangements</p> <p>4.8 Generation of antibody diversity</p> <p>4.9 Manipulations of the immune response</p>	
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PSC1MIPR3 Practical

Paper Code	Title of the Paper	Practical/Week	Credits
PSC1MIPR -4	Medical Microbiology & Immunology	2	04

Sr. No.	Name of the Practical	Date	Signature
1.	Problem solving exercises in medical microbiology based on diseases caused by- A. HIV (Human Immunodeficiency Virus) B. MOTT (Mycobacterium Other Than Tuberculosis) C. Chickengunia D. Helicobacter E. Vibrio cholerae 0139		
2.	Diagnosis for HIV CD4 lymphocyte count for AIDS		
3.	ELISA for AIDS		
4.	Diagnosis for MOTT		
5.	Acid fast staining for MOTT		
6.	Mono - Spot Test for diagnosis of Chickengunia (Demonstration experiment)		
7.	Diagnosis for V.c.0139 Cholera red test, String test, Oxidase test, Biochemical tests, & isolation on TCBS medium for identification of <i>Vibrio cholerae</i> 0139. serological diagnosis for V.c.0139 using specific monotypic antisera		
8.	Diagnosis for Helicobacter pyolari HPSA (<i>Helicobacter pyolari</i>) detection from stool sample. (Demonstration expt.) (kit method)		
9.	Study of virulence factors-Phagocytosis & Phagocytic index		
10.	Collection of human blood & separation of mononuclear cells by ficoll hypaque density gradient centrifugation		



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11.	Counting of viable cells by trypan blue		
12.	For internal assessment: A. Case study for epidemiology of the diseases included in unit I (Theory)-students have to collect data and interpret. This can be done from Net or approaching NGO's "SEHAT".		
	B. Collection of data, criteria, methodology etc. Assignment to be submitted.		

References

Unit	Title of the Reference
I	<ol style="list-style-type: none"> 1. Clinics in laboratory medicine, Emerging Infections and their causative agents. September 2004 vol. 24 no. 3. 2. Textbook of Microbiology 8th edition 2009-Ananthnarayan & Paniker-University press
II	<ol style="list-style-type: none"> 1. Principles of epidemiology in public health practices 3rd edition (www.cdc.gov/training/products/ss1000) 2. Basic lab methods in medical bacteriology, WHO Geneva. 3. Medical laboratory technology by Godkar. 4. Handbook of Epidemiology- W. Ahrens, I. Pigeot Springer- Verlag Berlin Herdelberg (2005). 5. Epidemiology for Public Health Practice- Robert H Friis & Thomas A. Sellers 3rd edition- Jones & Bartlett publishers. 6. Textbook of preventive and Community medicine- Park & Park. 7. Infectious disease surveillance by Nikuchia Nikanatha Blackwell Publishing 2005.
III	<ol style="list-style-type: none"> 1. Immunology – Essential and Fundamental, Sulabha Pathak and Urmi Palan. 3rd edition Capital publishing company. 2. Immunology- Kuby 6th edition W. H. Freeman and company- New York. 3. The Elements of immunology- Fahim Halim Khan- Pearson Education. 4. Immunology an introduction- 4th edition- Ian R. Tizard-Thomson
IV	<ol style="list-style-type: none"> 1. Immunology – Essential and Fundamental, Sulabha Pathak and Urmi Palan. 3rd edition Capital publishing company. 2. Immunology- Kuby 6th edition W. H. Freeman and company- New York. 3. The Elements of immunology- Fahim Halim Khan- Pearson Education. 4. Immunobiology –the immune system in health and disease 6th ed.-



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Practical Reference:

1. Medical laboratory technology- by Godkar.
2. Immunology-Essential & Fundamental-Sulbha Phatak & Urmi Palan-3rd edition Capital Publishing Company.
3. Clinical immunology – Principle & Practice 3rd ed. 2008 (Part -11 –clinical diagnostic immunology)
4. Bailey & Scott's – diagnostic microbiology 11th edition – Betty Forbes.
5. Koneman's Color Atlas & Text book of Diagnostic Microbiology 6th ed.



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SEMESTER I PRACTICALS (PSC1MIPR-4)

References:-

Unit I

Unit II

Unit III

5. .

Unit IV

5. Janeway.Travers.GS. References for Practicals:



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Semester II Detail Syllabus

PSC2MI-1

Course Code	Title	Credits
PSC2MI-1	Virology (60L)	04
Unit I:	(15L) VIROLOGY (Animal Viruses)	
	1.1 Animal Viruses : Influenza viruses : Classification, Clinical features, replication, genetic variation, Treatment and Surveillance (4L)	
	1.2 Rabies virus, epidemiology, Pathogenesis, Immunity, Management of human rabies, Viral life cycle, genetic variation. (3L)	01
	1.3 Pox virus ; Clinical features, Structure of virus, replication, Vaccinia, orthopox virus, variola virus. (4L)	
	1.4 Herpes Virus : Clinical signs and symptoms, varicella Zoster virus, Epstein-Barr virus, Cytomegalovirus, Life cycle, laboratory diagnosis, treatment (4L)	
Unit II:	(15L) VIROLOGY IN RELATION TO HUMAN HEALTH	
	2.1) Human Immunodeficiency Virus : transmission, epidemiology, life cycle, prevention, Diagnosis.(4L)	01
	2.2) Hepatitis Virus : Clinical features, epidemiology, Laboratory diagnosis, life cycle, Genetic diversity, prevention (3L)	



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<p>2.3)New reemerging viruses, Evolution and adaptation, ecological factors, climate variability, human factors- social behavior, exposure to zoonotic diseases, human movement (4L)</p> <p>2.4)Prions and Viroids, - CJD, BSE, Viruses and Cancer – retrovirus, DNA tumor virus, adeno virus, HCC (5L)</p>	
<p>Unit III: (15L)</p> <p style="text-align: center;">VIROLOGY(Bacterial Viruses)</p> <p>1.1 Bacteriophages : General properties of phages, properties of phage infected Bacterial cultures, Specificity of Phage Infection (3L)</p> <p>1.2 <i>E. coli</i> Phage T4 : Properties of T4 DNA, Genetic organization, the T4 growth cycle, Replication of T4 DNA (3L)</p> <p>1.3 <i>E.coli</i> Phage T7 and Lambda : Organization of the T7 genes, Growth Cycle, Regulation of transcription of T7 phage. (4L)</p> <p><i>E.coli</i> Phage (phi) X174, Filamentous DNA phages, Single stranded RNA phages, Lysogenic cycle. (5L)</p>	
<p>Unit IV: (15L)</p> <p style="text-align: center;">VIROLOGY(Plant Viruses)</p> <p>2.1 Plant viruses : Morphology, Transmission of plant viruses, symptoms of plant diseases caused by viruses.(4L)</p> <p>2.2 Plant virus life cycles, Plant satellite viruses and satellite Nucleic acids</p> <p>2.3 TMV, Citrus Tristeza Virus (CTV), : Viral structure, Genome, Host range, Transmission, Symptom and Control. (6L)</p> <p>Diagnosis of viral infections in plants(2L)</p>	01



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PRACTICALS: PSC2MIPR-1

SEMESTER II (60 Contact Hrs.)

- 1) Egg inoculation and cultivating animal virus in embryonated egg. Demonstration (04)
- 2) Cultivation of macrophage cell lines and study of cell viability (06)
- 3) Study of Mitosis. (06)
- 4) Study of Meiosis (06)
- 5) Estimation of NO (Nitric Oxide) produced by Macrophages. (08)
- 6) Study of Phagocytosis using bacterial culture / yeast cells (04)
- 7) Study of Cell membrane integrity using uptake of neutral red. (04)
- 8) Writing Research Paper –w.r.t. Techniques used to study cell cycle. (06)
- 9) Review on Cell – Cell communication. (06)
- 10) Assignment on Animal viruses – Epidemiology, Transmission (06)
- 11) Presentation of Assignment – Cell Biology (04)

REFERENCES :

- 1) General Virology – Luria
- 2) Introduction to Plant Virology – BOS, I. Longman, London, NY.
- 3) Animal Virology – Fenner and White. Academic Press. NY
- 4) Chemistry of Viruses – Knight C. Springer Verlag. NY
- 5) Virology – Delbecco and Giasberg. Harper and Ravi Pub. NY.
- 6) Bacterial and Bacteriophage Genetics – Edward Birge
- 7) 7)Microbial and Plant Protoplasts – Perberely
- 8) Principles of Virology –Flint, Enquist, Racaniello and Skalka, Vol I & II. ASM,
- 9) Understanding Viruses – Teri Shors. Jones and Bartlett pub.



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Course code: PSC2MI-2 (Microbial Genetics)

Semester II

Course Code	Title	Credits
PSMB-202	Microbial Genetics (60L)	04
	<p>Unit I Viral genetics, gene transfer [15L]</p> <p>1.1 Viral genetics [5L]</p> <p>A. Mapping the Bacteriophage genome.</p> <p>i. Phage phenotypes</p> <p>ii. Genetic recombination in phages</p> <p>iii. Genetic fine structure mapping</p> <p>iv. Deletion mapping</p> <p>B. Genes within genes : Bacteriophage Φ X174</p> <p>C. Constructing phage vectors- phage display vectors, suicide vectors, combining phage vectors and transposons</p> <p>1.2 Gene Transfer [10L]</p> <p>A. Drug resistance and gene transfer in bacteria.</p> <p>B. Genetic exchange in Bacteria – An overview SKILL DEVELOPMENT</p> <p>C. Mutant phenotypes in bacteria</p> <p>D. Basic test for transformation, conjugation and transduction</p> <p>E. Transformation:</p> <p>i. The transforming principle</p> <p>ii. Natural competency</p> <p>iii. Process of natural transformation- <i>Bacillus subtilis</i> (in detail)</p> <p>iv. Overview of transformation in <i>Streptococcus pneumoniae</i> & <i>Haemophilus influenza</i></p> <p>v. Artificial transformation</p>	01



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<p>vi. Transformation and gene mapping</p> <p>F. Conjugation:</p> <p>i. Discovery of conjugation</p> <p>ii. F factors and R factors</p> <p>iii. The conjugation machinery and transfer of DNA</p> <p>iv. F⁺ X F⁻ mating</p> <p>v. Hfr formation and conjugation</p> <p>vi. Formation of F primes and transfer from one cell to another</p> <p>vii. Genetic uses of F'</p> <p>viii. Gene mapping using Hfr crosses and 50% rule.</p> <p>ix. Mapping closely linked genes</p> <p>x. Mobilization of nonconjugable plasmids by</p> <p>xi. Conjugation from prokaryotes to eukaryotes</p> <p>G. Transduction:</p> <p>i. Discovery</p> <p>ii. Generalized transduction</p> <p>iii. P1 as model of generalized transduction</p> <p>iv. Specialized transduction- λ phage as model system</p> <p>v. LFT & HFT lysate Making merodiploids with specialized transducing phage Moving mutations from plasmids to specialized transducing phage to chromosome</p>	
<p>Unit II: Transposable genetic elements, genetic basis of cancer(15L)</p> <p>2.1 Transposable genetic elements [6L]</p> <p>A. Transposable Elements in Prokaryotes : An Overview</p> <p>The medical Significance of Bacterial Transposons</p> <p>B. Transposable Elements in Eukaryotes</p> <p>Ac and Ds Elements in Maize</p> <p>P Elements and Hybrid Dysgenesis in Drosophila</p> <p>Mariner, an Ancient and Widespread Transposon</p> <p>C. Retrotransposons</p> <p>Retroviruslike Elements</p> <p>Retroposons</p> <p>D. The Genetic and Evolutionary Significance of Transposable Elements</p>	<p>01</p>



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<p>Transposons and Genome Organization Transposons and Mutation</p> <p>Rearrangement of Immunoglobulin Genes</p> <p>Evolutionary Issues Concerning Transposable Elements</p> <p>2.2 Genetic basis of cancer [9L] EMPLOYABILITY</p> <p>A. A Common Killer</p> <p>B. Cancer: A Genetics Disease</p> <p>The Many Forms of Cancer</p> <p>Cancer and the Cell Cycle</p> <p>A Genetics Basis for Cancer</p> <p>C. Oncogenes</p> <p>Tumor-Inducing Retroviruses and Viral Oncogenes</p> <p>Cellular Homologs of Viral Oncogenes: The Proto-Oncogenes</p> <p>Mutant Cellular Oncogenes and Cancer</p> <p>Chromosome Rearrangement and Cancer</p> <p>D. Tumor Suppressor Genes</p> <p>Inherited Cancers and Knudson's Two-Hit Hypothesis Cellular</p> <p>Roles of Tumor Suppressor Proteins</p> <p>E. Genetic Pathways to Cancer</p>	
<p>Unit III: Developmental genetics (15L) EMPLOYABILITY</p> <p>3.1 Developmental genetics [5L]</p> <p>A. Cloning Experiments</p> <p>B. The Genetics of Pattern Formation in Drosophila</p> <p>C. Homeobox Genes in other Organisms</p> <p>D. The Genetics of Flower Development in Arabidopsis</p> <p>E. Programmed Cell Death in Development</p> <p>F. Evo-Devo: The Study of Evolution and Development</p> <p>3.2 The genetic control of animal development [10L]</p> <p>A. Stem Cell Therapy: A Brave New World?</p> <p>B. The Process of Development in Animals</p> <p>i. Oogenesis and fertilization</p> <p>ii. The Embryonic Cleavage Divisions and Blastula Formation</p>	01



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<ul style="list-style-type: none"> iii. Gastrulation and Morphogenesis <ul style="list-style-type: none"> C. Genetic Analysis of Development in Model Organisms <ul style="list-style-type: none"> i. Drosophila as a Model Organism ii. Caenorhabditis as a model organism D. Genetic Analysis of Development Pathways <ul style="list-style-type: none"> i. Sex Determination in Drosophila ii. Sex Determination in Caenorhabditis E. Molecular Analysis of Genes Involved in Development F. Maternal Gene Activity in Development <ul style="list-style-type: none"> i. Maternal-Effect Genes ii. Determination of the Dorsal-Ventral and Anterior-Posterior Axes in Drosophila Embryos G. Zygotic Gene Activity in Development <ul style="list-style-type: none"> i. Body Segmentation ii. Specification of Cell Types iii. Organ Formation 	
<p>Unit IV: Applications and ethics of genetic technology [15L]</p> <p>4.1 Mapping Human Genes at the Molecular Level</p> <p>RFLPs as Genetic Markers</p> <p>Linkage Analysis Using RFLPs</p> <p>Positional Cloning: The Gene for Neurofibromatosis</p> <p>The Candidate Gene Approach: The Gene for Marfan Syndrome</p> <p>Fluorescent in Situ Hybridization (FISH) Gene Mapping</p> <p>4.2 Genetic Disorders: Diagnosis and Screening</p> <p>Prenatal Genotyping for Mutations in the β- Globin Gene</p> <p>Prenatal Diagnosis of sickle-Cell Anemia</p> <p>Single Nucleotide Polymorphisms and Genetic Screening</p> <p>DNA Microarrays and Genetic Screening</p> <p>Genetic Testing and Ethical Dilemmas</p> <p>4.3 Treating Disorders with Gene Therapy</p> <p>Gene Therapy for Severe Combined Immunodeficiency (SCRID)</p> <p>Problems and Failures in Gene Therapy</p>	<p>EMPLOYABILITY</p> <p>01</p>



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The Future of Gene Therapy: New Vectors and Target-Cell

Strategies Ethical Issues and Gene Therapy

4.4 DNA Fingerprints

Minisatellites (VNTRs) and Microsatellites (STRs) Forensic

Applications of DNA Fingerprints

4.5 Genome Projects Use Recombinant DNA technology

The Human Genome Project: An overview

The Ethical, Legal, and Social Implications (ELSI) Program

After the Genome Projects

4.6 Biotechnology is an Outgrowth of Recombinant DNA Technology

Insulin Production by Bacteria

Transgenic Animal Hosts and Pharmaceutical Products

Transgenic Crop Plants and Herbicide Resistance

4.7 Marshalling recombinant DNA technology to fight AIDS

SEMESTER II

PRACTICALS : PSC2MIPR-2 (60 Contact Hrs)

List of practicals for semester II

- 1) Transformation
- 2) Conjugation, zygotic induction
- 3) Transduction
- 4) Identification of phage nucleic acid
- 5) Curing of plasmids
- 6) Study of transposable elements
- 7) Isolation of host range mutants
- 8) Problems on gene transfer mechanisms
- 9) Problems on viral genetics
- 10) Cancer genetics- visit to ACTREC



M. Sc. I Microbiology Syllabus

References:

Unit I:

- i. **Principles of Genetics, Third edition by D. Peter Snustad & Michael J. Simmons [pg 396 – pg 414]**
- ii. **Fundamental Bacterial Genetics by Nancy Trun and Janine Trempy – chapters 8, 10 and 11.**
- iii. **Snustad and Simmons 3rd edition [pg 418 – 435]**

Unit II:

- i. **Principles of Genetics, Third edition by D. Peter Snustad & Michael J. Simmons [pg 440-458, 695-704]**

Unit III:

- i. **Genetics, Second edition by Benjamin A. Pierce [pg. 608-619]**
- ii. **Principles of Genetics, Third Edition by D. Peter Snustad & Michael J. Simmons [629- 648]**

Unit IV:

- i. **Concept of Genetics, Seventh Edition by William S. Klug & Michael R. Cummings [pg 524-540]**
- ii. **Recombinant DNA by J.D. Watson (2nd edition) [pg 486-504]**

LIST OF REFERENCES FOR MICROBIAL GENTEICS.

1. **Watson, Baker, Bell, Gann, Levine, Losick, “Molecular Biology of the Gene”, Fifth Edition, Pearson Education (LPE)**
2. **Trun, Trempy, “Fundamental Bacterial Genetics”, Blackwell Publishing**
3. **Russell, P.J., “iGenetics- A Molecular Approach”, Third Edition, Pearson International Edition**
4. **Snustad & Simmons, “Principals of Genetics”, Third Edition, John Wiley & Sons Inc**
5. **Watson, Gilman, Witkowski, Zoller, “Recombinant DNA”, Second Edition, Scientific American Books**
6. **Klug & Cummings, “Concepts of Genetics”, Seventh Edition, Pearson Education (LPE)**
7. **Pierce, B.A., “Genetics- A Conceptual Approach”, Second Edition, W. H. Freeman & Co**
8. **Lewin, B., “Genes-IX”, Jones and Bartlett Publishers**



M. Sc. I Microbiology Syllabus

PSMB-203 Microbial Biochemistry

THEORY: SEMESTER –II

Course Code	Unit	Topic Headings	Credits	L/ Sem
PSC2MI-3 Microbial Biochemistry	I	ANALYTICAL BIOCHEMISTRY	4	15
		1.1. Determination of molecular weights, purity, length and volume of organic compounds		02
		1.2. Extraction, purification, application and analysis of proteins, carbohydrates and lipids. i. General methods of extraction: salting out, use of organic solvents ii. purification: chromatographic techniques iii. mass determination: ultracentrifuge, GC-MS iv. structure determination: X-ray diffraction, v. location: Confocal spectroscopy		06
		1.3. Methods of analysis: i. Proteins, ii. carbohydrates iii. lipids iv. other organic compounds (problem solving under all heads.)		02 02 02 01
	II	Enzymeology		15
		2.1. Enzyme kinetics: Discovery of enzymes, enzyme terminology, basic aspects of chemical kinetics, kinetics of enzyme catalyzed reactions, enzyme inhibition (reversible and irreversible), specific examples – effect of pH on enzyme activity (Fumerase), Enzyme action by X-ray crystallography, nerve gas and its significance, HIV enzyme inhibitors and drug design (Problems solving)		05
		2.2. Enzyme regulation: Phosphofructokinase as allosteric enzyme, general properties of allosteric enzymes, two themes of allosteric regulations, regulation by covalent modification, regulation by multi-enzyme complexes and multifunctional enzymes, specific example- the blood coagulation cascade (problem solving)		05
		2.3. Mechanisms of enzyme catalysis: five themes that occur in discussing enzymatic reactions, detailed mechanisms of enzyme catalysis for example- serine proteases, ribonucleases, triose phosphate isomerase, lysozyme, lactate and alcohol dehydrogenases, catalytic antibodies (Problem solving).		05
	III	SIGNALLING AND STRESS		15
		3.1. Introduction to two-component signaling systems:		05
		i. Response by facultative anaerobes to anaerobiosis, nitrate and nitrite, nitrogen supply, inorganic phosphate supply		
		ii. Effect of oxygen and light on the expression of photosynthetic genes in		



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	purple photosynthetic bacteria, response to osmotic pressure and temperature, response to potassium ion and external osmolarity, response to carbon sources		
	iii. Bacterial response to environmental stress- heat-shock response, repairing damaged DNA, the SOS response, oxidative stress,		05
	3.2. Synthesis of virulence factors in response to temperature, pH, nutrient, osmolarity and quorum sensors, chemotaxis, photoresponses, aerotaxis,		05
	3.3. Bacterial development and quorum sensing: Myxobacteria, Caulobacter, bioluminescence, systems similar to LuxR/LuxI in nonluminescent bacteria, biofilms.		
IV	MICROBIAL DEGRADTION		
	4.1. Degradation of aromatic and alicyclic compounds- important organisms, use of mixed cultures and manipulation of degradative genes, common pathways of aromatic degradation, aerobic and anaerobic degradation of aromatic compounds, aromatic and heterocyclic compounds with economical and ecotoxicological significance(phenolic pesticides, pthallic acid esters, lignosplphonates, surfactants, dyes and aromatics released during combustion.)		06
	4.2. Biotransformation of polycyclic aromatic hydrocarbons(PAHs)- Naphthalene, phenanthralene, anthracene, alicyclic and higher aliphatic hydrocarbons, halogenated aliphatics, branched chain alkanes and alkenes		03
	4.3. Biochemical mechanisms of pesticide detoxification		

PRACTICAL:(PSMBP—203):

Course Code	Topic Headings	Credits	L/ Week
PSMBP-203 MICROBIAL BIOCHEMISTRY (60 CONTACT HOURS)	ANALYTICAL BIOCHEMISTRY 1. Differential extraction with buffers, 2. purification strategy 3. Purification and concentration by precipitation- by decrease of pH, decrease in ionic strength, salting out, organic solvents, organic polymers, denaturation 4. Aqueous- two phase partitioning	2	04
	ENZYMOMOLOGY 5. purification of an extracellular enzyme(β -amylase) by salting out and dialysis 6. Enzyme kinetics-effect of enzyme concentration, substrate concentration, pH , temperature and inhibitors on enzyme activity, 7. Demonstration of proteolytic activity 8. Determination of glucose isomerase present intracellularly in <i>Bacillus sp.</i>		
	SIGNALLING AND STRESS		
	9. Adaptation of E. coli to anaerobiosis		
	10. Chemotaxis of Pseudomonas		
	11. Effect of temperature and water activity on		



M. Sc. I Microbiology Syllabus

swarming of Proteus		
12. Different bacteriolytic response associated with addition of lysozyme and salt..		
MICROBIAL DEGRADTION		
13. Microbial degradation of polycyclic aromatic hydrocarbons(PAHs)- enrichment, isolation and screening of bacteria		
14. PAH degradation studies		
15. Plasmid curing and determination of chemotaxis by drop assay method		

REFERENCES:

Theory:

Unit I: Biochemistry 3rd edition, Mathew, Van Holde and

Ahern, Pearson Education Principles of Biochemistry, 4th edition, Zubey

Principles of Biochemistry, Horton and Moran, Scrimgeour Pears Rawn

Principles of Biochemistry, Lehninger A.L., Cox and Nelson, CBS publishers and Distributors Pvt. Ltd. 1994

Unit II: Principles of Biochemistry, Lehninger A.L., Cox and Nelson, CBS publishers and Distributors Pvt. Ltd. 1994

Biochemistry by Conn and Stumph

Unit III: The physiology and biochemistry of prokaryotes, White D., Oxford University Press, 2000 Unit IV: Biotechnology H.J. Rehm and G. Reed

(ed.), Volume 6a. Biotransformations, Verlag and Chemie, 1984

Introduction to bacterial metabolism Doelle H.W., Academic Press, 1975 Microbial ecology, Atlas RM and Bartha, Addison Wesley Longman Inc. 1998.

Practical: **PSC2MIPR-3**

a. Laboratory manual in biochemistry by Jayaraman J., New Age International Publishers

b. An introduction to practical biochemistry 3rd edition, David T Plummer, Tata McGraw Hill edition 1998

c. Experimental biochemistry –A student companion, Rao Beedu, S. Deshpande, IK international Pvt. Ltd.

d. Laboratory manual in biochemistry, Immunology and Biotechnology, Nigam A and Ayyagiri A. Tata McGraw Hill edition

e. Source of Experiments for teaching Microbiology, Primrose and Wardlaw

f. Microbial Physiology and Biochemistry Laboratory manual: A quantitative approach, David White



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g. Principles and techniques of practical biochemistry, 4th edition, Wilson K. and Walker J.(Ed.) Cambridge University

Course Code PSMB-204	Unit	Topic Headings	Credits	L / Week
PSC2MI-4 Medical Microbiology & Immunology	I	<p><u>Advances in medical Microbiology :</u> (15 L)</p> <p>1.1 Emerging Diseases :- Detailed Study of following infections including Etiology, Transmission, Pathogenesis, Clinical Manifestations, Lab. diagnosis, Prophylaxis, and Treatment.</p> <p>Dengue, Listeriosis, VRE (Vancomycin Resistant enterococci)Leptospirosis, Hepatitis non A , Swine flu, conditions caused by Campylobacter , and prions</p>	4	01
	II	<p><u>Clinical Research:</u> (15 L) EMPLOYABILITY</p> <p>2.1 Introduction to Clinical Research.</p> <p>a. Good Clinical practice Guidelines</p> <p>b. Ethical aspects of Clinical Research</p> <p>c. Regulatory Requirements in clinical research</p> <p>d. Clinical Research Methodologies and Management</p> <p>e. Clinical Data Management and Statistics in Clinical Research.</p> <p>2.2 Modern Diagnostic Methods:</p> <p>a) -Advances in Molecular and Immunological Techniques.</p> <p>b) -Microarrays.</p> <p>c) -Advances in Fluorescence Technology and (FISH)</p>		01
	III	<p><u>Immune system and Health : Part –II</u> (15 L)</p>		01
		<p>3.1 Recent advances in immune tolerance</p> <p>a) -Central Tolerance</p>		



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- b) -Peripheral Tolerance
- c) -Tolerance Induction
- d) -T-cell Tolerance
- e) -B-cell Tolerance
- f) -Incomplete Tolerance
- g) -Duration of Tolerance

3.2 Recent advances in autoimmunity

- a) -Interplaying Factors
- b) -Triggering Factors
- c) -Mechanisms of Damage
- d) -Organ Specific Autoimmune Diseases
- e) -Systemic Autoimmune Diseases
- f) -Animal Models for Autoimmune Diseases
- g) -Proposed Mechanisms for Induction of Autoimmunity
- h) -Treatment of Autoimmune Diseases

3.3 Transplantation & Transfusion Immunology

SKILL DEVELOPMENT

- a) -Antigens Involved in Graft Rejection
- b) -Allorecognition
- c) -Graft Rejection-Role of APC's & Effector Cells
- d) -Graft v/s Host Diseases
- e) -Immuno Suppressive Therapies
- f) -Blood Transfusion:--
 - i. ABO & Rh Blood Groups
 - ii. Potential Transfusion Hazards
 - iii. Transfusion

Alternatives **3.4** Cancer

SKILL DEVELOPMENT

immunology.

- a) -Cancer:Origin & Terminology
- b) -Malignant Transformation of Cells
- c) -Oncogenes & Cancer Induction



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	d) -Tumors of the Immune System	
	e) -Tumor Antigens f) -Tumor Evasion of the Immune System g) -Cancer Immuno Therapy	
IV	Challenges in immune system (15 L) 4.1 Recent advances in vaccines a) -Challenges faced b) -HIV c) -Measles d) -T.B. 4.2 Immunodeficiency diseases a) -Primary Immunodeficiency b) -Defects in the Compliment System c) -Treatment Approaches for Immunodeficiency d) -Animal Models of Primary Immunodeficiency e) -Secondary Immunodeficiency & AIDS 4.3 Adversarial strategies to overcome immune response a) -microbial strategies in relation to the immune response b) -Inflammation Revisited c) -Protective Response Against Bacteria d) -The Habitat of Intracellular Bacteria e) -Immunity to Fungi f) -Immunity to Parasitic Infection	01



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SEMESTER II PRACTICALS (PSC2MIPR-4)

Problem solving exercises in medical microbiology with appropriate tests for the diagnosis of diseases :

1. Rapid identification for Dengue virus(IgM &IgG)kit method “TULIP” immunochromatography (Demonstration Experiment)
2. Diagnosis for VRE: Isolation using Bile Esculin agar, PYR test.
3. Diagnosis for VRE: AST.
4. **Diagnosis for VRE: MIC using High Comb MIC Test.** SKILL DEVELOPMENT
5. Diagnosis for Leptospirosis: Spirochaete staining.
6. Diagnosis for Hepatitis Non- A:ELISA.
7. Diagnosis for Swine flu-H1N1:Heamagglutination & Heamagglutination inhibition test.
8. Immunoelectrophoresis of proteins – Human serum
9. Determination of ABO & Rh – Antibody titre Major & Minor cross matching of blood.
10. SRID: For detection of immune deficiency and Complement deficiency.
11. Students will have to submit an assignment on clinical trials

References:

Unit I

1. Clinics in laboratory medicine, Emerging Infections and their causative agents. September 2004 vol. 24 no. 3.
2. Textbook of Microbiology 8th edition 2009-Ananthnarayan & Paniker-University press
3. (Some more References to be cited.)

Unit II

1. Textbook of clinical trials- editors David Machim, Simson Day & Sylvan Green-John Wiley & Sons.
2. Management of Data in Clinical Trials- Eleanor McFadden M.A. - John Wiley & Sons.
3. Clinical Trials- Issues and Approaches- Edited by Stanley H. Shapiro, Thomas A. Louis- Marcel Dekker Inc. New York.

b.

1. Immunology- Kuby 6th edition W. H. Freeman and company- New York.
2. The Elements of immunology- Fahim Halim Khan- Pearson Education.
3. Immunology an introduction- 4th edition- Ian R. Tizard-Thomson.
4. Roitt's Essential Immunology 12th edition- Wiley- Blackwell.
5. Koneman's color Atlas & Textbook of Diagnostic Microbiology 6th edition-Lippincott Williams & Wilkins



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Unit III

a.

1. Immunology- Kuby 6th edition W. H. Freeman and company- New York.
2. Immunology-Essential & Fundamental edited by Sulbha Pathak & Urmi Palan-3rd edition- Central Publishing Company.
3. Immunology an introduction- 4th edition- Ian R. Tizard-Thomson.

b.

1. Immunology- Kuby 6th edition W. H. Freeman and company- New York.
2. Immunology-Essential & Fundamental edited by Sulbha Pathak & Urmi Palan-3rd edition- Central Publishing Company.
3. Immunology an introduction- 4th edition- Ian R. Tizard-Thomson.
4. Roitt's Essential Immunology 12th edition- Wiley- Blackwell.
5. The Elements of immunology- Fahim Halim Khan- Pearson Education.
6. Immuno Biology-the immune system in health & disease-6th edition-Janeway, Travers-GS.

c.

1. Immunology- Kuby 6th edition W. H. Freeman and company- New York.
2. The Elements of immunology- Fahim Halim Khan- Pearson Education.
3. Immunology-Essential & Fundamental edited by Sulbha Pathak & Urmi Palan-3rd edition- Central Publishing Company.

d.

1. Immunology- Kuby 6th edition W. H. Freeman and company- New York.
2. Immunology-Essential & Fundamental edited by Sulbha Pathak & Urmi Palan-3rd edition- Central Publishing Company.
3. Immunology an introduction- 4th edition- Ian R. Tizard-Thomson.
4. Roitt's Essential Immunology 12th edition- Wiley- Blackwell.
5. The Elements of immunology- Fahim Halim Khan- Pearson Education

Unit IV

a

1. Current Published papers on recent advances in relevant vaccines to be referred.

b.

1. Immunology- Kuby 6th edition W. H. Freeman and company- New York.
2. Roitt's Essential Immunology 12th edition- Wiley- Blackwell.

c.

1. Roitt's Essential Immunology 12th edition- Wiley- Blackwell.
2. The Pathogenesis of Infectious Disease- Cedric A . Mims.ELBS.



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References for Practicals:

1. **Medical laboratory technology-** by Godkar.
2. **Immunology-Essential & Fundamental-Sulbha Phatak & Urmi Palan-3rd edition Capital Publishing Company.**
3. **Clinical immunology – Principle & Practice 3rd ed. 2008 (Part -11 –clinical diagnostic immunology)**
4. **Bailey & Scott’s – diagnostic microbiology 11th edition – Betty Forbes.**
5. **Koneman’s Color Atlas & Text book of Diagnostic Microbiology 6th ed.**

REFERENCES: USC1MI-1 & USC1MI-2

1. Prescott ,Hurley.Klein-Microbiology, 7th edition, International edition McGraw Hill.
2. Kathleen Park Talaro& Arthur Talaro - Foundations in Microbiology International edition 2002,| McGraw Hill.
3. Michael T.Madigan & J.M.Martin,Brock ,Biology of Microorganisms 12th Ed. Internationaledition 2006, Pearson Prentice Hall.
4. A.J.Salle,Fundamental Principles of Bacteriology.
5. Stanier.Ingraham et al ,General Microbiology 4th & 5th Ed. 1987, Macmillan Education Ltd
6. Microbiology TMH 5th Edition by Michael J.Pelczar Jr., E.C.S. Chan ,Noel R. Krieg
7. BIS:12035.1986: Code of Safety in Microbiological Laboratories
8. Outlines of Biochemistry 5/E, Conn P. Stumpf, G. Bruening and R. Doi. John Wiley & Sons. New York 1995
9. Lehninger. Principles of Biochemistry. 4th Edition. D. Nelson and M. Cox. W.H. Freeman and Company. New York 2005
10. Microbiology An Introduction. 6th Edition. Tortora, Funke and Case. Adisson Wesley Longman Inc. 1998.

REFERENCES: USC2MI-1 & USC2MI-2

1. Microbiology TMH 5th Edition by Michael J.Pelczar Jr., E.C.S. Chan ,Noel R. Krieg
2. A.J.Salle, Fundamental Principles of Bacteriology,McGraw Hill Book Company Inc.1984
3. Cruikshank, Medical Microbiology , Vol -II
4. Prescott ,Hurley.Klein-Microbiology, 5th & 6th edition, International edition 2002 & 2006, McGraw Hill.
5. Michael T.Madigan & J.M.Martin,Brock ,Biology of Microorganisms 11th Ed. International edition ,2006, Pearson Prentice Hall.
6. Ananthanarayan And Paniker, Textbook Of Microbiology,10th edition ,2013,University Press Hyderabad.

PRACTICAL BOOK/JOURNAL

Semester I:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department ; failing which the student will not be allowed to appear for the practical examination.

Semester II:

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department ; failing which the student will not be allowed to appear for the practical examination.

Overall Examination and Marks Distribution Pattern

Semester I

Course	USC1MI-1	USC1MI-2	Grand Total
Theory	100 02 Credits	100 02 Credits	200 04 Credits
Practicals	50 02 Credits	50 02 Credits	100 04 Credits
Total Marks	150	150	300
Total Credits	04 Credits	04 Credits	08 Credits

Semester II

Course	USC2MI-1	USC2MI-2	Grand Total
Theory	100 02 Credits	100 02 Credits	200 04 Credits
Practicals	50 02 Credits	50 02 Credits	100 04 Credits
Total Marks	150	150	300
Total Credits	04 Credits	04 Credits	08 Credits



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Re-accredited 'A⁺' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Program: M. Sc.

Revised Syllabus of M.Sc. (Part II) Microbiology

Choice Based Credit, Grading and Semester System

w.e.f. Academic Year 2020-21

PREAMBLE OF THE SYLLABUS

With the introduction of Academic autonomy by the esteemed Changu Kana Thakur Arts, Commerce and Science College, New Panvel from the academic year 2019-2020, the existing syllabus of M.Sc. Microbiology is restructured according to the CBCS pattern for its implementation from 2019-2020. This syllabus is prepared to make students more knowledge oriented in Microbiology subject. The new and updated syllabus is based on interdisciplinary approach with vigour and depth. The contents have been drawn to accommodate the widening horizons of the Microbiology discipline. It reflects the changing needs of the students, pertaining to the fields of Bio-Chemistry, Molecular Biology, Bio-Statistics and Research methodology, Environment protection, emerging techniques and pharmaceutical microbiology. The well-organized curricula including basic as well as advanced concepts in the Microbiology shall inspire the students for pursuing higher studies in Microbiology and for becoming an entrepreneur and also enable students to get employed in the Microbiology subject based industries.

OBJECTIVES TO BE ACHIEVED:-

- To enrich students' knowledge and train them in the microbial sciences.
- To introduce the concepts of application and research in Microbiology.
- To inculcate sense of scientific responsibilities and social and environment awareness.
- To enhance the employability of learners.
- To help students build-up a progressive and successful career.

M.Sc. Microbiology Syllabus (General outline)
Revised for Choice Based Credit System
To be implemented from the Academic year 2020-21

SEMESTER III		
Course Code	Title	Credits
PSC3 Mi 1 Theory	Tools and Techniques : Research Methodology	04 Credits (60 L)
Unit-I	Research Fundamentals and Terminology	15 L
Unit-II	Defining Research Problem and Data Collection	15 L
Unit-III	Sampling and Sampling Distributions	15 L
Unit-IV	Data Analysis and Report Writing	15 L
PSC3 Mi 2 Theory	Food Microbiology	04 Credits (60 L)
Unit-I	Microbes in Food	15 L
Unit-II	Uses of Microbes in Food	15 L
Unit-III	Control of Microbes in Food	15 L
Unit-IV	Microbial Detection and Food Safety	15 L
PSC3 Mi 3	Advances In Microbial Technology	04 Credits (60 L)
Unit-I	Agricultural Microbiology	15 L
Unit-II	Animal Biotechnology	15 L
Unit-III	Nano Biotechnology	15 L
Unit-IV	Medical Biotechnology	15 L
PSC3 Mi 4	Applied and Environmental Microbiology	04 Credits (60 L)
Unit-I	Microbial Diversity	15 L
Unit-II	Techniques in Microbial Ecology	15 L
Unit-III	Soil, Marine and Agricultural Microbiology	15 L
Unit-IV	Advanced Food and Water Microbiology	15 L
PSC3 Mi P	PRACTICALS	02 Credits (60 L)
SECTION-1	Literature Survey and Research Project Proposal	15 L
SECTION-2	Food Microbiology	15 L
SECTION-3	Advances in Biotechnology	15 L
SECTION-4	Applied and Environmental Microbiology	15 L ³

SEMESTER IV		
Course Code	Title	Credits
PSC4 Mi 1 Theory	Tools and Techniques: Biomolecular Analysis	04 Credits (60 L)
Unit-I	Spectroscopic Techniques	15 L
Unit-II	Chromatographic Techniques	15 L
Unit-III	Molecular Biology Techniques	15 L
Unit-IV	Nanotechnology Techniques	15 L
PSC4 Mi 2 Theory	Pharmaceutical Microbiology	04 Credits (60 L)
Unit-I	Principles and Applications of GMP in Pharmaceuticals and Cosmetics	15 L
Unit-II	Quality Management and Regulatory Aspects	15 L
Unit-III	Analytical Aspects for Pharmaceutical and Cosmetic Products	15 L
Unit-IV	Drug Discovery	15 L
PSC4 Mi 3	Advances in Biotechnology	04 Credits (60 L)
Unit-I	Pharmaceutical Biotechnology	15 L
Unit-II	IPR and Ethics in Biotechnology	15 L
Unit-III	Marine Biotechnology	15 L
Unit-IV	Advances in Molecular Biotechnology	15 L
PSC4 Mi 4	Applied and Environmental Monitoring & Management	04 Credits (60 L)
Unit-I	Bioremediation, Biodegradation & Waste disposal	15 L
Unit-II	Biofilm Management	15 L
Unit-III	Environmental Pollution & Monitoring	15 L
Unit-IV	Environmental & Natural Resources Management and Safety Standards	15 L
PSC4 Mi P	PRACTICALS	02 Credits (60 L)
SECTION-1	Dissertation based on Research Project and Poster Presentation.	15 L
SECTION-2	Pharmaceutical Microbiology	15 L
SECTION-3	Advances in Biotechnology	15 L
SECTION-4	Applied and Environmental Monitoring & Management	15 L

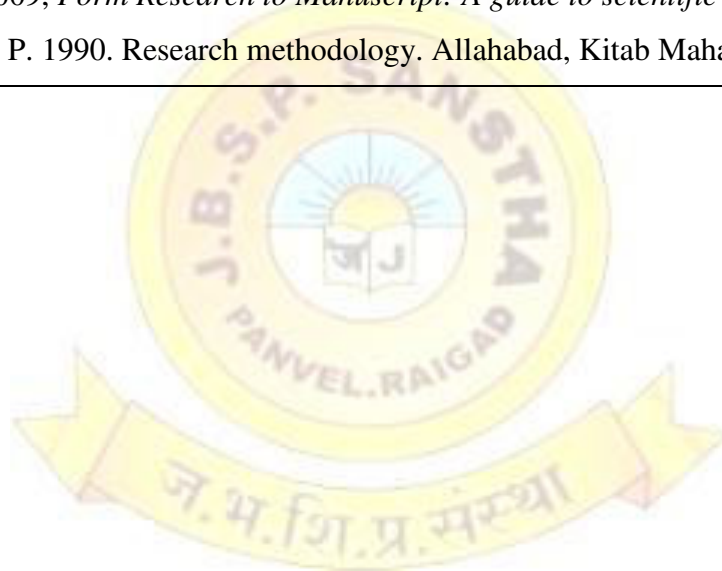
M. Sc. II Microbiology Syllabus Revision Academic Year 2020-2021

Semester III

Paper/Unit	Title	Lecture/Week	Total lectures
PSc3Mi 1	Tools and Techniques : Research Methodology	1	(60)
Unit I	Research Fundamentals and Terminology		(15)
	1.1 Meaning and Objective of research, features of a good research study, scientific method		(05L)
	1.2 Study designs and variations: basic, applied, historical, exploratory, experimental, ex-post-facto, case study, diagnostic research, crossover design, case control design, cohort study design, multifactorial design		(10L)
Unit II	Defining Research problem and data Collection SKILL DEVELOPMENT		(15L)
	2.1 Hypothesis, theory and scientific law: development, structure, conditions, sources, formulation, explanation of hypothesis; structure, identification, elements, classification, functions of theory; scientific laws and principles		(05L)
	2.2 Methods and techniques of data collection: types of data, methods of primary data collection(observation/ experimentation/ questionnaire/ interviewing/ case/ pilot study , methods), methods of secondary data collection(internal/ external), schedule method		(10L)
Unit III	Sampling and sampling distributions (15L) SKILL DEVELOPMENT		
	3.1 Sampling frame, importance of probability sampling, simple random sampling, systematic sampling, stratified random sampling, cluster sampling, problems due to unintended sampling, ecological and statistical population in the laboratory		05L
	3.2 Variables: nominal, ordinal, discontinuous, continuous, derived		05
	3.3 Dispersion, Correlation, regression, test of statistical significance		05
Unit IV	Data analysis and report writing SKILL DEVELOPMENT		(15L)
	4.1 Experimental data collection and data processing: Processing operations, problems in processing, elements of analysis in data processing, software for data processing,		05L
	4.2 Report writing and presentation: types of research reports, guidelines for writing a report, report format, appendices, Miscellaneous information, poster and oral presentations		06L
	Analysis of Variance		04

References: PSMB301 (Semester III)

1. Kothari, C.R.,1985, *Research Methodology- Methods and Techniques*, New Delhi, Wiley Eastern Limited.
2. Das, S.K. , 1986, *An Introduction to Research*, Kolkata, Mukherjee and Company Pvt. Ltd.
3. Misra R.P., 1989, *Research Methodology: A Handbook*, New Delhi, Concept Publishing Company
4. Kumar, R., 2005, *Research Methodology-A Step-by-Step Guide for for beginners*,(2nd.ed.),Singapore, Pearson Education.
5. Bhattachraya, D.K., 2006, *Research Methodology*,(2nd.ed.),New Delhi, Excel Books.
6. Panneerselvam R.,2012, *Research Methodology*, New Delhi, PHI Learning Pvt. Ltd.
7. Khan, Irfan Ali, 2008, *Fundamentals of Biostatistics*, Ukaaz Publications
8. Rosner B.A., 2011, *Fundamentals of Biostatistics*, Cengage Learning
9. Katz J.M., 2009, *Form Research to Manuscript: A guide to scientific writing*, USA, Springer Science
10. Saravanavel, P. 1990. *Research methodology*. Allahabad, Kitab Mahal



Paper/Unit	Title	Lecture /Week	Total lectures
PSc3Mi 2	Food Microbiology	1	(60)
Unit I	Microbes in foods		(15)
	1.1 Importance of microbes in food 1.2 Sources of microbes in food 1.3 Normal microbiological quality of food 1.4 Factors influencing microbial growth in food		
Unit II	Uses of microbes in food		(15L)
	2.1 Microbial stress response in food		03
	2.2 Starter cultures		02
	2.3 Microbiology of fermented foods General method of production 2.3.a. Cheese – Swiss and Blue cheese 2.3.b. Fermented meat product – Sausage 2.3.c. Fermented vegetable products – Pickles, soy product , Sauerkraut 2.3.d. Bread and Idli	EMPLOYABILITY	10L
Unit III	Control of microbes in food		(15L)
	3.1 Control of access		01
	3.2 Control by physical removal, heat, low temperature, reduced aw, low pH and organic acids, modified atmosphere, antimicrobial preservatives, irradiation		10
	3.3 Novel emerging techniques of food preservation		03
	3.4 Control by combination of methods (Hurdle concept)		01
Unit IV	Microbial Detection and Food Safety		(15L)
	4.1 Conventional Methods. 4.1.a. Methods used, Sampling for microbial analysis 4.1.b. Quantitative microbial enumeration in food 4.1.c. Qualitative methods of microbial detection 4.1.d. Bacterial Toxins 4.1.e. Rapid methods 4.1.f. Biosensors	SKILL DEVELOPMENT	07
	4.2 Controlling the Microbiological Quality of food. 4.2.a. Quality and Criteria 4.2.b. Sampling Schemes 4.2.c. QC using microbiological control 4.2.d. Control at source 4.2.e. Codes of GMP 4.2.f. HACCP 4.2.g. Laboratory Accreditation		08

References: PSc3Mi 2**References: Unit I**

1. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology 4th Ed. CRC Press.
2. Srilakshami B (2010) Food Science. 5th Ed. New Age International Publishers.
3. James Jay , M Loessner and D Golden (2005) Modern Food Microbiology 7th Ed.
4. Adams M R and Moss M O (2008) Food Microbiology 3rd Ed. RSC Publishing.
5. J Maud Kordylas (1991) Processing and Preservation of tropical and subtropical foods. ELBS Macmillan.

References: Unit II

1. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology 4th Ed. CRC Press.
2. Gerald Reed (2004) Prescott and Dunn's Industrial Microbiology 4th Ed. CBS Publishers.
3. J Maud Kordylas (1991) Processing and Preservation of tropical and subtropical foods. ELBS Macmillan.

References: Unit III

1. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology 4th Ed. CRC Press.
2. N Shakuntala Manay and Shadaksharaswamy M (1985) Foods Facts and Principles. New Age International

References: Unit IV

1. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology 4th Ed. CRC Press.
2. Adams M R and Moss M O (2008) Food Microbiology 3rd Ed. RSC Publishing.
3. N Shakuntala Manay and Shadaksharaswamy M (1985) Foods Facts and Principles. New Age International.
4. Harrigan W F and McCance M F (1976) Laboratory methods in food and dairy microbiology. Academic Press.
5. Aylward F (2001) Food Technology Processing and Laboratory Control. Agrobios (India)

Paper/Unit	Title	Lecture/Week	Total lectures
PSc3Mi 3	Advances In Microbial Technology	1	(60)
Unit I	Agricultural Microbiology		(15)
	1.1 Plant Tissue Culture for crop improvement--Initiation and maintenance of Callus and Suspension culture, Direct and Indirect Organogenesis, Micropropagation, Artificial seeds, Anther culture and dihaploids, Protoplast isolation culture and fusion, Production of haploids, Somaclonal variations, Germplasm conservation, Somatic hybrids, Cybrids.		SKILL DEVELOPMENT
	1.2 Production of secondary metabolites from plant cell cultures, Technology of plant cell culture for production of chemicals, Bioreactor systems and models for mass cultivation of plant cells.		
	1.3 Plant Transformation Technology – Agrobacterium mediated gene transfer, Agrobacterium based vectors, viral vectors, Direct gene transfer methods, chemical methods, electroporation, microinjection, particle bombardment, Molecular breeding, plant selectable markers, Reporter genes, Positive selection, Selectable marker elimination, Transgene silencing, Strategies to avoid transgene silencing.		
	1.4 Plant Genetic Engineering for Productivity and Performance— a) Biotic Stress Tolerance- Herbicide resistance, Glyphosate, Insect Resistance, Bt toxin, Disease Resistance, Virus resistance b) By manipulation of—Photosynthesis, Nitrogen fixation, Nutrient uptake efficiency c) For Quality Improvement-Protein, Lipids, carbohydrates, vitamins and minerals. d) Biosafety concerns of transgenic plants		
	1.5 Plants as bioreactors		
	1.6 Soil Microbes interaction, Biofertilizer, Biopesticide		
Unit II	Animal Biotechnology		(15L)
	2.1 Animal Tissue Culture: Primary culture, Organ culture, Embryo Culture, Established Cell lines		
	2.2 Scale up, Cryopreservation, Culture Collections		SKILL DEVELOPMENT
	2.3 Risks and Safety, Bioethics.		
	2.4 Stem Cell Technology, Cloning techniques Applications.		
	2.5 Transgenics and knockouts: Transgenic cattle, Transgenic birds, Transgenic fish		9

	2.6 Applications: Transgenic mice: i) Retroviral method ii) DNA microinjection method iii) Engineered Embryonic Stem cell method		
Unit III	Nanobiotechnology		(15L)
	3.1 Nanoscale systems, nanoparticles, nanowires, thin films and multilayers; Properties of nanomaterials		
	3.2 Synthesis of nanostructures - physical, chemical and biological, microbiological methods - a. Biomolecules as nanostructures. b. Nanoparticulate carrier systems, Micro and Nanofluidics c. Applications: Biosensors, drug and gene delivery systems, chip technologies, nano imaging, Nanomedicine and Cancer diagnostics and treatment.	SKILL DEVELOPMENT	
Unit IV	Medical Biotechnology		(15L)
	4.1 Genetic Testing of diseases and disorders, Cancer genetics, Immunogenetics; prenatal diagnosis-chorionic villus sampling, amniocentesis, Pre-implantation diagnosis, Genetic counselling.		07
	4.2 Gene therapy-concept, vectors, gene targeting and tissue-specific expression, Antisense Technology		
	4.3 Introduction to pharmacogenomics, Pharmacogenetics and toxicogenomics		
	4.4 Social- genetic discrimination: insurance and employment, human cloning, foeticide, Sex determination		
	4.5 Tissue Engineering, Methods of Synthesis, Biomolecular Engineering		

References: PSc3Mi 3

References: Unit I :PSMB303 (Semester III)

1. Plant Biotechnology: The genetic manipulation of plants,2005,A.Slater ,N.Scott & M.Fowler, Oxford Univ Press, Oxford.
2. Introduction to Plant Biotechnology(3rd Edtn), H.S. Chawla
3. Roberta Smith, Plant Tissue Culture: Techniques and Experiments,2nd Edn, Academic Press,2000
4. H.K.Das(ed),Textbook of Biotechnology,Wiley India,2004
5. J.H.Hammond, P. Mcgarvey, and V.Yusibov(eds), Plant Biotechnolgy, Springer Verlag,Heidelberg,2000
6. B.B.Buchanan, W.Gruissen and R.L.Jones(eds), Biochemistry and Molecular Biology of Plants,American Society of Plant Biology,Rockville,USA,2000.
7. Plant Biotechnology and Agriculture:Prospects for the 21st Century, Arie altman ,Paul Michael Hasegawa,
8. Plant Biotechnology and Genetics:Principles, Techniques & Applications, Stewart, C.Neal,June 2008,John Wiley & Sons

References: Unit II

1. Animal Cell Culture by Ian Freshney
2. Basic Cell Culture. Ed.J.M.Davis 2nd.Ed 2007. Oxford press
3. Animal Cell Culture Sudha Gangal
4. Principles of biotechnology and applications-Glick and Pasternack

References: Unit III

1. Nanobiotechnology by David Goodsell. John Wiley
2. Handbook of Nanostructured biomaterials and their applications in nanobiotechnology by Nalwa HS 2005. American scientific publishers
3. Nanobiotechnology by Niemeyer CM & Mirkin CA 2005 .Wiley Interscience

References: Unit IV

1. Jogdand S. N., Medical Biotechnology, Himalaya Publishing House, Mumbai, (2008)
2. Judit Pongracz, Mary Keen, Medical Biotechnology, Churchill Livingstone, Elsevier (2009)
3. [Pratibha Nallari](#) & [V. Venugopal Rao](#), Medical Biotechnology, Oxford University Press, India (2010)

Paper/Unit	Title	Lecture /Week	Total lectures
PSc3Mi 4	Applied And Environmental Microbiology (4 Credits)	1	(60)
Unit I	Microbial Diversity		(15)
	1.1 Microbial ecology: concepts, niche, habitat, ecosystem		
	1.2 Introduction to microbial diversity: Types of microorganisms- bacteria, Archaeobacteria, Eucarya interactions between microorganisms , ecological succession		
	1.3 Extremophiles: Habitat, effect of extreme conditions on cellular components membrane structure, nucleic acids and proteins, adaptation mechanism in microorganisms in diverse environments	SKILL DEVELOPMENT	
	1.4 Study of Thermophiles, Psychrophiles, halophiles, Piezophiles, Acidophiles, Alkaliphiles, Xerophiles, Radiation resistant organisms, Methanogens.		
	1.5 Biotechnological Applications of extreme proteins from the above groups		
	1.6 Geo-microbiology: Biofouling, bio-corrosion, bioleaching.		
Unit II	Techniques in Microbial Ecology		(15L)
	2.1 Environmental sample collection and processing.: Soils and Sediment, Water, Air, Detection of Microorganisms on fomites		
	2.2 Cultural Methods: Cultural methods for isolation & enumeration of Bacteria		
	2.3 Physiological Methods: Measuring microbial activity in pure culture; Carbon respiration, Stable isotope probing, Use of radioisotopes as tracers Adenylate energy charge, Enzyme assays	SKILL DEVELOPMENT	
	2.4 Functional genomics & proteomics based approach		
	2.5 Immunological methods: Immunoassays		
	2.6 Nucleic acid based methods of analysis: Obtaining Nucleic acids from Environment, Use of Gene probes, PCR,		
	2.7 Recombinant DNA Techniques, RFLP, Denaturing /Temperature gradient, Plasmid analysis, Reporter genes. Rep PCR fingerprinting and microbial diversity		
	2.8 Molecular Techniques to Assess Microbial Community Structure, Function, and Dynamics in the Environment: culturable and unculturable bacterial analysis		
Unit III	Soil, Marine & Agricultural Microbiology		(15L)
	3.1 Soil Microbiology: The litho ecosphere: Soil formation, Properties (physical and chemical) Soil communities. Link to microbial interactions. Soil sampling for surface, subsurface soils .Processing and storage of samples.		
	3.2 Marine microbiology: Marine and estuarine habitats. Characterization and stratification of the oceans Vertical and horizontal zones of marine habitats Marine microbes	EMPLOYABILITY	12

	characteristics, distribution, composition & activity.		
	3.3 Agricultural microbiology: Factors affecting microbial load of soils. Relationship between plants and microbes rhizosphere, phyllosphere. Beneficial uses of microorganisms for plant growth and development, Interactions with aerial plant structures	EMPLOYABILITY	
	3.4 Microbial contribution to animal nutrition Special reference to Rumen flora		
	3.5 Biogeochemical cycles for Carbon Nitrogen and Oxygen. Degradation of recalcitrant polymers and xenobiotics eg cellulose, lignin, lignocellulose. Combating Greenhouse effect using microbes. Concept of Carbon credits		
Unit IV	Advanced Food & Water Microbiology	EMPLOYABILITY	(15L)
	4.1 Sampling, sample processing approaches for analysis of foods implicated in outbreaks with measurement of uncertainty for mycotoxic fungi ,pathogenic bacteria(Enteropathogenic <i>E. coli</i> , <i>Vibrio</i> , <i>Salmonellae</i>) and viruses (Hepatitis A, Norwalk) in meat/fish products as per BIS/ISO/APHA standards		07
	4.2 Use of biosensors and enzymatic/ thermal techniques for food analysis		
	4.3 Food additives and ingredients: Food additives-definitions, classification and functions, (Preservatives, antioxidants, colors, emulsifiers, sequesterants, natural and microbial flavors)		
	4.4 Toxicological evaluation of food additives		
	4.5 Applications of fibres from food sources, microbial fructooligosaccharides		
	4.6 Nutraceuticals and health foods: Introduction to nutraceuticals: definitions, basis of claims for a compound as a nutraceuticals, regulatory issues for nutraceuticals Microbes and production of nutraceuticals like lycopene, isoflavonoids, prebiotics and probiotics, glucosamine, phytosterols. Formulation of functional foods containing nutraceuticals-stability and analytical issues, labelling issues	ENTREPRENEURSHIP	
	4.7 Drinking water risk assessment & its safety: Bottled water–legislation: a) Types of bottled water. BIS Regulations regarding the production of bottled waters wrt final quality of the product. b) Potential chemical and microbiological hazards in the bottles depending on the type of water, the type of bottle and the bottling procedure. The application of HACCP in the bottling plants: Water Quality attained from point of use water purifier units c) Types of water purifiers: Microbiological specifications and methods used certify water purifiers International standards regulating quality of water purifiers	EMPLOYABILITY	

References: PSc3Mi 4

Unit - I Microbial Diversity

1. Brock Biology of microorganisms 12th ed Madigan, Martinko, Dunlap, Clara, Pearson Intl Ed
2. R. M. Atlas and R. Bartha - 1998 - Microbial Ecology - Fundamentals and Applications.
3. Addison Wesley Longman, Inc.
4. Microbial Diversity- Current Perspective and Potential Application--Johri and Satyanarayana
5. Methods in Microbiology Vol 35- Extremophiles (2006) Edited by Fred Rainey, Aharon Oren (Academic press)

UNIT - II Techniques in Microbial Ecology

1. R. M. Atlas and R. Bartha - 1998 - Microbial Ecology - Fundamentals and applications. Addison Wesley Longman, Inc.
2. R. M. Maier, I. L. Pepper and C. P. Gerba 2010, Environmental Microbiology Academic Press
3. Rastogi & Sani, [Microbes and Microbial Technology](#), 2011, pp 29-57, Molecular Techniques to Assess Microbial Community Structure, Function, and Dynamics in the Environment
4. A K Bej and M H Mahbubani, Applications of the polymerase chain reaction in environmental .Microbiology. *Genome Res.* 1992 1: 151-159
5. The Metagenomics of soil by *Rolf Daniel*, 470/June 2005/vol3, www.nature.com/reviews
6. Metagenomics: DNA sequencing of environmental samples, Susannah Green Tringe and Edward M. Rubin, 806/November 2005/Volume 6
7. www.nature.com/reviews/genetics

Unit - III : Soil, Marine & Agricultural Microbiology

1. Marine Microbiology: Ecology and Applications. [Colin Munn](#). Garland publishing. ISBN: 0815365179
2. Environmental Microbiology. [Alan H. Varnam](#). Manson Publishing. 2000.
3. Agricultural Microbiology. [G. Rangaswami](#), [D. J. Bagyaraj](#), [D.G. Bagyaraj](#). PHI Learning Pvt. Ltd., 2004
4. Microbes and Microbial Technology: Agricultural and Environmental Applications. [Iqbal Ahmad](#), [Farah Ahmad](#), [John Pichtel](#). Springer, 2011.

UNIT -IV: Advanced Food & Water Microbiology

1. AOAC International. 2003. Official methods of analysis of AOAC International. 17th Ed. Gaithersburg, MD, USA, Association of Analytical Communities.
2. Kirk RS & Sawyer R. 1991. [Pearson's Chemical Analysis of Foods](#). 9th Ed. Longman Scientific & Technical.
3. Leo ML. 2004. Handbook of Food Analysis. 2nd Ed. Vols. I-III.
4. Linden G. 1996. Analytical Techniques for Foods and Agricultural Products. VCH.
5. Macleod AJ. 1973. Instrumental Methods of Food Analysis. Elek Sci. Marcel Dekker
6. Nielsen S. (Eds.). 1994. Introduction to Chemical Analysis of Foods. Jones & Bartlett.

Practicals PSc3Mi 1

PSc3Mi 1	Tools and Techniques: Research Methodology (60L) Unit I : Literature survey (15L) Unit II : Literature survey (15L) Unit III : Writing Research Project Proposal (15L) Unit IV : Writing Research Project Proposal (15L)	02
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Practicals PSc3Mi 2

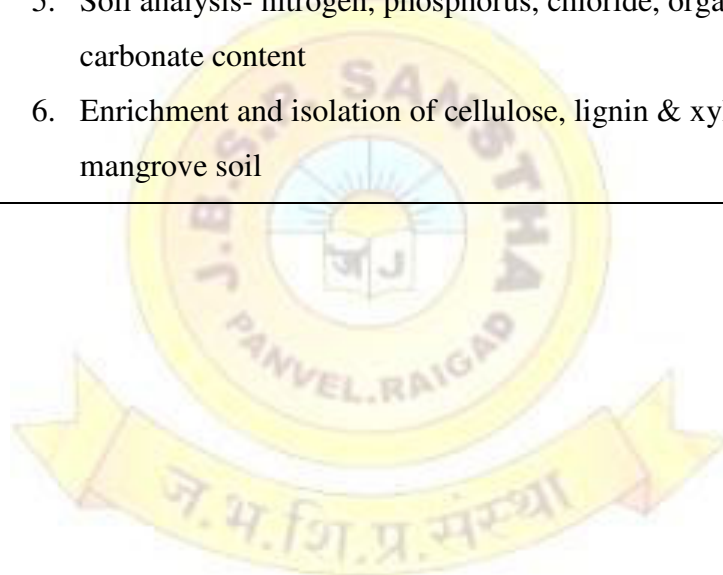
PSc3Mi 2	Food Microbiology (60L) <ol style="list-style-type: none"> 1. Microbiological study of fermented foods (Idli batter and sauerkraut) 2. Microbiological load in carrot and apple juice, salad, mayonese 3. Quality Assessment and Analysis of food <ol style="list-style-type: none"> a. Milk (Raw, Packed) SKILL DEVELOPMENT b. Ice-cream c. Yoghurt 4. Report to be written in journal on Novel detection methods for food borne pathogens/ toxins 	02
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Practicals PSc3Mi 3

PSc3Mi 3	Advances in Biotechnology <ol style="list-style-type: none"> 1. Terminology, Laboratory design of Animal tissue culture laboratory 2. Preparation of complete medium, Sterilization and sterility checking 3. Chick embryo fibroblast culture, viable staining 4. Lymphocyte culture, viable staining and heamocytometer count 5. Preparation of Nanosilver By Wet reduction Method(Chemical),using Neem Extact(plants) & Bacteria(Microbiological) 6. Characterisation of Nanosilver by UV spectrometry and microscopic methods 7. Antimicrobial effect of Ionic silver and Nanosilver prepared by above methods 8. Study of Nanosilver coated Gauze/textiles for antimicrobial effect on different bacteria 	02
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Practicals PSc3Mi 4

<p>PSc3Mi 4</p>	<ol style="list-style-type: none"> 1. Enrichment & isolation of thermophiles from hot springs/compost heaps & extraction of thermophilic enzymes & determination of its specific activity. 2. Estimation of anti-oxidants and anti-nutritional factors (tannin/phytic acid) by spectrometric method 3. Microbiological analysis of fish samples wrt sample processing for recovery and detection of Enteropathogenic <i>E. coli</i>, <i>Vibrio</i>, <i>Salmonellae</i> as per BIS/ISO/APHA standards and computation of measure of uncertainty 4. Assessment of point of use water purifiers (Zero B) for removal of bacteria 5. Soil analysis- nitrogen, phosphorus, chloride, organic matter, & calcium carbonate content 6. Enrichment and isolation of cellulose, lignin & xylanase degraders from mangrove soil 	<p>02</p>
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Semester IV

Paper/Unit	Title	Lecture/Week	Total lectures
PSc4Mi 1	Tools and Techniques : Biomolecular Analysis	1	(60)
Unit I	Unit I Spectroscopic Techniques		(15)
	1.1 UV-visible spectroscopy: Beer- Lambert's Law, Instrumentation, operation, calibration, accuracy and applications		05
	1.2 IR: Principles, Instrumentation, operation, calibration, accuracy and applications		05
	1.3 Atomic Absorption Spectroscopy: Principles, Instrumentation, operation, calibration, accuracy and applications		05
Unit II	Chromatographic Techniques	EMPLOYABILITY & SKILL DEVELOPMENT	(15L)
	2.1 Gas Chromatography: Principles, Instrumentation, operation, calibration, accuracy and applications		05
	2.2 High Performance Liquid Chromatography: Principles, Instrumentation, operation, calibration, accuracy and applications		05
	2.3 Supercritical Liquid Chromatography: Properties of SFE/SFC, Instrumentation, operation, advantages and applications		05
Unit III	Molecular Biology Techniques		(15L)
	3.1 Variations/ Modifications of PCR: Hot- Start PCR, Multiplex PCR, Nested PCR, RT-PCR, Broad Range PCR, arbitrarily primed PCR, Quantitative PCR, Real time PCR		05
	3.2 Hybridization array technology: applications of microarrays in microbiology, Microarray platform technologies (oligonucleotide microarrays, cDNA microarrays)		05
	3.3 FISH with other techniques: (confocal laser scanning microscopy, microautoradiography, flow cytometry, immunofluorescence, microsensors, peptide, nucleic acids)		05
Unit IV	Nanotechnology Techniques		(15L)
	4.1 Microscopy: i. Scanning Probe Microscopes - scanning tunnelling microscope (STM), atomic force microscope (AFM), magnetic force microscope (MFM), scanning near field microscope (SNOM) ii. Electron Microscopy: SEM, TEM		10
	4.2 Diffraction Techniques: X-ray diffraction (XRD)		02
	4.3 Photoluminescence Spectroscopy: X-ray and UV photoelectron spectroscopies (XPS)/Auger electron spectroscopy		03 ¹⁷

References: PSc4Mi 1

1. Persing, H.D. et al. 2004, *Molecular Microbiology: Diagnostic principles and practice*, Washington D.C., ASM press.
2. Chandler D.E. and Roberson R.W. 2009, *Bioimaging: current concepts in light and electron microscopy*, Singapore, Jones and Bartlett Publishers
3. Muralidharan V.S. and Subramania A. 2010, *Nanoscience and Technology*, New Delhi Ane Books Pvt Ltd.
4. Viswanathan B. 2010, *NanoMaterials*, New Delhi, Narosa Publishing House.
5. Pattabhi V. and Gantham N. 2002, *Biophysics* (2nd Ed.) Springer.
6. Narayana P. 2008, *Essentials of Biophysics*, New Age International Pvt Ltd Publishers
7. Sharon, Madhuri and Maheshwar, 2012, *Bio-Nanotechnology: concepts and applications*. New Delhi, Ane books Pvt Ltd.
8. Scott R. P.W. 2012, *Principles and Practice of Chromatography (Chrom-Ed Book Series)* , Reese-Scott Partnership
9. McNair H. M. and Miller J. M., 2009, *Basic Gas Chromatography* , Wiley International
10. Kulkarni Sulabha, 2011, *Nanotechnology: Principles and Practices*, New Delhi, Capital Publishing Company.
11. Chattopadhyay K.K. and Banerjee A.N. , 2012, *Introduction to Nanoscience and Nanotechnology*, New Delhi, PHI Learning Pvt. Ltd.
12. Miller J. M. , 2009, *Chromatography: Concepts and Contrasts*, USA, John Wiley and Sons, Inc.
13. Banwell, C.N. and McCash, E.M., 2012, *Fundamentals of Molecular Spectroscopy*, 4th Ed., New Delhi, Tata McGraw Hill Education Pvt. Ltd.
14. Upadhyay, Upadhyay and Nath, 2012, *Biophysical Chemistry: Principles and Techniques*, Mumbai, Himalaya Publishing House
15. Braithwaite A. and Smith F.J., 2001, *Chromatographic Methods*, 5th Ed. , London, Kluwer Academic Publishers
16. *Analytical Chemistry by Open Learning Series*, 2008, New York, John Wiley and Sons.
17. Braun R. , *Introduction to Instrumental Analysis*, New York, McGraw Hill Book Company
18. Skoog, Holler and Nieman, *Principles of Instrumental Analysis*, 5th Ed. Australia, Thomson Brock/Cole

Paper/Unit	Title	Lecture/Week	Total lectures
PSc4Mi 2	Pharmaceutical Microbiology	1	(60)
Unit I	Principles and applications of GMP in pharmaceuticals and cosmetics	SKILL DEVELOPMENT	(15)
	1.1 Principles – Applications and Definitions		
	1.2 The concept of Quality		
	1.3 The regulatory factors		
	1.4 QC, QA and GMP		
	1.5 Quality assurance beyond GMP		
	1.6 ISO		
	1.7 Sanitary practices in cosmetic manufacturing		
Unit II	Quality management and regulatory aspects	SKILL DEVELOPMENT	(15L)
	2.1 Premises and contamination control, location, design, structure, layout, services and cleaning		
	2.2 Personnel management, training, Hygiene and health		
	2.3 Documentation		
	2.4 Quality control and GCLP		
	2.5 Sterile and other products		
	2.6 Global regulatory and toxicological aspects of cosmetic preservation		
Unit III	Analytical aspects for pharmaceutical and cosmetic Products	EMPLOYABILITY	(15L)
	3.1 Quality control and GCLP		
	3.2 Sterile and other products.		
	3.3 Validation		
	3.4 Cosmetics microbiology- testing methods and preservation 3.4.a Antimicrobial preservation efficacy and microbial content testing 3.4.b Validation method for cosmetics 3.4.c Preservation strategy 3.4.d Evaluation of antimicrobial mechanism		
Unit IV	Drug Discovery	ENTREPRENEURSHIP	(15L)
	4.1 Modern Methods of Drug Discovery		
	4.2 Proteomics		
	4.3 Bioinformatics		19

	4.4 High throughput screening technology		
	4.5 Natural products for lead identification		
	4.6 The role of protein 3D structures in the drug discovery process.		

References: PSc4Mi 2

Unit I

1. Sharp John (2000) Quality in the manufacture of medicines and other healthcare products. Pharmaceutical Press.
2. Iyer S. (2003) Guidelines on cGMP and quality of Pharmaceutical products. D K Publishers Mumbai.
3. Philip A , Taylor and Francis (2006) Cosmetic Microbiology a practical approach.2nd Ed.

Unit II

1. Denyer S p, Hodges N A and Gorman S P (2005) Hugo and Russell's Pharmaceutical Microbiology. Blackwell Publishing.
2. Bibek Ray and Arun Bhunia (2008) Fundamental Food Microbiology. 4th Ed. CRC Press.
3. Sharp John (2000) Quality in the manufacture of medicines and other healthcare products. Pharmaceutical Press.
4. Bhatia R and Ichhapujani R L (1995) Quality Assurance in Microbiology. CBS publishers and distributors.

Unit :III

1. Sharp John (2000) Quality in the manufacture of medicines and other healthcare products. Pharmaceutical Press.
2. Philip A , Taylor and Francis (2006) Cosmetic Microbiology a practical approach.2nd Ed.

Unit IV

1. Hillisch A and Hilgenfeld R (2009) Modern Methods of drug discovery. Springer International Edition.
2. Kadam s s, Mahadik K R and Bothara K G (2009). Principles of medicinal Chemistry. Vol II Nirali Prakashan Pune.
3. Lemke T L and Williams D A (2008) Foye's Principles of Medicinal Chemistry. 6th Ed. Wolter Luwer, Lippincott Williams and Wilkins. N Delhi.

	<p>Regulatory Concerns, Human Misuse</p> <p>2.2.e) Future ‘Bioethical Conflicts’ in Biotechnology. - Changing perception of Nature, Human Genetic Engineering</p> <p>2.2.f) Bioethics vs Business: A Conflict?- IPP, Global Issues of Technology Transfer, Safety vs Costs, Is New Technology Better</p> <p>2.2.g) Resolution of Conflicts- Who can be trusted?, Public Education, Sufficient Regulations</p> <p>2.2.h) Ethical limits of Biotechnology.-Absolute or Relative, Timeless or Transient</p> <p>2.2.i) Criteria to Assess whether Biotech Research is Ethical.</p>		
Unit III	Marine Biotechnology		(15L)
	<p>3.1 Extreme environmental conditions, Marine life forms, Biomimetic materials, new class of pharmaceuticals, industrial products and processes, vaccines, diagnostics and analytical reagents, Environmental research in marine environment, Methods in Marine Microbiology – Detection of microorganisms and microbial activity, Metabolic diversity, Extreme Environment conditions, Marine bacteria, marine archaea, Biofouling and biodeterioration, Degradation of pollutants, Bioremediation, Role of microorganisms in ocean processes, Marine Genomics and Proteomics.</p>		
	3.2 Marine bioprospecting – Isolation of Marine Natural Products		
	<p>3.3 Diversity of marine derived compounds - Alkaloid, Terpenoids and steroides, nucleoside, aminoacids, peptides, depsipeptide, polyketide, Macrolide; Marine Enzymes- protease, lipase, chitinase, glucanase; Marine biominerals; Biomineralized structures; Biocomposites; Biopolymers - polysaccharides, chitin, marine collagens</p>		
	3.4 Bioactive Compounds And Biomaterials From Marine Environment.		
Unit IV	Advances in Molecular Biotechnology		(15L)
	4.1 Chemical synthesis and sequencing of DNA: Phosphoramidite method, Uses of synthesized oligonucleotides, Dideoxynucleotide method for sequencing of DNA, Automated DNA sequencing, Using Phage M13 as a sequencing vector		
	4.2 Manipulation of Gene Expression in Procaryotes: Gene expression from strong and regulatable promoters, Fusion proteins, unidirectional tandem gene arrays, Increasing protein stability, protein folding, DNA integration into host chromosome		
	4.3 Heterologous protein production in eukaryotic cells: Expression systems like Saccharomyces cerevisiae, Pichia pastoris, Baculovirus-Insect cell, mammalian cell		
	4.4 Directed Mutagenesis: Oligonucleotide directed mutagenesis with M13, Oligonucleotide directed mutagenesis with plasmid DNA, PCR amplified oligonucleotide directed mutagenesis, Random mutagenesis with degenerate oligonucleotide primer,		22

	Random mutagenesis with nucleotide analogues, Error-prone PCR, DNA shuffling, Mutant proteins with unusual amino acids		
	4.5 Protein Engineering: Adding disulfide bonds, Changing asparagine to other amino acids, Reducing the number of free sulfhydryl residues, Increasing enzymatic activity, Modifying metal cofactor requirement, Decreasing protease sensitivity, Modifying protein specificity, Increasing enzyme stability and specificity, altering multiple properties		
	4.6 Synthetic Biology: Introduction, types, mechanisms, applications in industry		

References: PSc4Mi 3

Unit I :

1. Gary Walsh, Pharmaceutical Biotechnology – Concepts and Applications (EBook), John Wiley & Sons Ltd. (2007)
2. Jogdand S. N., Biopharmaceuticals, Himalaya Publishing House, Mumbai (2006)
3. K. Sambamurthi, Pharmaceutical Biotechnology, New Age International (2006)
4. Daan J. A. Crommelin, Robert D. Sindelar and Bernd Meibohm Pharmaceutical Biotechnology: Fundamentals and Applications, informa healthcare, (Oct 30, 2007)

References: Unit II: 2.1:

1. Biodiversity, Biotechnology & Traditional Knowledge- Understanding Intellectual Property Rights , Aravind Kumar, Govind Das, Narosa
2. A textbook of Biotechnology, R.C.Dubey ,S.Chand.

References: Unit II: 2.2:

1. Biotechnology, Second Completely Revised Edition-Volume 12-Legal, Economic and **Ethical** Dimensions. Volume Editor-D.Brauer(A multi- Volume Comprehensive Treatise), H.J.Rehm and G.Reed, A.Puhler ,P Stadler
2. Ethics in Biotechnology-An Executive Guide, Chris MacDonald & Rahul.K. Dhanda
3. www.BiotechEthics.ca

References:Unit: III :

1. RSK Barners & R.N Huges : Introduction to Marine Ecology, Blackwell
2. David H.Attway & Oskar R.Zabosky: Marine Biotechnology: Volume 1, 2, 3, Plenum Press, (1993).
3. P.J.Scheuer: Marine. Natural Products, Volume 1 & 2 (1978). Volume (1980-81) Academic Press.
4. O.Kinne: Marine Ecology, Vol.V.Ocean Management 3&4, John Wiley & Sons, (1984).
5. Rita Colwell (Ed.): Biotechnology in Marine Sciences, Academic Press, (1981).
6. R.R.Colwell (ed), Biotechnology of Marine Science, (1982).
7. R.R.Colwell et. al (eds) Biotechnology of Marine polysaccharides, (1985).
- David H.Attway & Oskar R.Zabosky: Marine Biotechnology, Volume 1, 2, 3, plenum press (1993).
8. P.J.Scheuer: Marine Natural Products, Volume 1&2 (1978) Volume (1980, 81), Academic Press

References: Unit IV

1. Molecular Biotechnology: Principles and Applications of Recombinant DNA Bernard R. Glick, Jack J. Pasternak, 4/e (2010), ASM Press
2. An Introduction to Molecular Biotechnology: Molecular Fundamentals, Methods and Applications in Modern Biotechnology edited by Michael Wink, (2006)Wiley VCH
3. Molecular biotechnology: principles and practices Channarayappa, (2006), Universities Press
4. Synthetic Biology

Paper/ Unit	Title	Lecture/ Week	Total lectures
PSc4Mi 4	Applied and Environmental Monitoring & Management	1	(60)
Unit I	Bioremediation, biodegradation & Waste disposal		(15)
	1.1 Engineering and bioremediation process its needs and limitations		
	1.2 Bioremediation in Soil of BTEX hydrocarbons		
	1.3 Petroleum contamination, Polycyclic aromatic compounds		
	1.4 Nitroaromatic compounds, PCB, Chlorinated Phenols, Chlorinated aliphatic compounds, Molecular technique in Bioremediation		
	1.5 Sewage & Sludge treatment and disposal methods.		
Unit II	Biofilm management		(15L)
	2.1 Structure and properties of biofilms		
	2.2 Formation of biofilm , Regulation of Initial Attachment, Biofilm Formation Proceeds via Multiple Convergent Genetic Pathways, Early Attachment Events, Maturation of the Biofilm , Detachment and Return to the Planktonic Growth Mode		
	2.3 Study of Quorum Sensing: Cell- Cell Communication amongst bacteria, and its similarity with <i>M. xanthus</i> Fruiting Body Development.		
	2.4 Multispecies biofilms: Clinical Relevance		
	2.5 Biofilms in plant-associated habitats: In the Phyllosphere (impact on survival and bacterial interactions, interaction of plants with epiphytic biofilms,), In the Rhizosphere (ubiquity and importance for rhizosphere bacteria, impact of rhizosphere biofilms on plant biology,)		
	2.6 Biofilm eradication: Methods and commonly used biocides such as surfactants, enzymes, triclosan, chlorhexidine, quarternary ammonium compounds		
	2.7 Use of other biofilm management methods such as probiotic organisms and prebiotics to restore disrupted beneficial biofilms to a “normal state”. Correction of environmental conditions for enhanced bioremediation of biofilms (eg dental plaque)		
	2.8 Disadvantages of biofilm management strategies-development of resistant strains-cross resistance induction		
	2.9 Biofilms from different environments, Impact of environment on biofilm development and its composition and implications of each on biofilms in water bodies, biofouling associated microbial biofilms prosthetics associated biofilms, human associated biofilms eg. Gut		
Unit III	Pollution control and monitoring		(15L)
	3.1 Introduction to Pollution, Pollution Control and Monitoring, Natural and anthropogenic pollution. Role of government and public in		

EMPLOYABILITY &
SKILL DEVELOPMENT

EMPLOYABILITY &
SKILL DEVELOPMENT

	pollution control		
	3.2 Air pollution: Sources - Organic and inorganic pollutants, particulate matter, photochemical smog, acid rain, ozone depletion, greenhouse effect, global warming, and role of microorganisms in cause and mitigation of global warming, climate change. Control measures of air pollution - dust control equipment, control measures for specific gaseous pollutants Effects of air pollution, assessment & monitoring. (Indoor air pollution, vehicular pollution and control, odour control)		
	3.3 Water pollution: Sources of water and their contamination, types of pollutants, Effects of water pollution on plants, animals and human beings. Indicator microorganisms. Eutrophication – causes, effects and control measures		
	3.4 Wastewater treatment – aerobic and anaerobic. CETP, Water quality criteria and standards for discharge. Assessment & monitoring of water pollution.	ENTREPRENEURSHIP	
	3.5 Marine pollution: Sources, effects and coastal management		
	3.6 Thermal pollution: Sources, effects and control		
	3.7 Soil Pollution: Chemical composition and classification (hazardous and non-hazardous) of soil, sources of soil pollution, effects on plants, animals and human beings, biomagnification, control measures, assessment and monitoring		
	3.8 Noise pollution: Sources, impact, measurement and indices, control and abatement		
	3.9 Radioactive pollution: Sources, effects, prevention and control measures		
Unit IV	Environmental & natural resources management and safety standards		(15L)
	4.1 Natural resources: Renewable/ non-renewable. Land, water, forest, minerals, energy, food. Associated problems and management practices. Environmental Impact Assessment and Sustainable Development	EMPLOYABILITY & SKILL DEVELOPMENT	
	4.2 Solid waste management: Biodegradable waste from kitchen, abattoirs and agricultural fields and their recycling by aerobic composting or biomethanation. Non biodegradable waste like plastics, glass metal scrap and building materials and plastic recycling, metal recycling.		
	4.3 Hazardous waste management: Hazardous waste from paint, pesticides and chemical industries and their composition, Probable means to reduce these waste through Common Effluent Treatment Plants		
	4.4 Biomedical and electronic waste management, recovery of precious metals from electronic waste resources.		
	4.5 Biohazards: Introduction, levels of biohazards, Risk assessment, proper cleaning procedures		25

	4.6 Biosafety: Historical background and introduction, need of biosafety levels, biosafety guidelines for GMOs and LMOs. Role of Institutional biosafety committee. RCGM, GEAC, etc. for GMO applications in food and agriculture. Environmental release of GMOs. Overview of national regulations and relevant international agreements. Ecolabelling, IS 22000, Generally Recognized as Safe (GRAS)		
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References: PSc4Mi 4

UNIT- I: Bioremediation, biodegradation & Waste disposal

1. Principles and Applications by Ronald L
2. Crawford and Don L Crawford
3. Biotechnology: B.D.Singh
4. A textbook of Biotechnology: R.C.Dubey
5. Environmental Biotechnology by Allan Scragg, 2nd Edn

UNIT- II: Biofilm management

1. Davies DG, Parsek MR, Pearson JP, Iglewski BH, Costerton JW, Greenberg EP. 1998. The involvement of cell-to cell signals in the development of a bacterial biofilm. *Science* 280 (5361):295–98
2. O’Toole GA, Kolter R. 1998. The initiation of biofilm formation in *Pseudomonas aeruginosa* WCS365 proceeds via multiple, convergent signaling pathways: a genetic analysis. *Mol. Microbiol.* 28:449–61
3. Morris, C. E. and Monier, J. M. 2003. The ecological significance of biofilm formation by plant-associated bacteria. *Annu. Rev. Phytopathol.* 41:429–53
4. O’Toole, G., Kaplan, H. B. and Kolter, R., 2000. Biofilm formation as microbial development. *Annu. Rev. Microbiol.* 2000. 54:49–79
5. Bacterial biofilms: from the Natural environment to infectious diseases. *Nature Reviews Microbiology* 2, 95-108 (February 2004)

UNIT - III Pollution control and monitoring

1. Environmental microbiology. P. D. Sharma. Alpha Science International 2005 ed.
2. Wastewater engineering: Treatment and reuse. Metcalf and Eddy, Tata McGraw Hill Publishing Co. Ltd. 4th Ed.
3. A textbook of environmental pollution and control. S S. Dara
4. Environmental chemistry A. K. De
5. Environmental pollution control engineering. C. S. Rao. New Age International Publishers.
6. APHA 1998. Standard Methods for the examination of water and wastewater, 20th Ed.
7. Biotechnology of Odour and Air pollution Control. Springer
8. Water and Wastewater analysis Volume 1. Handbook of methods in environmental studies. S. K. Maiti. ABD Publishers 2004
9. Soil analysis Volume 2. Handbook of methods in environmental studies. S. K. Maiti. ABD Publishers 2004
10. Environmental chemistry B. K. Sharma

UNIT - IV Environmental & natural resources management and safety standards

1. Resource ecology. S. K. Agarwal
2. Environmental management. H. V. Jadhav, Vipul Prakashan , 2002
3. Environmental management. R.K. Jain and others
4. Modern trends in ecology and environment. R. S. Ambasht
5. Industrial hygiene and safety. M. H. Fulekar

Practicals PSc4Mi 1

PSc4Mi 1	Tools and Techniques: Biomolecular Analysis	02
	Unit I : Research project experimental work Unit II: Research project experimental work Unit III: Research project experimental work Unit IV: Research project experimental work	

Practicals PSc4Mi 2

PSc4Mi 2	Pharmaceutical Microbiology	02
	1. Sterility testing and reporting (as per Pharmacopeia) 2. Microbial load in cosmetic product 3. Efficacy testing of preservatives like parabens 4. Efficacy of preservation and shelf life study. 5. Preparation of cosmetic product and its preservation study 6. Report on LAL and other tests for QC	

Practicals PSc4Mi 3

PSc4Mi 3	Advances in Biotechnology	02
	1. Assignments on IPR-Case studies on different patents granted 2. Report on International Bioethics survey on specific concerned issues 3. Research Project experimental work	

Practicals PSc4Mi 4

PSc4Mi 4	Applied and Environmental Monitoring & Management	02
	1. Biofilm visualization by staining of a slide immersed in different environments such as soil, water, saliva (to emphasize compositional and structural variations in biofilms from different environment).s 2. Determination of MIC of disinfectant/antimicrobials with sessile and planktonic bacteria (to show higher resistance of biofilms to antimicrobials as compared to planktonic cells) quantified using crystal violet assay 3. Analysis of sludge: sewage and industrial for the following parameters: Sludge volume index (SVI), Mixed liquor suspended solids (MLSS), Mixed liquor volatile suspended solids (MLVSS), F/M ratio. 4. Demonstration of Analysis of SO _x , NO _x , heavy metal (As/Cr) pollutants using volumetric/ spectrophotometric methods. 5. Study tour/ academic visit to any large scale industry (environmental health and safety aspects) Food/ Pharma/chemical, environmental consultancy, research centres OR Study tour/ academic visit to Sewage treatment plant/ ETP of any industry /water purification unit/ Pollution Control Board Lab, CETP, landfill, etc. 6. Preparation/ drafting of an EIA report. 7. Case studies: sustainable agricultural practices, coastal zone management, 8. MEOR, management of monuments, air pollution episodes, oil spills.	

Modality of Assessment

I] Theory Examination pattern

A. Internal examination 40%

Sr. No.	Internal Examination pattern	Marks
1.	Internal Class Test	20
2.	<ul style="list-style-type: none"> • One seminar based on curriculum to be assessed • by the teacher of the institution teaching P. G. learners • Selection of the topic, Introduction, write up, references & Presentation with the use of ICT 	15
3.	<ul style="list-style-type: none"> • Active participation in routine • Class instructional deliveries • Overall conduct as a responsible learner 	05

B. External examination - 60 %

Semester End Theory Assessment -

60 marks

- i. Duration - These examinations shall be of two and half hours duration.
- ii. Theory question paper pattern :-
 1. There shall be **five** questions each of **12** marks. On each unit there will be one question & fifth one will be based on all the four units.
 2. All questions shall be compulsory with internal choice within the questions. Each question will be of **24** marks with options.
 3. Questions may be sub divided into sub questions **a, b, c & d only, each carrying six marks OR a, b, c, d, e & f only** each carrying **four** marks and the allocation of marks depends on the weightage of the topic.

II] Practical Examination Pattern

(A) **Internal Examination:- There will not be any internal examination/ evaluation for practicals.**

(B) **External (Semester end practical examination) Per course :-**

Sr. No.	Particulars	Marks
1	Laboratory work	40
2	Journal	05
3	Viva	05

Semester III:

Practical examination will be held at the college at the end of the semester. One external examiner and one internal examiner will be appointed by the Principal/ Chairman, Board of studies in Microbiology of the college. The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head of the Department/ Co-coordinator of the department; failing which the student will not be allowed to appear for the practical examination.

Research proposal: Candidates are required to present two copies of duly certified research proposal (Spiral bound) as per the format of University Grants Commission with relevant references (minimum 25) and make the power point presentation of the same for the evaluation by the examiner.

Assignments: Candidates are required to present duly certified assignments (Spiral bound) as per the format provided by the institution and make the oral presentation of the same for the evaluation by the examiner.

Semester IV:

Practical examination will be held at the college at the end of the semester. One external examiner and one internal examiner will be appointed by the Principal/ Chairman, Board of studies in Microbiology of the college. The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head of the Department/ Co-coordinator of the department; failing which the student will not be allowed to appear for the practical examination

Research project work: Candidates are required to present duly certified dissertation report based on the topic of research along with the laboratory notebook containing raw data and make the poster presentation of the research work for evaluation by the examiner.

Assignments: Candidates are required to present duly certified assignments (Spiral bound) as per the format provided by the institution and make the oral presentation of the same for the evaluation by the examiner.

Semester III

Course	PSc3Mi 1		Total	PSc3Mi 2		Total	PSc3Mi 3		Total	PSc3Mi 4		Total	Grand total
	Internal	External		Internal	External		Internal	External		Internal	External		
Theory	40	60	100	40	60	100	40	60	100	40	60	100	400
Practical	--	50	50		50	50		50	50		50	50	200

Course	PSc4Mi 1		Total	PSc4Mi 2		Total	PSc4Mi 3		Total	PSc4Mi 4		Total	Grand total
	Internal	External		Internal	External		Internal	External		Internal	External		
Theory	40	60	100	40	60	100	40	60	100	40	60	100	400
Practical	--	50	50		50	50		50	50		50	50	200



Janardan Bhagat Shikshan Prasarak Sanstha's



Changu Kana Thakur
Arts, Commerce and Science College, New Panvel
(Autonomous)

Re-accredited A+ Grade by NAAC
'College with Potential for Excellence' Status Awarded by University Grants Commission
'Best College Award' by University of Mumbai

**Affiliated to University of Mumbai with
an Autonomous status**

Revised Syllabus for
Program: B.Sc. Biotechnology
F.Y. B.Sc. Biotechnology
Choice based Credit & Grading system (60:40)

Total credits-132

(To be implemented from the academic year (2022-2023))

(Approved in the academic council meeting held on _____)

Preamble:

Biotechnology is one of the youngest branches of Life Science, which has expanded and established as an advanced interdisciplinary applied science in the last few years. Biotechnology at the core envisages the comprehensive study of Life and the Interdisciplinary potential of Biotechnology has led to a unique status for Biotechnology in Research and Industry.

Biotechnology has its applications in almost every field touching practically every human activity. The applied aspect of Biotechnology is now getting established with its applications in Industry, Agriculture, Health and Environment, Biotechnology is the leading science expanding exponentially.

Biotechnology demands a trained, skilled human resource to establish the Industry and Research sectors. The field is novel and still expanding which demands inputs in Infrastructure and Technology. The need of the hour is to design appropriate syllabi which keeps pace with changing times and technology with emphasis on applications while elucidating technology in depth. The syllabi till today had been sufficient to cater to the needs of students for building up their careers in industry and research. However, with the changing scenario at local and global level, we feel that the syllabus orientation should be altered to keep pace with developments in the education and industrial sector. Theory supplemented with extensive practical skill sets will help a graduate student to avail the opportunities in the applied fields (research, industry or institutions), without any additional training. Thus, the college itself will be developing trained and skilled manpower.

Biotechnology being an interdisciplinary subject, this restructured syllabus will combine the principles of physical, chemical, and biological sciences along with developing advanced technology. Biotechnology curricula are operated at two levels viz. undergraduate and postgraduate. The undergraduate curricula are prepared to impart primarily basic knowledge of the respective subject from all possible angles while postgraduate syllabus emphasizes on more applied courses. In addition, students are to be trained to apply this knowledge particularly in day-to-day applications of biotechnology and to get a glimpse of research.

Speciality Programme: Bachelor of Science (B.Sc.) B.Sc. in Biotechnology

Eligibility: As per University of Mumbai rules.

Choice Based Credit System (CBCS)

Revised Scheme of Examination:

The performance of the learners shall be evaluated into two components. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first component and by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examination are as shown below:

A) INTERNAL ASSESSMENT : 40%

40 Marks

Sr. No	Particular	Marks
01	One periodical class test/ online examination to be conducted in the given semester.	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group / Individual Project 2. Presentation and write-up on the selected topics of the subjects / Case studies 3. Test on Practical Skills 4. Open Book Test 5. Quiz	20 Marks

Question Paper Pattern

(Periodical Class Test / online examination for the Courses at Under Graduate Programme)

- ❖ Maximum Marks: 20
- ❖ Duration 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions / True/False / Answer in One or Two Lines (Concept based Questions) (1 Mark each)	20 Marks

B) Semester End Examination : 60%**60 Marks**

- **Undergraduate Programme of F.Y. B.Sc. (Semester I and II)**
- Duration: The examination shall be of 2 hours duration.

Theory Question Paper Pattern

1. There shall be four questions of 15 marks each. (30 marks with internal options).
2. On each unit there will be one question and fourth question will be based on entire syllabus.
3. All questions shall be compulsory with internal options.
4. Questions may be subdivided into sub questions a,b,c..... and the allocation of marks depends on the weightage of the unit.

Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 out of 60) separately, to pass the course and minimum of Grade D, in each project wherever applicable to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

F.Y. B.Sc. Biotechnology

Semester -I				
Course Code	Course Type	Course Title	Credits	Lectures / Week
UBT1BIT	Core Subject	Biotechnology- I	2	3
UBT1BOM	Core Subject	Basics of Microbiology	2	3
UBT1BCH	Core Subject	Basic Chemistry- I	2	3
UBT1BOC	Core Subject	Bioorganic Chemistry- I	2	3
UBT1CBI	Core Subject	Cell Biology	2	3
UBT1GEN	Core Subject	Genetics	2	3
UBT1ESS	General Elective	Environmental Science and Sustainable Development	2	3
UBT1CAB	Skill Enhancement Elective	Computer Applications in Biotechnology		30L/Sem.
UBT1PR1	Core Subject Practical	Practical of UBT1BIT & UBT1BOM	2	6
UBT1PR2	Core Subject Practical	Practical of UBT1BCH & UBT1BOC	2	6
UBT1PR3	Core Subject Practical	Practical of UBT1CBI & UBT1ESS	2	6

F.Y. B.Sc. Biotechnology

Semester -II				
Course Code	Course Type	Course Title	Credits	Lecture /Week
UBT2BIT	Core Subject	Biotechnology- II	2	3
UBT2MAI	Core Subject	Microbiology and Immunology	2	3
UBT2BCH	Core Subject	Basic Chemistry- II	2	3
UBT2BOC	Core Subject	Bioorganic Chemistry- II	2	3
UBT2MBG	Core Subject	Molecular Biology and Genetic Engineering	2	3
UBT2PAP	Core Subject	Plant and Animal Physiology	2	3
UBT2 LSB	Ability Enhancement Course	Laboratory Skills & Biostatistics	2	3
	Skill Enhancement Elective	Communication Skills	2	30L/Sem.
UBT2PR1	Core Subject Practical	Practical of UBT2BIT & UBT2MAI	2	6
UBT2PR2	Core Subject Practical	Practical of UBT2BCH & UBT2BOC	2	6
UBT2PR3	Core Subject Practical	Practical of UBT2MBG & UBT2PAP	2	6
			22	

SEMESTER-I THEORY

SEMESTER-I
Paper-I Biotechnology-I (UBT1BIT)

Course Objective: To familiarize the students with the potential and different applications and regulations of biotechnology

Learning Outcome: By the end of the course the student will:

- Develop an understanding of developments in various fields of Biotechnology.
- Be able to relate to applications and benefits of Biotechnology in the fields of agriculture, livestock, human health and environment.
- Justify the Biosafety rules and its implementation.
- To understand concept and significance of IPR.

Unit	Title	Credits	Lectures
UNIT I Introduction to Biotechnology	<p>What is biotechnology? Biotechnology –an interdisciplinary biological science; Biotechnology – definition; History & Introduction to Biotechnology; Traditional and Modern Biotechnology; Scope and importance of biotechnology;</p> <p>World of Biotechnology- Plant Biotechnology, Animal Biotechnology, Pharmaceutical Biotechnology, , Industrial Biotechnology, Marine Biotechnology, Medical biotechnology, Environmental Biotechnology.</p> <p>Biotechnology in India – Bio-business in India, booming biotech market, success story of biotech market, policy initiatives; and global trends; Biotechnology research in India; Potential of modern biotechnology; Achievement of biotechnology; Prevention of misuse of biotechnology; Biotechnology Institutions in India (Public and Private Sector);</p> <p>Public Perception of Biotechnology.</p> <p>Case study: Serum Institute of India and its products</p>	2	15

<p>Unit II Applications of Biotechnology</p>	<p>Applications of Biotechnology:</p> <p>Agriculture: GM fruits- GM papaya, GM tomato, Insect resistant transgenic plants – Bt cotton, Bt brinjal, Modifications in nutrient quality – starch, oilseed protein, golden rice</p> <p>Livestock: Transgenic Animal: Mice, Rabbit, Cattle, Goat, Sheep, Pigs & Fish, animals</p> <p>Human welfare: Cloned genes for production of -Insulin; recombinant vaccine for Hepatitis B virus. Molecular farming, Edible vaccines and their advantages Environment</p> <p>Case study: GMOs Pros and Cons</p>		<p>15</p>
<p>UNIT III Rules and Regulations in Biotechnology</p>	<p>Biosafety- Introduction, Risk assessment- Assessment of risk during laboratory research, Risk assessment of biotechnology products; Containment – physical and biological containment; Planned introduction of GMOs; Biosafety during industrial production using GMO's ; Biosafety guidelines in India.</p> <p>Intellectual Property Right (IPR) and Protection (IPP) - Forms of protection- Patents, Copy rights, Trade secret, Trademarks, Plant variety protections. Patenting of biological material, significance of patent in India.</p> <p>The World Intellectual Property Organization (WIPO), General Agreement on Tariffs and Trade (GATT), Trade related IPRs (TRIP's) Patent status International scenario.</p>		<p>15</p>
<p>References</p> <ol style="list-style-type: none"> 1. Dubey, R. C. (1993). A textbook of Biotechnology. S. Chand Publishing. 2. Dubey, R. C. (2014). Advanced biotechnology. S. Chand Publishing. 3. Singh, B. D., & Singh, B. D. (2007). Biotechnology expanding horizons. Kalyani publishers. 			

SEMESTER-I
Paper-II Basics of Microbiology (UBT1BOM)

Course Objective: To build a firm foundation in microbiology, sterilization techniques and staining.

Learning Outcome: By the end of the course the student will:

- Build skill towards use of microscopy and staining techniques.
- Explain the concepts of sterilization and the mechanism of disinfection.
- Categorize different types of microorganisms based on their nutritional requirements.
- Apply different methods and techniques for growth and enumeration of microorganisms.

Unit	Title	Credits	Lectures
UNIT I Introduction to Microbiology	Fundamentals, History and Evolution of Microbiology: Discovery of Microorganisms, Conflict over spontaneous generation. Role of microorganisms in disease Classification: The place of Microorganisms in the living world, Classification Whittaker's five kingdom classification, Introduction to Bergey's Manual, Groups of Microorganisms, Applications of microbiology in various fields Nutrition, Cultivation and Maintenance of microorganisms: Nutritional categories of microorganisms, Design and Types of Culture Media, methods of isolation.(Pure Culture Techniques- Streak plate, Pour, Spread plate, Tube dilution)	2	15
UNIT II Sterilization Techniques	Introduction: Definition and concept of Sterilization and Disinfection. Types and Applications: Dry Heat, Steam under pressure Gases, Radiation and Filtration Chemical Agents and their Mode of Action: Aldehydes, Halogens, Quaternary Ammonium Compounds, Phenol and Phenolic Compounds, Heavy Metals, Alcohol, Dyes, and Detergents.		15

	Disinfectant: Ideal Disinfectant. Examples of Disinfectants and Evaluation of Disinfectant (Tube dilution & Agar plate techniques, Phenol coefficient, Tissue toxicity index)	
UNIT III Microscopy and stains	<p>Simple and Compound Microscope: General principles of optics; various parts and their functions - objectives - numerical aperture, resolving power, depth of focus, working distance, aberrations; oculars; condensers.</p> <p>Principle, working and applications of Dark Field Microscope; Phase Contrast Microscope, Fluorescent Microscope, TEM and SEM</p> <p>Stains and Staining Solutions- Definition of Dye and Chromogen; acidic and basic dyes; functions and types of chromophore and auxochrome groups. Definition and function of stain; mordant, intensifiers and Fixative.</p> <p>Simple, negative, differential staining and special staining.</p>	15
<p>References:</p> <ol style="list-style-type: none"> 1. Prescott, L. M. (2002). Microbiology 5th Edition. 2. Prescott, L. M. (2015). Microbiology 10th Edition. 3. Pelczar, Microbiology. (1993). India: McGraw-Hill Education. 4. Ananthanarayan, R., Paniker, C. J. (2006). 5. Ananthanarayan and Paniker's Textbook of Microbiology. India: Orient Longman. 6. Salle, A. J., & A. J. Salle (1954). Fundamental principles of bacteriology McGraw-Hill. 7. Frobisher M. Fundamentals of Microbiology (9th Ed) 		

SEMESTER-I
Paper-III Basic Chemistry-I (UBT1BCH)

Course Objective: To acquaint the students with basic concepts of Chemistry like Chemical bonds, Titrimetry, Gravimetry, Stereochemistry Isomerism.

Learning Outcome: By the end of the course the student will able to:

- Explain chemical bonds.
- Develop skills towards use of titrimetric and gravimetric analysis.
- Differentiate between chiral and achiral molecules and different enantiomers.
- Illustrate of different types of chemical formulas.

Unit	Title	Credits	Lectures
UNIT I Chemical bonds	<p>Chemical Bonds: Types and transition between the main types of bonding.</p> <p>Ionic Bond: Nature of Ionic Bond, factors influencing the formation of Ionic Bond. Structure of NaCl and CsCl.</p> <p>Covalent Bond: Nature of Covalent Bond, Types of covalent bond (Polar and Coordinate covalent bonds). Structure of CH₄, NH₃, Shapes of BeCl₂, BF₃.</p> <p>Hydrogen Bond: Theory of Hydrogen Bonding and Types of Hydrogen Bonding (with examples of RCOOH, ROH, Salicylaldehyde, Amides and Polyamides)</p> <p>Interactions stabilizing biomolecules – Hydrophobic Interactions, Dipole-Dipole Interactions, Van der Waals interactions and Disulfide bonds</p>	2	15
UNIT II Titrimetry and Gravimetry	<p>Titrimetric Analysis: Titration, Titrant, Titrand, End Point, Equivalence Point, Titration Error, Indicator, Primary and Secondary Standards, Characteristics and examples.</p> <p>Types of Titrations – Acid -Base, Redox, Precipitation, Complexometric Titration.</p> <p>Acid - Base Titration – Strong Acid Vs Strong Base. Theoretical aspects of Titration Curve and</p>		15

	<p>End Point Evaluation. Theory of Acid –Base Indicators, Choice and Suitability of Indicators.</p> <p>Gravimetric Analysis: Solubility and Precipitation, Factors affecting Solubility, Nucleation, Particle Size, Crystal Growth, Colloidal State, Ageing/Digestion of Precipitate. Co-Precipitation and Post-Precipitation. Washing, Drying and Ignition of Precipitate.</p>		
<p>UNIT III Stereochemistry Isomerism</p>	<p>Types of Isomerism: Structural Isomerism and Stereoisomerism with Suitable examples.</p> <p>Geometric Isomerism and Optical Isomerism: Enantiomers, Diastereomers, and Racemic mixtures Cis-Trans, Threo, Erythro and Meso isomers. Diastereomers (Cis-Trans Isomerism) in Alkenes.</p> <p>Conformation: Conformations of Ethane. Difference between Configuration and Conformation.</p> <p>Configuration: Asymmetric Carbon Atom, Stereogenic/ Chiral Centers, Chirality Representation of Configuration by –Flying Wedge Formula</p> <p>Projection formulae: Fischer, Newman and Sawhorse. The Interconversion of the Formulae. E, Z System of Nomenclature-Rules and Examples</p>		<p>15</p>
<p>Referencing:</p> <ol style="list-style-type: none"> 1. Bahl, B. S., & Bahl, A. (2017). A textbook of organic chemistry. S. Chand Publishing. 2. Lee, J. D. (2008). Concise inorganic chemistry. John Wiley & Sons. 3. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2013). Fundamentals of analytical chemistry. Cengage learning. 4. Vogel, A. I., & Jeffery, G. H. (1989). Vogel's textbook of quantitative chemical analysis. Wiley. 5. Mosher, M. (1992). Organic Chemistry. (Morrison, Robert Thornton; Boyd, Robert Neilson) 			

SEMESTER-I
Paper-IV Biochemistry-I (UBT1BOC)

Course Objectives: To acquaint the students with different concepts of biomolecules.			
Learning Outcomes: By the end of the course the student will:			
<ol style="list-style-type: none"> 1. Discuss the chemistry of carbohydrates with their roles. 2. Explain Classification and general properties of Proteins. 3. Elaborate protein structure and function. 4. Understand structure and functions of Nucleic acids 			
Unit	Title	Credits	Lectures
UNIT I Basics of Carbohydrate Chemistry	<p>Carbohydrates: Introduction, definition and general formula. Classification of carbohydrates:</p> <p>Monosaccharides: Classification, Chemical reactions and significance of Monosaccharides, Epimers, Anomers and Mutarotation. Biologically important Derivatives of Hexoses: Glucosamine, Gluconic acid, uronic acid, N-acetyl glucosamine, N-Acetylmuramic acid</p> <p>Disaccharides: Maltose, Lactose, Sucrose, Cellobiose (structures, Reducing and Non reducing sugars biological significance, structure and bond type)</p> <p>Polysaccharides: Homo-polysaccharides and Hetero-polysaccharides; Structure and Storage Polysaccharides. Industrial applications of carbohydrates.</p>	2	15
UNIT II Amino acids and Proteins	<p>Amino acids: General introduction, Classification and structures, properties (physical chemical). Isomerism. Titration Curve of Amino Acids. Concept of Isoelectric pH, Zwitterion Reactions of Amino Acids: Sorenson's Titration, Ninhydrin Test.</p> <p>Classification of Proteins: Simple- Fibrous and Globular Conjugated- Nucleoprotein, Lipoprotein, Glycoprotein, Phosphoprotein, Chromoprotein, Metalloprotein Derived- Primary and Secondary</p>		

	<p>Peptide bond: Features Example of Dipeptide, tripeptide, Nonapeptide e.g., Oxytocin, Vasopressin Amino acid composition of Bovine Cytochrome C and Bovine Chymotrypsinogen</p> <p>Three-dimensional Structure of proteins: Concept of Monomeric, dimeric and multimeric proteins, Primary structure - Peptide linkage, Native Secondary structure - Alpha Pleat and Beta fold; Spatial arrangements of adjacent amino acid residues Tertiary structure - Three-Dimensional arrangement Quaternary structure Di and Multimeric proteins E.g., structure of human Insulin</p> <p>Properties of proteins: Solubility, Molecular weight, Shape, Iso electric pH, Salting out of proteins for purification</p> <p>Protein Denaturation and folding: Denaturing agents and properties of denatured proteins.</p>		
<p>UNIT III Nucleic acids</p>	<p>The Composition and structure of DNA and RNA: Structure, Function of Nucleic Acids, Properties and Types of DNA, RNA. Structure of Purine and Pyrimidine Bases Hydrogen Bonding between Nitrogenous Bases in DNA. Structure of Nucleosides, Nucleotides and Polynucleotides. Watson and Crick's Model. DNA Denaturation.</p> <p>Structure of RNA. Types of RNA. Differences between DNA and RNA. Difference between A, B and Z forms of DNA</p>		<p>15</p>
<p>References :</p> <ol style="list-style-type: none"> 1. Stryer, L. (2015). Biochemistry. (8th edition) New York: Freeman. 2. Lehninger, A. L. (2017). Principles of Biochemistry (7th edition). New York, NY: W 3. Voet, D., & Voet, J. G. (2018). Biochemistry (5th edition). Hoboken, NJ: J. Wiley & Sons. 4. Cox, M. M., & Nelson, D. L. (2017). Lehninger principles of biochemistry (Vol. 7). New York: Wh Freeman. 5. Conn, E., & Stumpf, P. (2009). Outlines of biochemistry. John Wiley & Sons. 6. Satyanarayana U. and Chakrapani U. (2007). Biochemistry. 3rd Edition. Books and Allied (P) Ltd. 7. Mu, P., & Plummer, D. T. (2001). Introduction to practical biochemistry. Tata McGraw-Hill Educatio 			

SEMESTER-I
Paper-V Cell Biology (UBT1CBI)

Course Objective: To build a firm foundation of concepts related to cell biology			
Learning Outcome: By the end of the course the student will:			
<ul style="list-style-type: none"> • Discuss the ultrastructure, function and location of organelles in prokaryotic and eukaryotic cells • Illustrate the principles of membrane transport with different types of pumps and cell junctions. • Compare different phases of cell cycle along with roles of restriction points and checkpoints • Define the role of apoptosis in maintenance and development of healthy cells. 			
Unit	Title	Credits	Lectures
UNIT I Structure of Prokaryotic and Eukaryotic Cell	Ultra-structure of Prokaryotic Cell: Cell theory, Concept of Cell Shape and Size, Detail Structure of Slime Layer, Capsule, Flagella, Pili, Cell Wall (Gram Positive and Negative), Cell Membrane, Cytoplasm and Genetic Material Storage Bodies and Spores	2	15
	Ultra-structure of Eukaryotic Cell: Plasma membrane, Cytoplasmic Matrix, Microfilaments, Intermediate Filaments, and Microtubules Organelles of the Biosynthetic-Endoplasmic Reticulum & Golgi apparatus. Lysosome, Eukaryotic Ribosomes, Mitochondria, and Chloroplasts. Nucleus –Nuclear Structure, Nucleolus Cilia and Flagella Comparison of Prokaryotic and Eukaryotic Cells.		
UNIT II Cell membrane	Membrane Structure and Function- Chemical composition of membranes, Membrane lipids; Membrane proteins Functions of membranes: Transport, Cell-cell interactions, Receptors. Membrane Model: Fluid Mosaic Model Membrane transport: Active Transport, Passive Transport, Diffusion and Osmosis, Membrane		15

	<p>transport associated disease e.g. cystic fibrosis. Bulk transport: endocytosis and exocytosis Membrane junctions Classification of junctions: Occluding: Tight, Anchoring: Desmosomes, Channel- forming: Gap, Plasmodesmata. Cell Coat and Cell Recognition.</p>		
<p>UNIT III Cell cycle</p>	<p>Cell cycle, cell division and cell death Cycle in Prokaryotic and Eukaryotic cell (G0, G1, G2, M phases)Cell cycle phases, Control of mitosis by cyclins, MPF activity and cyclin-dependent kinases, checkpoints in cell cycle regulation</p> <p>Mitosis and Meiosis and their significance; Eukaryotic cell division</p> <p>Programmed Cell Death- Introduction to Apoptosis, Apoptosis pathways and its regulation; Difference in Apoptosis and Necrosis.</p>		<p>15</p>
<p>References:</p> <ol style="list-style-type: none"> 1. Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2008). Molecular Biology of the Cell (5th Ed.). New York: Garland Science. 2. Lodish, H. F. (2016). Molecular Cell Biology (8th Ed.). New York: W.H. Freeman. 3. Cooper, G. M., & Hausman, R. E. (2013). The Cell: a Molecular Approach (6th Ed.). Washington: ASM; Sunderland. 4. Karp, G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th Edition. John Wiley & Sons. Inc. 5. De Robertis, E.D.P. and De Robertis, E.M.F. 2006. Cell and Molecular Biology. 8th edition.Lippincott Williams and Wilkins, Philadelphia. 			

SEMESTER-I

Paper-VI Genetics (UBT1GEN)

Course Objective: To provide insight to students on fundamental concepts of mendelian genetics, microbial genetics and cytogenetics.

Learning Outcome: By the end of the course the student will able to:

- Compare different mechanisms of Genetic Exchange in Bacteria.
- Illustrate Incomplete dominance, codominance and multiple alleles.
- Explain the organization of Eukaryotic Genetic Material, in Chromosomal aberrations and Sex Determination

Interpret the Mendel's Principle in Human Genetics

Unit	Title	Credits	Lectures
UNIT I Genetics Fundamentals	<p>Introduction to genetic and sub-disciplines of genetics: Transmission genetics, Molecular genetics, Population genetics and Quantitative genetics.</p> <p>Basic Terminologies in genetics</p> <p>Mendelian Genetics: Monohybrid Crosses and Mendel's Principle of Segregation Dihybrid crosses and Mendel's Principle of Independent Assortment.</p> <p>Extensions of and Deviations from Mendelian Genetic Principles: Multiple Alleles - ABO Blood groups Modifications of Dominance Relationships: Incomplete Dominance and Co-dominance. Environmental effect on the expression of the Human Genes.</p> <p>Gene Interactions and Modified Mendelian Ratios- Epistatic and non-epistatic interactions Essential Genes and Lethal Alleles</p>	2	15
UNIT II Cytogenetics	<p>Structure and organization of eukaryotic genetic material - Histone and non-histone proteins, nucleosome structure. Heterochromatin, Euchromatin, Polytene Chromosomes, Lampbrush chromosome.</p> <p>Chromosomal banding techniques Karyotype and Idiogram</p>		15

	<p>Variation in Chromosomal Structure and Number: Deletion, Duplication, Inversion, Translocation, Aneuploidy, Euploidy and Polyploidy and Syndromes- Klinefelter, Turner, Cri-du-Chat, Trisomy-21, Trisomy-18 and Trisomy-13.</p> <p>Sex Determination and Sex Linkage: Mechanisms of Sex Determination (XX-XY, ZZ-ZW, XX-XO)</p> <p>Dosage Compensation and Barr Body.</p>		
<p>UNIT III Microbial Genetics</p>	<p>Genetic analysis in Bacteria- Prototrophs, Auxotrophs.</p> <p>Bacteriophages: Lytic and Lysogenic development of Phage.</p> <p>Mechanism of Genetic Exchange in Bacteria: Conjugation; Transformation; Transduction (Generalized Transduction, Specialized Transduction);</p> <p>Bacterial Transposable Elements.</p>		<p>15</p>
<ol style="list-style-type: none"> 1. Russell, P. J., & Gordey, K. (2002). IGenetics, San Francisco: Benjamin Cummings. 2. Verma, P. S., & Agarwal, V. K. (2004). Cell Biology, Genetics, Molecular Biology, 13 Evolution and Ecology: Evolution and Ecology. S. Chand Publishing. 3. Simmons, M. J., & Snustad, D. P. (2006). Principles of genetics. John Wiley & Sons. 4. Russell, P. J. (2000). Fundamentals of genetics. Longman Publishing Group. 5. Karp, G. (2009). Cell and molecular biology: concepts and experiments. John Wiley & Sons. 6. Strickberger M., Genetics. (1995). Australia: Deakin University. 			

SEMESTER-I

Paper-VII Environmental Science and Sustainable Development (UBT 1ESS)

Course Objectives: To sensitize and create awareness about Ecology, renewable energy and different Environmental Issues.			
Learning Outcomes: By the end of the course the student will: <ul style="list-style-type: none"> • Develop an understanding of the structure and functioning of the ecosystems. • Gain insights about the concept of pollution, climate change and sustainable development • Understand the relevance of renewable energy sources and conservation of biodiversity • Understand the relevance of conservation of biodiversity 			
Unit	Title	Credits	Lectures
UNIT I Ecological interactions and Biodiversity	<p>Concept of Ecosystems: Definition and Components- Structure and function of ecosystem aspects of ecosystems Food Chain and Food Web, Ecological Pyramids (Energy, Biomass and Number) Aquatic and Terrestrial Ecosystems, Different Abiotic Factors of ecosystem and adaptations to different abiotic factors</p> <p>Ecological Interactions: Commensalism, Mutualism, Predation and Antibiosis, Parasitism, competition</p> <p>Biodiversity and its conservation: Introduction – definition: genetic, species, ecosystem diversity, biogeographic classification of India, value of biodiversity, biodiversity at global, national and local levels, India as a mega diversity nation, Hotspots of biodiversity, threats to biodiversity, conservation of biodiversity</p>	2	15
UNIT II Pollution and climate change	<p>Environmental Pollution: Definition, Cause, effects and control measures of- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Role of an individual in prevention of pollution. Pollution case studies.</p> <p>Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.</p>		15

	<p>Sustainable development: Concept, basic principles of sustainable development, post-brundtland world, roots of sustainability, Indicators, paradigm towards new discipline-sustainability science.</p>		
<p>UNIT III Renewable sources of energy</p>	<p>Introduction: Renewable and Non-renewable resources. The need for a sustainable lifestyle. Energy resources: Types of energy Non- renewable energy - Oil, coal and its environmental impacts. Renewable energy: Hydroelectric power, Solar energy, Biomass energy, Biogas, Wind power and Geothermal energy. Biogas technology: Biogas plant & types, biodigester. Biogas- composition, production and factors affecting production and uses. Biofuels: Ethanol production, Microbial hydrogen production, Biodiesel, Petrocrops.</p>		<p>15</p>
<p>References :</p> <ol style="list-style-type: none"> 1. Verma, V. (2010). Botany. India: Ane Books Pvt Ltd. 1. Bharucha, E. (2005). Textbook of Environmental Studies for Undergraduate Courses. India: Universities Press (India) Pvt. Limited. 2. Verma, P. S. (2004). Cell Biology, Genetics, Molecular Biology: Evolution and Ecology. India: S. Chand Limited. 3. Khoiyangbam, R. S. (2015). Introduction to Environmental Sciences. India: Energy and Resources Institute. 4. Fulekar, M. H. (2010). Environmental Biotechnology. United Kingdom: CRC Press. 5. Scragg, A. H. (2004). Environmental Biotechnology. United Kingdom: Oxford University Press 			

SEMESTER-I

Paper-VIII Computer Applications in Biotechnology (UBT1CAB)

Course Objectives: To develop the students' understanding of computers.			
Learning Outcomes: By the end of the course the student will:			
<ul style="list-style-type: none"> • Develop an understanding of computer networking and internet • Develop skills to use word processing, spreadsheet, and presentation software. • Develop skills to present biological data. 			
Unit	Title	Credits	Lectures
UNIT I Introduction to computers	<p>Overview and functions of a computer system Input and output devices, Storage devices.</p> <p>Modern computers: The workstation, The Minicomputer, Mainframe Computers, Parallel processing Computer Super Computer.</p> <p>Introduction to operating systems: Operating System concept, Windows, Unix / Linux & servers.</p> <p>Word Processing: Basic Operations, Creating and Editing documents, Formatting documents.</p> <p>Spreadsheet: Creating and editing workbook, organizing and formatting worksheets; Data analysis and management; Using formulas and functions</p> <p>Presentation Graphics: Creating and Editing Presentations, Designing and Enhancing Presentation, Delivering Presentation, Advanced Presentation Graphics.</p>	2	15
UNIT II Computer networking	<p>Introduction to networking and Internet: Various terminologies Associated hardware devices, gadgets (Router, Switch) tools, services, and resources Network Topologies and Protocols, LAN, WAN and MAN, World Wide Web (WWW),</p> <p>Network security: fire walls</p> <p>Internet:-Introduction, History of Internet, Internetworking Protocol,</p> <p>Email:-E-mail Address, E-mail Message Format, E-mail Services, How E-mail Works File Transfer Protocol (FTP), How FTP Works?</p> <p>Computer viruses: An overview of Computer viruses: What is a virus? Virus signs, how do they</p>		15

	<p>get transmitted? What are the dangers? General Precautions.</p> <p>Introduction to R: Data input, Arithmetic Operators, Vector Operations, Matrix Operations, Data Frames, Built-in Functions. Frequency Distribution, Grouped Frequency Distribution, Diagrams and Graphs, Summary statistics for raw data and grouped frequency distribution.</p>		
<p>References:</p> <ol style="list-style-type: none"> 1. Sinha, P. K., Sinha, P. (2004). Computer Fundamentals. India: BPB Publications. 2. Goel, A. (2010). Computer Fundamentals. India: Pearson Education. 3. Wempen, F. (2014). Computing Fundamentals: Introduction to Computers. Germany: Wiley. 4. Tanenbaum, A. S., Wetherall, D. (2014). Computer Networks. United Kingdom: Pearson Education. 5. Khanal, A. B. (2015). 			

F.Y. B.Sc. Biotechnology
Semester -I
PRACTICALS

Course Code	Title	Credits
<p>UBT1PR1 Practical of UBT1BIT & UBT1BOM</p>	<ol style="list-style-type: none"> 1. Assignment on any one branch of Biotechnology. 2. Analyze a case-study and write a report on any one recent application of Biotechnology (Not older than past 5 years) 3. Field visit/ Virtual visit (website) of National/ International research institutes for research in biotechnology and have a group discussion during the lab session. 4. Study of Microscope – Compound Microscope (Including Handling and storage), Dark Field Microscope, Phase Contrast Microscope, Fluorescent Microscope, TEM, SEM. 5. Monochrome staining using any suitable material. (Bacteria/Plant/Animal tissue) 6. Negative staining 7. Differential staining – <ol style="list-style-type: none"> a. Gram staining, b. Acid fast staining, 8. Romanowsky staining. 9. Special staining – <ol style="list-style-type: none"> a. Cell wall b. Capsule c. Spores 10. Fungal staining – Wet mount (Lactophenol cotton blue/Methylene Blue) 11. Preparation of media- Nutrient broth and Agar, MacConkey Agar, Sabouraud's Agar 12. Sterilization of Laboratory Glassware and Media using Autoclave and Hot air oven 13. Aseptic transfer technique (tube to tube, tube to plate, pipette to tube). 14. Isolation techniques: T-streak, polygon method 15. Colony Characteristics of Microorganisms. 16. Qualitative Assay of enzyme urease, amylase, dehydrogenase, catalase and protease from Plant/Animal/Microbial source. 17. Use of Bergey's manual to help identify any one isolate 	<p>2</p>

<p>UBT1PR2 Practical of UBT1BCH & UBT1BOC</p>	<ol style="list-style-type: none"> 1. Safety in Chemistry Laboratory: Dress code, Dos and Don't, First Aid 2. Preparation of Normal, Molar, Molal, Percent solution 3. Preparation of solution - PPM and PPB 4. Determine the rate constant for the saponification reaction between ethyl acetate and NaOH by back titration method 5. Determination of Acetic acid in Vinegar by Titrimetric Method. 6. Determination of the amount of Fe (II) present in the given solution titrimetrically. 7. Determination of amount of NaHCO₃ + Na₂CO₃ in the given solid mixture titrimetrically. 8. Determination of the amount of Mg (II) present in the given solution complexometrically. 9. Determination of percent composition of BaSO₄ and NH₄Cl in the given mixture gravimetrically. 10. Characterization of Organic Compounds any three organic compounds 11. Structures of Aldo series and Keto series of Monosaccharides, disaccharides and Polysaccharides 12. Qualitative tests for carbohydrates; Molisch test, Benedict's test, Iodine test, Osazone formation 13. Estimation of carbohydrates by Lane-Eynon method 14. Tutorial: Structure of Amino acids. 15. Titration curve of amino acid. 16. Qualitative analysis of amino acids and proteins. 17. Separation by Paper Chromatography a. Amino acids b. Sugars. 18. Estimation of Protein by Biuret method. 19. Study of Watson and Crick model of DNA using micrographs/ Schematic representations. 20. Qualitative analysis of DNA and RNA. 21. Extraction of DNA from suitable material. 22. Assignment - Practice problems on stereochemistry (Identifying - stereoisomers, conformations of specific compounds, chirality and symmetry elements; drawing stereoisomers; locating and naming stereogenic centers) 	<p style="text-align: center;">2</p>
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<p>UBT1PR3 Practical of UBT1CBI & UBT1GEN</p>	<ol style="list-style-type: none"> 1. Study of mitosis from suitable plant material 2. Study of meiosis from suitable plant material/Permanent slides/Photographs 3. Study of mitosis using pre-treated root tips of Allium cepa to study the effect of mutagens- chemical (colchicine/ PDB) on mitosis 4. Problems based on Mendelian Genetics, its modifications and gene interactions. 5. Study of Karyotype - Normal and abnormal 6. Barr body identification in cells of Buccal smear 7. Preparation of competent cells and demonstration of Bacterial transformation and mapping 8. Demonstration of Bacterial Conjugation and interrupted mating-based mapping 9. Demonstration of transduction and mapping 10. Conduct a survey on observable genetic traits and compare those inventories with other students in groups. (Blood group, tongue rolling, earlobe attachment, PTC tasting etc.) 11. Study of blood groups ABO in humans 	<p>2</p>
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SEMESTER-II THEORY

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SEMESTER-II
Paper-I Biotechnology- II (UBT2BIT)

Course Objectives: To acquaint students with the applications of biotechnology in the field of food, medicine and fermentation			
Learning Outcomes: By the end of the course the student will: <ul style="list-style-type: none"> • Explain the basic principles of PTC and callus culture. • Develop an understanding of the application of biotechnology in the food industry. • Gain insight into details of genetic engineering. • Discuss tools and techniques used in medical biotechnology 			
Unit	Title	Credits	Lectures
UNIT I Plant Tissue Culture	<p>Concept of Cell Culture, Cellular Totipotency.</p> <p>Organization of Plant Tissue Culture</p> <p>Laboratory: Equipment's and Instruments</p> <p>Aseptic Techniques: Washing of Glassware, Media Sterilization, Aseptic Workstation, Precautions to maintain Aseptic Conditions.</p> <p>Culture Medium: Nutritional requirements of the explants, PGR's and their in-vitro roles, Media Preparation.</p> <p>Callus Culture Technique: Introduction, Principle, Protocols and Applications.</p>	2	15
UNIT II Food Biotechnology	<p>Introduction to food biotechnology:</p> <p>History of microorganisms in food science and key developments, Applications of biotechnology in fermented food products</p> <p>Introduction to Unit Operations and Processes:</p> <p>Basic unit operations, food processing & packaging (canning & bottling), Production of cultures</p> <p>Fermented food products:</p> <p>Bread, Vinegar, Sauerkraut, Single Cell Protein (SCP), Probiotics.</p> <p>Food spoilage, food deterioration, food contamination and Food Adulteration</p> <p>Methods of food preservation</p> <p>Indicators of Food Microbial Quality & Safety: HACCP, FSSAI & FDA</p>		15

<p>Unit-III Applications of Microbes in Biotechnology</p>	<p>Microbiology of Fermented Foods: Fermented Milks, Chocolates, Cheese Production, Meat, Fish, Wines and Champagne & Beers, Ales, Distilled Spirit and Breads.</p> <p>Microbes as a source of Products of Industrial Importance-Antibiotics, amino acids, Organic Acids, Biosurfactants, Biopolymers and Vaccines</p> <p>Microbial energy conversion-Biofuel</p> <p>Microbes in agriculture Biotechnology- Bio insecticides and bio pesticides.</p> <p>Roles of microbes in Environmental Biotechnology-Microbial Fuel Cells: Batteries Powered by Microbes. Biodegradation and Bioremediation Harness Microbes to Clean the Environment.</p>		<p>15</p>
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References

1. K.K. De Plant tissue culture.
2. Bhojwani and Razdan plant tissue culture, Elsevier.
3. Frazier, W. C., & Westhoff, D. C. (1983). Food microbiology 5th Ed. 2. Lee, B. H. (2014).
4. Fundamentals of food biotechnology. John Wiley & Sons.
5. Jay, J. M., Loessner, M. J., & Golden, D. A. (2008). Modern food microbiology. Springer Science & Business Media. 4. Woolverton, C. J., Sherwood, L., Willey, J. (2014).
6. Prescott's Microbiology. India: McGraw-Hill Education.
7. Patel, A. H. (1984). Industrial Microbiology. Macmillan India. 6. Khan, F. A. (2011). Biotechnology fundamentals. CRC Press

SEMESTER-II

Paper-II Microbiology and Immunology (UBT2MAI)

Course Objective: To build a firm foundation of concepts related to Microbiology and Immunology.			
Learning Outcome: By the end of the course the student will:			
<ul style="list-style-type: none"> ● Compare replication mechanisms used by viruses along with their cultivation, purification techniques ● Apply different methods and techniques for growth and enumeration of microorganisms. ● Elaborate the concept of Immunity and role of antigens and immunoglobulin in the immune system. ● Explain the Humoral and Cellular Immune Response 			
Unit	Title	Credits	Lectures
UNIT I Virology	Introduction to virology: Historical perspective, General Characteristics of Viruses: Host Range Viral Structure: Nucleic Acid, Capsid and Envelope General Morphology- Helical, Polyhedral, Enveloped, Complex. Taxonomy of Viruses Viral Multiplication: Multiplication of Bacteriophages and Animal Viruses Isolation, Cultivation, and Identification of Viruses: Growing Bacteriophages and animal viruses in the Laboratory, Viral Identification Case studies- TMV, Influenza COVID-19	2	15
UNIT II Microbial Growth	Definition of Growth Mathematical and expression of growth Growth curve Measurement of growth Efficiency of growth yield ,Synchronous growth Factors influencing microbial growth: oxygen, temp., pH, salt etc. Batch Culture Continuous Culture of microorganisms Chemostat and Turbidostat Enumeration of Microorganisms: Direct and Indirect Methods Preservation and Maintenance of cultures, Culture Depositories		15

<p>UNIT III Immunology</p>	<p>Introduction to Immunology: Overview of Immune Systems: Innate Immunity, Mechanisms of innate immunity, Acquired Immunity, Local and Herd Immunity, Humoral and Cellular Immunity - Factors Influencing and Mechanisms of each. Antigens: Immunogenicity Versus Antigenicity, Factors That Influence Immunogenicity, Epitopes, Haptens, Superantigens Antibodies: Basic Structure of Antibodies, Antibody-Mediated Effector Functions, Antibody Classes and Biological Activities, Antigenic Determinants on Immunoglobulins. Monoclonal Antibodies Introduction to vaccination</p>		<p>15</p>
<p>References :</p> <ol style="list-style-type: none"> 1. Pelczar, Microbiology. (1993). India: McGraw-Hill Education. 2. Stanier, R. Y. (1987). General Microbiology. Hong Kong: Macmillan. 3. Funke, B. R., Case, C. L., Tortora, G. J. (2013). Microbiology: An Introduction. United Kingdom: Pearson. 4. Woolverton, C. J., Sherwood, L., Willey, J. (2014). Prescott's Microbiology. India: McGraw-Hill Education 5. Goldsby, U. R. A., Kuby, J., Kindt, T. J., Goldsby, R. A., Osborne, B. A., Marcus, D. A. (2003). Immunology. United Kingdom: W. H. Freeman. 6. Rao, C. V. (2017). Immunology. United Kingdom: Alpha Science International, Limited. 			

SEMESTER-II
Paper-III Basic Chemistry- II (UBT2BCH)

Course Objective: To acquaint the students with some core concepts of Physical Chemistry.			
Learning Outcome: By the end of the course the student will:			
<ul style="list-style-type: none"> • Develop an understanding of thermodynamics. • Learn about reaction kinetics and order of reaction. • Gain insight into the details of reaction mechanisms in Organic Chemistry. 			
Unit	Title	Credits	Lectures
UNIT I Thermodynamics	Thermodynamics: System, Surrounding, Boundaries Sign Conventions, State Functions, Internal Energy and Enthalpy: Significance, examples, (Numericals expected.) Laws of Thermodynamics and its Limitations: Mathematical expression. Qualitative discussion of Carnot Cycle for ideal Gas and Mechanical Efficiency. Laws of Thermodynamics as applied to Biochemical Systems. Concept of Entropy, Entropy for Isobaric, Isochoric and Isothermal Processes. Thermodynamics of ATP; Helmholtz	2	15
UNIT II Chemical Kinetics	Reaction Kinetics: Rate of Reaction, Rate Constant, Measurement of Reaction Rates Order & Molecularity of Reaction, Integrated Rate Equation of First and Second order Reactions (with equal initial concentration of reactants). Determination of Order of Reaction: a) Integration Method b) Graphical Method c) Ostwald's Isolation Method d) Half Time Method.		15
UNIT III Reaction Mechanisms in Organic Chemistry	Review of organic reaction mechanisms with special reference to Nucleophilic and electrophilic substitution (SN1, SN2, SNi, SE 1, SE2) Reactions. Elimination (E1 and E2) Reactions. Addition reactions- (regioselectivity: Markovnikov's addition-carbocation		15

	<p>mechanism, anti- Markovnikov's addition-radical mechanism).</p> <p>Oxidation Reduction reactions: Principles of Oxidation & Reduction Reactions: Oxidizing and Reducing Agents.</p>		
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References

1. Rao, C. N. R. (1973). University General Chemistry: An Introduction To Chemical Science. India: Macmillan India Limited.
2. Chang, R. (2000). Physical Chemistry for the Chemical and Biological Sciences. United Kingdom: University Science Books.
3. Lee, J.D., Concise Inorganic Chemistry, 5TH ED. (2008). India: Wiley India Pvt. Limited.
4. Bajpai, D. N. (2001). Advanced Physical Chemistry. India: S. Chand, Limited.
5. Singh, A. K., Singh, N. B., Das, S. S. (2009). Physical Chemistry: Volume II. India: New Age International

SEMESTER-II

Paper-IV Bioorganic Chemistry- II (UBT2BOC)

Course Objective: To build a firm foundation on the fundamentals of Bioorganic Chemistry and analytical techniques			
Learning Outcome: By the end of the course the student will: <ul style="list-style-type: none"> • Discuss the basics of lipid biochemistry. • Illustrate structure, functions and applications of enzymes. • Develop skills towards the principle, working and applications of different analytical techniques. 			
Unit	Title	Credits	Lectures
Unit I Basics of Lipid Chemistry	Definition and Biological functions of fats and Lipids. Definition of Fatty acids. Sources, Cis-trans forms Classification of Fatty acids: Saturated Fatty Acids, Unsaturated Fatty Acids: Definition of MUFA and PUFA. C16- C20. Palmitoleic acid, Oleic, Linoleic, Lenolenic, Arachidonic acid Storage Lipids: AcylGlycerols, Types and properties of Triacylglycerols: Hydrolysis, Saponification, Antioxidant, Rancidity, Acid number, RM number, Action of lipase. Structural lipids: Phospholipids, Cardiolipin Action of Phospholipase Sterols: Structure and functions Eg: Cholesterol	2	15
UNIT II Enzymes	Introduction to biocatalysis: Properties of Enzymes Substrate, Optimum conditions, Co-substrate, Coenzyme, Cofactors Classification and Nomenclature (one reaction per Class) Mechanism of Enzyme Action, Active Sites, Enzyme Specificity, Factors affecting enzyme activity (Effect of pH, Temperature, Substrate Concentration, Enzyme concentration) Enzyme Kinetics: Derivation of Michaelis-Menten Equation, Lineweaver-Burk plot, Concept of Km Types of Enzyme Inhibitions: Irreversible & Reversible (Competitive, Uncompetitive, Non-Competitive)		15

	Isoenzymes Allosteric Modulators, Co-Factors, Zymogens, Enzyme units Oxidizing and Reducing Agents.		
UNIT III Basics of Analytical techniques	Methods of Separation: Precipitation, Filtration, Distillation and Solvent Extraction Chromatography: Definition, Principles, and applications of Paper Chromatography, Thin Layer Chromatography, Column Chromatography Spectroscopy, Colorimetry: Properties of electromagnetic radiation, interaction with matter, lasers Colorimetric assays - Principle, Beer-Lambert's Law, Limitations of Beer-Lambert's Law, Electrophoresis: General principles, Factors affecting electrophoresis, Types of support media used, Types of electrophoresis (Agarose gel electrophoresis, PAGE): Oxidizing and Reducing Agents.		15

References

1. Cox, M. M., & Nelson, D. L. (2008). Lehninger principles of biochemistry (Vol. 5). New York: Wh Freeman.
2. Conn, E., & Stumpf, P. (2009). Outlines of biochemistry. John Wiley & Sons.
3. Satyanarayana U. and Chakrapani U. (2007). Biochemistry. 3rd Edition. Books and Allied (P) Ltd.
4. Plummer, D. T. (2001). Introduction to practical biochemistry. Tata McGraw-Hill Education.
5. Jain, J. L. (2004). Fundamentals of Biochemistry. India: S. Chand Limited.
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7. Principles and Techniques of Biochemistry and Molecular Biology. (2010). United States: Cambridge University Press.
8. Basic principles in Physical and analytical Chemistry F. Y. B. Sc. Pure Chemistry Sem I Unit III.
9. Analytical Chemistry sixth edition by Caryd christian

SEMESTER-II

Paper-V Molecular Biology and Genetic Engineering (UBT2MBG)

Course Objective: To build a firm foundation of molecular biology and Genetic Engineering			
Learning Outcome: By the end of the course the student will: <ul style="list-style-type: none"> • Compare the replication in prokaryotes and eukaryotes • Classify the different types of mutations • Illustrate different DNA repair mechanisms. • Explain details of genetic engineering 			
Unit	Title	Credits	Lectures
UNIT I Replication	DNA Replication in Prokaryotes and Eukaryotes- Semi-conservative DNA replication, DNA Polymerases and its role, <i>E.coli</i> Chromosome Replication, Bidirectional Replication of Circular DNA molecules. Rolling Circle Replication, DNA Replication in Eukaryotes	2	15
UNIT II Mutation and DNA Repair	Mutations: Definition and Types of Mutations. Mutagenesis and Mutagens. (Examples of Physical, Chemical and Biological Mutagens), Types of Point Mutations. DNA Repair: Photoreversal, Base excision Repair, Nucleotide Excision Repair, Mismatch Repair, SOS Repair and Recombination Repair		15
UNIT III Genetic Engineering	Genetic engineering: Definition and developments. What is gene cloning? Strategy for cloning How to clone a gene? How to construct rDNA? Source DNA [insert], Isolation of DNA from bacterial cell Enzymes in genetic engineering: Restriction endonuclease; DNA ligase; Enzymes to modify ends of DNA molecules - exonuclease; endonuclease; S1 nuclease; alkaline phosphatase; polynucleotide kinase; DNA polymerase and klenow fragment; reverse transcriptase; terminal deoxynucleotidyl transferase.		15

	<p>Vectors: Role as agents of transfer Features of plasmid vectors, Plasmid vectors - pBR322, pUC BAC Plant virus vectors and Animal virus vectors Shuttle vector; Expression vector.</p> <p>Host cells: E. coli; Bacillus subtilis; Saccharomyces cerevisiae; Xenopus oocytes; Mammalian fertilized egg cell.</p>		
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References

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3. Russell, P. J. (2000). Fundamentals of genetics. Longman Publishing Group. Nicholl, D. S. T. (2002).
4. An Introduction to Genetic Engineering (Studies in Biology). India: Cambridge University Press.
5. Brown, T. A. (2013). Gene Cloning and DNA Analysis: An Introduction. Germany: Wiley.
6. Genetic Engineering: Principles and Practice. (n.d.). India: McGraw-Hill Education.
7. A Textbook of Biotechnology by R C Dubey 4th Ed
8. Biotechnology: Fundamentals and Applications by S. S. Purohit

SEMESTER-II
Paper-VI Plant and Animal Physiology (UBT2PAP)

Course Objective: To provide an insight in to the different physiological processes of plants and animals.			
Learning Outcome: By the end of the course the student will: <ul style="list-style-type: none"> • Interpret the intracellular organization of photosynthesis and Pathway • Explain the Physiological Processes of Plants and functions of plant growth regulators. • Develop a comprehensive and deep understanding of the vital physiological processes of animals. • Understand concept of Human Nutrition 			
Unit	Title	Credits	Lectures
UNIT I Plant Physiology	<p>Photosynthesis:</p> <p>Hill's Reaction and its Significance, Light Reactions, Cyclic and Non-Cyclic Photo-induced Electron Flow, Energetics of Photosynthesis,</p> <p>Dark Phase of Photosynthesis, Calvin Cycle, C-3, C-4, CAM pathways, Rubisco oxygenase activity.</p> <p>Plant hormones: Structure and physiological roles- Auxin, Gibberellins, Cytokinins, Ethylene, Abscisic acid.</p>	2	15
UNIT II Animal Physiology	<p>Introduction to physiology:</p> <p>Concept of homeostasis.</p> <p>Blood: Functions of blood, general properties of blood, Composition of blood. Coagulation and Haemolysis of Blood.</p> <p>Respiratory system:</p> <p>Phases of Respiration, Principle of gaseous exchange, Mechanism of breathing.</p> <p>Digestion and absorption:</p> <p>Digestion and Absorption in humans.</p> <p>Excretion: Structure of kidney, Structure of nephron. Function of kidney, Urine formation, Dialysis</p>		
UNIT III Human Nutrition	<p>Definition of Nutrition,</p> <p>Basal metabolic rate: Factors affecting BMR, Measurements and its Significance, Human Energy requirement</p>		15

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2. Verma, S. K., Verma, M. (2008). A Textbook of Plant Physiology, Biochemistry and Biotechnology. India: S. Chand Limited.
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6. Sembulingam, K. (2008). Essentials of Medical Physiology. India: Juta, Limited.
7. Sherwood, L. (2012). Introduction to Human Physiology. United States: Brooks/Cole.
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SEMESTER-II

Paper-VII Laboratory Skills & Biostatistics (UBT2LSB)

Course Objective: To develop understanding of Laboratory Skills & Biostatistics			
Learning Outcome: By the end of the course the student will:			
<ul style="list-style-type: none"> • Make use of GLP,SOP and Biosafety guidelines • Develop skills towards preparation of standard solutions in the laboratory. • Understand the role of buffers • Organize the biological data using statistical tool 			
Unit	Title	Credits	Lectures
UNIT I Good Laboratory Practices and Biosafety Guidelines	GLP: Concept of GLP, Objectives, Practicing GLP, Guidelines to GLP; Documentation of Laboratory work, Preparation of SOPs, Decontamination and Disposal Safety measures in Laboratory: Common safety symbols, General Work Procedure, Emergency Procedure, Apparel in the Laboratory, Chemical Handling.	2	15
UNIT II Standard solutions and Buffers	Preparation of standard Solutions: Concept and significance of Chemical and Biological solutions. Normality, Molarity, Molality, Mole fraction, Mole concept, Solubility, Weight ratio, Volume ratio, Weight to Volume ratio, ppb, ppm, millimoles, milliequivalents (Numerical expected). Primary and Secondary Standards: Preparation of Standard Solutions, Principle of Volumetric Analysis. Concept of pH: Buffer solutions -Concept of Buffers, Derivation of Henderson -Hasselback equation for Acidic and Basic buffers. Buffering capacity Biological buffers: Significance of biological buffers, Carbonate, Acetate and Phosphate buffers. Protein buffers (Introduction) Significance of TRIS buffers (Introduction)		15
Unit III Biostatistics	Introduction to Biostatistics: Definition & Importance of Statistics in Biology Variables, Types of variables (Quantitative & Qualitative) Types of Data and data visualization: Concept of Data, Sources of data, Types of data (Quantitative & Qualitative), Representation of Data and Graphs		15

	<p>Sampling strategies: Population and Sample, Significance of using samples, , Sampling techniques</p> <p>Types of Statistics: Introduction to Descriptive & Inferential statistics</p> <p>Measures of central tendency: Mean, Mode, Median (Ungrouped & Grouped data)</p> <p>Measures of dispersion: Range, Variance, Standard deviation (Ungrouped & Grouped data), Coefficient of variation</p> <p>Measures of location: Percentiles, Interquartile range (Box-Whisker plot) Normal/Gaussian distribution, Standard normal deviate, Sampling variation, Standard error of mean</p>		
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References

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SEMESTER-II
Paper-VII Communication Skills

Course Objective: To acquaint the students with different aspects of communication skills			
Learning Outcome: By the end of the course the student will:			
<ul style="list-style-type: none"> • Develop an understanding of communication skills required to excel in real work environment and corporate life. • Make use of technical and non-technical qualities in career planning • Learn about Leadership, team building, decision making and stress management 			
Unit	Title	Credits	Lectures
UNIT I Academic Skills	<p>Essentials of Grammar: Parts of speech, Articles, Modals, Sentences and their types., Punctuation marks</p> <p>Employment Communication: Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter. Email Writing</p> <p>Professional Presentation: Nature of Oral Presentation, planning a Presentation, Preparing the Presentation, Delivering the Presentation</p> <p>Job Interviews: Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Changes in the Interview Process, FAQ During Interviews</p> <p>Group Discussion: Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion, Individual Traits</p>	2	15
UNIT II Soft and Professional Skills	<p>Introduction to Soft Skills and Hard Skills</p> <p>Personality Development: Knowing Yourself, Positive Thinking, Johari's Window, Communication Skills, Non-verbal Communication, Physical Fitness Definition</p>		15

	<p>Etiquette and Mannerism: Introduction, Professional Etiquette, Technology Etiquette</p> <p>Communication Techniques:</p> <p>Ethical Values: Ethics and Society, Theories of Ethics, Correlation, between Values and behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics</p> <p>Leadership and Team Building: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams</p>		
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References

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2. Chauhan, G. S., Sharma, S. (2016). Soft Skills: An Intergrated Approach to Maximise Personality. India: Wiley.
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6. Sherfield, R. M. (2009). Cornerstone: Developing Soft Skills. Pearson Education India

PRACTICALS

Course Code	Title
UBT2PR1 (Practical of UBT2BIT2 & UBT2MAI)	<ol style="list-style-type: none"> 1. Preparation of Stock Solutions and Preparation of Media for PTC. 2. Aseptic Transfer Technique, Surface Sterilization (Seed sterilization) 3. Inoculation for Callus Culture. 4. Isolation and characterization of organisms causing Food Spoilage (Using Bergey's Manual) 5. Isolation and characterization of food fermenting organism from idli batter (Using Bergey's Manual) 6. Determination of food preservative concentration (salt & sugar) using MIC. 7. Detection of Food adulterants in food samples 8. Electron micrographs/diagrammatic study of: <ol style="list-style-type: none"> a. animal viruses (rhabdo, influenza, paramyxo, hepatitis and retroviruses) b. plant viruses (caulimo, gemini, tobacco ringspot, cucumber mosaic and alpha-alpha mosaic viruses) 9. Demonstration of Isolation and enumeration of bacteriophages (PFU) from water/sewage sample using double agar layer technique. 10. Motility by hanging drop method/stab culture 11. Methods of preservation of culture 12. Study of Growth Curve of <i>E. coli</i> 13. Preparation of vaccine (Demonstration) and Sterility testing of vaccine 14. Enumeration by Breed's count 15. Isolation and Enumeration of microorganisms- 16. Serial dilution, Surface spread method 17. Serial dilution, Pour plate method

	<p>18. Study of reaction pattern of an antigen with a set of antibodies by Ouchterlony double diffusion method</p> <p>19. Demonstration of Phagocytosis</p> <p>20. Study of bacterial flora of skin (as a physical barrier in innate immunity) by swab method/Hand imprint method.</p>
<p>UBT2PR2 (Practical of UBT2BCH2 & UBT2BOC2)</p>	<ol style="list-style-type: none"> 1. To determine enthalpy of dissolution of salt like KNO_3. 2. Determine the rate constant for hydrolysis of ester using HCl as a catalyst. 3. Study the kinetics of reaction between Thiosulphate ion and HCl. 4. Study reaction between potassium Persulphate and Potassium Iodide kinetically and hence to determine order of reaction. 5. Study the reaction between NaHSO_3 and KMnO_4 and balancing the reaction in acidic, alkaline and neutral medium. 6. Study transfer of electrons (Titration of sodium thiosulphate with potassium dichromate). 7. Determination of the volume strength of hydrogen peroxide solution by titration with standardized potassium permanganate solution. 8. Determination of amount of K oxalate and oxalic acid in the given solution titrimetrically. 9. Qualitative tests for lipids. 10. Iodine value of Oil. 11. Separation by Thin layer chromatography <ol style="list-style-type: none"> a. Plants Pigments b. Fatty acids. 12. Enzyme Kinetics: 13. Study of the effect of pH 14. Temperature on activity of Amylase 15. Study of Effect of substrate concentration on amylase enzyme activity and determination of V_{max} and K_m.

	<p>16. Study of Effect of enzyme concentration on amylase enzyme activity.</p> <p>17. Study of Effect of inhibitors on amylase enzyme activity.</p> <p>18. Determination of absorption maxima of CuSO₄/ K₂Cr₂O₇.</p> <p>19. Verification of Beer and Lambert's Law.</p> <p>20. Quantitative estimation of sugars by DNSA method</p> <p>21. Estimation of DNA by DPA method.</p>
<p>UBT2PR3 (Practical of UBT2MBG & UBT2PAP)</p>	<ol style="list-style-type: none"> 1. Study of Semiconservative replication of DNA through micrographs/ Schematic representation. 2. Agarose gel electrophoresis of genomic DNA 3. Study the effect of UV radiation as a mutagenic agent 4. Identification of types of point mutations from given DNA sequences 5. Isolation of antibiotic/ dye resistant mutants using replica plate technique. 6. Demonstration of Ames test for mutagenicity 7. Study of Hill's reaction 8. To measure the rate of photosynthesis by Winkler's method 9. Effect of PGRs on seed germination 10. Solvent extraction of plant pigments and study the absorption spectra of pigments 11. Qualitative detection of plant secondary metabolites using standard tests - e.g. Tests for tannins, flavonoids, alkaloids, terpenoids, saponins, steroids. 12. Separation of Carotenoids by thin layer chromatography 13. Separation of serum from blood 14. Effect of different concentrations of sodium chloride on RBC and determination of the concentration isotonic to blood. 15. Study of human blood count (RBC and WBC) using haemocytometer 16. Estimation of Hemoglobin in human blood. 17. Analysis of Urine



Janardan Bhagat Shikshan Prasarak Sanstha's

**Changu Kana Thakur
Arts, Commerce and Science College, New Panvel
(Autonomous)**

Re-accredited A+ Grade by NAAC

'College with Potential for Excellence' Status Awarded by University Grants Commission
'Best College Award' by University of Mumbai

**Affiliated to University of Mumbai with
an Autonomous status**

Revised Syllabus for

Program: B.Sc. Biotechnology

S.Y. B.Sc. Biotechnology

Choice based Credit & Grading system (60:40)

(To be implemented from the academic year (2020-2021))

Preamble:

Biotechnology is one of the youngest branches of Life Science, which has expanded and established as an advanced interdisciplinary applied science in last few years. Biotechnology at the core envisages the comprehensive study of Life and the Interdisciplinary potential of Biotechnology has led to a unique status for Biotechnology in Research and Industry.

Biotechnology has its applications in almost every field touching practically every human activity. The applied aspect of Biotechnology is now getting established with its applications in Industry, Agriculture, Health and Environment, Biotechnology is the lead science expanding exponentially.

Biotechnology demands a trained, skilled human resource to establish the Industry and Research sectors. The field is novel and still expanding which demands inputs in Infrastructure and Technology. The need of the hour is to design appropriate syllabi which keeps pace with changing times and technology with emphasizes on applications while elucidating technology in depth. The syllabi till today had been sufficient to cater to the needs of students for building up their careers in industry and research. However, with the changing scenario at local and global level, we feel that the syllabus orientation should be altered to keep pace with developments in the education and industrial sector. Theory supplemented with extensive practical skill sets will help a graduate student to avail the opportunities in the applied fields (research, industry or institutions), without any additional training. Thus, the college itself will be developing the trained and skilled man-power.

Biotechnology being an interdisciplinary subject, this restructured syllabus will combine the principles of physical, chemical, and biological sciences along with developing advanced technology. Biotechnology curricula are operated at two levels viz. undergraduate and postgraduate. The undergraduate curricula are prepared to impart primarily basic knowledge of the respective subject from all possible angles while postgraduate syllabus emphasizes on more applied courses. In addition, students are to be trained to apply this knowledge particularly in day-to-day applications of biotechnology and to get a glimpse of research.

**Speciality Programme: Bachelor of Science (B.Sc.)
B.Sc. in Biotechnology**

Eligibility: As per University of Mumbai rules.

Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below: -

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks	
01	One periodical class test / online examination to be conducted in the given semester	20 Marks	
02	One case study / project with presentation based on curriculum to be assessed by the teacher concerned	15 Marks	
	Presentation		10 Marks
	Written Document		05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks	

Question Paper Pattern

(Periodical Class Test for the Courses at Under Graduate Programmes)

Maximum Marks: 20

Duration: 40 Minutes

Questions to be set: 02

All Questions are Compulsory

Question No.	Particular	Marks
Q. 1	Match the Column/Fill in the Blanks/Multiple Choice Questions/Answer in One or Two Lines.(Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q. 2	Answer in Brief(Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 %

60 Marks

Undergraduate Programmes of S. Y. B.Sc. (Sem. III & IV)

Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be four questions of 15 marks each (30 marks with internal options).
2. On each unit there will be one question and fourth question will be based on entire syllabus.
3. All questions shall be compulsory with internal options.
4. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Note: As per previous ordinance there will not be any internal examination for practical.

S.Y. B.Sc. Biotechnology

Semester -III				
Course Code	Course Type	Course Title	Credits	Lectures / Week
UBT3BPH	Core Subject	Biophysics	2	3
UBT3APC	Core Subject	Applied Chemistry-I	2	3
UBT3IMM	Core Subject	Immunology	2	3
UBT3CBC	Core Subject	Cell Biology and Cytogenetics	2	3
UBT3MOB	Core Subject	Molecular Biology	2	3
UBT3BPT	Skill Enhancement Elective	Bioprocess Technology	2	3
UBT3RSM	General Elective	Research Methodology	2	3
UBT3PR1	Core Subject Practical	Practical of UBT3BPH and UBT3APC	2	6
UBT3PR2	Core Subject Practical	Practical of UBT3IMM and UBT3CBC	2	6
UBT3PR3	Core Subject and Skill Enhancement Elective Practical	Practical of UBT3MOB and UBT3BPT	2	6

S.Y. B.Sc. Biotechnology

Semester -IV				
Course Code	Course Type	Course Title	Credits	Lectures /Week
UBT4BIC	Core Subject	Biochemistry	2	3
UBT4APC	Core Subject	Applied Chemistry-II	2	3
UBT4MEM	Core Subject	Medical Microbiology	2	3
UBT4ENB	Core Subject	Environmental Biotechnology	2	3
UBT4BBI	Core Subject	Biostatistics and Bioinformatics	2	3
UBT4MOD	Skill Enhancement Elective	Molecular Diagnostics	2	3
UBT4END	General Elective	Entrepreneurship Development	2	3
UBT4PR1	Core Subject Practical	Practical of UBT4BIC and UBT4APC	2	6
UBT4PR2	Core Subject Practical	Practical of UBT4MEM and UBT4ENB	2	6
UBT4 PR3	Core Subject and Skill Enhancement Elective Practical	Practical of UBT4 BBI and UBT4 MOD	2	6

SEMESTER-III THEORY

SEMESTER-III
Paper-I BIOPHYSICS (UBT3BPH)

Course Objective: The objective of this course is to have a firm foundation of the fundamentals and applications of current biophysical theories.			
Learning Outcome: By the end of the course the student will:			
<ul style="list-style-type: none"> • Develop an understanding of the different aspects of classical Physics. • Be able to relate principles of Physics to applications and techniques in the field of Biology such as Microscopy, Spectroscopy and Electrophoresis. 			
Unit	Title	Credits	Lectures
UNIT I Spectroscopy and Microscopy	Lasers: Properties and Applications of Laser. Spectroscopy: <ul style="list-style-type: none"> • Introduction to Electromagnetic Radiation. • Types and Properties of Spectra; • Basic Laws of Light Absorption. • Spectrophotometer: -Principle, Instrumentation and Applications; • UV-Vis Spectrophotometer, Single and Dual Beam Spectrophotometer. Microscopy: <ul style="list-style-type: none"> • Electron Microscopy- principle, instrumentation applications and Preparation of Specimen, SEM, TEM. Fluorescence Microscopy. 	2	15
UNIT II Heat, Sound, and Fluid Dynamics	Heat: <ul style="list-style-type: none"> • Concept of Temperature; Modes of Heat Transfer; Measuring Temperature; Platinum Resistance Thermometer; Thermocouple and Thermistors. Sound: <ul style="list-style-type: none"> • Types of Sound Waves - Audible, Ultrasonic and Infrasonic Waves; Doppler Effect; • Applications of Ultrasonic Waves. Fluid Dynamics: Viscosity: <ul style="list-style-type: none"> • Definition Flow of Liquids through Capillaries; Stokes' Law; Terminal Velocity. • Determination of 'η' by Falling Sphere Method; Viscosity Estimation by Oswald's Viscometer. Surface Tension: <ul style="list-style-type: none"> • Definition - Surface Tension and Surface Energy; Capillary Action; Angle of Contact; • Wettability; Temperature Dependence of Surface Tension. • Applications in Biology. 		15

UNIT III Electrophoretic Techniques	Electrophoresis: <ul style="list-style-type: none"> • Migration of Ions in an applied electric field; Factors affecting Electrophoretic Mobility; Moving Boundary Electrophoresis; • Principle of Electrophoresis; Supporting Matrix; • Paper Electrophoresis; AGE; • Native and SDS PAGE (reducing and non-reducing, continuous and discontinuous); • IEF and 2D PAGE. • Staining and Detection Methods; • Gel- Documentation. Applications in biology 		15
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SEMESTER-III

Paper-II APPLIED CHEMISTRY-I (UBT3APC)

Course Objective: <ul style="list-style-type: none"> • The objective of this course is to have a firm foundation of the fundamentals and applications of Organic and Green Chemistry. Learning Outcome: By the end of the course the student will be able to: <ul style="list-style-type: none"> • Develop an understanding of the different aspects of Organic and Green Chemistry. • Discuss role of Organic Compounds in Biology and Synthesis of Organic Compounds. • Discuss role of Green Chemistry and its application in Industry. 			
Unit	Title	Credits	Lectures
UNIT I Organic Chemistry	Introduction to types of Organic Reactions: <ul style="list-style-type: none"> • Addition, Elimination, & Substitution reactions. • Mechanisms of Organic Reactions and Reactive intermediates, Methods of generation • General reactions of the following reactive intermediates: <ul style="list-style-type: none"> • Carbocation, Carbanion, Carbon free radical • Essential & Non-essential elements in biological system. • Role of metal ions in biological system. • Biological role of caboxyperoxidases, catalases and peroxidases of organic compounds. 	2	15
UNIT II Synthesis of Organic Compounds	Synthesis of Organic Compounds: <ul style="list-style-type: none"> • Criteria for Ideal Synthesis, Selectivity and Yield. • Linear and Convergent Synthesis and • Multicomponent Reactions. • Microwave Assisted Organic Synthesis, • Ultrasound in Synthesis and Polymer Supported Synthesis. 		15

UNIT III Green Chemistry and Synthesis	Green Chemistry and Synthesis: <ul style="list-style-type: none"> • Introduction to Green Chemistry; • Need and Relevance of Green Chemistry; Principles of Green Chemistry. • Green Synthesis in Industry: Green Materials, • Green Reagents, Green Solvents and Green • Catalysts. 		15
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SEMESTER-III
Paper-III IMMUNOLOGY (UBT3IMM)

Course Objective:			
<ul style="list-style-type: none"> • The objective of this course is to familiarize students with the Immune Effector Mechanisms and various Immunotechniques. 			
Learning Outcome: By the end of the course the student will be able to:			
<ul style="list-style-type: none"> • Understand the role of different types of Cells, Effector Molecules and Effector Mechanisms in Immunology. • Understand the principles underlying various Immunotechniques. 			
Unit	Title	Credits	Lectures
UNIT I Effectors of Immune Response	<ul style="list-style-type: none"> • Haematopoiesis; Cells of the Immune System; • Primary and Secondary Lymphoid Organs. • Complement System- • Classical, Alternate and Lectin; • Regulation and Biological Effects of Complement System; • Deficiencies of Complement System 	2	15
UNIT II Generation of B-Cell and T-cell Response	<ul style="list-style-type: none"> • Major Histocompatibility Complex-MHC-I and MHC-II- General Organization, Structures and Peptide Interactions. • Antigen processing and presentation: • Endocytic and Exocytic Pathways. • T-cell and B-cell Maturation, activation and differentiation. 		15
UNIT III Immuno- Techniques	<p>Precipitation Reactions:</p> <ul style="list-style-type: none"> • Immunoprecipitation, Immunoelectrophoresis, • CIEP, Rocket Electrophoresis and • 2-D Immunoelectrophoresis. <p>Agglutination Reactions:</p> <ul style="list-style-type: none"> • Passive, Reverse Passive, Agglutination Inhibition. • Coomb's Test; Complement Fixation Tests, • RIA, ELISA, ELISPOT, Chemiluminescence, Western Blot, Immunofluorescence, Flow Cytometry. • Affinity chromatography. <p>Alternatives to Antigen-Antibody Reactions.</p>		15

SEMESTER-III

Paper-IV CELL BIOLOGY AND CYTOGENETICS (UBT3CBC)

Course Objective:

- The objective of this course is to have a firm foundation in the fundamentals of Cell Biology and Cytogenetics.

Learning Outcome: By the end of the course the student will be able to:

- Develop an understanding of the Cytoskeleton and Cell Membrane.
- Discuss the principles underlying Linkage, recombination and Mapping.

Unit	Title	Credits	Lectures
UNIT I Cytoskeleton	<p>Overview of the Major Functions of Cytoskeleton.</p> <p>Microtubules: Structure and Composition.</p> <ul style="list-style-type: none"> • MAPs: Functions- Role in Mitosis, Structural Support and Cytoskeleton Intracellular Motility. • Motor Proteins: Kinesins, Dynein; MTOCs. Dynamic Properties of Microtubules. • Microtubules in Cilia and Flagella. <p>Microfilaments:</p> <ul style="list-style-type: none"> • Structure, Composition, Assembly and Disassembly. • Motor Protein: Myosin. • Muscle Contractility: Sliding Filament Model. Actin Binding Proteins: Examples of Non- • Muscle Motility. <p>Intermediate Filaments:</p> <ul style="list-style-type: none"> • Structure and Composition; Assembly and Disassembly; Types and Functions. <p>Drugs targeting cytoskeleton-</p> <ul style="list-style-type: none"> • Colchicine, Cytochalasins, Taxol, Phalloidin, Vinblastine 	2	15
UNIT II Cell Membrane	<ul style="list-style-type: none"> • Uptake of Nutrients by Prokaryotic Cells; Cell Permeability. • Principles of Membrane Transport- • Transporters and Channels; Active Transport, Passive Transport; Types of Transporters; • Types of ATP Driven Pumps - Na⁺ K⁺ Pump. • Cell Junctions; Cell Adhesion and Extracellular Material, • Microvilli; Tight Junctions, Gap Junctions; • Cell Coat and Cell Recognition. 		15
UNIT III Genetic Linkage,	<p>Genetic Linkage:</p> <ul style="list-style-type: none"> • Morgan's experiment in Drosophila, Corn experiment <p>DNA recombination:</p>		15

Crossing Over and Chromosomal Mapping	<ul style="list-style-type: none"> • Crossing over; Holliday model of recombination; • Gene conversion and mismatch repair Gene Mapping in eukaryotes: <ul style="list-style-type: none"> • Two-point Cross; Three-point Cross • Pedigree analysis- Dominant and Recessive traits for Autosomal and Sex Chromosome; • Tetrad analysis 		
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SEMESTER-III

Paper-V MOLECULAR BIOLOGY (UBT3MOB)

Course Objective:

- The objective of this course is to have an insight into mechanism of Gene Expression and Regulation.

Learning Outcome: By the end of the course the student will be able to:

- Discuss the mechanisms associated with Gene Expression at the level of Transcription and Translation.
- Impart the knowledge of molecular Biology Techniques

Unit	Title	Credits	Lectures
UNIT I Gene Expression- Transcription	Gene Expression- an Overview Transcription Process in Prokaryotes: <ul style="list-style-type: none"> • RNA Synthesis; Promoters and Enhancers; • Initiation of Transcription at Promoters; • Elongation and Termination of an RNA Chain. Transcription in Eukaryotes: <ul style="list-style-type: none"> • Eukaryotic RNA Polymerases; Eukaryotic Promoters; Transcription of Protein Coding Genes by RNA Polymerase; Eukaryotic Mrna's; Transcription of other genes; • Spliceosomes; RNA editing. 	2	15
UNIT II Gene Expression- Translation	Nature of Genetic Code. Wobble Hypothesis. Translation: <ul style="list-style-type: none"> • Process of Protein Synthesis (Initiation, Elongation, Translocation, Termination); • Post Translation Modifications. • Protein sorting. • Introduction to operon concept 		15
UNIT III R-DNA Technology	<ul style="list-style-type: none"> • Enzymes in genetic engineering: • DNA Polymerases, Restriction Endonucleases, • Ligases, Reverse Transcriptases, Nucleases, Terminal Transferases, Alkaline Phosphatases, • Polynucleotide kinase Gene cloning vectors: <ul style="list-style-type: none"> • Plasmids, Bacteriophage Vectors- insertion 		15

	<ul style="list-style-type: none"> • vectors, replacement vectors, Cosmids, Phagemids, Vectors for Plant and Animal Cells, • Shuttle Vectors, YAC Vectors, Expression Vectors • Gene cartridges 		
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SEMESTER-III

Paper-VI BIOPROCESS TECHNOLOGY (UBT3BPT)

Course Objective:

- The objective of this course is to understand the basics skills applied in Fermentation Technology and build a foundation for more advanced studies in Bioprocess Technology.

Learning Outcome: By the end of the course the student will be able to:

- Develop an understanding of the various aspects of Bioprocess Technology.
- Develop skills associated with screening of Industrially Important Strains.
- Understand principles underlying design of Fermenter and Fermentation Process.

Unit	Title	Credits	Lectures
UNIT I Microorganisms in Industrial Processes	Types of Microorganisms used in Industrial Processes: <ul style="list-style-type: none"> • Bacteria, Actinomycetes, Fungi and Algae. Screening and Maintenance of Strains: <ul style="list-style-type: none"> • Primary Screening and Secondary Screening; Cultivation; Preservation of Industrially Important Microbial Strains. 	2	15
UNIT II Fermentor and Fermentation Processes	Design of a Fermentor: <ul style="list-style-type: none"> • Stirred Tank Fermentor- Basic Design; Parts of a Typical Industrial Fermentor. Fermentation Media: <ul style="list-style-type: none"> • Components; Design and Optimization. Sterilization: <ul style="list-style-type: none"> • Sterilization of Fermentor and Fermentation Media. Process Parameters: <ul style="list-style-type: none"> • pH, Temperature, Aeration, Agitation, Foam Types of Fermentation: <ul style="list-style-type: none"> • Surface and Submerged; Batch and Continuous, Aerobic and Anaerobic. Product Isolation and Purification. Study of Representative Fermentation Processes: <ul style="list-style-type: none"> • Outline of Penicillin and Ethanol Production by Fermentation along with flow diagram. 		15
UNIT III In-vivo and In-vitro Assay of	Assay of Industrial Products: <ul style="list-style-type: none"> • Chemical and Biological; Types and Subtypes; Kinetics. • Advantages and Disadvantages. • Half-Life Determination of Pharmacological 		15

Industrial Products	Products. • Overview of Bioavailability and Bioequivalence Studies		
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SEMESTER-III

Paper-VII RESEARCH METHODOLOGY (UBT3RSM)

Course Objective: The objective of this course is to develop Research Aptitude, Logical Thinking and Reasoning.

Learning Outcome: By the end of the course the student will be able to:

- Understand basic principles of Research Methodology and identify a Research Problem.
- Understand a general definition of Research Design.
- Understand process of Scientific Writing.
- Identify the overall Process of Designing a Research Study from its inception to its Report.

Unit	Title	Credits	Lectures
UNIT I Introduction to Research Methodology and Research Problem	<ul style="list-style-type: none"> • Meaning of Research; Objectives of Research; • Motivation in Research; Types of Research; Research Process; Criteria of Good Research; What is a Research Problem? Selecting the Problem; Necessity of Defining the Problem; Technique Involved in Defining a Problem. Developing a Research Plan, Types of Data and Data collection Methods, Case Study Method 	2	15
UNIT II Research Design, Interpretation and Report Writing	<ul style="list-style-type: none"> • Meaning of Research Design; Need for Research Design; Features of a Good Design; Important Concepts Relating to Research Design; Different Research Designs; Basic Principles of Experimental Designs; • Interpretation and Report Writing • Meaning of Interpretation, Why Interpretation? Technique of Interpretation, Precautions in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports • Oral Presentation 		15
UNIT III Introduction to Scientific Writing	<ul style="list-style-type: none"> • Introduction and Process of Scientific Writing : • Types of Scientific writing, Process of Scientific Writing: Thinking, Planning, Rough Drafts and Revising Contents. 		15

	<ul style="list-style-type: none"> • How to write a research paper and research project proposal? , • Abstract Writing, Main content, • Hour- glass Model of Research paper writing, Review of Literature, Bibliography, • Ethics in Scientific writing and research Publication: Plagiarism-Introduction to Plagiarism, Examples of Plagiarism 		
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PRACTICALS

SEMESTER III		
Course Code	Title	Credits
UBT3PR1 (Practical of UBT3BPH and UBT3APC)	<ol style="list-style-type: none"> 1. Study of Absorption Spectra of Colored Compounds (CuSO₄, KMnO₄). 2. Verification of Beer-Lambert's Law. 3. Extraction of Plasmid DNA and Separation by Agarose Gel Electrophoresis. 4. Determination of Purity of Plasmid DNA using UV Spectrophotometry. 5. Study of the Structure and Function of an Electron Microscope (Visit /Video Demonstration - including Sample Preparation and Staining). 6. Demonstration of Structure and Working of a Fluorescence Microscope (Stained Preparation). 7. Electrophoresis of Proteins by PAGE and SDS-PAGE. 8. Purification of any TWO Organic Compounds by Recrystallization Selecting Suitable Solvent. 9. Organic Estimations: Acetone, Amide, Benzoic Acid. 10. Organic Preparations : <ol style="list-style-type: none"> a. Acetylation of Primary Amine (Preparation of Acetanilide). b. Base Catalyzed Aldol Condensation (Synthesis of Dibenzalpropanone). 	2
UBT3PR2 (Practical of UBT3IMM and UBT3CBC)	<ol style="list-style-type: none"> 1. Complement Fixation Test (CFT). 2. Passive Agglutination- RA Factor Test. 3. Immunoelectrophoresis. 4. ELISA (Kit-based) - HEPALISA. 5. DOT-ELISA. 6. Western Blotting - Demonstration. 7. Flow Cytometry - Lab Visit. 	2

	8. Mapping based on Tetrad Analysis and Three Point Cross. 9. Pedigree Analysis- Autosomal and Sex-Linked.	
UBT3PR3 (Practical of UBT3MOB and UBT3BPT)	1. Study of <i>E.coli</i> Diauxic Growth Curve- (Lactose and Glucose). 2. Study of lac Gene Expression using Blue-White Selection. 3. Expression of β -galactosidase and Measurement of Activity. 4. Screening for an Antibiotic Producing Strain of Microorganism. 5. Screening for an Alcohol Producing Strain of Microorganism. 6. Lab Scale Production of Penicillin (Static and shaker). 7. Purification of Penicillin from Broth Culture of <i>Penicillium</i> spp. by Solvent Extraction. 8. Lab Scale Production of Ethanol. 9. Purification of Ethanol from Broth Culture of <i>Saccharomyces</i> spp. by Distillation. 10. Estimation of Penicillin from Recovered Broth by Chemical (Iodometric) Method. 11. Estimation of Penicillin from Recovered Broth by Biological (Bioassay) Method. 12. Estimation of Alcohol from Recovered Broth by Dichromate Method.	2

SEMESTER-IV THEORY

SEMESTER-IV
Paper-I BIOCHEMISTRY (UBT4BIC)

Course Objective:			
<ul style="list-style-type: none"> The objective of this course is to gain an insight into the Metabolic Processes associated with Catabolism of Carbohydrates, Amino Acids, Lipids and Nucleotides. 			
Learning Outcome: By the end of the course the student will be able to:			
<ul style="list-style-type: none"> Discuss the Metabolic Pathways of Carbohydrates, Amino Acids, Lipids and Nucleotides. Explain the Role of Energy Rich Molecules in Metabolism. 			
Unit	Title	Credits	Lectures
UNIT I Carbohydrate Metabolism, ETS and Energy Rich Compounds	Carbohydrate Metabolism: <ul style="list-style-type: none"> Glycolytic Pathway and its Regulation, Homolactic Fermentation; Alcoholic Fermentation; Energetics of Fermentation; Citric Acid Cycle and its Regulation; Gluconeogenesis; Pentose Phosphate Pathway; Glyoxalate Pathway; Reductive TCA. (Sequence of Reactions, Regulation, Energy Yield and Metabolic Disorders of the above Pathways) Electron Transport System: <ul style="list-style-type: none"> Electron Transport and Oxidative Phosphorylation. Inhibitors of ETS. Energy Rich Compounds: <ul style="list-style-type: none"> ATP as Energy Currency, Structure of ATP, Hydrolysis, Other Energy Rich Compounds other than ATP like PEP, Creatine Phosphate 	2	15
UNIT II Amino Acid Metabolism	Amino Acid Breakdown: <ul style="list-style-type: none"> Deamination, Transamination, Urea Cycle, Breakdown of Glucogenic and Ketogenic, Amino Acids. Amino Acids as Biosynthetic Precursors: <ul style="list-style-type: none"> Biosynthesis of Epinephrine, Dopamine, Serotonin, GABA, Histamine, Glutathione. (Sequence of Reactions, Regulation and Metabolic Disorders of the above Pathways) 		15
UNIT III Lipid and Nucleotide Metabolism	Lipid Metabolism: <ul style="list-style-type: none"> Mobilization, Transport of Fatty Acids. Beta, Alpha and Omega Oxidation of Saturated Fatty Acids; Oxidation of Unsaturated Fatty Acids; Oxidation of Odd Chain Fatty Acids. Energy Yield, Ketone Body Breakdown to Yield Energy. 		15

	<ul style="list-style-type: none"> (Sequence of Reactions, Regulation, Energy Yield and Metabolic Disorders of the above Pathways) <p>Nucleotide Metabolism:</p> <ul style="list-style-type: none"> Degradation of Purines and Pyrimidines. 		
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SEMESTER-IV

Paper-II APPLIED CHEMISTRY - II (UBT4APC)

Course Objective:			
<ul style="list-style-type: none"> The objective of this course is to have a firm foundation of the fundamentals and applications of current Chemical Theories for the Physical World. 			
Learning Outcome: By the end of the course the student will be able to:			
<ul style="list-style-type: none"> Develop an understanding of the different aspects of Analytical Chemistry. Gain knowledge of Natural Product Chemistry and related acquired skills. Gain an understanding of basic concepts in Polymer Chemistry and Nanomaterials. 			
Unit	Title	Credits	Lectures
UNIT I Sampling and Separation techniques	<p>Sampling:</p> <ul style="list-style-type: none"> Importance of sampling and sampling techniques. Types of sampling- Random and Non-Random, Sampling of solids, Liquids and Gases. <p>Separation techniques:</p> <ul style="list-style-type: none"> Solvent Extraction Partition Coefficient and Distribution Ratio, Extraction Efficiency, Separation Factor, Role of Complexing Agents, Chelation, Ion Pair Formation, Solvation, Soxhlation Centrifugation: Basic principles of sedimentation, Instrumentation and application of centrifuges and ultra-centrifuges Density gradient centrifugation 	2	15
UNIT II Natural Product Chemistry	<p>Natural Product Chemistry:</p> <ul style="list-style-type: none"> Primary and secondary metabolites. <p>Classification of natural products:</p> <ul style="list-style-type: none"> Alkaloids, terpenoids, saponins, coumarin, Phenolics, Essential oils and steroids. <p>Herbs with medicinal properties:</p> <ul style="list-style-type: none"> Curcuma longa, Ocimum tenuiflorum, Bacopa monnieri, Cuminum cyminum. <p>Chromatographic Separation of natural products:</p> <ul style="list-style-type: none"> Gas chromatography and its application's 		15

	<ul style="list-style-type: none"> Liquid chromatography: HPLC and its applications, HPTLC for Separation and analysis of natural products. 		
UNIT III Polymers	<p>Polymers:</p> <ul style="list-style-type: none"> Introduction to polymers Types of polymers- Monomer, polymer, Homopolymer, copolymer, Thermoplastics And Thermosets, Biodegradable polymers. <p>Nanomaterials:</p> <ul style="list-style-type: none"> Introduction to Nanomaterials. Forms of Nanomaterials: Nanoparticles, Nanofilms and Nanotubes Synthesis and Characterization of Nanomaterials. Applications of Nanomaterials. 		15

SEMESTER-IV

Paper-III MEDICAL MICROBIOLOGY (UBT4MEM)

Course Objective: The objective of this course is to gain insight into Disease Factors and Processes and Diseases Caused by Microorganisms.

Learning Outcome: By the end of the course the student will be able to:

- List the factors playing a role in causing a disease.
- Discuss the various aspects of Systemic Infections including Causative Agents, Symptoms and Prophylaxis.
- Gain the technical capability of handling, isolating and identifying various Bacteria.

Unit	Title	Credits	Lectures
UNIT I Infectious Diseases	<p>Host Parasite Relationship:</p> <ul style="list-style-type: none"> Normal Flora; Factors Affecting the Course of Infection and Disease; Mechanisms of Infection and Virulence Factors. <p>Infection:</p> <ul style="list-style-type: none"> Patterns of Infection; Types of Infections; Signs and Symptoms; Epidemiology and Epidemiological Markers. <p>Diseases:</p> <ul style="list-style-type: none"> Origin of Pathogens; Vectors; Acquisition of Infection; Koch's Postulates. 	2	15
UNIT II Medical Microbiology- Causative Organisms- I	<p>Skin :S. aureus, S. pyogenes.</p> <p>Respiratory Tract Infections :</p> <ul style="list-style-type: none"> <i>M. tuberculosis, S. pneumonia</i> (Characteristics, Transmission, Course of Infection, Lab Diagnosis, Management of TB, Prevention and Control, Immuno and Chemoprophylaxis, DOTS and MDR). <p>Urinary Tract Infections:</p> <ul style="list-style-type: none"> <i>E. coli</i>: Characteristics, Virulence, Clinical disease, and <i>E. coli</i> Infections. <i>Proteus</i>. 		15

UNIT III Medical Microbiology- Causative Organisms- II	GI Tract Infections : <ul style="list-style-type: none"> • <i>Salmonella and Shigella spp.</i> (Characteristics, Virulence- Pathogenesis and Immunity, Clinical Disease, Carriers Lab Diagnosis, Phage Typing Prophylaxis and Treatment). Sexually Transmitted Diseases : <ul style="list-style-type: none"> • Syphilis and Gonorrhoea. Nosocomial Infections : <ul style="list-style-type: none"> • <i>Pseudomonas aeruginosa</i> 		15
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SEMESTER-IV

Paper-IV ENVIRONMENTAL BIOTECHNOLOGY (UBT4ENB)

Course Objective: The objective of this course is to gain awareness about different Types of Environmental Pollution and Related Issues.			
Learning Outcome: By the end of the course the student will be able to:			
<ul style="list-style-type: none"> • Gain an understanding of the causes, types and control methods for Environmental Pollution. • Application of different life forms in Environmental Remediation. 			
Unit	Title	Credits	Lectures
UNIT I Environmental Pollution	Sources of Pollution Air Pollution: <ul style="list-style-type: none"> • Types; Sources; Classification of Air Pollutants; Air Pollution Monitoring and Control. Water Pollution: <ul style="list-style-type: none"> • Causes, Types and Classification; • Eutrophication; Assessment of Water Quality- • Pollutant Monitoring and Control; Soil and Solid Waste Pollution: <ul style="list-style-type: none"> • Characteristics of Wastes, Impacts of Solid Waste on Health, Occupational Hazards and Control. Soil Erosion: <ul style="list-style-type: none"> • Concept, Causes and Effects. 	2	15 Lectures
UNIT II Global Environmental Problems and Issues	Green House Effect: <ul style="list-style-type: none"> • Factors Responsible for Green House Effect; • Green House Gases. • Global Warming; • Ozone Depletion; • Kyoto Protocol; • UV Radiation; Acid Rain. 		15 Lectures
UNIT III Bioremediation	<ul style="list-style-type: none"> • Concept of Bioremediation. • Microorganisms in Bioremediation, Mycoremediation and Phytoremediation. • Bioremediation Technologies. • Measuring Bioremediation in the Field. 		15 Lectures

	<ul style="list-style-type: none"> • Bioaugmentation and Biostimulation. • Monitoring the Efficacy of Bioremediation. 		
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SEMESTER-IV

Paper-V BIOINFORMATICS and BIOSTATISTICS (UBT4BBI)

Course Objective: The objective of this course is learning and understanding basic concepts of Bioinformatics and Biostatistics.

Learning Outcome: By the end of the course the student will be able to:

- Gain an understanding of the basic concepts of Bioinformatics and Biostatistics.
- Understand the tools used in Bioinformatics.
- Apply the various Statistical Tools for Analysis of Biological Data.

Unit	Title	Credits	Lectures
UNIT I Introduction to Computers and Biological Databases	Computer Basics: <ul style="list-style-type: none"> • Organization of a Computer; I/O Units; Computer Memory; Processor; Binary Arithmetic, Architecture; Operating System. Internet Basics: <ul style="list-style-type: none"> • Connecting to the Internet, E-mail, FTP, www, Difference between www and Internet. Biological Databases: <ul style="list-style-type: none"> • Classification of Databases - Raw and Processed Databases; Primary (NCBI), Secondary (PIR) and Tertiary or Composite (KEGG) Databases; Structure and Sequence Databases. • Specialized Databases - Protein Pattern Databases; Protein Structure and Classification Databases (CATH/SCOP). Genome Information Resources: <ul style="list-style-type: none"> • DNA Sequence Databases Specialized Genomic Resources. • Protein Databases based on Composition, • Motifs and Patterns. Protein Structure Visualization Software: <ul style="list-style-type: none"> • RasMol, Cn3D, Jmol 	2	15 Lectures
UNIT II BLAST and Sequence Alignment	BLAST and Sequence Alignment: <ul style="list-style-type: none"> • BLAST and its Types; Retrieving Sequence using BLAST. Pairwise Alignment: <ul style="list-style-type: none"> • Identity and Similarity; Global and Local Alignment; Pairwise Database Searching. Multiple Sequence Alignment: <ul style="list-style-type: none"> • Goal of Multiple Sequence Alignment; Computational Complexity; Manual 		15 Lectures

	Methods; Simultaneous Methods; Progressive Methods; Databases of Multiple Alignment; Secondary Database Searching, MSA and Phylogenetic Trees.		
UNIT III Biostatistics	Theory and Problems based on: Correlation analysis- <ul style="list-style-type: none"> Coefficient of correlation: Direct, Short-cut method, Spearman's Rank Correlation coefficient, Scatter Diagram Theory and Problems based on: Regression analysis- <ul style="list-style-type: none"> Regression coefficients, Regression lines (Linear Regression X on Y and Y on X). Steps in Testing Statistical Hypothesis Parametric Tests <ul style="list-style-type: none"> Z Test – Single Mean and Two Means, t-Test – Single Mean, Paired and Unpaired; Non-Parametric Tests-Chi-Square Test.		15 Lectures

SEMESTER-IV

Paper-VI MOLECULAR DIAGNOSTICS (UBT4MOD)

<p>Course Objective: The objective of this course is learning and understanding Molecular Techniques and utilizing these techniques in Diagnosis.</p> <p>Learning Outcome: By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> Gain an understanding of the basic Principles used in Molecular Diagnosis. Gain critical thinking and analytical skills to understand new Diagnostic Methods. Apply the knowledge and skills gained in the course should be useful in developing new Diagnostic Kits. 			
Unit	Title	Credits	Lectures
UNIT I Basics of Molecular Diagnostics	<ul style="list-style-type: none"> Overview of Molecular Diagnostics Characterization and analysis of Nucleic Acids and Proteins: <ul style="list-style-type: none"> Extraction, Isolation and Detection of DNA, RNA and Proteins; Restriction Endonucleases and Restriction Enzyme Mapping. Hybridization Techniques: <ul style="list-style-type: none"> Southern, Northern, Western and FISH; Markers, Probes and its Clinical Applications. 	2	15 Lectures
UNIT II Nucleic Acid Amplification Methods	Target amplification: <ul style="list-style-type: none"> PCR - General Principle; Components of a Typical PCR Reaction; Experimental Design; Primer Designing; Control of PCR Contamination and Mispriming; PCR Product Clean-up and Detection. 		15 Lectures

	PCR Types: <ul style="list-style-type: none"> Reverse Transcriptase and Real Time PCR. Probe amplification: <ul style="list-style-type: none"> Ligase Chain Reaction 		
UNIT III Molecular Biology based Diagnostics	DNA Polymorphism and Identification: <ul style="list-style-type: none"> RFLP and Parentage Testing; RFLP and Sickle-Cell Anaemia. Molecular Diagnostics for Infectious Diseases <ul style="list-style-type: none"> Molecular Testing for Neisseria, Molecular Diagnosis for HIV-1; Genetic Counselling and Molecular Diagnosis <ul style="list-style-type: none"> Genetic Testing- Need and Uses; genetic Counselling. Ethical, Social and Legal Issues to Molecular Genetic Testing		15 Lectures

SEMESTER-IV

Paper-VII ENTREPRENEURSHIP DEVELOPMENT (UBT4END)

Course Objective: To develop and systematically apply an Entrepreneurial way of thinking that will allow identification and creation of Business Opportunities.

Learning Outcome: By the end of the course the student will be able to:

- Develop an understanding of the systematic process and to select and screen a Business idea.
- Design strategies for successful implementation of ideas.
- Write a Business Plan.
- Understand different forms of Intellectual Property protection

Unit	Title	Credits	Lectures
UNIT I Introduction to Entre- preneurship Development	Concept of Entrepreneur; <ul style="list-style-type: none"> Entrepreneurship; Need and Importance; Factors Influencing Entrepreneurship; Essentials of a Successful Entrepreneur 	2	15 Lectures
UNIT II Setting-up, Planning of an Enterprise and Bio business	Setting-up of an Enterprise <ul style="list-style-type: none"> Location of Enterprise; Real Estate and Human Resource Planning, Financial Planning; Role of Government and Financial Institutions in Entrepreneurship Development; Raising Money from Venture Capitalists, Government Grants Preparation of a Business Plan Innovation & entrepreneurship in Bio-business		15 Lectures

	<ul style="list-style-type: none"> • Introduction and scope in Bio-entrepreneurship, types of bio-industries and competitive dynamics between the sub-industries of the bio sector 		
UNIT III Intellectual Property Rights (IPR)	<ul style="list-style-type: none"> • What is Intellectual Property? • Types of IPR, Patents, Copyright, Trademarks, Trade secret, Geographical indications, Traditional knowledge and Protection of undisclosed information. • Registered (Industrial) design, Brand, Logo, Regulatory Affairs, Corporate Law, IPR generation and Protection. • Patenting Biotechnological Inventions. 		15 Lectures

PRACTICALS

SEMESTER III		
Course Code	Title	Credits
UBT4PR1 (Practicals of UBT4BIC and UBT4APC)	<ol style="list-style-type: none"> 1. Determination of Lactate Dehydrogenase (LDH) Activity in Blood Serum. 2. Determination of Total, LDL and HDL Cholesterol in Serum. 3. Organ Function Tests: Liver (SGPT, SGOT); Kidney (Urea from Serum). 4. Estimation of Uric acid and Creatinine in Urine. 5. Qualitative Detection of Ketone Body in Urine. 6. Isolation of Mitochondria and Demonstration of ETC using a Marker Enzyme. 7. Separation of Binary (Solid-Solid) Mixture (Min 4 Compounds). 8. Identification of Organic Compound of Known Chemical Type (Min 4 Compounds). 9. HPLC analysis and interpretation of any one secondary metabolite from plants 10. Analysis of essential oils from any plant source using GC. 11. HPTLC fingerprint analysis of any one medicinally important plant. 12. Chemical and Biological Synthesis of Silver Nanoparticles and its characterisation by UV- Vis Spectrophotometer. 	2

<p>UBT4PR2 (Practicals of UBT4MEM and UBT4ENB)</p>	<ol style="list-style-type: none"> 1. Identification of <i>S.aureus</i>-Isolation, Catalase, Coagulase Test. 2. Identification of <i>E.coli</i>-Isolation, Sugar Fermentations, IMViC. 3. Identification of <i>Salmonella</i>- Isolation, Sugar Fermentations, TSI Slant. 4. Identification of <i>Shigella</i>- Isolation, Sugar Fermentations, TSI Slant. 5. Identification of <i>Proteus</i>- Isolation, Sugar Fermentations, IMViC. 6. Identification of <i>Pseudomonas</i> - Isolation, Urease test, Oxidase Test, TSI Slant. 7. RPR Test (Kit Based). 8. Permanent Slide- <i>Mycobacterium</i>. 9. Biological Oxygen Demand (BOD). 10. Chemical Oxygen Demand (COD). 11. Isolation of Bacteria from Air by Gravity Sedimentation Method. 12. Most Probable Number (MPN) - Presumptive, Confirmed and Completed tests. 13. Bioremediation of metal. 14. Visit to STP / CETP 	<p>2</p>
<p>UBT4PR3 (Practicals of UBT4 BBI and UBT4 MOD)</p>	<ol style="list-style-type: none"> 1. Familiarization with NCBI, EMBL, DDBJ, PIR, KEGG Databases. 2. Use of NCBI BLAST Tool. 3. Pairwise and Multiple Sequence Alignment and Phylogeny. 4. Classification of Proteins using CATH/SCOP. 5. Visualization PDB Molecules using Rasmol/Raswin. 6. Handling and Calibration of Micropipette. 7. Isolation, Quantitative Analysis and AGE of Genomic DNA from Bacteria and Yeast. 8. Isolation and Detection of RNA from Bacteria and Yeast. 9. Restriction Enzyme Digestion. 10. RFLP- Kit Based. 11. Primer Designing through Open Online Source NCBI- BLAST. 12. DNA Amplification - PCR. 13. Problems based on Correlation and Regression analysis 14. Problems based on Parametric and Non-parametric tests 	<p>2</p>

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Janardan Bhagat Shikshan Prasarak Sanstha's



**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

**Affiliated to University of Mumbai with an autonomous
Status**

**Revised Syllabus of
Program: T.Y. B.Sc. Biotechnology
(Semester V & VI)
Choice Based Credit & Grading System (60:40)**

(To be implemented from Academic Year 2021-2022)



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T.Y. B.Sc. Biotechnology Course Structure
(Semester V)

Course code	Title	Theory/ Practical	Marks	Credits	No. of Lectures & Practical
UBT5CBI	Cell biology	Theory	100	2.5	60
UBT5MMI	Medical Microbiology & Instrumentation	Theory	100	2.5	60
UBT5GMB	Genomes and Molecular Biology	Theory	100	2.5	60
UBT5MBI	Marine Biotechnology	Theory	100	2.5	60
UBT5PR1	Cell biology+ Medical Microbiology & Instrumentation	Practical	100	3.0	72
UBT5PR2	Genomes and Molecular Biology+ Marine Biotechnology	Practical	100	3.0	72
UBT5BIS	Applied Component: Biosafety	Theory	100	2.0	48
UBT5PR3	Applied Component: Biosafety	Practical	100	2.0	48
		TOTAL	800	20	480

(Semester VI)

Course code	Title	Theory/ Practical	Marks	Credits	No. of Lectures & Practical
UBT6BIC	Biochemistry	Theory	100	2.5	60
UBT6IMI	Industrial Microbiology	Theory	100	2.5	60
UBT6PNE	Pharmacology and Neurochemistry	Theory	100	2.5	60
UBT6ENB	Environmental Biotechnology	Theory	100	2.5	60
UBT6PR1	Biochemistry + Industrial Microbiology	Practical	100	3.0	72
UBT6PR2	Pharmacology - Neurochemistry and Environmental Biotechnology (50M)+ Project work (50M)	Practical	100	3.0	72
UBT6ABT	Applied Component: Agribiotechnology	Theory	100	2.0	48
UBT6PR3	Applied Component: Agribiotechnology	Practical	100	2.0	48
		TOTAL	800	20	480



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Preamble:

Biotechnology is one of the youngest branches of Life Science, which has expanded and established as an advanced interdisciplinary applied science in the last few years. Biotechnology at the core envisages the comprehensive study of Life and the Interdisciplinary potential of Biotechnology has led to a unique status for Biotechnology in Research and Industry.

Biotechnology has its applications in almost every field touching practically every human activity. The applied aspect of Biotechnology is now getting established with its applications in Industry, Agriculture, Health and Environment, Biotechnology is the leading science expanding exponentially.

Biotechnology demands a trained, skilled human resource to establish the Industry and Research sectors. The field is novel and still expanding which demands inputs in Infrastructure and Technology. The need of the hour is to design appropriate syllabi which keeps pace with changing times and technology with emphasis on applications while elucidating technology in depth. The syllabi till today had been sufficient to cater to the needs of students for building up their careers in industry and research. However, with the changing scenario at local and global level, we feel that the syllabus orientation should be altered to keep pace with developments in the education and industrial sector. Theory supplemented with extensive practical skill sets will help a graduate student to avail the opportunities in the applied fields (research, industry or institutions), without any additional training. Thus, the college itself will be developing trained and skilled man-power.

Biotechnology being an interdisciplinary subject, this restructured syllabus will combine the principles of physical, chemical, and biological sciences along with developing advanced technology. Biotechnology curricula are operated at two levels viz. undergraduate and postgraduate. The undergraduate curricula are prepared to impart primarily basic knowledge of the respective subject from all possible angles while postgraduate syllabus emphasizes on more applied courses. In addition, students are to be trained to apply this knowledge particularly in day-to-day applications of biotechnology and to get a glimpse of research.

The current syllabus includes all basic concepts of biological sciences. Students will also be introduced with emerging fields in Biotechnology like Marine biotechnology, Environmental biotechnology, Pharmacology, Agribiotechnology etc. Project component has been introduced in the curriculum to provide good quality self-learning. It is hoped that the revised syllabus shall serve its objective of promoting outcome-based learning to meet the changing needs of the biotechnology sector.



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Teaching pattern: One (01) Credit would be of thirty- forty (30-40) learning hours; of this more than fifty percent of the time will be spent on classroom instructions including practical as prescribed by the University. Rest of the time spent invested for assignments, projects, journal writing, case studies, library work, industrial visits, attending seminars/workshops, preparations for examinations etc. would be considered as notional hours. The present syllabus considers (60L as classroom teaching and 15 lectures as Notional hours/ paper). Each lecture duration would be for 48 min. The names of the reference books provided in the syllabus are for guidance purposes only. Students and faculty are encouraged to explore additional reference books, online lectures, videos, science journals for latest/ additional information.

Examination pattern: The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component.

Theory:

The question paper for the Term End Exam would be of 60 marks consisting of 4 Questions (15M each), of which one question from each unit in the syllabus. Questions may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

The question paper would be set for 120 marks including internal options.

Practical:

- Would be conducted over a period of 3 days; 50M each paper.
- Each student to perform 2 major and 2 minor practical for Semester V and 2 major and project presentation for Semester VI
- Viva would be conducted during the practical during Semester V; Semester VI would have ONLY project presentation
- Distribution of marks for the experiments carried out during the examination:
- Semester V (50M/ paper): Major: 20M; Minor: 10M; Viva: 10M; Journal 10M.
- Semester VI (50M/paper): Major (x2): 40M; Journal: 10M; Project 50M
- The report could be around 25-30 pages with appropriate referencing and formatting. Marks distribution for the project would be as follows: 25M documentation, 15M presentation, 10 M viva and interactions;
- Students would undertake a project for 1-2 months during the last semester for 50 M. The project should include either of the following:
One/ more major instrumentation OR
One / more major technique/s required in the field of interest OR
Bioinformatics OR Biostatistics.



Programme Specific Outcomes
B.Sc. Biotechnology degree programme

- PS01 Students will learn the basic concepts of Chemistry and analytical chemistry applied in Biological Sciences.
- PS02 An education in Cell biology, Biochemistry, Animal and plant physiology, human genetics and Immunology will impart knowledge to the students about cellular structure, biomolecules, metabolic pathways, its regulation along with defense mechanisms and physiological processes in plants and animals.
- PS03 Students will also learn the concepts of biodiversity, ecology, environment and its conservation.
- PS04 Students will gain basic information of microbial cultures, sterilization methods and enzyme production. They will be taught biosafety guidelines and good laboratory practices.
- PS05 Introduction of recent topics like Drug delivery, Marine biotechnology, Bioinformatics will impart knowledge of mechanism of drug delivery, drug designing and applications of marine organisms as food, nutraceutical and cosmetics etc.
- PS06 Students will understand the principles and the applications of molecular biology and genetic engineering methods with an emphasis on the application of recombinant DNA technology to animals, plants and microbial organisms.
- PS07 The course will give the knowledge of Bioethics, IPR, entrepreneurship, scientific writing, Communication, and management skills to the students.
- PS08 Students will get hands-on training of techniques used in Cell Biology, Biochemistry, Microbiology, Immunology, Molecular Biology and Genetic Engineering.



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SEMESTER V		
Course Code	Title	Credits
UBT5CBI	Paper-I (Cell Biology)	2.5
Course Objectives	<p>CO1-Students will get knowledge of different types of extracellular signals and receptors, and explain their functional significance.</p> <p>CO2-Students will get knowledge of developmental biology which includes stages, mechanisms and patterns of embryonic development.</p> <p>CO3-Students will get knowledge of plant developmental biology and stem cell biology.</p> <p>CO4-The students will be able to learn how genetics contributes to predisposition and progression of cancer. It will help the students to understand how immunotherapy is, and can be, used to treat human illness.</p>	
Learning Outcomes	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Understand the molecules involved in cell signaling. • Gain an understanding of the basic concepts of events during embryonic development and stem cell biology. • Gain insight into the biology of cancer cells. 	
UNIT	Topics	Lectures
Unit-I Cell Signalling	<p>Cell signaling and signal transduction: Introduction General Principles of Cell Signalling.</p> <p>Signaling via G-Protein-linked Cell-Surface Receptors Signaling via Enzyme-linked Cell-Surface Receptors Target-Cell Adaptation.</p> <p>The Logic of Intracellular -Signaling: Lessons from Computer-based "Neural Networks.</p>	15
Unit-II Developmental Biology	<p>Overview of how the modern era of developmental biology emerged through multidisciplinary approaches.</p> <p>Stages of development- zygote, blastula, gastrula, neurula cell fate & commitment – potency- concept of embryonic stem cells, differential gene expression, terminal differentiation, lineages of three germ layers, fate map.</p> <p>Mechanisms of differentiation- cytoplasmic determinants, embryonic induction, concept of morphogen, mosaic and regulative development Pattern formation- axis specification, positional identification (regional specification), Morphogenetic movements.</p> <p>Model organisms in Developmental biology: Hydra, Zebra fish, <i>C. elegans</i> etc.</p>	15



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Unit-III Plant Developmental Biology & Stem cell Biology	<p>Overview of Plant Development: Embryogenesis and early pattern formation in plants; Plant Meristem Organization and Differentiation- Organization of Shoot Apical Meristem (SAM); Organization of Root Apical Meristem (RAM); Phloem differentiation.</p> <p>Model organisms and experimental tools in cell and developmental plant biology: <i>Arabidopsis thaliana</i>.</p> <p>Definition, classification and source of stem cells; Stem cells and therapeutic cloning.</p>	15
Unit-IV Cancer Biology	<p>Cancer: Introduction, Characteristics of normal cell and cancerous cell, Tumor- Benign and malignant.</p> <p>Types of cancer</p> <p>Cancer as a Micro-evolutionary Process - invasion metastasis, angiogenesis.</p> <p>Oncogenes and tumor suppressor genes; The Molecular Genetics of Cancer.</p> <p>Cancer and Virus, Cancer diagnosis and treatment, Preventive measures for cancer.</p>	15
References		
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SEMESTER V		
Course Code	Title	Credits
UBT5MMI	Paper-II (Medical Microbiology & Instrumentation)	2.5
Course Objectives	<p>CO1- The students will get knowledge of viral replication strategies; and compare and contrast replication mechanisms used by viruses relevant for human disease.</p> <p>CO2- Students will learn the mechanism of action of chemotherapeutic drugs and resistance.</p> <p>CO3- Students will learn basic principles and applications of spectroscopy.</p> <p>CO4- Students will learn about new emerging diseases and new vaccine strategies.</p>	
Learning Outcomes	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> ● Identify various common and new emerging diseases of human, different diagnostic techniques and various methods involved in infection control. ● Compare different separation techniques & use them in research work. 	
UNIT	Topics	Lectures
Unit-I Virology	<p>Introduction to viruses-Position in biological spectrum; Virus properties.</p> <p>General structure of viruses, Baltimore Classification and Taxonomy(ICTV);</p> <p>Cultivation of viruses, Reproduction of ds DNA phages: One step growth experiment, Temperate phages and lysogeny - lambda phage, Regulation of phage gene expression.</p> <p>Hepatitis /ssRNA (influenza), animal viruses and plant (TMV)virus;</p> <p>Virus purification and assays; Cytocidal infections and cell damage ,Viroids and Prions;</p>	15
Unit-II Chemotherapeutic drugs	<p>Discovery and Design of antimicrobial agents,</p> <p>Classification of Antibacterial agents, Selective toxicity, MIC, MLC;</p> <p>Mode of action for:</p> <ul style="list-style-type: none"> ● Beta lactam antibiotics: Penicillin, Cephalosporins ● Glycopeptides: Vancomycin ● Polypeptides: Bacitracin ● Injury to Plasma membrane: Polymyxin ● Inhibition of protein synthesis Aminoglycosides, Tetracycline, Chloramphenicol, Macrolides and Erythromycin 	15



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	<ul style="list-style-type: none"> • Inhibition of Nucleic acid synthesis: Quinolones, Rifampicin, Metronidazole • Antimetabolites: Sulphonamides, Trimethoprim, 2-deoxy D Glucose. • Antifungal drugs, Antiviral drugs Amantadine, Acyclovir, Remdesivir. <p>Drug Resistance: Mechanism, Origin and transmission of drug resistance; Use and misuse of antimicrobial agents.</p>	
Unit-III Common and New Emerging diseases	<p>Introduction to new emerging diseases and causative agents like MERS, SARS, Swine flu, COVID-19, Nipah virus, Ebola virus.</p> <p>Diagnosis, Treatment and preventive measures for MERS, SARS, COVID-19, Nipah virus, Ebola virus.</p> <p>Malaria and Dengue Virus.</p> <p>Vaccines: Subunit Vaccines -HSV, Peptide Vaccines, Attenuated Vaccines-Cholera, Vector Vaccines-Vaccinia virus, Genetic Immunization.</p>	15
Unit-IV Bio analytical techniques	<p>Basic Principles of spectroscopy: Principle, instrumentation and applications of IR, NMR, atomic absorption and Mass spectroscopy, fluorimetry, ORD and CD.</p> <p>Isotopes in Biology: Detection Techniques of Radioactivity: GM counter, Scintillation counter, Autoradiography, Applications of Tracer techniques in Biology.</p>	15
References		
<ol style="list-style-type: none"> 1. Principles and techniques in biochemistry and molecular biology (2010), Keith Wilson and John Walker, 7th edition, Cambridge University Press. 2. Biophysics (2002) Vasantha Pattabhi and N. Gautham, Kluwer Academic Publishers. 3. Physical Biochemistry: principles and applications, 2nd edition (2009), David Sheehan, John Wiley & Sons Ltd. 4. Mim's Medical Microbiology 5th edition. 5. Microbiology by Prescott Harley and Klein 5th edition Mc Graw Hill. 6. Medical Microbiology Jawetz, E., Brooks, G.E, Melnick, J.L., Butel, J.S Adelberg E. A 18th edition. Medical Microbiology by Patrick Murray 5th edition. 7. Foundations in Microbiology by Talaro and Talaro Third edition W.C Brown 8. Understanding Viruses by Teri Shors. 		



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SEMESTER V		
Course Code	Title	Credits
UBT5GMB	Paper-III (Genomes and Molecular Biology)	2.5
Course Outcomes	<p>CO1- Students will learn different techniques of gene transfer in plants to develop transgenic plants.</p> <p>CO2- Students will learn different techniques of gene transfer in animals to develop transgenic Animals.</p> <p>CO3- Students will be able to Understand the range of molecular laboratory techniques used routinely in human forensic analysis and population genetic analysis including sex typing, DNA profiling, Single Nucleotide Polymorphism (SNP) detection and DNA sequencing.</p> <p>CO4- The students will have knowledge of tools like gene sequencing and editing.</p>	
Learning Outcomes	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Understand the basis of gene cloning and development of transgenic animals and plants • Gain knowledge regarding recent developments in genome sequencing and editing. 	
UNIT	Topics	Lectures
Unit-I Genetic Engineering of Plants	<p>Gene transfer methods in plants: Plant transformation with the Ti plasmid of <i>A. tumefaciens</i>, Ti plasmid derived vector system.</p> <p>Physical and Chemical methods of transferring genes to plants: electroporation, micro-projectile bombardment, liposome mediated, protoplast fusion, PEG and calcium phosphate mediated gene transfer.</p> <p>Viral Vectors for plant cells transformation brief introduction.</p> <p>GM Crops: GM Papaya, BT Cotton, BT Brinjal, Golden Rice, Improvement of seed quality proteins. Pros. and Cons. of GM crops.</p>	15
Unit-II Genetic Engineering of Animals	<p>Gene transfer methods in Animals: Transgenic mice-methodology-retroviral method, DNA microinjection, ES method, genetic manipulation with cre-loxP. Brief introduction of vectors for animal cells.</p> <p>Transgenic animal recombination system.</p> <p>Cloning live stock by nuclear transfer.</p> <p>Applications of Transgenic animals: Animal models, use of transgenic animals in therapeutic, agriculture and food.</p>	15



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Unit-III Tools in Molecular Biology	<p>Construction of genomic DNA libraries, cDNA libraries and chromosomal libraries.</p> <p>Recombinant selection and screening methods: genetic, immunochemical, Southern and Western analysis, nucleic acid hybridization, HART, HRT.</p> <p>Expression of cloned DNA molecules and maximization of expression.</p> <p>Locating genes on chromosomes: Chromosome walking and jumping.</p> <p>Maxam-Gilbert's method, Sanger's dideoxy method, Automated DNA sequencing, Pyro-sequencing.</p>	15
Unit-IV Prokaryotic gene regulation and Gene editing	<p>Prokaryotic gene regulation: Lactose and Tryptophan operons- Gene organization and regulation.</p> <p>Human genome mapping and its implications in health and disease; RNAi, ZNF(Zinc finger nucleases), TALENS (Transcription Activator Like Effector Nucleases), CRISPER/Cas system(Clustered Regularly Interspersed Repeats)</p>	15
References		
<ol style="list-style-type: none">1. iGenetics A Molecular Approach 3rd Edition Peter J. Russell.2. Molecular Biotechnology-Principles and Applications of Recombinant DNA Technology 4th Edition Glick B.R., Pasternak J.J., Patten C.L.3. Principles of Gene Manipulation 7th Edition Primrose S.B., Twyman R.M.4. Biotechnology 3rd Edition S.S. Purohit.5. Genomes 3rd Edition T.A. Brown.6. Biotechnology B.D. Singh.7. Gene Cloning and DNA Analysis 6th Edition T.A. Brown.8. Genomics Cantor C.R., and Smith C.L. John Wiley & Sons. (1999)		



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SEMESTER V		
Course Code	Title	Credits
UBT5MBI	Paper-IV (Marine Biotechnology)	2.5
Course Objectives	<p>CO1 Students will learn methodological approaches that are currently being used for microbial bio-prospecting, with emphasis in the marine environment.</p> <p>CO2 Students will get knowledge of various functional food ingredients and nutraceuticals obtained from marine sources.</p> <p>CO3 Students will get knowledge of different applications of marine biotechnology.</p> <p>CO4 Students will learn basic technical aspects of marine food technology.</p> <p>CO5 Students will get knowledge of aqua farming and their and techniques like aquaponics and fish feed technology.</p>	
Learning Outcomes	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> ● Learn methodological approaches used for microbial prospecting. ● Understand marine organism and their application ● Marine food products preparation and preservation methods ● Learn importance of aquaculture technique, fish feed technology. 	
UNIT	Topics	Lectures
Unit-I Introduction to Marine Biotechnology	<p>Seawater composition and its properties.</p> <p>Classification of the marine environment. Characteristics of marine microorganisms.</p> <p>Specialized microorganisms: Extremophiles: barophiles, thermophiles, psychrophiles, halophiles actinomycetes, polyextremophiles and anaerobes. Marine viruses and Giruses, Giant bacteria, Marine algae and plants (seaweeds, sea grasses, mangrove plants).</p> <p>Microbial Bioprospecting in Marine Environments.</p> <p>Ocean acidification and its significance, Red tides.</p>	15
Unit-II Applications of Marine Biotechnology	<ul style="list-style-type: none"> ● Marine Bioactive as Potential Nutraceuticals and functional food and Cosmetics. ● Seaweeds for removal of metal pollutants. ● GFP, RFP characteristics and their applications ● Green mussel adhesive protein ● Biomimetics ● Algal biofuels ● Marine Extremozymes and their Significance. 	15



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Unit-III Marine Food Technology	<p>Preservation and processing of marine food: Chilling method, Drying, salt curing, pickling and smoking; Freezing and cold storage, Thawing, Canning; Role of preservatives in processing.</p> <p>Packaging - fresh fish, frozen fish, individually quick frozen (IQF) products.</p> <p>Fishery by-products-Fish Meal, Fish Oils, Fish Silage, Fish gelatin, Fish calcium, Chitin & Chitosan, Hydroxyapatite.</p> <p>Indicators for freshness determination of fish.</p> <p>Food Safety & Standards Authority of India (FSSAI): Ensuring food quality.</p>	15
Unit-IV Aquaculture Technology	<p>Importance of coastal aquaculture; Aqua farms: Design and construction; Criteria for selecting cultivable species; Culture systems and management practices, Seed production in controlled condition.</p> <p>Fish Feed Technology: Types of feed, conventional feed vs functional feeds; Principles of feed formulation and manufacturing, Culture of Live food organisms.</p> <p>Bio-floc technology; Aquaponics; Zero water exchange aquaculture system; Aqua mimicry; Hydroponics; Raceway system of aquaculture.</p> <p>Micro-algae-indoor and mass-culture methods, Biotechnological approaches for production of important microalgae and other commercial important products.</p>	15
References		
<ol style="list-style-type: none"> 1. Handbook of Fish and Marine Product Processing. 2. Se-kwon Kim, S.K. Springer Handbook of Marine Biotechnology; Springer: Berlin, Germany; Heidelberg, Germany, 2015. 3. Nollet, Leo M. L- Marine microorganisms- extraction and analysis of bioactive compounds-CRC Press_Taylor& Francis (2017) 4. R. S. K. Barnes, R. N. Hughes(auth.)-An Introduction to Marine Ecology, Third Edition-Wiley-Blackwell (1999) 5. Fabio Rindi, Anna Soler-Vila, Michael D. Guiry (auth.), Maria Hayes (eds.)-Marine Bioactive Compounds_ Sources, Characterization and Applications-Springer US (2012) 6. Reference for marine food technology https://mail.google.com/mail/u/0/?tab=rm&ogbl#inbox/FMfcgzGkXctXBqxHDBtSqmdmrVzSznfn?projector=1&messagePartId=0.1 7. Trends in Fish Processing Technology ; Edited by Daniela Borda, Anca I. Nicolau, Peter Raspor : CRC Press Taylor and Farancis Group 8. Fish Processing Technology Second edition Edited by G.M.HALL Lecturer Food Engineering and Biotechnology Group Loughborough University. 		



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SEMESTER V		
Course Code	Title	Credits
UBT5BIS	Paper-V (Applied Component: Biosafety)	2.0
Course Objectives	<p>C01-Students will be acquainted with the biosafety regulation in Biotechnology.</p> <p>C02-Students will be familiar with Biosafety Guidelines</p> <p>C03-Learners will understand how to detect potential contamination risks for products.</p> <p>C04-Students will be able to develop the concepts of biosafety in Biotechnology.</p>	
Learning Outcomes	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Gain an overview regarding Biosafety guidelines, various levels,role of Institutional committee. • Understand regarding Microbiological testing in pharmaceuticals & common microbial contaminants. • Gain knowledge about the regulation in r-DNA technology along with understanding of bioethics. 	
UNIT	Topics	Lectures
Unit-I Introduction to Biosafety	<p>Introduction, Biological Risk Assessment, Hazardous Characteristics of an Agent</p> <p>Genetically modified agent hazards; Cell cultures</p> <p>Hazardous Characteristics of Laboratory Procedures</p> <p>Potential Hazards Associated with Work Practices</p> <p>Safety Equipment and Facility Safeguards</p> <p>Pathogenic risk and management</p>	12
Unit-II Biosafety Guidelines and Regulation	<p>Biosafety guidelines integrated with Government of India;</p> <p>Definition of GMOs & LMOs;</p> <p>Regulations and Guidelines on Biosafety: Scope of Regulation, Competent Authorities,</p> <p>Roles of Institutional Biosafety Committee, RDAC, IBSC, RCGM, GEAC, SBCC, DLC etc. for GMO applications in food and agriculture;</p> <p>Environmental release of GMOs; Risk Analysis, Risk Assessment and Risk management.</p>	12
Unit-III Detection and testing of contaminants	<p>Microbial Contamination in food and pharma product;</p> <p>Some common microbial contaminants;</p> <p>Microbiological Assays for pharmaceutical products;</p> <p>Regulatory Microbiological testing in pharmaceuticals.</p>	12



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Unit-IV Biosafety in Biotechnology	<p>Concepts on biosafety in Biotechnology,</p> <p>Regulating rDNA technology, Regulating food and food ingredients, Genetically engineered crops,</p> <p>Livestock Bioethics; Contemporary issues in Bioethics.</p> <p>Alteration of the Nutritional Content of Food,</p> <p>Controversy about the Labeling of Genetically Modified Foods.</p> <p>Concerns about the Impact of Genetically Modified Organisms on the Environment.</p>	12
References		
<ol style="list-style-type: none">1. Pharmaceutical Microbiology - Hugo, W.B, Russell, A.D 6th edition Oxford Black Scientific Publishers.2. Biosafety in Microbiological and Biomedical Laboratories - 5th Edition, L. Casey Chosewood Deborah E. Wilson U.S. Department of Health and Human Services Centers for Disease Control and Prevention National Institutes of Health.3. Molecular Biotechnology –Principles and Applications of Recombinant DNA Glick, B.R, Pasternak, J,J Patten, C.L 4th edition ASM press4. Joshi, R.; Biosafety and Bioethics (Ed.) (2006), Isha Books, Delhi.5. Department of Biotechnology, Ministry of Science and Technology, Government of India; Revised guidelines for safety in biotechnology. Available from: http://dbtbiosafety.nic.in/guideline/pdf/guidelines94.pdf.		



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SEMESTER V		
Course Code	Title	Credits
UBT5PR1	Practicals of Cell biology+ Medical Microbiology & Instrumentation	3.0
<ol style="list-style-type: none">1. Demonstration: Principle, working and applications of FTIR.2. MIC and MLC of any one antibiotic3. Antibiotic sensitivity test using agar cup method4. Antibiotic sensitivity test using paper disc method5. Antibiotic sensitivity test using ditch method.6. Synergistic Action of two drugs7. Cancer Biology: (Field visit and 2 page report in the journal)8. Chick embryo candling and inoculation methods Demonstration experiment9. Isolation of coliphages from Sewage and Determining Bacteriophage Titers (demonstration)10. Preparation of TAB vaccine.11. To check COVID antigen by kit method(demonstration/Video)12. Study through permanent slides and photographs. Meristems, structure of anther, (Female gametophyte: Polygonum (monosporic) type of Embryo sac Development.13. Dissection of embryo/endosperm from developing seeds.		



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SEMESTER V		
Course Code	Title	Credits
UBT5PR2	Practicals of Genomes and Molecular Biology + Marine Biotechnology	3.0
<ol style="list-style-type: none"> 1. Transformation in <i>E.coli</i>. 2. Conjugation 3. Replica plate 4. Genomic DNA Extraction: Animal cells. 5. Phage titration: Demonstration 6. Gradient plate technique 7. Bacterial gene expression (Kit may be used). 8. Formulation of Fish Feed using Ingredients from Plant Sources and their standardization. 9. DPPH assay for antioxidant extracted from marine algae 10. Extraction of carotenoids from marine algae/Bacteria/Fungi. 11. Extraction and estimation of Gelatin from marine source. 12. Extraction of Collagen from marine source. 13. Extraction of alkaloids from marine organisms and their separation by TLC. 14. Preparation of fish silage. 		

SEMESTER V		
Course Code	Title	Credits
UBT5PR3	Practicals of Applied Component: Biosafety	2.0
<ol style="list-style-type: none"> 1. Validation of autoclave 2. Vitamin B12 bioassay 3. To check sterility of injectable. 4. Testing for adulterants in food. 5. Operation and safety precautions: Fire, handling of chemicals etc. 6. Sterile testing methods for pharmaceutical products. 7. Isolation of pathogenic bacteria from fomites on operating room of pharmaceutical industry/ Packaging material of pharmaceutical product etc. 8. A case study on clinical trials of drugs in India with emphasis on ethical issues. 9. Case study on medical errors and negligence. 10. Case study on handling and disposal of laboratory waste. 11. Effects of storage and processing on the nutritive value of certain foods. 		



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SEMESTER-VI



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SEMESTER VI		
Course Code	Title	Credits
UBT6BIC	Paper-I (Biochemistry)	2.5
Course Objectives	<p>CO1- Students will learn the levels of protein structure and protein-ligand interactions</p> <p>CO2- Analyze the metabolism of carbohydrates and fates of various intermediate and end product.</p> <p>CO3- Students will get knowledge of different protein purification techniques.</p> <p>CO4- Students will learn about different hormones and their biochemical functions with associated disorders.</p> <p>CO5- Students will get knowledge of protein denaturation and folding.</p>	
Learning Outcomes	<p>Learning outcomes: By the end of the VI course the student will be able to:</p> <ul style="list-style-type: none"> • Understand the quaternary protein ligand interactions, protein folding and degradation. • Understand the biosynthetic pathways and regulation of biomolecules like carbohydrates and lipids. • Learn the various functioning of endocrine gland secretions with their associated disorders. 	
UNIT	Topics	Lectures
Unit-I Protein Biochemistry	<p>Quaternary structure of proteins with special reference to Hemoglobin, cooperative oxygen binding and Concerted and sequential models for allosteric proteins.</p> <p>Protein denaturation, Folding and role of Molecular Chaperons, Protein degradation basic concept.</p> <p>Protein Purification techniques: Principle and applications of Dialysis, salting and salting-out, gel filtration, ion exchange, FPLC, affinity and hydrophobic interaction chromatography.</p>	15
Unit-II Metabolism	<p>Carbohydrate biosynthesis and its regulation: Peptidoglycan in Bacteria; Starch and sucrose in Plants, Glycogen in Animals, inborn errors of glycogen metabolism.</p> <p>Biosynthesis and regulation of Cholesterol, Atherosclerosis.</p>	15
Unit-III Endocrinology-I	<p>Classification of hormones: Mechanism of action of group I and II hormones.</p> <p>Hormones of Hypothalamus and pituitary gland</p> <p>Anterior Pituitary Hormones: GH</p> <p>Posterior Pituitary Hormones: Oxytocin and Vasopressin</p>	15



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	<p>Thyroid hormones: Biosynthesis, Biochemical and physiological functions, disorders and thyroid function tests.</p> <p>Hormones that regulate Calcium metabolism: PTH and Calcitriol.</p> <p>Chemistry, Biochemical and physiological functions of androgens, estrogens and progesterone. Hormonal regulation of menstrual cycle, Hormonal contraception. Placental hormones.</p>	
Unit-IV Endocrinology-II	<p>Hormones of Adrenal Cortex: Glucocorticoids and Mineralocorticosteroids- Biochemical and physiological functions and disorders.</p> <p>Hormones of Adrenal Medulla: Synthesis, Biochemical and physiological functions and disorders of Catecholamines.</p> <p>Hormones of pancreas: structure, biochemical and physiological functions and disorders: Insulin and glucagon. Diabetes mellitus, hypoglycemia. Glucose tolerance test. Recombinant Insulin.</p>	15
References		
<ol style="list-style-type: none"> 1. Lehninger, principles of biochemistry, 7th edition (2005), David Nelson and Michael Cox W.H. Freeman and Company, New York. 2. Biochemistry, 4th edition (2010), Voet and Voet, John Wiley and sons, USA 3. Harper's Illustrated Biochemistry, 27th edition, RK Murray, DK Granner, PA Mayes and VW Rodwell, McGraw Hills publication. 4. Biochemistry, 4nd edition (2017), Satyanarayana and Chakrapani, Books & Allied (P) Ltd 5. Nutrition Science, 6th edition (2017), Srilakshmi, new age international publishers 		



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SEMESTER VI		
Course Code	Title	Credits
UBT6IMI	Paper-II (Industrial Microbiology)	2.5
Course Objectives	<p>CO1-Students will learn the production outline of various dairy products.</p> <p>CO2-Students will learn the different modes of fermentation and Down-stream Processing.</p> <p>CO3-Students will learn to develop strategy for fermentation process development</p> <p>CO4-Students will understand the Standard operating procedures, GMP and QA and QC.</p>	
Learning Outcomes	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Understand various fermentation processes. • Learn outline of Down-streaming processing and understand various methods applied in solvent recovery, cell disruption & separation. • Gain knowledge regarding requirements of QA-QC along with various documentation & Audit reports. 	
UNIT	Topics	Lectures
Unit-I Dairy Technology	<p>Milk: Normal flora, changes in raw milk, Enumeration</p> <p>Factors affecting bacteriological quality</p> <p>Dairy technology Preservation methods, Pasteurization</p> <p>Starter Cultures</p> <p>Fermented products-Production process and spoilage of Cheese, Swiss and Cheddar, Butter, Yogurt and Buttermilk.</p>	15
Unit-II Fermentation process	<p>Introduction to Inoculum development, Bacterial and fungal inoculum development with one example each</p> <p>Scale up, Scale down</p> <p>Production of: Streptomycin, Protease, Glutamic acid, Lysine, ethanol production Semi-synthetic Penicillin, Wine</p> <p>Mushroom cultivation</p> <p>Biotransformation</p>	15
Unit-III Down-stream Processing (DSP)	<p>Introduction of DSP</p> <p>Foam separation, Types of Precipitation, Filtration, Centrifugation, Chromatography in DSP</p> <p>Cell disruption- physical and chemical methods; Solvent recovery, Membrane processes, Drying, Crystallization.</p> <p>Whole broth processing</p>	15



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Unit-IV QA-QC	Concept of GMP Requirements of GMP implementation, Documentation of GMP practices, Regulatory certification of GMP. Quality Control (QC): Concept of QC, Requirements for implementing QC, QA concepts: Concept of QA, Requirements for implementing. Calibration records (QA-QC), Validation of methods; Documentation of results; Audits and Audit reports.	15
References		
<ol style="list-style-type: none">1. Applied Dairy Microbiology Elmer H Marth and James L Steele MerceL Dekker Inc New York, 2nd edition2. Fundamentals of Microbiology by Frobisher, 9th Ed3. Microbial Technology Peppler,H.J and Perlman,D 2nd Academic Press Practicals4. Industrial Microbiology Prescottt and Dunn CBS publishers5. Industrial microbiology by Casida6. Industrial Microbiology by A.H. Patel7. Dairy technology by Yadav and Grower8. Fermentation technology by Stanbury and Whitaker9. Pharmaceutical Microbiology by Hugo and Russel		



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SEMESTER VI		
Course Code	Title	Credits
UBT6PNE	Paper-III (Pharmacology and Neurochemistry)	2.5
Course Objectives	<p>CO1- Students will learn the mechanism of drug action and its dose-response relationship.</p> <p>CO2- Students will learn the mechanisms of drug delivery and action in the body.</p> <p>CO3- Students will get in depth knowledge on toxic substances and poisons ie. Toxicology.</p> <p>CO4- Students will understand the properties of cells that make up the nervous system including the propagation of electrical signals used for cellular communication.</p>	
Learning Outcomes	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Learn the basic concept of mechanism of drug action • Learn drugs and their poisonous effect if the administered for longer period of time • Understand the basic concept of poisons and their types. • Gain the knowledge of basic neurochemistry and action of specific drugs on the Central Nervous System. 	
UNIT	Topics	Lectures
Unit-I General principles of Pharmacology	<p>Mechanism of drug action; drug receptors and biological responses; second-messenger systems, the chemistry of drug-receptor binding; dose-response relationship; therapeutic index; ED, LD; Potency and Intrinsic Activity; Drug antagonism</p> <p>Definition: Drugs, Small molecules, Large Molecules/ Biologics and biosimilars with example.</p> <p>Similarities and Differences: Small molecules versus generics, Biologics versus Biosimilars.</p>	15
Unit-II Drug Absorption Distribution Metabolism and Excretion	<p>Absorption of drugs from the alimentary tract; factors affecting rate of gastrointestinal absorption; absorption of drugs from lungs; skin; absorption of drugs after parenteral administration factors influencing drug distribution; binding of drugs to plasma proteins; Physiological barriers to drug distribution.</p> <p>Drug Metabolism: sites of drug metabolism and phases of Metabolism.</p> <p>Drug Excretion: Renal and Non-renal Drug Elimination.</p>	15



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<p>Unit-III Basic Toxicology and Regulatory Toxicology</p>	<p>Background Definitions; Causation: degrees of certainty Classification; Causes Allergy in response to drugs Effects of prolonged administration: chronic organ toxicity; Adverse effects on reproduction.</p> <p>Poisons: Deliberate and accidental self-poisoning Principles of treatment Poison-specific measures General measures; Specific poisonings: cyanide, methanol, hydrocarbons, volatile solvents, heavy metals; herbicides and pesticides; biological substance (overdose of medicinal drugs is dealt with under individual agents);</p> <p>Incapacitating agents: drugs used for torture; Nonmedical use of drugs.</p>	<p>15</p>
<p>Unit-IV Neurochemistry</p>	<p>Anatomy and functioning of the brain; Neuronal pathways (Introduction);</p> <p>Propagation of nerve impulses; Neuronal excitation and inhibition; Synapses and gap junctions;</p> <p>Action of Neurotoxins and neurotransmitters.</p> <p>Drugs affecting the Central Nervous System:-Agents Affecting Neuromuscular transmission, Sedative-hypnotic and Anxiolytic drugs, drugs Used in Neurodegenerative Disorders, Antiepileptic Drugs.</p>	<p>15</p>
<p>References</p>		
<ol style="list-style-type: none"> 1. Modern Pharmacology with clinical Applications Craig,C.R, Stitzel,R.E 5th edition. 2. Casarett & Doull's Toxicology - The Basic Science of Poisons (6th Edition). 3. Clinical Pharmacology Bennet, PN, Brown,M.J, Sharma,P 11th edition. 4. Textbook of Medical Physiology Guyton, A.C and Hall 11th edition J.E Saunders 5. Biochemistry Metzler, D.E Elsevier 6. Gerard Marshall Raj Ramasamy Raveendran: Introduction to Basics of Pharmacology and Toxicology, Volume 1: General and Molecular Pharmacology: Principles of Drug Action springer. 		



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SEMESTER VI		
Course Code	Title	Credits
UBT6ENB	Paper-IV (Environmental Biotechnology)	2.5
Course Objectives	<p>CO1- Students will learn the concepts of solar energy, wind power, geothermal energy and hydropower, biomass energy, Biogas technology and Biofuels.</p> <p>CO2- Students will understand the techniques and strategies of Industrial effluent treatment.</p> <p>CO3- Students will understand the techniques of waste water management.</p> <p>CO4- Students will be Exposed to the processes which are currently associated and taking place in industry along with their consequences on generation of hazardous waste.</p>	
Learning Outcomes	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Understand aspects and utilization of renewable energy sources for both domestics and industrial application. • Understand the current applications of biotechnology to environmental quality evaluation, monitoring and remediation of contaminated environments. • Identify the most common techniques for preventing, minimizing, recycling, disposing and treatment of waste and their application on site remediation. 	
UNIT	Topics	Lectures
Unit-I Renewable Sources of Energy	<p>Energy sources renewable solar energy, wind power, geothermal energy and hydropower.</p> <p>Biogas technology- biogas plant & types, biodigester.</p> <p>Biogas- composition, production and factors affecting production, uses.</p> <p>Biomass energy, Biofuels – ethanol production, Microbial hydrogen production, Biodiesel, Petrocrops.</p>	15
Unit-II Industrial Effluent Treatment	<p>Biological processes for industrial effluent treatment, Aerobic biological treatment- activated sludge process, CASP, advanced activated sludge processes (any two) Biological filters, RBC, FBR Anaerobic biological treatment- contact digesters, packed bed reactors, anaerobic baffled digesters, UASB</p> <p>Solid waste treatment: Green Manure, Bio- compost making methods Types and methods of vermicomposting, field applications.</p> <p>Pollution indicators, Biosensors</p>	15



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	<p>Biodegradation of xenobiotics- persistent compounds, chemical properties influencing biodegradability, microorganisms in biodegradation.</p> <p>Use of immobilized enzymes or microbial cells for treatment.</p>	
Unit-III Wastewater Treatment	<p>Wastewater treatment Introduction, biological treatment, impact of pollutants on bio-treatment,</p> <p>Use of packaged organisms and genetically engineered organisms in waste treatment.</p> <p>Heavy metal pollution – sources, microbial systems for heavy metal accumulation, techniques used for heavy metal removal.</p> <p>Biosorption by bacteria, fungi and algae</p> <p>Factors affecting biosorption and Limitations of biosorption</p>	15
Unit-IV Hazardous Waste Management	<p>Biodegradation of waste from:</p> <ul style="list-style-type: none"> • Tanning industry • Petroleum industry • Paper & pulp industry • Dairy industry • Distillery • Dye industry • Antibiotic industry • Removal of oil spillage & grease deposits 	15
References		
<ol style="list-style-type: none"> 1. Environmental Biotechnology Alan Scragg Oxford University press 2. Environmental Biotechnology M.H. Fulekar Oxford & IBH Publishing Co. Pvt. Ltd. 3. Environmental Biotechnology (Basic concepts and applications) Indu Shekar Thakur IK International 4. Environmental Biotechnology (Industrial pollution management) S.N. Jogdand Himalaya Publishing House 		



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SEMESTER VI		
Course Code	Title	Credits
UBT6ABT	Paper-V (Applied Component: Agribiotechnology)	2.0
Course Objectives	<p>CO1-Students will be Exposed to technology and the techniques that can be used to improve the efficiency of agricultural operations like greenhouse technology.</p> <p>CO2-Students will develop knowledge crop improvement methods.</p> <p>CO3- They will gain the knowledge of different markers used in plant breeding techniques'</p> <p>CO4-Students will gain concept of bio-fertilizers, Symbiotic-Non symbiotic nitrogen fixation in leguminous plant, assimilation of phosphorus and biopesticides.</p>	
Learning Outcomes	<p>By the end of the course the student will be able to:</p> <ul style="list-style-type: none"> • Understand greenhouse technology and its uses. • Understand the methods of plant improvement and use of microbes as bio-fertilizers, PGRs and bio-pesticides. • They will also learn about genetic and molecular markers in plant breeding along with DNA barcoding. 	
UNIT	Topics	Lectures
Unit-I Precision Agriculture and Agriculture system	<p>Introduction to Agriculture and Agriculture systems- Greenhouse Technology-- Types of green house, importance, functions and features of green house, Design criteria and calculation.</p> <p>Construction material, covering material and its characteristics, growing media, green house irrigation system. Nutrient management.</p> <p>Greenhouse heating, cooling and shedding and ventilation system, Computer controlled environment. Phytotrons, fertigation and roof system.</p> <p>Precision Cultivation- tools, sensors for information acquisition.</p>	12
Unit-II Biotechnology for Crop Improvement	<p>Production of virus free plants- shoot meristem culture, micro propagation, production of Haploid plants, somatic hybridization and cybridization, synthetic seeds.</p> <p>Molecular Pharming, edible vaccines.</p> <p>Development of salt resistant, fungal resistant and herbicide resistant plants by genetic engineering.</p> <p>Hydroponics: an overview of techniques and media used.</p>	12



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Unit-III Molecular Markers in Plant Breeding	<p>Genetic markers in plant breeding-classical markers, DNA markers (RFLP, RAPD, AFLP, SSR, SNP)</p> <p>Application of Molecular Markers to Plant Breeding [quantitative trait locus (QTL) mapping]</p> <p>Plant DNA Barcoding- Barcoding Markers (matK, rbcL, ITS, tmH-psbA), steps, recent advances, Benefits, Limitations.</p>	12
Unit-IV Bio-fertilizers and Bio-pesticides	<p>Bio-fertilizer: Nitrogen-fixing Rhizobacteria - Symbiotic Nitrogen Fixers and Nonsymbiotic Nitrogen Fixers.</p> <p>Plant Growth Promoting Microorganisms-Phosphate-Solubilizing Microbes (PSM).</p> <p>Plant Growth Promotion by Fungi-- Mycorrhizae Arbuscular Mycorrhizae Ectomycorrhizae.</p> <p>Microbial Inoculants -- Inocula, Carriers, and Applications, Monoculture and Co-culture Inoculant Formulations Biocontrol, Polymicrobial Inoculant Formulations.</p> <p>Biopesticides – types, <i>Bacillus thuringiensis</i>, insect viruses and entomopathogenic fungi (characteristics, physiology, mechanism of action and application).</p>	12

References

1. M. Ajmal Ali, G. Gyulai, F. Al-Hemaid -Plant DNA Barcoding and Phylogenetics, LAP Lambert Academic Publishing (2015)
2. P. Parvatha Reddy (auth.)-Sustainable Crop Protection under Protected Cultivation Springer Singapore (2016)
3. S.B. Anderson (ed.), Plant Breeding from Laboratories to Fields, InTech,2013
4. Travis R. Glare, Maria E. Moran-Diez - Microbial-Based Biopesticides_ Methods and Protocols (2016, Humana Press)
5. Arie Altman, Paul Michael Hasegawa-Plant Biotechnology and Agriculture_ Prospects for the 21st Century-Academic Press (2011
6. Bhojwani, S.S. and Razdan 2004 Plant Tissue Culture and Practice.
7. Slater, A., Scott, N.W. & Fowler, M.R. 2008 Plant Biotechnology: The Genetic Manipulation of Plants, Oxford University Press.
8. Advanced Biotechnology by R C Dubey S Chand publication.



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SEMESTER VI		
Course Code	Title	Credits
UBT6PR1	Practicals of Biochemistry + Industrial Microbiology	3.0
<ol style="list-style-type: none"> 1. Protein separation by salting out. 2. Demonstration of dialysis 3. Separation of components from a mixture using Affinity chromatography (Kit may be used) 4. Separation of components from a mixture using Size exclusion chromatography 5. Estimation of Milk protein-Pynes method 6. Microbial analysis of Milk by MBRT and RRT 7. Phosphatase test in Milk 8. DMC of milk sample 9. Isolation of Normal flora from Milk and curd 10. Wine production and testing. 11. Determination of blood glucose levels for detection of diabetes mellitus. 12. Determination of serum cholesterol (total, HDL and LDL ratio) 13. Estimation of Glycogen 14. Identification questions based on hormones (Case study). 		

SEMESTER VI		
Course Code	Title	Credits
UBT6PR2	Practicals of Pharmacology - Neurochemistry and Environmental Biotechnology and Project Work	3.0
<ol style="list-style-type: none"> 1. LD 50, ED 50 evaluation using suitable models e.x <i>Daphnia</i>, <i>Chironomus</i> larvae. 2. Study the effect of heavy metals on the growth of bacteria. 3. Determination of Total Solids from an effluent sample. 4. Study of physico-chemical (pH, color, turbidity, BOD, COD) parameters of any one industrial effluent sample. 5. Estimation of chromium from Effluents (Demonstration) 6. Visit to ETP/ CETP/ Vermi-compost unit. 7. Short-term Project . 		



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	SEMESTER VI	
Course Code	Title	Credits
UBT6PR3	Practicals of Applied Component: Agribiotechnology	2.0
<ol style="list-style-type: none">1. RAPD analysis demonstration experiment.2. Isolation of Rhizobium.3. Isolation of Azotobacter.4. Isolation of Phosphate solubilising bacteria5. Rapid screening tests for abiotic stress tolerance (drought, - PEG, Mannitol & salinity NaCl).6. To estimate the Proline content in salt stressed plants.7. Preparation of synthetic seeds.8. Micropropagation of suitable plant species.9. Preparation of bio-fertilizer.10. To observe effect of bio-fertilizer on plant growth.11. Preparation of hydroponic solution and hydroponic culture.12. Visit to the greenhouse facility and submission of a field visit report.		



Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

Affiliated to University of Mumbai with an Autonomous Status

Program: M.Sc. Biotechnology

M.Sc. Part-I

(Semester I & II)

Choice Based Credit & Grading System (60:40)

Total Credits: 96

(To be implemented from Academic Year 2022-2023)

(Approved in the academic council meeting held on _____)

Preamble:

Master of Science (M.Sc.) Programme in Biotechnology is a P.G. Programme of Department of Biotechnology, Changu Kana Thakur Arts, Commerce & Science College, New Panvel, affiliated to University of Mumbai with an Autonomous status. Biotechnology is technology based on biology. Biotechnology harnesses cellular and bio-molecular processes to develop technologies and products that help to improve our lives and the health. Modern biotechnology provides breakthrough products and technologies to combat debilitating and rare diseases, reduce our environmental footprint, feed the hungry, cleaner energy, and have safer, cleaner, and more efficient industrial manufacturing processes.

The Choice Based Credit and Grading System (CBCGS) to be implemented through this curriculum would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. The proposed credit-based curriculum and grading system will even add much more to the existing interdisciplinary nature of biotechnology.

Under the 'autonomy' we have made an attempt to design Master's in Biotechnology course syllabus to cater to the needs of credit based- semester and grading system. The changing scenario of higher education in India and abroad is taken into consideration to make this syllabus more oriented towards current need of modern research and industrial sectors.

The present M.Sc. Biotechnology Second Year (Semester-I and II) syllabus is based on the remodeled M.Sc. Biotechnology Curriculum, May 2017, Department of Biotechnology, Ministry of Science and Technology, Government of India and revised syllabus of University of Mumbai. Syllabus is robust and well-designed to enable students to pursue high quality research or increase employability of the students.

It is hoped that the revised syllabus shall serve its objective of promoting outcome-based learning to meet the changing needs of the biotechnology sector.

Programme Outcomes for M.Sc. Degree

Sr. No.	OUTCOME FOR M.Sc. PROGRAMME	GRADUATE ATTRIBUTE
After completion of M.Sc. programme students will acquire		
PO-1	The ability to identify and describe broadly accepted methodologies of science, and different modes of reasoning.	Disciplinary knowledge
PO-2	An ability to demonstrate proficiency in various instrumentation, modern tools, and advanced techniques to meet industrial expectations and research outputs.	Disciplinary knowledge
PO-3	Ability to identify problems, formulate, and prove hypotheses by applying theoretical knowledge and skills relevant to the discipline.	Problem-solving
PO-4	The ability to articulate thoughts, research ideas, information, scientific outcomes in oral and in written presentation to range of audience.	Communication skills
PO-5	A capacity for independent, conceptual, and creative thinking, and critical analysis through the existing methods of enquiry.	Critical thinking
PO-6	Acquisition of skills required for cutting edge research, investigations, field study, documentation, networking, and ability to build logical arguments using scholarly evidence.	Research skills
PO-7	An ability to portray good interpersonal skills with the ability to work collaboratively as part of a team undertaking a range of different team roles	Teamwork
PO-8	The ability to understand ethical responsibilities and impact of scientific solutions in global, societal, and environmental context and contribute to sustainable development.	Moral and ethical awareness/ multicultural competence
PO-9	An openness to and interest in, life-long learning through directed and self-directed study.	self-directed learning
PO-10	The ability to translate the knowledge and demonstrate the skills required to be employed and successful professional development.	Life-long learning

Programme Specific Outcomes for
M.Sc. Biotechnology

Name of the Programme:	M.Sc. Biotechnology
Upon completion of M.Sc. Biotechnology programme students will be able to:	
PSO-1	Demonstrate comprehensive knowledge and interdisciplinary skills in the core and allied courses in biotechnology along with other emerging trends.
PSO-2	Apply modern Bio-analytical tools, techniques, software and equipment to analyze and solve problems in different areas of biotechnology.
PSO-3	Design research problems, test hypothesis, prepare scientific report and use biostatistical and bioinformatics tools for data interpretation and draw conclusions.
PSO-4	Apply entrepreneurial skills and appraise bioethics, biosafety, research ethics, and plagiarism and intellectual property rights.

M.Sc. Biotechnology Course Structure

Semester I

Course	Course Type	Course code	Marks	Credits	Nos of Lectures / week
1.1. Advanced Biological Chemistry	Core Course	PBT1ABC	100	4	4
1.2. Immunology	Core Course	PBT1IMM	100	4	4
1.3. Molecular Biology	Core Course	PBT1MOB	100	4	4
1.4. Emerging Techniques in Biological Sciences	Core Course	PBT1ETB	100	4	4
1.5. Practical-I Practical's of PBT1ABC & PBT1IMM	Core Course	PBT1PR1	100	4	8
1.6. Practical-II Practical's of PBT1MOB & PBT1ETB	Core Course	PBT1PR2	100	4	8
		Total	600	24	32

Semester II

Course	Course Type	Course code	Marks	Credits	Nos of Lectures / week
2.1. Metabolism	Core Course	PBT2MET	100	4	4
2.2. Cellular Processes and Developmental Biology	Core Course	PBT2CPD	100	4	4
2.3. Bioprocess Technology	Core Course	PBT2BPT	100	4	4
2.4. Research Methodology and Scientific Communication Skills	Core Course	PBT2RMS	100	4	4
2.5. Practical-I Practical's of PBT2MET & PBT2CPD	Core Course	PBT2PR1	100	4	8
2.6. Practical-II Practical's of PBT2BPT & PBT2RMS	Core Course	PBT2PR2	100	4	8
		Total	600	24	32

Examination Scheme

Choice Based Credit System (CBCS)

Revised Scheme of Examination

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part. The allocation of marks for the Internal Assessment and Semester End Examination are as shown below:

A) INTERNAL ASSESSMENT : 40%

40 Marks

Sr. No	Particular	Marks
1	One periodical class test/ online examination to be conducted in the given semester.	20 Marks
2	Any two tools out of these (10 Marks each)	20 Marks
	Group/Individual Project	
	Presentation and write-up on the selected topics of the subjects / Case studies	
	Test on Practical Skills	
	Open Book Test	
Quiz		

Question Paper Pattern

(Periodical Class Test for the courses at Post-Graduate Programmes)

Maximum Marks: 20

Duration 30 Minutes

Particular	Marks
Match the column / Fill in the Blanks / Multiple Choice Questions / True/False / Answer in One or Two Lines (Concept based Questions) (1 Mark each)	20 Marks

B) Semester End Examination :60%

60 Marks

Duration: The examination shall be of 2 ½ hours duration.

Question Paper Pattern

Theory Question Paper Pattern
<ol style="list-style-type: none">1. There shall be five questions each of 12 marks.2. All questions shall be compulsory with internal options.3. Questions may be subdivided into sub questions a, b, c..... and the allocation of marks depends on the weightage of the unit.

Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 out of 60) separately, to pass the course and minimum of Grade D, in each project wherever applicable to pass a particular semester.

Semester-I

M.Sc. Biotechnology

Semester -I

Paper-I Advanced Biological Chemistry (PBT1ABC)

Course Objectives:	<ul style="list-style-type: none"> To build upon the advanced concepts of protein structure and functions. To emphasize upon the role of enzymes and lipid aggregates. To introduce the students to recent trends in the bio-molecular structures and interactions. 		
Course Outcomes:	<p>After completing the course, Student will able to:</p> <ul style="list-style-type: none"> Discuss protein structure, folding pathways and diseases within the context. Understand the enzyme catalysis, kinetics and relevance of enzymes. Apply methodologies of Biomolecular interactions and DNA topology. Elaborate on significance of Membrane architecture and lipid aggregates. 		
Units	Topics	Credit	Lectures
Unit-I Protein Structure and Folding	<p>Primary structure of proteins and their determination – end group analysis; cleavage of disulfide bond; separation, characterization of polypeptide chain; specific peptide cleavage reactions.</p> <p>Secondary structure: Alpha-Helix, Beta sheets, Turns and loops. Super-secondary structures: Domains and motifs. Ramachandran plot.</p> <p>Tertiary structure- fibrous (Collagen) and globular (Myoglobin) structure, Protein stability.</p> <p>Quaternary structure: Subunit Interactions, Symmetry in Proteins and Determination of Subunit Composition (Hemoglobin).</p> <p>Protein folding: Denaturation, Anfinsen's classical experiment mechanisms and Pathways of Protein folding. Molecular chaperons, Protein misfolding and diseases.</p>	4	15

<p>Unit- II Enzymes and their Applications</p>	<p>General characteristics of enzymes.</p> <p>Enzyme catalysis – general principles of catalysis. Enzyme Activity, Various factors influencing enzyme activity and Enzyme inhibition.</p> <p>Enzyme kinetics: Significance; Rapid Equilibrium and Steady State approach, Michaelis-Menten's and Haldane equations, Significance of Km, Catalytic efficiency and turnover number and Kinetic perfection. Order of kinetics.</p> <p>Methods of plotting enzyme kinetics data: Lineweaver-Burk, Hanes-Woolf, Woolf, Augustinsson-Hofstee, Eadie-Scatchard; Direct linear plot; Advantages and disadvantages.</p> <p>Relevance of enzymes in metabolic regulation, activation, inhibition and covalent modification.</p> <p>Clinical Enzymology- Enzymes as therapeutic agents and diagnostic tools.</p>		<p>15</p>
<p>Unit- III Biochemistry of Nucleic acids</p>	<p>Different forms of DNA, Super-helix topology- linking number, Twist and writhing number, measurement of supercoiling and Topoisomerases.</p> <p>Genome organization - bacterial genome; Structure of eukaryotic chromosomes; Heterochromatin and Euchromatin; DNA re-association kinetics (Cot curve analysis); DNA melting and buoyant density; DNA methylation & Imprinting.</p> <p>Nucleic acid binding protein – Leucine Zipper, Zinc fingers OB fold, Beta Barrel, Helix-turn-helix, and Helix-loop-helix.</p> <p>DNA – protein interaction, Methodologies for detection: Protein – Protein and DNA – Protein interactions.</p>		<p>15</p>

<p>Unit- IV Membrane Architecture & Lipid Aggregates</p>	<p>Composition and Architecture of membrane: structural lipids in membranes, membrane bound proteins- structure, properties, and function.</p> <p>Membrane Dynamics: lipid movements, flippase, FRAP, Lipid raft, Membrane fusion.</p> <p>Solubilization of the membrane by using different detergents</p> <p>Lipid aggregates: micelles, bilayers and liposomes.</p>	<p>15</p>
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1.	Stryer, L. (2015). Biochemistry. (8th edition) New York: Freeman.
2.	Lehninger, A. L. (2017). Principles of Biochemistry (7th edition). New York, NY: Worth.
3.	Voet, D., & Voet, J. G. (2018). Biochemistry (5th edition). Hoboken, NJ: J. Wiley & Sons.
4.	Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2008).
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12.	Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001) Palmer Trevor, Publisher: Horwood Pub. Co., England.
13.	Metabolic Engineering: Principles and Methodologies. (1998). Gregory N Stephanopoulos, Aristos A Aristidou, Jens Nielsen. Publisher: Academic Press, San Diego, US.
14.	An Introduction to Practical Biochemistry. 3rd Edition, (2001), David Plummer, Tata McGraw Hill Edu. Pvt. Ltd. India.
15.	Biochemical Methods. 1st, (1995), S. Sadashivam, A. Manickam, New Age International Publishers, India.

M.Sc. Biotechnology
Semester -I
Paper-II Immunology (PBT1IMM)

Course Objectives:	<p>The objectives of this course are to learn about structural features of components of immune system as well as their function.</p> <p>The major emphasis of this course will be on development of immune system and mechanisms by which our body elicits immune response. This will be imperative for students as it will help them to predict about nature of immune response that develops against bacterial, viral or parasitic infection.</p>		
Course Outcomes:	<p>On completion of this course, students should be able to:</p> <ul style="list-style-type: none"> • Discuss structural features of components of immune system as well as their function. • Explain the concept of cytokines, hypersensitivity reactions and Autoimmunity. • Elaborate tumour immunology, immunodeficiency and Transplantation. • Evaluate useful animal models in Immunology. • Apply their knowledge and design immunological experiments to demonstrate and figure out kind of immune responses. 		
Units	Topics	Credit	Lectures
<p style="text-align: center;">Unit -I</p> <p>Overview of The Immune System</p>	<p>Overview of the Immune System</p> <p>Components of innate and acquired immunity; Phagocytosis; complement and inflammatory responses; pathogen recognition receptors (PRR) and pathogen associated molecular pattern (PAMP); innate immune response; mucosal immunity.</p> <p>Antigens: Immunogens, Hapten.</p> <p>Humoral Immunology</p> <p>Immunoglobulin: fine structure and superfamily</p> <p>Multigene organization of Ig gene, Variable region gene rearrangement and generation of antibody diversity, Class switching among the constant region</p> <p>Synthesis, assembly, and secretion of Immunoglobulins, B-cell development, activation, differentiation and memory.</p>	4	15

	<p>Cellular Immunology</p> <p>T-cell development (Early thymocyte development, Positive and negative selection, Apoptosis), T-cell development, activation, differentiation and memory (XA, JH).</p>		
<p>Unit -II</p> <p>Immune effector Mechanism</p>	<p>Cytokines: Properties, receptor, cytokine related diseases and cytokine based therapies.</p> <p>Hypersensitivity Reactions: Type I -IV.</p> <p>Autoimmunity: types of autoimmune diseases; mechanism for Induction of Autoimmunity; treatment of autoimmune diseases.</p>		15
<p>Unit -III</p> <p>Clinical Immunology</p>	<p>Immunodeficiency: Primary immunodeficiency, acquired or secondary immunodeficiency.</p> <p>Tumor immunology: tumor antigens; immune response to tumors and tumor evasion of the immune system, cancer immunotherapy.</p> <p>Transplantation: immunological basis of graft rejection; clinical transplantation and: clinical transplantation and immunosuppressive therapy</p>		15
<p>Unit- IV</p> <p>Immunodiagnosics and Animal Models</p>	<p>Immunodiagnosics: Haem-agglutination and Blood typing; Phage Display libraries; Microscopy and Imaging; TUNEL Assay; Assay for cytotoxic T Cell.</p> <p>Detection of Immunity in Vivo: Tuberculin Test, Testing of allergic responses, Arthur Reaction and adaptive transfer of Lymphocyte and Haemotopoietic Stem Cell.</p> <p>Animal models: Inbred-strain, Adoptive transfer technique, Congenic-strain, Transgenic animals, and their use in immunological studies, Knockout Mice.</p>		15

References:

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2.	Brostoff, J., Seaddin, J. K., Male, D., & Roitt, I. M. (2002). Clinical Immunology. London: Gower Medical Pub.
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4.	Elgert, Klaus D.: Immunology: Understanding the immune system. (2nd edition) Hoboken. John Wiley & Sons, Inc., 2009. 978-0-470-08157-0--(616.079Elg).
5.	Paul, W. E. (2012). Fundamental Immunology. New York: Raven Press.
6.	Goding, J. W. (1996). Monoclonal Antibodies: Principles and Practice: Production and Application of Monoclonal Antibodies in Cell Biology, Biochemistry, and Immunology. London: Academic Press.
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8.	Praful Godkar: Textbook of Medical Biochemistry, Bahalani Publishers
9.	Medical Microbiology by Anantnarayan.
10.	Ian R Tizard: Immunology, An introduction, fourth edition, Thomson.
11.	Abbas, A.K., Lichtman, A.H. and Pillai, S. (2007) Cellular and Molecular Immunology. Saunders Elsevier, USA.

M.Sc. Biotechnology
Semester -I
Paper-III Molecular Biology (PBT1MOB)

Course Objectives:	The objectives of this course are to provide knowledge related to different mechanisms of transcription, translation, Gene Expression and Regulation in Prokaryotes & Eukaryotes. Thus providing them an insight to the basis of molecular biology.		
Course Outcomes:	After completing the course, Student will able to: <ul style="list-style-type: none"> • Compare the mechanism of replication in prokaryotes and eukaryotes • Elaborate on transcription in Prokaryotes & Eukaryotes • Explain the different DNA damage and repair systems • Discuss the mechanism of translation, gene expression and transposition 		
Unit	Topics	Credits	Lectures
Unit- I Replication, Repair and Recombination	Replication mechanism in prokaryotes and eukaryotes; Enzymes and accessory proteins; Fidelity; Replication of single stranded circular DNA; Gene stability. DNA repair- enzymes; Photo-reactivation; Excision repair; Mismatch correction; SOS repair. Recombination: Homologous and non-homologous; Site specific recombination.	4	15
Unit- II Prokaryotic transcription and regulation	Prokaryotic Transcription: Transcription unit; Promoters, Operators, Regulatory elements, Initiation; Attenuation; Termination-Rho-dependent and independent; Anti-termination Transcriptional regulation-Positive and negative; Operon concept- <i>lac</i> , <i>trp</i> and <i>ara</i> operons Transcriptional control in lambda phage.		15

<p>Unit-III Eukaryotic Transcription and Post Transcriptional Modifications</p>	<p>Eukaryotic transcription and regulation; RNA polymerase- structure and types; Eukaryotic promoters and enhancers; General Transcription factors; TATA binding proteins (TBP) and TBP associated factors (TAF); Transcriptional and post-transcriptional gene silencing.</p> <p>Post Transcriptional Modifications- Processing of hnRNA, tRNA, rRNA; capping and polyadenylation; Splicing; RNA editing; Nuclear export of mRNA; mRNA stability; Catalytic RNA.</p> <p>Regulatory RNA and RNA interference mechanisms.</p>		<p>15</p>
<p>Unit-IV Translation and Transposition</p>	<p>Translation machinery; Ribosomes; Composition and assembly; Universal genetic code; Degeneracy of codons; Termination codons; Wobble hypothesis; Mechanism of translation ; Co- and post-translational modifications. Protein degradation: Ubiquitin-Proteasome pathway and lysosomal proteolysis.</p> <p>Transposition- Transposable genetic elements in prokaryotes and eukaryotes; Mechanisms of transposition; Role of transposons in mutation.</p>		<p>15</p>

References:

1.	Genes XI, 11th edition (2012), Benjamin Lewin, Publisher - Jones and Barlett Inc. USA
2.	J.D. Watson, T.A. Baker, S.P. Bell, A. Gann, M. Levin, R. Losick. (2013). Molecular Biology of the Gene (7th edition). Benjamin Cummings, San Francisco, USA.
3.	R.F. Weaver (2007). Molecular Biology. (4th edition). McGraw Hill. New York. USA.
4.	Genome 3 T.A Brown
5.	iGenetics A Molecular Approach Third Edition, Peter J. Russell
6.	Molecular Biology, 5th Edition (2011), Weaver R., McGrew Hill Science. USA
7.	Lewin's GENES XII 2017 Jocelyn E. Krebs , Elliott S. Goldstein , Stephen T. Kilpatrick Jones and Bartlett Publishers

M.Sc. Biotechnology
Semester –I

Paper-IV- Emerging Techniques in Biological Sciences (PBT1ETB)

Course Objectives:	The objectives of this course are to provide introductory knowledge concerning genomics, proteomics and their applications. The students will be given exposure to advanced analytical tools to study biological system.		
Course Outcomes:	After completing the course, Student will able to: <ul style="list-style-type: none"> • Illustrate the principle underlying various advance microscopy & spectroscopy and proteomics techniques • Elaborate on emerging techniques in Genomics & Transcriptomics • Discuss the advanced techniques used in molecular cytogenetics • Understand the principle & application of the CRISPR-CAS system 		
Unit	Topics	Credits	Lectures
Unit-I Advanced Microscopic and Spectroscopic Techniques	Microscopy: Scanning and Transmission microscopes: different fixation and staining techniques for EM, Freeze-etch and freeze- fracture methods for EM, Image processing methods in microscopy. Confocal microscopy, Atomic Force Microscopy, Super-Resolution Imaging with Stochastic Optical Reconstruction Microscopy (STORM) and Photo-activated Localization Microscopy (PALM). Spectroscopy- Principle and applications of UV Visible, ORD, CD, NMR, FTIR, ESR and X-ray diffraction.	4	15
Unit-II Protein Purification & its Characterization	Protein purification and characterization Techniques: Dialysis, Salting in and Salting out, Chromatography: Size exclusion, Affinity, Ion-exchange and FPLC. 2D-PAGE, isoelectric focusing, Mass spectrometry and its versions. Protein Expression Profiling: Protein Microarrays/ Protein chips: Types and applications. Gel-based quantitative proteomics: DIGE (Difference in Gel Electrophoresis). Gel-free based quantitative proteomic: Surface plasmon resonance. In vivo and In-vitro labelling- SILAC and ICAT		15

<p>Unit-III Functional & Comparative genomics and Transcriptomics</p>	<p>Genomics: Gene expression by SAGE and Microarrays: Construction of microarrays – genomic arrays, cDNA arrays and oligo arrays and its applications. Next Generations Sequencing (NGS): Principles and Instrumentation.</p> <p>Assigning Gene Function Experimentally: Gene Knockouts in Yeast, Mouse & <i>Mycoplasma genitalium</i>, Metagenomic Analysis.</p> <p>Transcriptomics: Northern blotting, DDRT PCR, gel free assays like biolayer interference</p>		<p>15</p>
<p>Unit-IV Molecular Cytogenetics</p>	<p>Advanced fluorescence techniques: Fluorescence Lifetime (FLIM), Fluorescence Resonant Energy Transfer (FRET), Fluorescence Correlation Spectroscopy (FCS)</p> <p>Advanced Cytogenetic techniques and applications - FISH, M-FISH, SKY, CGH, Marker Chromosomes, and Prenatal Diagnosis of Common Aneuploidies.</p> <p>CRISPR CAS: History, principle and Applications.</p> <p>Identification and classification of organisms using Molecular markers- 16S rRNA typing/sequencing.</p>		<p>15</p>

References:

1.	Principles and Techniques of Biochemistry and Molecular Biology, 7th edition, (2010), Wilson K.M., Walker J.M., Cambridge University Press, U
2.	Biophysical chemistry by Upadhyay, Upadhyay and Nath, Himalaya publication house.
3.	Biophysics. 1st edition (2002), Pattabhi V and Gautham N. Kluwer Academic Publisher, USA.
4.	Huang, B., Bates, M., & Zhuang, X. (2009). Super-Resolution Fluorescence Microscopy. Annual Review of Biochemistry, 78(1), 993-1016. doi:10.1146/annurev.biochem.77.061906.092014
5.	Molecular Cytogenetics: Protocols and Applications, Edited by: Y. S. Fan © Humana Press Inc., Totowa, NJ 2001.
6.	Lander, E. (2016). The Heroes of CRISPR. Cell, 164(1-2), 18-28. Doi: 10.1016/j.cell.2015.12.041.
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8.	Microarray and Microplates: Applications in biomedical sciences Shu Ye, Ian Day, 2003, Bios Scientific Ltd, oxford.
9.	iGenetics A Molecular Approach Third Edition, Peter J. Russell

M.Sc. Biotechnology
Semester -I
PRACTICAL- I (PBT1PR1)
(Practicals of PBT1ABC and PBT1IMM)

8- Credits

1.	Preparation of buffers and Reagents
2.	Viscosity study of protein.
3.	Titration of amino acids and calculation of pK value
4.	Protein Estimation using the following methods: Bradford and Folin Lowry method
5.	Experimental verification that absorption at OD260 for denatured DNA as compared to native double stranded DNA
6.	Isolation partial purification and Characterization of any one enzyme <ul style="list-style-type: none"> • Preparation of cell-free lysates • Ammonium Sulfate precipitation • Dialysis of the purified protein solution • Enzyme assay • Generating a Purification Table Enzyme Kinetic Parameters: K_m , V_{max} and K_{cat}
7.	LDH Zymography
8.	Video demonstration of membrane dynamics
9.	Cell permeability testing- osmotic fragility
10.	Preparation of TAB and sterility testing
11.	Perform serum electrophoresis (horizontal)
12.	To perform the Dot blot assays
13.	To check antibody titer by Tube precipitation test
14.	In-vitro demonstration of phagocytosis and calculating phagocytic index
15.	Latex bead agglutination / precipitation test for detection of rheumatoid factor (RF).
16.	Separation of lymphocytes on Ficoll Histopaque and viability count
17.	Demonstration/Video of tuberculin test, hypersensitivity reaction Arthur reaction.
18.	Complement fixation test

M.Sc. Biotechnology
Semester -I
PRACTICAL- II (PBT1PR2)
(Practicals of PBT1MOB & PBT1ETB)

08 Credits

1.	Diauxic growth curve of <i>E.coli</i>
2.	Extraction of Genomic DNA Extraction from Bacteria and separation by Agarose gel electrophoresis
3.	Extraction of Genomic DNA Extraction from human samples (Cheek cells, Blood) and separation by Agarose gel electrophoresis
4.	Restriction Enzyme digestion of plasmid DNA
5.	Ligation Reaction
6.	Conjugation in bacteria
7.	Demonstration/ video of 2D PAGE
8.	Demonstration of affinity & gel filtration chromatography techniques
9.	Microscopy types Confocal, Fluorescence, STORM – videos and pictures – Write up
10.	To determine an unknown protein concentration by plotting a standard graph of BSA using UV-Vis Spectrophotometer and validating the Beer- Lambert’s Law
11.	Photo album of chromosomal abnormalities in normal and disease condition: <ul style="list-style-type: none"> • Numerical Detected By Using Different Probes – Centromeric, Locus Specific, Telomeric Structural -Translocations and Fusion Genes • Detection Of Inversions And Interstitial Deletions By SKY • CGH For a disease or cancer
12.	Overview of MALDI-TOF-MS Virtual
13.	Recovery of DNA from low-melting temperature agarose gel
14.	To resolve soluble proteins by Native PAGE followed by staining with Coomassie Brilliant Blue R-250
15.	To resolve soluble proteins by discontinuous, SDS-gel electrophoresis under denaturing conditions followed by staining with Coomassie Brilliant Blue R-250 and silver stain
16.	Identification of protein using analytical technique Mass spectroscopy (demonstration)
17.	FTIR/NMR spectrum based theory questions

Semester -II

M.Sc. Biotechnology
Semester -II
Paper-I Metabolism (PBT2MET)

Course Objectives:	The objectives of this course are to build upon knowledge of biochemical principles with specific emphasis on different metabolic pathways. The course shall make the students aware of various disease pathologies within the context of each topic.		
Course Outcomes:	After completing the course, Student will able to: <ul style="list-style-type: none"> • Illustrate major metabolic pathways with Principles of Metabolic regulations. • Justify role of metabolic pathways in various disease pathology. • Correlate different adaptations in plants with respect to carbon assimilation. • Discuss role of phytochemicals. 		
Units	Topics	Credit	Lectures
Unit -I Bioenergetics, Carbohydrate & Lipid Metabolism	Bioenergetics and Thermodynamics-basic principles; equilibria and concept of free energy; coupled interconnecting reactions in metabolism and common Biochemical reactions. Carbohydrate Metabolism- Overview of major pathways of carbohydrate metabolism. HMP and Uronic acid pathways with their significance, Metabolism of other important sugars – fructose. Coordinated regulation of glycogen breakdown and synthesis. Inborn errors of carbohydrate metabolism. Synthesis of essential fatty acids- Overview.	4	15
Unit -II Amino-acid and Nucleic acid Metabolism	Biosynthesis of essential amino acids. Metabolic breakdown of amino acids leading to Krebs cycle intermediate. Disorders of amino acid metabolism.		15

	Nucleic acid metabolism Biosynthesis and degradation of purines and pyrimidines with regulation, disorders of Nucleic acid metabolism.		
Unit -III Plant metabolism	C-3 cycle and C-4 cycles, CAM, glyoxalate pathway, photosynthetic formation of hydrogen. Integration of carbohydrate metabolism in plants. Nitrogen fixation and role of nitrogenase, Annamox reactions. Plant secondary metabolism - Introduction, Pathways for secondary Metabolite 1. Mevalonate pathways 2.Shikimate Pathway 3.Isoprene Unit Pathways Major Secondary metabolites with their functions (alkaloid, terpenoids, phenolics).		15
Unit- IV Principles of Metabolic regulations and Metabolic Engineering	Principles of Metabolic regulations-Regulations of Metabolic pathways and analysis of Metabolic control. Integration of Metabolic pathways. Synthetic Biology-Introduction and applications. Metabolic Engineering- Historical perspective and introduction. Importance of metabolic engineering, Plant and microbial metabolic engineering-examples Metabolic flux analysis. future of metabolic engineering		15

References:

1.	Lehninger, Principles of Biochemistry. 7th Edition (2008), David Nelson& Michael Cox, W.H. Freeman and company, NY
2.	Phytochemical Method, 3rd edition (1998), A.J. Harborne, Springer, UK.
3.	Pharmacognosy, 14th edition, (2008), Dr. C. K. Kokate, A. P. Purohit, S. B. Gokhale, NiraliPrakashan, India
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8.	Buchanan B; Gruissem W et al (2nd Ed.) Biochemistry and Molecular Biology of Plants John Wiley & Sons 2015.

M.Sc. Biotechnology
Semester -II

Paper-II- Cellular Processes and Developmental Biology (PBT2CPD)

Course Objectives	The objectives of this course are to provide an understanding of the functions of cells at molecular level and give a thorough knowledge about protein trafficking, biomolecules, cellular development and Human Embryonic development.		
Course Outcomes	<p>Students should be able to:</p> <ul style="list-style-type: none"> • Outline the concept of cell cycle regulation, cellular signaling, transport and trafficking. • Determine the role of Cell ECM and cell -cell interactions in maintenance of cellular integrity and functions; • Analyze genes and genetic changes affecting cycle regulation and mechanisms that lead to apoptosis. • Understand Human Embryonic development and Post fertilization events 		
Unit	Topics	Credits	Lectures
Unit -I Cellular processes	<p>Cell cycle and its regulation; Cell division: mitosis, meiosis and cytokinesis; Checkpoints in cell cycle regulation.</p> <p>Cell differentiation: stem cells, their differentiation into different cell types and organization into specialized tissues; cell-ECM and cell-cell interactions; Cell Signalling: Principles of signalling, Signalling molecules, receptors and their functions.</p> <p>Intercellular communications: nerve impulses, Neuro-transmitters; agonist & antagonist Reactions.</p> <p>Cell death: different modes of cell death and their regulation.</p>	4	15
Unit -II Cellular transport, Membrane trafficking	Molecular mechanisms of membrane transport, nuclear transport Protein Transport: Translocation of Secretory Proteins across the ER Membrane, Insertion, Protein Modifications,		15

	<p>Folding, and Quality Control in the ER, Protein sorting and export from Golgi Apparatus.</p> <p>Sorting of Proteins: to Mitochondria and Chloroplasts. Molecular Mechanisms of Vesicular Traffic, early and later Stages of the Secretory Pathway, Receptor-Mediated Endocytosis.</p>		
Unit -III Genome instability and cell transformation	<p>Mutations, proto-oncogenes, oncogenes and tumour suppressor genes, physical, chemical and biological mutagens; types of mutations; intra-genic and inter-genic suppression; role of transposons in genome; viral and cellular oncogenes; tumor suppressor genes; structure, function and mechanism of action; activation and suppression of tumor suppressor genes; oncogenes as transcriptional activators.</p>		15
Unit- IV Human Embryonic Development and Model Organism	<p>Human Embryonic development: Events during fertilization, in-vitro fertilization, Zona Pellucida, glycoprotein, Oelemma protein and their role in fertilization, sperm antigens and their functional significance. Molecular and biochemical events during sperm function. Post fertilization events</p> <p>Major Model Organism in Developmental Biology: Xenopus, Zebra fish, Chick, Mouse, <i>C. elegans</i>, Drosophila</p>		15

References:

1.	Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2008). <i>Molecular Biology of the Cell</i> (5th Ed.). New York: Garland Science.
2.	Lodish, H. F. (2016). <i>Molecular Cell Biology</i> (8th Ed.). New York: W.H. Freeman.
3.	Krebs, J. E., Lewin, B., Kilpatrick, S. T., & Goldstein, E. S. (2014). <i>Lewin's Genes XI</i> . Burlington, MA: Jones & Bartlett Learning.
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6.	Watson, J. D. (2008). <i>Molecular Biology of the Gene</i> (5th ed.). Menlo Park, CA: Benjamin/Cummings.

M.Sc. Biotechnology
Semester -II

Paper-III-Bioprocess Technology (PBT2BPT)

Course Objectives	The objectives of this course are to educate students about the fundamental concepts of bioprocess technology and its related applications, thus preparing them to meet the challenges of the new and emerging areas of the biotechnology industry.		
Course Outcomes	Students should be able to: <ul style="list-style-type: none"> • Appreciate relevance of microorganisms from industrial context • Give an account of design and operations of various fermenters • Calculate yield and production rates in a biological production process, interpret data and need for oxygen and oxygen transfer; • Understand important microbial/enzymatic industrial processes in the food and fuel industry. 		
Unit	Topics	Credits	Lectures
<p style="text-align: center;">Unit- I</p> <p>Basic principles of biochemical engineering</p>	<p>Sources of Microorganisms Used in Biotechnology- Literature search and culture collection supply, Isolation de novo of organisms producing metabolites of economic importance.</p> <p>Strain Improvement- Selection from naturally occurring variants, Manipulation of the genome of industrial organisms in strain improvement</p> <p>Bioreactor design and analysis- Batch and continuous fermenters; modifying batch and continuous reactors: chemostat with recycle, multistage chemostat systems, fed-batch operations; conventional fermentation v/s biotransformation; immobilized cell systems; large scale animal and plant cell cultivation; Upstream processing: media formulation and optimization; sterilization; aeration, agitation and heat transfer in bioprocess; scale up and scale down; measurement and control of bioprocess parameters. fermentation economics</p>	4	15

<p>Unit- II</p> <p>Downstream processing, Industrial Production and Recovery processes</p>	<p>Downstream processing and product recovery</p> <p>Separation of insoluble products - filtration, centrifugation, sedimentation, flocculation; Cell disruption; separation of soluble products: liquid-liquid extraction, precipitation, chromatographic techniques, reverse osmosis, ultra and microfiltration, electrophoresis; final purification: drying; crystallization; storage and packaging.</p> <p>Industrial Production and Recovery process of following (with one example each):</p> <p>Vitamins, Amino acids, Enzymes (Extra and Intra cellular), Antibiotics, Organic acids, Production of recombinant pharmaceuticals, Human growth hormone, Interferon vaccines.</p> <p>Biotransformation product (Steroids)</p>		<p>15</p>
<p>Unit- III</p> <p>Applications of enzyme technology</p>	<p>Rationale for immobilizing enzymes, Methods for enzyme immobilization, Properties of immobilized enzymes, applications of immobilized enzymes.</p> <p>Industrial applications of enzymes in pharmaceuticals, food industries, Detergents, paper and leather processing.</p> <p>Enzyme Engineering and its applications.</p>		<p>15</p>
<p>Unit- IV</p> <p>Applications of microbial technology in food process operations and biofuels</p>	<p>Microbial biomass production - mushrooms, SCP</p> <p>Fermented foods and beverages: Sauerkraut production, soya bean fermentations, coffee, cocoa and tea fermentations</p> <p>Food additives and supplements -</p> <p>Lipids, Nucleosides, nucleotides and related compounds - Vitamins</p> <p>Natural food preservatives - bacteriocins from lactic acid bacteria - production and applications e.g., Nisin</p> <p>Microbial production of colours and flavours.</p> <p>Polyhydric alcohols: low -calorie sweetener particularly useful for sweetening food products for diabetics</p>		<p>15</p>

	Microbial exo-polysaccharides - Xanthan gum Process Food wastes- for bioconversion to useful products (Compost, biofuels, biomass cheap source of raw material in fermentation etc.)		
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References:

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8.	Nduka Okafor Modern industrial microbiology and biotechnology Science Publishers, Enfield,
9.	Robert Whitehurst and Maarten Van Oort - Enzymes in food technology 2nd ed
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M.Sc. Biotechnology
Semester –II

Paper-IV-Research Methodology and Scientific Communication Skills (PBT2RMS)

Course Objectives	The objectives of this course are to acquire the ability to articulate thoughts, research ideas, information, and scientific outcomes in oral and in written presentation to a range of audience. The course mainly emphasizing methodologies used to do research, use framework of these methodologies for understanding effective lab practices and scientific communication and appreciate scientific ethics.		
Course Outcomes	After completing the course, Student will able to: <ul style="list-style-type: none"> • Design research problems, formulating the objectives, test hypotheses and prepare scientific reports using appropriate research processes. • Appraise Research writing, Research ethics, Data fudging and Plagiarism with the help of statistical and referencing software. • Develop the concept of effective communication, presentation skills and computing skills for scientific research. • Critically analyze the classical papers in biotechnology through the existing methods of enquiry. 		
Unit	Topics	Credits	Lectures
Unit-I Scientific Research and Research Methodology	Scientific Research: Meaning of Scientific Research, Definition, Characteristics, Types of Research, and Need of research. Identification of the problem: assessing the status of the problem, formulating the objectives, Hypotheses, Research Methods and Methodology: Selecting & defining Research problem Research Process Research Design/Plan: Preparing Research design (experimental or otherwise), Actual investigation, Surveys - Case Study - Field Studies & others.	4	15
Unit-II Research Ethics	Research in Practice: Literature review, Journals, Conference Proceedings, Journal Impact factor, Citation Index, h, g, h-g index, Referencing software: Mendeley, Endnote.		15

	<p>Research Ethics: Social implications of research, biosafety issues Animal experimentation ethics, wild-life ethics and human experimentation ethics</p> <p>Data fudging and Plagiarism: Definition, Common types of plagiarism, Intentional and Unintentional plagiarism, Detection of plagiarism by anti-plagiarism tools (Turnitin, Duplichecker, Viper, Copyleaks), Use of URKUND, Turnitin and iThenticate software, Penalties for Plagiarism, Avoiding plagiarism.</p>		
<p>Unit-III Process of communication</p>	<p>Concept of effective communication- setting clear goals for communication; determining outcomes and results; initiating communication; avoiding breakdowns while communicating; creating value in conversation; barriers to effective communication; Presentation skills - formal presentation skills; preparing and presenting using overhead projector, PowerPoint; defending interrogation; scientific poster preparation & presentation; participating in group discussions;</p> <p>Computing skills for scientific research - web browsing for information search; search engines and their mechanism of searching; hidden Web and its importance in scientific research; internet as a medium of interaction between scientists; effective email strategy using the right tone and conciseness.</p>		15
<p>Unit-IV Scientific communication</p>	<p>Scientific Communication: Importance of scientific communication, Types of scientific communications, Logical organization of scientific data and documentation</p> <p>Different modes of scientific communication:</p> <p>Scientific Writing: What are Scientific Writing Skills, Good Scientific Writing Skills</p> <p>Research Proposal writing: Format and layout</p> <p>Research Paper writing: Format and layout</p> <p>Report Writing: Format and layout</p> <p>Thesis writing : (Introduction, Literature review, Materials and Methods, Results, Discussion, Conclusion and Implications, conflict of interest)</p>		15

	Legal forms of communication in science: Plagiarism and scientific misconduct, Ethics in scientific communication, Patent submissions.		
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2.	Valiela, I. (2001). Doing Science: Design, Analysis, and Communication of Scientific Research. Oxford: Oxford University Press.
3.	On Being a Scientist: a Guide to Responsible Conduct in Research. (2009). Washington, D.C.: National Academies Press.
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9.	Fisher R A, The Design of Scientific Experiment (1971) 9th edition, Collier Macmillan Publishers, London
10.	Martha Davis, Scientific Papers And Presentations 2nd edition (2004), Academic Press
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12.	John D'Angelo, Ethics in Science: Ethical Misconduct in Scientific Research (2012),CRC Press, USA
13.	David B. Resnik, The Ethics of Science: An Introduction (1998), Routledge Publication, UK5.

M.Sc. Biotechnology
Semester -II
PRACTICAL- I (PBT2PR1)
Practicals of (PBT2MET+ PBT2CPD)

08 Credits

1.	Isolation of starch from potato and its estimation by anthrone method
2.	The isolation and assay of glycogen from liver and skeletal muscles of bird/mammal
3.	Isolate chloroplasts from the given plant material, quantitate and resolve the proteins by SDS-PAGE to identify major chloroplast proteins
4.	TLC for amino acid separation
5.	Detection of saponification and Iodine value of lipids
6.	Estimation of urate/creatinine ratio to diagnose Lesch Nyhan syndrome
7.	Detection of phenylalanine for PKU
8.	Secondary metabolite study-Extraction and Qualitative estimation of phyto-constituents
9.	Determination of total Nitrogen content by Kjeldahl method
10.	Programmed cell death during limb development in Chick
11.	Karyotyping and Ideogram construction in onion roots using Colchicine treatment
12.	Candling, Observing chick embryo- stages of development: prepared slides/ preserved specimens
13.	Developmental Biology- Visit to laboratory/ video lectures for latest Developments in the field
14.	Cell death /apoptosis studies using flow-cytometry demonstration
15.	Isolation of cell organelle by differential centrifugation techniques from plant / animal sources

M.Sc. Biotechnology
Semester -II
PRACTICAL- I (PBT2PR1)
Practicals of (PBT2BPT+ PBT2RMS)

08 Credits

1.	Maintenance of the isolated production organism (Agar slants/ glycerol stocks /soil culture/ lyophilization) at least two methods
2.	Demonstration of media optimization by Plackett Burman test
3.	Study of Working of lab bench fermenter (with production of enzyme or antibiotic using screened organism)
4.	Immobilize an organism / enzyme and detect the conversion of substrate to product
5.	Physico-chemical characterization of an industrial effluents
6.	Pigment production and isolation from a microbial source (yeast, fungi or bacteria) Spirulina
7.	Recovery and Assay of product formed (Bioassay or Enzyme assay)
8.	Detection of different food enzymes by simple tests (amylase, catalase, invertase, papain, pectinase, pepsin)
9.	Study of the pickling process (sauerkraut / pickled cucumbers) with respect to physical, chemical / biochemical and biological changes occurring during the pickling process
10.	Visit to industry and Report writing
11.	Research Methodology: Review writing/ Report writing/Research paper writing (Following proper Research methods/Methodology)
12.	Scientific presentation of research paper from a reputed journal.
13.	Research Data collection and analysis from different Sources <ul style="list-style-type: none"> • Research Data collection and analysis from Primary Sources • Research Data collection and analysis from Secondary Sources • Research Data collection and analysis for Survey based Research • Different Sampling methods for Research
14.	Scientific communication: <ul style="list-style-type: none"> • Gathering scientific data from various sources. • Written communication: Guide to clear writing, forms and styles of writing • Scientific publication writing • Oral communication variants • Concept of Plagiarism

15.	Write a research proposal on any topic of your interest from the MSc syllabus. (For research proposal contents and format refer to NSF guidelines. https://www.nsf.gov/pubs/policydocs/pappg19_1/nsf19_1.pdf , For reference work use Mendeley Desktop. https://www.mendeley.com/guides/desktop)
16.	To study a patent and to develop a patent application for a hypothetical product or process.
17.	Critical Analysis of Classical Papers: How does the Course Module work? Students may be divided in groups and each group may be responsible for one classical paper. Each week there may be a 1.5 hour presentation cum discussion for each of the papers. At the end of the semester each student will be asked to write a mini-review (2-3 pages long) on any one classical paper, other than the one he/she presented/discussed.



Janardan Bhagat Shikshan Prasarak Sanstha's



**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Affiliated to University of Mumbai with an autonomous Status

**Revised Syllabus of
Program: M.Sc. Biotechnology
M.Sc. Part-II
(Semester III & IV)
Choice Based Credit & Grading System (60:40)**

(To be implemented from Academic Year 2020-2021)

Preamble:

Master of Science (M.Sc.) Programme in Biotechnology is a P.G. Programme of Department of Biotechnology, Changu Kana Thakur Arts, Commerce & Science College, New Panvel, affiliated to University of Mumbai with an Autonomous status. Biotechnology is technology based on biology. Biotechnology harnesses cellular and bio-molecular processes to develop technologies and products that help to improve our lives and the health. Modern biotechnology provides breakthrough products and technologies to combat debilitating and rare diseases, reduce our environmental footprint, feed the hungry, cleaner energy, and have safer, cleaner, and more efficient industrial manufacturing processes.

The Choice Based Credit and Grading System (CBCGS) to be implemented through this curriculum would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities. The proposed credit-based curriculum and grading system will even add much more to the existing interdisciplinary nature of biotechnology.

Under the 'autonomy' we have made an attempt to design Master's in Biotechnology course syllabus to cater to the needs of credit based- semester and grading system. The changing scenario of higher education in India and abroad is taken into consideration to make this syllabus more oriented towards current need of modern research and industrial sectors.

The present M.Sc. Biotechnology Second Year (Semester III and IV) syllabus is based on the remodeled M.Sc. Biotechnology Curriculum, May 2017, Department of Biotechnology, Ministry of Science and Technology, Government of India and revised syllabus of University of Mumbai. Syllabus is robust and well-designed to enable students to pursue high quality research or increase employability of the students. Online course component has been introduced in the curriculum in keeping with the digital initiatives of MHRD to provide good quality self-learning content through MOOCs under SWAYAM and allied platforms. It is hoped that the revised syllabus shall serve its objective of promoting outcome-based learning to meet the changing needs of the biotechnology sector.

M.Sc. Biotechnology Course Structure

Semester III

Course code PSBT	Title	Theory /Practical	Marks	Credits	Nos of Lectures / week
PBT3AVM	Applied Virology and Microbiology	Theory	100	4	4
PBT3EBT	Environmental Biotechnology	Theory	100	4	4
PBT3BRA	Biologics and Regulatory Affairs	Theory	100	4	4
PBT3MET	Molecular Enzymology and Enzyme Technology	Theory	100	4	4
PBT3PR1	Practical- I (Paper-I &IV)	Practical	100	4	8
PBT3PR2	Practical –II (Paper-II &III)	Practical	100	4	8
		TOTAL	600	24	32

Semester IV

Course code PSBT	Title	Theory /Practical	Marks	Credits	Nos of Lectures / week
PBT4NBT	Nanobiotechnology	Theory	100	4	4
PBT4OSB	OMICS & Systems Biology	Theory	100	4	4
PBT4DDC	Drug Discovery & Clinical Study	Theory	100	4	4
PBT4SWF	Scientific Writing & Food Biotechnology	Theory	100	4	4
PBT4PR1	Practical- I (Paper-I &II)	Practical	100	4	8
PBT4PR2	Practical –II (Paper-III &IV)	Practical	100	4	8
		TOTAL	600	24	32

Teaching pattern: One (01) Credit would be of thirty-forty (30-40) learning hours; of this, more than fifty per cent of the time will be spent on classroom instructions including practical as prescribed by the University. Rest of the time would be invested for assignments, projects, journal writing, case studies, library work, industrial visits, attending seminars/workshops, preparations for examinations etc. would be considered as notional hours. The present syllabus considers (60L as classroom teaching and 15 lectures as Notional hours/ paper). Each lecture duration would be for 60 min. The names of the reference books provided in the syllabus are for guidance purpose only. Students and faculty are encouraged to explore additional reference books, online lectures, videos, science journals for latest/ additional information.

Eligibility: As per University of Mumbai Rules

Scheme of Examinations: (a) Internal assessment of 40 marks per course per semester should be conducted. (b) External assessment of 60 marks per course per semester at the end of every semester (c) Practical examination of 200 marks should be conducted at the end of every semester.

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks	
01	One periodical class test / online examination to be conducted in the given semester	20 Marks	
02	One case study (clinical case/trial study report for paper III) /review / project with presentation based on curriculum to be assessed by the teacher concerned	15 Marks	
	Presentation		10 Marks
	Written Document		05 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks	

Semester -IV		
	a. FOR PAPER 4: The internal assessment will comprise of the following: Online course: The student is expected to complete at least one online course relevant for the subject from any of the appropriate reputed online platforms. A proof of successful completion of the online course must be provided for the award of marks. /TEST	20 Marks
	b. Research Proposal: The student is expected to submit a research proposal relevant to the subject	20 Marks

**Question Paper Pattern
(Periodical Class Test for the Courses at Under Graduate Programs)**

Maximum Marks: 20

Duration: 40 Minutes

Questions to be set: 02

All Questions are Compulsory

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 % 60 Marks Duration: 2 $\frac{1}{2}$ hours

Question Paper Pattern

Theory question paper pattern
<ol style="list-style-type: none"> 1. There shall be five questions each of 12 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Passing Standard:

The learners shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of grade D in each project wherever applicable to pass a particular

Practical Examination Evaluation scheme (50 marks per paper)

SL. No.	Questions	MARKS
1.	Practical Question 1	25
2.	Practical Question 2	15
3.	Journal	05
4.	Viva Voce	05
OR		
1.	Practical Question	40
2.	Journal	05
3.	Viva Voce	05
	Semester IV- Project Dissertation	100
<ul style="list-style-type: none">• For semester IV it is mandatory for students to undergo Hands-on Project training in an established research laboratory or college laboratory for 4-6 months; This should involve one or more relevant instrumentation technique.• Thesis on the same to be evaluated by the guide alternatively by an internal examiner for 50M based on the student's performance, written matter and experimentation.• A certificate must be appended with the thesis. The external examiner will assess for 50M as a Presentation during practical exams. Marks allotted by Internal examiner would be scaled down if required as per university guidelines		

The practical examinations at a center would be evaluated by one external examiner assigned by the University and one internal examiner assigned by the college/department.

Semester-III

M.Sc. Biotechnology
Semester -III
Paper-I Applied Virology & Microbiology (PBT3AVM)

Course Objectives:	<ul style="list-style-type: none"> • Students will be exposed to pandemic diseases, significance of epidemiology in studying various diseases and societal & economic issues related to such diseases. • Students will also learn details about emerging viral, bacterial, parasitic pathogens. Students will learn advanced, automated methods for determining antimicrobial susceptibility, drug resistance and various aspects of biofilms 		
Course Outcomes:	<ul style="list-style-type: none"> • Students will understand epidemiological principles in prevention, control and management of pandemic disease. They will acquire understanding of antimicrobial resistance for management of drug resistance in population. • Students will understand the different aspects of biofilm and their management. They will also get insights into latest development of diagnostics & therapeutics for such diseases. 		
Units	Topics	Credit	Lectures
<p style="text-align: center;">Unit-I Pandemic Diseases, Pathogenesis, Diagnosis and Treatment</p>	<ul style="list-style-type: none"> • Introduction to Pandemic diseases and causative agent like H1N1, MERS, SARS, Swine flu, COVID-19, Nipah virus, Ebola virus. • Structure of these virus-coat and envelope protein, genome composition. • Pathogenesis (Mechanism of infection) and Acute Clinical manifestations (Signs and symptoms) of H1N1, MERS, SARS, Swine flu, COVID-19, Nipah virus, Ebola virus. • Diagnosis, and Treatment for H1N1, MERS, SARS, Swine flu, COVID-19, Nipah virus, Ebola virus. • Economic and Social loss due to t Viruses. 	4	15

<p align="center">Unit- II Epidemiology of Infectious Diseases</p>	<ul style="list-style-type: none"> • Concept of Host, Reservoir, Source of infection, Carrier, Epidemic, Endemic, Pandemic, Outbreak • History, Definition scope, importance of epidemiology • Epidemiology, Health & Public Health • Epidemiological principles in prevention & control of disease • Measures of disease frequency – Concept of incidence, prevalence, Incidence rate, cumulative incidence, case fatality • Epidemiological studies Organizations in disease control & Research – WHO, CDC, UNICEF, NACO, ICMR, NARI, NIV & NGOs 		<p align="center">15</p>
<p align="center">Unit- III Medical Microbiology</p>	<ul style="list-style-type: none"> • Emerging Pathogens / Infections: Diseases caused by Bacteria / parasites/ viruses- Name of causative agent, Name of disease caused, History, Antigenic structure, virulence factors, source of infection, Transmission, Pathogenesis, Clinical manifestations, Laboratory diagnosis, Treatment, Prophylaxis, vaccines, Current research and developments • Bacteria as emerging pathogens / Diseases caused by bacteria: MOTT, Legionella, Conditions caused by <i>Helicobacter pylori</i> • Viruses as emerging pathogens / Diseases caused by viruses: HIV (AIDS), Chikungunya, Dengue, • Parasites as emerging pathogens / Diseases caused by parasites: Malaria, <i>Entamoeba histolytica</i> (Amoebic dysentery) 		<p align="center">15</p>
<p align="center">Unit- IV Biofilms & Antimicrobial Activity</p>	<ul style="list-style-type: none"> • Structure of Biofilm – Extracellular polymeric substances, Biofilm architecture. • Stages in formation of Biofilm. • Microbial interactions in Biofilms (Quorum sensing) Need for formation of Biofilms by microorganisms. • Microorganisms commonly associated with biofilms on indwelling medical devices 		<p align="center">15</p>

	<p>Response of biofilms to host defense mechanisms & antimicrobial agents</p> <ul style="list-style-type: none"> • Recent advances in biofilm management. • Conventional methods of drug susceptibility testing (Kirby-Bauer disc diffusion, Stoke's method, E test) • Advanced methods- Macro & Micro broth dilution methods, Time kill curves, serum killing curves and checker-board assays. • Detection of drug resistance in Staphylococci, Streptococci, Enterococci. Automated methods of sensitivity testing. Concept of CLSI standards. 		
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References:

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2.	Basic Epidemiology R. Bonita, Beaglehole, T. Kjellstrom, 2nd Edition, 2006, WHO.
3.	Principles of Epidemiology in Public Health Practice, Third edition, US Department of Health & Human Services, CDC, 2012.
4.	Martin Rusnák, Viera Rusnáková, Georges Kamtoh,,: Relations Between Epidemiology and Public Health, 2018 https://www.researchgate.net/publication/323964710
5.	Evaluation and use of Epidemiological evidence for environmental health risk assessment guideline document World Health Organization 2000 eur/00/5020369
6.	Ananthanarayan and Paniker's Textbook of Microbiology, by Reba Kanungo, 10th ed Universities Press; Tenth edition, 2017
7.	Koneman's Colour Atlas & Textbook of Diagnostic microbiology, 7th edition, 2017, Lippincott, Williams & Wilkins.
8.	Mackie & McCartney Medical Microbiology, J. G. Collee, J. P. Duguid, A. G. Fraser, B. P. Marmion, Thirteenth edition, Churchill Livingstone
9.	Bailey and Scotts Diagnostic Microbiology Forbes, Sahem et al 12th ed, Moshby

M.Sc. Biotechnology
Semester -III

Paper-II - Environmental Biotechnology (PBT3EBT)

Course Objectives	<ul style="list-style-type: none"> This course aims to introduce learners to latest concepts in environmental biotechnology, various types of pollutions, monitoring, latest mitigation strategies and management of the same. Health hazards of pollution and waste, solid waste management, biodiversity concepts and data management and environmental monitoring. 		
Course Outcomes	<ul style="list-style-type: none"> At the end of the course, students will be able to understand various concepts of environmental biotechnology, latest development in the area and use of microbiological, molecular and analytical methods in environmental biotechnology. 		
Units	Topics	Credit	Lectures
Unit -I Air pollution and Management	<ul style="list-style-type: none"> Air pollution & air Quality Monitoring, Sampling, and Source Apportionment. Air Pollution Management in Urban Settlement & Rural Areas, Integrated Air Pollution Management, Green Belt. Bio scrubber. Catalytic Systems. Green Technology. Ozone Layer Depletion Atmospheric Brown Cloud Impact on Flora and Fauna Impact on Crop Yield, concept of carbon credit, footprint. 	4	15
Unit -II Soil pollution And Solid waste Management	<ul style="list-style-type: none"> Causes of soil salinity; Chemical and metallic pollution of agricultural soil; Mining and soil pollution. Bioleaching of metals, bioaugmentation & biomagnification for soil remediation. Phytostabilization - Contaminant removal, Soil cover, Rhizosphere modification, Geotextile capping solid waste; Industrial solid waste; Domestic solid waste; Agricultural solid waste; Municipal solid waste; Major sources of solid wastes; Effects of solid waste generation on quality of air, water and public health; 		15

	<ul style="list-style-type: none"> • Solid waste management, Disposal of organic and medical waste; Recovery and recycling of metallic waste; Disposal of plastic waste and hazardous wastes. 		
<p>Unit -III Water Pollution and Management</p>	<ul style="list-style-type: none"> • Biofilms in treatment of waste water; Biofilm development and biofilm Kinetics; Aerobic Biofilms. • Marine pollution-major pollutants (heavy metal, pesticide, oil, thermal, radioactive, plastics, litter and microbial, microplastics); • Biological indicators (Marine microbes, algae and crustaceans) and accumulators: Biotechnological application of hazardous waste management of water; Use of microbial systems, Phytoremediation strategies in constructed wetlands, Designing constructed wetlands, Substrate, Hydraulic loading rate, Hydraulic retention time, The selection of plant species, Surface area of wetland, Mechanisms to remove pollutants from constructed wetlands 		15
<p>Unit- IV Biodiversity & Environment Monitoring</p>	<ul style="list-style-type: none"> • Introducing biodiversity informatics, Global patterns of distribution of biodiversity, biomes, Composition and distribution of biodiversity in India, Taxonomic Database Working Group (TDWG) standards, compatibility and interoperability, taxonomically intelligent systems, Global biodiversity information system-Overview of the UNEP/GEF biodiversity data management project (BDM) • Biosensors in Environmental Monitoring – Working & its application for monitoring environment pollutants, Application of protein biomarkers; Biosensors and biochips. IOT for water quality monitoring – General working, Application, water Parameters. 		15

References:

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M.Sc. Biotechnology
Semester -III

Paper-III- Biologics and Regulatory Affairs (PBT3BRA)

Course Objectives:	<ul style="list-style-type: none"> To introduce learner to the basic concept of Biologics and Biosimilars, and its therapeutic uses To expose learner to the methodologies/steps involved in the production of Biologics/Biosimilars. To educate learner with the nuances of characterization of Biosimilars with emphasis on Reference Biologic. To familiarize learner with the regulatory aspects of approval of a Biologic/Biosimilar. 		
Course Outcomes	<p>At the end of the course, the learner will be:</p> <ul style="list-style-type: none"> Familiar with the basic concepts and significance of Biologics/Biosimilar in addition to having knowledge about its therapeutic applications Knowledgeable in the steps involved in the production of Biologics/Biosimilars Aware of the protocols/techniques required for characterization of the Biosimilars relative to the Reference Biologic Acquainted with the regulatory aspects of approval of a Biosimilars. 		
Unit	Topics	Credits	Lectures
Unit- I Introduction to Biologics and Biosimilars	<ul style="list-style-type: none"> Definition: Drugs, Small molecules, Large molecules/Biologics; Categories of Biologics: protein-based hormones, enzymes, monoclonal antibodies, vaccines, blood products, and gene/cellular therapies. Similarities and Differences: Small molecules versus generics, Biologics versus Biosimilars. USFDA Approved Small Molecules and USFDA Approved Generics USFDA Approved Biologics and USFDA Approved Biosimilars. Indian Regulatory Scenario in relation to Small Molecules and Biologics. Therapeutic uses of some of the Biologics/Biosimilars Acceptable quality differences between approved Biosimilar and innovator's product. 	4	15

<p>Unit- II</p> <p>Production of Biologics and Biosimilars</p>	<ul style="list-style-type: none"> • Reference Biologic and its significance, Choice of expression system/s and stability of cell lines Development of upstream and downstream processes and scale up to manufacturing. • Major factors contributing to the maintenance of product quality: raw materials and manufacturing conditions, virus filtration, mycoplasma removal, ultrafiltration. • Example: Production of Monoclonal antibody, downstream processing of Mab Introduction to the concept of Biobetters vs Biosimilars. 		<p>15</p>
<p>Unit- III</p> <p>Characterization of Biologics and Biosimilars</p>	<ul style="list-style-type: none"> • Appearance, particulates, pH, osmolality, particle size Molecular Weight, Protein Sequence and/or amino acid composition Glycosylation, Sialylation, Phosphorylation, Acetylation, and Myristoylation, if any Sulfhydryl groups(s) and di-sulphide bridges. • Size and Purity on HPLC/ MALDI Isoform pattern, Gel electrophoresis (IEF, SDS PAGE and Native PAGE), Western blot Fluorescence spectrum FTIR spectrum and NMR spectrum Bioassays, characterization using Monoclonal Antibody as an example. 		<p>15</p>
<p>Unit- IV</p> <p>Quality Assurance & Regulatory Affairs of Biologics and Biosimilars</p>	<ul style="list-style-type: none"> • Introduction to Regulatory Affairs and approvals of Biosimilars, Products approved under the FD&C. • PHS/BCPI Act 2009: Innovator Biologics Approval, Biosimilar Pathway, Totality of Evidence, Information required to demonstrate biosimilarity, Inter changeability, Product Switching, Product Naming Global regulatory framework. 		<p>15</p>

References:

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7.	International Journal of Drug Regulatory Affairs; 2017, 5(1), 20-24.
8.	Introduction to Biosimilars and Regulatory Requirements. Fact Sheet 3. International Federation of Pharmaceutical Manufacturers & Association (Geneva) & International Alliance of Patients Organization (UK).

M.Sc. Biotechnology Semester -III

Paper-IV-Molecular Enzymology and Enzyme Technology (PBT3MET)

Course Objectives	<ul style="list-style-type: none"> To get familiarity with the basic concepts of enzymes like enzyme kinetics, catalytic power of enzymes, active site and transition state, regulatory and allosteric enzymes, on protein enzymes. Techniques of enzyme purification and its importance. Need for enzyme engineering and its benefits and applications. Role of enzymes as a diagnostic tool and for industrial applications. Use of enzymes as Biosensors. 		
Course Outcomes	<ul style="list-style-type: none"> Enzyme deficiencies and use of enzymes as therapeutics. At the end of the course the student will be aware of the enzyme kinetics, the catalytic power of an enzyme, changes in the active site, and the importance of the transition state. The importance of obtaining enzymes in their pure form and the ways it can be achieved. The need for and methods for enzyme engineering to enhance its activity or half-life. The significance of enzymes as diagnostic tools, in therapy, industrial application and as biosensors; and the outcome of enzyme deficiencies. 		
Unit	Topics	Credits	Lectures
Unit-I Basic concepts of Enzymology	<ul style="list-style-type: none"> Brief history and introduction; chemical nature and properties of enzymes; how enzymes work-mechanism of action; catalytic power and specificity of enzymes; types of catalysis; active site; transition state and evidence for enzyme transition state complementarity; enzyme kinetics – factors affecting enzyme activity; enzyme inhibition; enzyme specificity; Regulatory enzymes, regulation of enzyme activity; allosteric enzymes and their kinetic properties; units of enzymes; non protein enzymes. 	4	15
Unit-II Techniques of Enzyme Purification and Studies /Enzyme Engineering	<p>Purification and Characterization:</p> <ul style="list-style-type: none"> Based on molecular size (Dialysis/ ultrafiltration, density gradient centrifugation, size exclusion chromatography); based on solubility of proteins (Isoelectric precipitation, salting out); Based on electric charge 		15

	<p>(Ion exchange chromatography, Electrophoresis-capillary electrophoresis, 2D electrophoresis);</p> <ul style="list-style-type: none"> • Based on adsorption properties (Adsorption and Affinity chromatography). • Other techniques: Immobilized metal ion affinity chromatography, Hydrophobic interaction chromatography, Reversed-phase chromatography and Chromato-focusing. <p>Enzyme engineering - Introduction, Objectives, Principles, Examples and Steps involved in enzymes engineering. Random mutagenesis and molecular breeding of DNA. Recent advances in rational approaches for Enzyme engineering. Applications of enzyme engineering.</p>		
<p>Unit-III Industrial & Medical Application Of Enzymes</p>	<ul style="list-style-type: none"> • Textile Industry, Detergent Industry, Pulp and Paper Industry, Animal Feed Industry: Enzyme Technology for Detoxification of Mycotoxins in Animal Feed, Phytases for Feed Applications and Leather Industry. Enzyme Applications for Human and Animal Nutrition. • Biosensors - Introduction, instrumentation, Types and examples. • Enzymes based sensors as diagnostic tools- Biosensors for Blood Glucose, Biosensors for Urea in Blood and Urine, Biosensors for Uric Acid, Biosensors for Arginine, Biosensors for Asparagine, Biosensors for Creatinine, Biosensors for Cholesterol, Allosteric enzyme-based biosensors. 		15
<p>Unit-IV Enzyme Deficiencies/ Diagnostic Enzymes/ Therapeutics</p>	<ul style="list-style-type: none"> • Disorders of amino acid metabolism- Phenylketonuria, Alkaptonuria, Homocystinuria. • Disorders of carbohydrate metabolism - Galactosemia, Hereditary fructose intolerance, hereditary lactose intolerance. • Disorder of lipid metabolism - Gaucher disease, Fabry disease. • Enzymes in diagnosis of diseases- Liver disorders, Cancer, Cardiac disorders. • Role of Other enzymes- Lysozyme, Butyryl choline esterase and Lipases. 		15

	<ul style="list-style-type: none"> • Therapeutic uses of enzymes - enzymes in replacement therapy enzymes in cancer treatment, enzymes for fibrinolysis, enzymes used for various treatments and enzyme gene therapy. • Iso-enzymes; enzyme pattern in diseases. 		
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3.	Berg JM, Tymoczko JL, Stryer L (2002): Biochemistry, 5th ed., Freeman WH and Co., New York.
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17.	Fundamentals of Enzyme Engineering, Young Je Yoo, Yan Feng, Yong-Hwan Kim, Camila Flor J. Yagonia, : Springer Netherlands 2017

M.Sc. Biotechnology
Semester -III
PRACTICAL- I (PBT3PR1)

4 Credits

Paper-I

1.	Viral Titering – Plaque Assay, Tissue Culture Infectious Dose (TCID), Chicken Embryo Infectious Dose (CEID)
2.	Immunoassays: For detection of the virus antigens by ELISA / RIA
3.	Detection techniques for COVID like RT- PCR and various RAPID tests
4.	Diagnosis of dengue (kit method).
5.	Diagnosis of Chikungunya (kit method)
6.	Antibiotics susceptibility testing by broth Macro dilution method & Micro broth dilution method
7.	Study of microbial biofilm formation on various surfaces & Biofilm visualization by staining
8.	Demonstration of minimum biofilm inhibition concentration of antibiotics/disinfectants

Paper-II

1.	Soil and water quality assessment (temp, pH, salinity, water holding capacity of soil etc.
2.	Study of metal tolerance of microorganisms isolated from soil/water.
3.	Soil ecosystem analysis/ analysis of microorganisms of soil.
4.	Analysis of compost.
5.	Detection of heavy metals concentration in soil/ water.
6.	Study and comparison of different air samplers.
7.	Growth curve of metal tolerant organism isolated from soil/ water.

M.Sc. Biotechnology
Semester -III
PRACTICAL- I (PBT3PR2)

4 Credits

Paper-III

1.	Electrophoresis {PAGE (native, SDS, reducing, non- reducing)} to characterize the protein with regard to its molecular weight, structure/subunits/SS bonds etc., or for detection of impurities in the product.
2.	Concentration of protein with Folin Lowry
3.	Western blot/dot blot for purity of product demonstration/ dummy sandwich preparation of semi-dry or wet western blot sandwich.
4.	HPLC /FTIR/NMR spectrum based theory questions may be asked for interpretation
5.	Visit to a facility manufacturing Biosimilar

Paper-IV

1.	Microbial Enzyme production: a. Partial purification using ammonium sulphate precipitation. b. Dialysis of the salt-precipitated protein. c. Assessing the enzyme activity and the protein content.
2.	Effect of inhibitors/ chemicals on enzyme activity.
3.	Extraction of enzymes from any plant sources.
4.	Measurement of Enzymatic Activity by Using a Colorimetric Assay.
5.	Purification of Acid Phosphatase from Wheat Germ.
6.	Enzyme Immunoassays. a. Methods for Enzyme Immunoassays. b. Non-competitive Solid-phase Enzyme Immunoassay. c. Competitive, Solid-phase Enzyme Immunoassay.
7.	Determining of Alkaline Phosphatase (ALP) Concentration in Blood Plasma.
8.	Measuring Lactase Enzymatic Activity.
9.	Screening of new microbial strains for production of enzymes and perform its activity staining (zymogram).
10.	To determine Specific activity of α Amylase from different sources.

Semester-IV

M.Sc. Biotechnology
Semester -IV
Nanobiotechnology (PBT4NBT)

Course Objectives	<ul style="list-style-type: none"> • The course aims at providing a general and broad introduction to multi-disciplinary field of nanotechnology. • It will familiarize students with the synthesis and applications of nanomaterials in the field of medicine. • The course will also give an insight into complete systems where nanotechnology can be used to improve our everyday life. 		
Course Outcomes	<ul style="list-style-type: none"> • Students should be able to understand the basic science behind the properties of nanomaterials and the principles behind advanced experimental techniques for studying nanomaterials. Also understand the different aspects and applications of nanomaterials. 		
Unit	Topic	Credits	Lectures
Unit -I Introduction to Nanotechnology and Nanomaterials	<ul style="list-style-type: none"> • Introduction: Nanotechnology, Nature's biological pathway, Examples of nanomaterials and nanostructures found in nature. • Nanometer-scale materials: Nanometer-Scale Metals Nano Metal Oxides, Nanopolymers, Quantum Dots, Carbon nanostructures. • Nanorobotics devices of nature ATP synthase, the kinesin, myosin, dynein, flagella modulated motion. 	4	15
Unit -II Synthesis of Nanomaterials	<ul style="list-style-type: none"> • Synthesis of nanometer-scale materials- Top down and Bottom up approaches. • Self-Assembly of nanoparticles and its mechanism. • Bio-directed synthesis and assembly of nanomaterials Synthesis and Assembly of Nanoparticles and Nanostructures Using Bio-Derived Templates 		
Unit -III Nanotechnology in Drug Delivery	<ul style="list-style-type: none"> • Biological Barriers to Nanocarrier- Mediated Delivery of Therapeutic and Imaging Agents, Nano-Sized Carriers for Drug Delivery, nano enabled drug delivery system, nanorobotics in medicine, • Nanomedicine: biopharmaceutics, implantable materials, implantable chemicals, surgical aids. 		

<p>Unit -IV Applications of nanotechnology and Nanotoxicology</p>	<ul style="list-style-type: none"> • Applications of Nanomaterials. • Nanotoxicology: Unique Properties, Toxicity of Nanomaterials, Factors Responsible for the Nanomaterial Toxicity, Routes of Exposure, Mechanisms of Nanoparticle Toxicity, • In Vitro Testing Methods for Nanomaterials, Ecotoxicity Analyses of Nanomaterials 		
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10.	Arun Kumar - Nanomedicine in drug delivery-CRC Press _ Taylor & Francis (2013).
11.	Yuliang Zhao, Zhiyong Zhang, and Weiyue Feng - Toxicology of Nanomaterials-Wiley- VCH (2016)
12.	Diwan, Parag, and Ashish Bharadwaj, eds. The Nanoscope: Encyclopedia of Nanoscience and Nanotechnology. Pentagon Press, 2005. (Vol 1-6)

M.Sc. Biotechnology
Semester -IV

OMICS & Systems Biology (PBT4OSB)

<p>Course objective:</p>	<ul style="list-style-type: none"> • Bring awareness of the emerging fields of OMICS and Systems Biology, biological systems as a whole and how parts of a systems interact with each other To introduce the techniques involved in Genomics, Proteomics, transcriptomics, Lipidomics and Metabolomics. • To describe the key features of human genome project • To understand the applications of the different OMICS technology to screening, testing and treatment of human diseases. • Perturbation of biological systems to study various responses in the biological systems using high throughput techniques. • Introduction to the modeling systems, databases, computational tools used in systems biology Data mining: The unit aims at introducing the concept of knowledge discovery process, data mining methods and various scientific application of data mining. The unit also explores application of systems biology in different field of health care.
<p>Course outcome:</p>	<p>At the end of the course learners will be able to</p> <ul style="list-style-type: none"> • Understand how the data is generated by OMICS technologies to contribute to different databases. • Understand, compare and contrast the techniques involved in Genomics, Proteomics, transcriptomics, Lipidomics and Metabolomics. • Will be able to apply the different technologies of OMICS to the screening, testing and treatment of human diseases. • Understand the structure and dynamics of a systems as a whole. Apply the different approaches to study systems biology by top down and bottom up approach. • Introduction to concepts of knowledge discovery process and data mining methods. Understand the application of data mining in genomics, proteomics and development of tools in bioinformatics. Have the knowledge of applications of systems biology in development of personalized medicine, drug development.

Unit	Topic	Credit	Lectures
Unit-I OMICS- The OMICS Technology, A Broad Outlook	<ul style="list-style-type: none"> • Tools of Omics-Introduction to Epigenomics Human genome project- goals, conclusions and application. • Structural and functional proteomics- protein- protein interaction and identification of interactions by various methods. • Application of Proteomics and Genomics in human diseases –screening, testing and treatment of diseases. • Metagenomics: concept, strategies, and applications in environmental biotechnology, agriculture and health 	4	15
Unit-II Transcriptomics, Lipidomics and Metabolomics	<ul style="list-style-type: none"> • Introduction to Transcriptomics, Lipidomics And Metabolomics, Glycomics, • Pharmacogenomics Techniques used in Lipidomics- Mass Spectroscopy, TLC, HPLC, GC and Capillary electrophoresis, MALDI. • Technique used in Metabolomics- Mass Spectroscopy, Electrophoresis, chromatography- GC, LC & NMR. • Technique used in Transcriptomics- next generation sequencing, northern blotting, DDRT-PCR, microarrays, gel free assays like biolayer interference, SPR. • Applications of transcriptomics metabolomics and lipidomics in human diseases –screening, testing and treatment of diseases. (in clinical applications, personalized medicine, infectious diseases) 		15
Unit-III Introduction to Systems Biology	<ul style="list-style-type: none"> • Systems biology towards systems level understanding of biological systems • Systems structure, systems dynamics, systems design and control, systems project Models and Modelling systems in systems biology • What is a model? Key properties of models, Basic of computational models, networks, 		15

	<p>data integration, standards, and model organism</p> <ul style="list-style-type: none"> • Perturbation of biological systems and 'Omics' as Quantitative high throughput experimental tools for systems biology Standards and formats for systems biology. • Computational Databases and software tools in systems biology. • Biological networks: metabolic networks, gene regulatory networks, PPI networks, genetic interaction (GI) networks, and signaling networks. 		
<p>Unit-IV Data mining and Application of Systems Biology</p>	<ul style="list-style-type: none"> • Introduction to Knowledge of discovery in databases (KDD) What is knowledge, need for KDD, KDD process outline, concept and goals. • Data Mining methods: Statistics – classification, correlation, association analysis, regression, and clustering Machine learning –Symbolic and statistical approaches. • Text mining, and Pattern evaluation. • Data mining in scientific application • Application of systems biology: 1. Systems biology to systems medicine. 2. Application of systems biology in drug discovery and development 3. Systems biology and synthetic biology. 		15

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2.	Integration of omics approaches and systems biology for clinical applications. Antonia Vlahou, Harald Mischak, Jerome Zoidakis, Fulvio Magni. Wiley publications.
3.	Omic technologies: genomics, transcriptomics, proteomics and metabolomics. Richard P. Horgan And Louise C. Kenny Scientific advisory committee (sac), the obstetrician and gynaecologist.
4.	Bioinformatics and functional Jonathan Pevsner. Wiley blackwell genomics, <i>third edition</i> publications.

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6.	Introduction to proteomics- <i>tools for the new biology-</i> by Daniel C. Liebler, Humana press totowa, nj.
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M.Sc. Biotechnology
Semester -IV

Drug Discovery & Clinical Study (PBT4DDC)

Course Objectives:	<ul style="list-style-type: none"> • The objective of this course is to have a firm foundation in Drug Discovery and Clinical Studies. • To provide students' knowledge about Clinical Trial Design and Indian Regulations, Pharmacovigilance and Clinical Data Science. 		
Course Outcomes:	<p>By the end of the course the student will:</p> <ul style="list-style-type: none"> • Able to learn about drug discovery-design pathway using some in-silico tools. Able to understand the clinical trial design set up as well as they will gain information on rules-regulation and responsibilities in clinical studies. 		
Unit	Topics	Credit	Lectures
Unit-I Clinical Research Informatics in Drug Discovery	<p>Introduction to the drug discovery & development</p> <ul style="list-style-type: none"> • Source of drugs • Structural effects on drug action • Drugs derived from natural products • General principles of pharmacology • Drug development and testing process <p>Approaches to new drug discovery</p> <ul style="list-style-type: none"> • Computer-aided drug design • Identification of novel drug candidates and drug targets • Construction the signaling network of a drug using integer linear programming • Identification for druggable targets of a disease 	4	15
Unit II Clinical Trial Design And Indian Regulations	<p>Clinical Trial Design</p> <ul style="list-style-type: none"> • Basic framework of clinical trial • Randomized clinical trials and different phases • Adaptive randomization methods • Seamless design • Internal pilot design • Design selection factors 		15

	<p>Regulations</p> <ul style="list-style-type: none"> • The national regulatory body • Key documents in clinical research • Regulatory requirements for the conduct of clinical trials in India <p>The Roles and Responsibilities of Stakeholders in the Sharing of Clinical Trial Data</p> <ul style="list-style-type: none"> • Participants in clinical trials, Investigators, • Research institutions and universities • Journals and Professional societies 		
<p>Unit III Pharmaco-vigilance</p>	<p>Scope and purposes of pharmacovigilance</p> <ul style="list-style-type: none"> • Adverse Drug Reactions (ADR) • ADR classification • Nature and mechanism of ADR • Concept of safety • Phases and types of DATA <p>The process of Pharmacovigilance</p> <ul style="list-style-type: none"> • Signal detection, evaluation and investigation, • Communication <p>Methods of evaluating effectiveness of action</p> <p>International regulatory collaboration</p> <ul style="list-style-type: none"> • WHO, CIOMS, ICH, ISoP, ISPE 		15
<p>Unit-IV Clinical Data Science</p>	<p>Data management in clinical research: An overview</p> <ul style="list-style-type: none"> • Data Sources and Data Types • Standards in Healthcare Data • Research Data Stewardship for Healthcare Professionals • Preparing Data for Prediction Model Development • Prediction Modeling Methodology • Clinical Decision Support System 		15

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11.	An Introduction to Pharmacovigilance, Second Edition Patrick Waller and Mira Harrison- Woolrych ISBN 9781119289753 (Adobe PDF)
12.	Data management in clinical research: An overview, Indian J Pharmacol. 2012 Mar-Apr; 44(2): 168–172. Binny Krishnankutty, Shantala Bellary, and Latha S. Moodahadu doi: 10.4103/0253-7613.93842 PMID: 2252946
13.	Fundamentals of Clinical Data Science Pieter Kubben, Michel Dumontier Andre Dekker ISBN 978-3-319-99712-4 ISBN 978-3-319-99713-1 (eBook) https://doi.org/10.1007/978-3-319-99713-1

M.Sc. Biotechnology
Semester -IV

Scientific Writing & Food Biotechnology (PBT4SWF)

Course Objectives:	<ul style="list-style-type: none"> • To develop skills for the processing and analysis of scientific data. • To enable students to present their research results in the format of oral or poster presentations at conferences, to write scientific publications (theses, articles) and to prepare applications for scientific grants (research proposals). • To inculcate good scientific writing practices. 		
Course Outcomes:	<ul style="list-style-type: none"> • Think critically, organize and analyze scientific data. • Develop advanced scientific writing skills to write research articles, reviews, thesis, and proposals and to make oral, poster or power point presentations. Understand the best practices of scientific writing by adhering to research ethics and by avoiding plagiarism. 		
Unit	Topics	Credit	Lectures
<p style="text-align: center;">Unit-I Basic Scientific Writing and Plagiarism</p>	<p>Introduction to scientific writing.</p> <ul style="list-style-type: none"> • Basic scientific writing skills: style and language, spelling, grammar, syntax, jargon and sentence structure. • Elements of a scientific paper: abstract, introduction, materials & methods, results, discussion, references and drafting titles. • Scientific writing process: thinking, planning, rough draft, revision of content. • Processing data & application of statistics Displaying data: text, table, graph and defining terms and abbreviations. • Statistical analysis and tools for experimental data. • Referencing software: Mendeley, Endnote. Plagiarism: Definition, Common types of plagiarism, Intentional and Unintentional plagiarism, Detection of plagiarism by anti-plagiarism tools (Turnitin, Duplichecker, Viper, Copyleaks), Penalties for plagiarism, Avoiding plagiarism. 	04	15

<p>Unit II Advanced Scientific Writing</p>	<p>Guidelines for Medical writing. Scientific writing skills:</p> <ul style="list-style-type: none"> • Writing a research paper for biomedical journal, • Writing science research papers and articles, Writing a research proposal, • Writing a research report, writing popular reports, writing thesis and dissertation, Writing clinical study reports. • Presentation skills: Oral presentation, Poster Preparation & presentation, PowerPoint presentations. • Research ethics, Scientific misconduct. 		<p>15</p>
<p>Unit III Food Biotechnology- Nutraceuticals</p>	<ul style="list-style-type: none"> • Nutraceuticals and functional foods Definition, characteristic features, and classification, phytonutraceuticals, • Prebiotics and Probiotics, Sources (with examples e.g. microbes, plants, algae, animals), Blue biotechnology, Food security, Food preservation, Chemopreservation Food processing (animal and sea food), Food packaging 		<p>15</p>
<p>Unit-IV Food biotechnology in management of health and disease</p>	<ul style="list-style-type: none"> • Applications of nutraceuticals in human health and nutrition- health effects of commonly used nutraceuticals and functional foods (case studies), Safety and Regulatory guidelines • Nutraceuticals in management of health and disease • Development of designer foods for specific chronic diseases • Nutraceutical adjuvants 		<p>15</p>

References:

1.	Thomas, C George. (2019). Research Methodology and Scientific Writing 2nd edition.
2.	Kumar, Ranjeet. (2011). Research methodology: a step-by-step guide for beginners 3rd edition.
3.	Jennifer Peat, Elizabeth Elliott, Louise Baur, and Victoria Keena. (2002). Scientific Writing (BMJ Books).
4.	J.R. Mathews & R.W.Mathews (2008) Successful Scientific Writing, 3rd Ed. Cambridge University Press.
5.	https://www.ema.europa.eu/en/documents/scientific-guideline/ich-e-3-structure-content-clinicalstudy-reports-step-5_en.pdf
6.	https://www.emwa.org/documents/about_us/EMWAguidelines.pdf
7.	https://www.otago.ac.nz/hedc/otago615367.pdf
8.	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3510958/
9.	http://medind.nic.in/iad/t02/i1/iadt02i1p21.pdf
10.	https://intranet.birmingham.ac.uk/as/registry/policy/conduct/plagiarism/interactive-course.aspx
11.	https://www.bowdoin.edu/dean-of-students/judicial-board/academic-honesty-and-plagiarism/common-types-of-plagiarism.html
12.	https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism?wssl=1
13.	https://holyfamily.libguides.com/c.php?g=610218&p=4236572
14.	https://plagiarismdetector.net
15.	https://www.duplichecker.com

M.Sc. Biotechnology
Semester -IV
PRACTICAL- I (PBT4PR1)
Paper-I

4 Credits

1.	Biosynthesis and characterization of eco-friendly silver nanoparticles by using plant/leaf extracts/green tea
2.	Synthesis and characterization of zinc sulfide nanoparticles by A reverse micelle method
3.	Synthesis and characterization of Fluorescent Carbon Nanoparticles from Candle Soot and its separation of using the Thin-Layer Chromatographic Method
4.	Synthesis of alginate beads and investigation of citric acid release from a nano shell coating of polymer
5.	Antimicrobial activity testing of Nanoparticles/nanocomposites

Paper-II

1.	Gel electrophoresis of lipids (lipoproteins extracted from various sources) to separate and identify the lipid fraction
2.	Preparation of report based on -Databases and data repositories used in systems Biology
3.	Detection assay for gene expression using micro array and qRT -PCR (demonstration)
4.	Identification of protein using analytical technique Mass spectroscopy (demonstration)

M.Sc. Biotechnology
Semester -IV
PRACTICAL- I (PBT4PR2)

4 Credits

Paper-III

1.	Exploration of various learning platforms in online courses listed below :
	Online courses in fundamentals of Neuroscience from Harvard University https://online-learning.harvard.edu/course/fundamentals-neuroscience-part-1-electrical-properties-neuron?delta=0
	Molecular Biology from MIT https://ocw.mit.edu/courses/biology/7-28-molecular-biology-spring-2005/
	Introduction to Bioethics from Georgetown https://bioethicsarchive.georgetown.edu/phlx101-2/course.html#units/introduction
2.	Write a research proposal on any topic of your interest from the MSc syllabus. For research proposal contents and format refer to NSF guidelines. https://www.nsf.gov/pubs/policydocs/pappg19_1/nsf19_1.pdf For reference work use Mendeley Desktop. https://www.mendeley.com/guides/desktop
3.	Complete an online course (Minimum 1 week) on the topic related to the biotechnology. Write a comprehensive report on the studied course contents.
	Swayam https://swayam.gov.in/
	NPTEL https://nptel.ac.in/noc/
	MOOC https://www.it.iitb.ac.in/frg/wiki/images/7/7b/Demo-PPT.pdf
	E-learning https://www.bellevuecollege.edu/elearning/start/intro/

Paper-IV

1.	Estimation of total sugars from food products (dairy, fruit juices, bakery)
2.	Determination of acid value of natural fats and oils.
3.	Determination of iodine number of fats and oils.
4.	Estimation of vitamin B by HPLC (demonstration)
5.	Study of nutraceuticals important plants like Zinziber, Curcuma, Alovera, Asparagus, Ocimum etc.
6.	Estimation of antioxidant property of phytochemical by DPPH.
7.	Qualitative test for tannins, phenols, isoflavones, alkaloids using TLC.
8.	Estimation of food preservatives/additives (Parabens) from food sample by HPLC (demonstration).
9.	Estimate Cholesterol contents in given sample by Zak's methods
10.	Estimation of bio-burden by viable counts.
11.	Estimation of gluten from food sample.
12.	To study nutritional components (protein, carbohydrate, secondary metabolites, lipids, vitamin C) of following: Bee honey, Mushrooms, Lentils, Soya, Dairy product, Amla, Papaya, Spinach

Practical References:

1. Cappuccino, J. G., & Welsh, C. (2016). Microbiology: a Laboratory Manual. Benjamin-Cummings Publishing Company.
2. Collins, C. H., Lyne, P. M., Grange, J. M., & Falkinham III, J. (2004). Collins and Lyne's Microbiological Methods (8th ed.). Arnold's.
3. Tille, P. M., & Forbes, B. A. Bailey & Scott's Diagnostic Microbiology,
2. Green, M. R., & Sambrook, J. (2012). Molecular Cloning: A Laboratory Manual. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press.
3. Wilson K and Walker J. (2000). Principles and Techniques of Practical Biochemistry, 5th Edition, Cambridge University Press.
2. Holme D and Peck H. (1998). Analytical Biochemistry, 3rd Edition, Longma
4. Plummer DT (1971). An Introduction to Practical Biochemistry. McGraw-Hill, NY.



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW
PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
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**Program: B.Sc
Revised Syllabus of F.Y.B.Sc. Computer Science
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2021-22**

Preamble

The rise of Information and Communication Technology (ICT) has profoundly affected modern society. Increasing applications of computers in almost all areas of human endeavor has led to vibrant industries with concurrent rapid change in technology. As the computing field advances at a rapid pace, the students must possess a solid foundation that allows and encourages them to maintain relevant skills as the field evolves. Specific languages and technology platforms change over time. Thus, students must continue to learn and adapt their skills throughout their careers. To develop this ability, students will be exposed to multiple programming languages, tools, paradigms and technologies as well as the fundamental underlying principles throughout this programme. The programme offers required courses such as programming languages, data structures, computer architecture and organization, algorithms, database systems, operating systems, and software engineering; as well as specialized courses in artificial intelligence, computer-based communication networks, distributed computing, information security, graphics, human-computer interaction, multimedia, scientific computing, web technology, and other current topics in computer science.

The core philosophy of this programme is to –

- Form strong foundations of Computer Science
- Nurture programming, analytical & design skills for real-world problems.
- Introduce emerging trends to the students in a gradual way.
- Groom the students for the challenges of ICT industry

The students these days not only aspire for a career in the industry but also look for research opportunities. The main aim of this programme is to deliver a modern curriculum that will equip graduates with strong theoretical and practical backgrounds to enable them to excel in the workplace and to be lifelong learners. Not only does it prepare the students for a career in the Software industry, it also motivates them towards further studies and research opportunities. Graduating students, can thus take up postgraduate programmes in CS leading to research as well as R&D, can be employable at IT industries, or can adopt a business management career in the first year i.e., for semester I & II, basic foundation of important skills required for software development is laid.

The syllabus proposes to have four core subjects of Computer science and two core courses of Mathematics- Statistics. All core subjects are proposed to have theory as well as practical tracks. While the Computer Science courses will form fundamental skills for solving computational problems, the Mathematics & Statistics course will inculcate research-oriented acumen. Ability Enhancement Courses on Soft Skill Development will ensure an overall and holistic development of the students. The syllabus design for further semesters encompasses more advanced and specialized courses of Computer Science. We sincerely believe that any student taking this programme will get a very strong foundation and exposure to basics, advanced and emerging trends of the subject. We hope that the students' community and teachers' fraternity will appreciate the treatment given to the courses in the syllabus.

We wholeheartedly thank all experts who shared their valuable feedback and suggestions in order to improve the contents; we have sincerely attempted to incorporate each of them. We further thank the members of the Board of Studies for their confidence in us.

Scheme of Examination

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Continuous Assessment	20 Marks

Question Paper Pattern for Continuous Assessment (Total Marks 20 to be converted in 10 marks)

Marks	Group Project*/ Individual Project	Presentation and write- up	Practical Skills	Open book test	Quiz
5	Hypothesis/Topic of the project	Presentation skill	Demonstration of skill	High order thinking questions (HOTS)	Quiz on application of subject in real life
5	Actual laboratory work/Field work	Knowledge	Viva		
5	Result/output	Quality of ppt	Report		
5	Dissertation/Report	Writing skill	Problem solving ability		

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
<ol style="list-style-type: none"> 1. There shall be four questions each of 15 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

I. Practical Examination : – 300 (50 marks x 6 core papers)

II. Each core subject carries :- 50 Marks

Sr. No.	Particulars of External	Marks
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	50

Minimum 75 % practical from each core subjects are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Exam) -----

Semester - I *[Under CBCS Scheme]*

Course	Course Type	Course code	Hrs./ week	Internal assessment	Semester - end examination	Total	Credits
Computer Organization and Design	Core	UCS1COD	3	40	60	100	2
Programming with Python I	Core	UCS1PP1	3	40	60	100	2
Programming with C	Core	UCS1PWC	3	40	60	100	2
Database Management Systems – I	Core	UCS1DM1	3	40	60	100	2
Discrete Mathematics	Core	UCS1DMA	3	40	60	100	2
Descriptive Statistics	Core	UCS1DST	3	40	60	100	2
Soft Skill Development	Ability enhancement	UCS1SSD	3	40	60	100	2
Environmental Science		USC1EVS	2	40	60	100	2
Practical of UCS1COD and UCS1PP1	Core	UCS1PR1	6	--	100	100	2
Practical of UCS1PWC and UCS1DM1	Core	UCS1PR2	6	--	100	100	2
Practical of UCS1DMA and UCS1DST	Core	UCS1PR3	6	--	100	100	2

Semester - II
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs./ week	Internal assessment	Semester - end examination	Total	Credits
Object Oriented Programming using C++	Core	UCS2OOP	3	40	60	100	2
Programming with Python II	Core	UCS2PP2	3	40	60	100	2
LINUX	Core	UCS2LIN	3	40	60	100	2
Data Structure	Core	UCS2DST	3	40	60	100	2
Calculus	Core	UCS2CAL	3	40	60	100	2
Statistical Methods	Core	UCS2STM	3	40	60	100	2
Digital Marketing	Ability enhancement	UCS2DIM	3	40	60	100	2
Spoken English		USC2SPC	2	40	60	100	2
Practical of UCS2OOP and UCS2PP2	Core	UCS2PR1	6	--	100	100	2
Practical of UCS2LIN and UCS2DST	Core	UCS2PR2	6	--	100	100	2
Practical of UCS2CAL and UCS2STM	Core	UCS2PR3	6	--	100	100	2

Semester I

Computer Organization and Design

Course Description	
Semester	I
Course Name	Computer Organization and Design
Course Code	UCS1COD
Credit	2
Hours	45

Course Objectives

1. To understand the basic structure and organization of computers
2. To understand the structure and operation of modern processors and their instruction sets
3. To understand the working of microcontroller

Course Outcomes

1. Explain the underlying principles of computers
2. Analyze the Instruction set architecture
3. Analyze the role of various hardware components of processor
4. Analyze how data is transferred between various peripheral devices in the computer

Course Code UCS1COD	Course Title Computer Organization and Design	Credits 02
Unit I	Computer Abstractions and Technology: Basic structure and operation of a computer, functional units and their interaction. Representation of numbers and characters. Logic circuits and functions: Combinational circuits and functions: Basic logic gates and functions, truth tables; logic circuits and functions. Minimization with Karnaugh maps. Synthesis of logic functions with and-or-not gates, Nand gates, nor gates. Fan-in and fan-out requirements; tri state buffers. Half adder, full adder, ripple carry adder. (Flip flops) Gated S-R and D latches, edge-triggered D latch. Shift registers and registers. Decoders, multiplexers. Sequential circuits and functions: State diagram and state table; finite state machines and their synthesis.	15 L

Unit II	<p>Microcontroller: Introduction to microcontroller, Difference between microcontroller and microprocessor Types of microcontrollers, Memory, Instruction set, Applications 8051 microcontroller Architecture</p> <p>Instruction set architectures:</p> <p>Memory organization, addressing and operations; word size, big-endian and little-endian arrangements. Instructions, sequencing. Instruction sets for RISC and CISC (examples Altera NIOS II and Free scale ColdFire). Operand addressing modes; pointers; indexing for arrays. Machine language, assembly language, assembler directives. Function calls, processor runtime stack, stack frame. Types of machine instructions: arithmetic, logic, shift, etc. Instruction sets, RISC and CISC examples.</p>	15 L
Unit III	<p>Basic Processor Unit:</p> <p>Main components of a processor: registers and register files, ALU, control unit, instruction fetch unit, and interfaces to instruction and data memories. Datapath. Instruction fetch and execute; executing arithmetic/logic, memory access and branch instructions; hardwired and micro programmed control for RISC and CISC. Basic I/O: Accessing I/O devices, data transfers between processor and I/O devices. Interrupts and exceptions: interrupt requests and processing.</p>	15 L

Textbooks:

- 1) Carl Hamacher et al., Computer Organization and Embedded Systems, 6 ed., McGraw-Hill 2012
- 2) Microprocessors and Microcontrollers: Architecture, Kant Krishna

Additional References:

- 1) Patterson and Hennessy, Computer Organization and Design, Morgan Kaufmann, ARM Edition, 2011
- 2) R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd., 4th Edition, 2010

Sr. No.	Practicals of Computer Organization and Design
1	Study and verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, and EX-NOR).
2	Simplify given Boolean expression and realize it.
3	Design and verify a half/full adder.
4	Design and verify half/full subtractor.
5	Design a 4-bit magnitude comparator using combinational circuits.
6	Design and verify the operation of flip-flops using logic gates.
7	Verify the operation of a counter.
8	Verify the operation of a 4-bit shift register.
9	Using SPIM, write and test an adding machine program that repeatedly reads in integers and adds them

	into a running sum. The program should stop when it gets an input that is 0, printing out the sum at that point.
10	Perform arithmetic operations based on 8051 microcontrollers using KEIL simulator.

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Computer Abstraction and technology	15h	1	1	1
2	Instruction set architecture	15h	2	1	2
3	Basic processor unit	15h	3	1	2

Programming with Python-I

Course Description	
Semester	I
Course Name	Programming with Python-I
Course Code	UCS1PP1
Credit	2
Hours	45

Course Objectives:

1. Master the fundamentals of writing Python scripts
2. Learn core Python scripting elements such as variables and flow control structures
3. Discover how to work with lists and sequence data

Course Outcomes:

1. Understand the pros and cons of scripting languages vs. classical programming languages
2. Understand Python programming basics and paradigm
3. Apply loops, control statements, and string manipulations
4. Illustrate the use of lists, tuples & dictionaries for representing compound data

Course Code UCS1PP1	Course Title Programming with Python-1	Credits 02
Unit I	<p>Overview of Python: History; Features of Python, Execution of a Python Program, Python Interpreter, Comparison of Python with C and Java, Installing Python, Writing and Executing First Python Program, Getting Help, IDLE</p> <p>Data Types, Variables and Other Basic Elements: Comments, Docstrings, Data types- Numeric Data type, Compound Data Type, Boolean Data type, Dictionary, Sets, Mapping, Basic Elements of Python, Variables</p> <p>Input and Output Operations: Input Function, Output Statements, The print () function, The print(“string”) function, The print (variables list) function, The print(object) function, The print (formatted string) function, Command Line Arguments.</p> <p>Operators: Arithmetic operators, Assignment operators, Unary minus operator, Relational operators, Logical operators, Bitwise operators, Membership operators, Identity operators, Precedence of Operators, Associativity of Operators</p> <p>Control Statements: The if statement, the if ... else Statement, the „if...elif ... else“ Statement, Loop Statement- while loop, for loop, Infinite loop, Nested loop, the else suite, break statement, continue statement, pass statement, assert statement, return statement</p>	15 L
Unit II	<p>Arrays: Creating Arrays, Indexing and Slicing of Arrays, Basic Array Operations, Arrays Processing, Mathematical Operations on Array, Aliasing Arrays, Slicing and Indexing in NumPy Arrays, Basic slicing, Advanced Indexing, Dimensions of Arrays, Attributes of an Array, The ndim Attribute, The shape Attribute, The size Attribute, The item size Attribute</p> <p>Functions: Function definition and call, Returning Results, Returning Multiple Values from a Function, Built-in Functions, Difference between a Function and a Method, Pass Value by Object Reference, Parameters and Arguments, Formal and Actual Arguments, Positional Arguments, Keyword Arguments, Default Arguments, Arbitrary Arguments, Recursive Functions, Anonymous or Lambda Functions, Using Lambda with the filter() Function, Using Lambda with the map() Function, Using Lambda with the reduce() Function Modules:</p> <p>OOPS: What is Object Oriented Programming, what is Procedural Programming, Difference between object-oriented Programming and Procedural Programming, Python OOP’s Concept- Object, Class, Encapsulation, Inheritance, Polymorphism, Data Abstraction</p>	15 L

Unit III	<p>Strings: Creating Strings, Functions of Strings, Working with Strings, Length of a String, Repeating and Concatenating Strings, Checking Membership, Comparing Strings, Removing Spaces, Finding Substrings, Counting Substrings, Immutability, Splitting and Joining Strings, Changing Case, Checking Starting and Ending of a String, Sorting Strings, searching in the Strings, Testing Methods, Formatting Strings, Finding the Number of Characters and Words, Inserting Substrings into a String</p> <p>List and Tuples: Lists, List Functions and Methods, List Operations, List Slices, Nested Lists, Tuples, Functions in Tuple</p> <p>Dictionaries: Creating a Dictionary, Operators in Dictionary, Dictionary Methods, Using for Loop with Dictionaries, Operations on Dictionaries, Converting Lists into Dictionary, Converting Strings into Dictionary, Passing Dictionaries to Functions, Sorting the Elements of a Dictionary using Lambda, Ordered Dictionaries</p>	15 L
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Textbooks:

1. Practical Programming: An Introduction to Computer Science Using Python 3, Paul Gries, Jennifer Campbell, Jason Montojo, Pragmatic Bookshelf, 2nd Edition, 2014
2. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016.

Additional References:

1. Programming through Python, M. T Savaliya, R. K. Maurya & G M Magar, Sybgen Learning India, 2020

Sr. No.	Practicals of Programming with Python-1
1	Script and interactive modes; defining a function in the two modes; executing a script; interactively executing a statement list (semicolon-separated sequence of simple statements)
2	Programs using built-in and user-defined functions.
3	Programs based on conditional constructs, the for statement and the range function.
4	Programs related to string manipulation.
5	Write a Python Program for demonstration of an Array, and Adding an element in an array.
6	Programs based on the while statement with break and continue.
7	Programs using built in functions from the time, math and random modules.
8	Programs related to dictionaries.
9	Programs using list comprehensions and anonymous functions.
10	Programs using the built-in methods of the string, list and dictionary classes.
11	Programs using OOP

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Introduction to Python-1	15h	1	2	1
2	Array, Function, OOPS	15h	2	2	2
3	Strings, List, Tuples, Dictionary	15h	4	2	3

Programming With C

Course Description	
Semester	I
Course Name	Programming with C
Course Code	UCS1PWC
Credit	2
Hours	45

Course Objectives:

1. Provide basic knowledge of concepts and programming language.
2. Describe implementation of operators, data types and loops.
3. Illustrate the array, pointer and file handling techniques.
4. Use of string functions and evaluation of string operations.

Course Outcome:

1. Explain the basic programming concepts and broad view of programming language.
2. Apply programming concepts such as operators, primitive data types, and loops.
3. Illustrate the use of an array, pointer, and file handling techniques.
4. Demonstrate the use of strings and string handling functions.

Course Code: UCS1PWC	Course Title Programming with C	Credits 02
Unit I	<p>Programming Paradigms: Use of Algorithms/Flow Charts for problem solving</p> <p>Structure of C program: Header and body, Use of comments. Interpreters' vs compilers, Python vs C. Compilation of a program.</p> <p>Formatted I/O: print(), scan ().</p> <p>Data: Variables, Constants, data types like: int, float char, double and void, short and long size qualifiers, signed and unsigned qualifiers. Compare with datatypes in Python. Compare static typing in C vs dynamic typing in Python</p> <p>Variables: Declaring variables, scope of the variables according to block, hierarchy</p>	15 L

	<p>of data types. Compare explicit declarations in C with implicit declarations in Python.</p> <p>Types of operators: Arithmetic, relational, logical, compound assignment, increment and decrement, conditional or ternary, bitwise and comma operators. Precedence and order of evaluation, statements and Expressions. Automatic and explicit type conversion.</p> <p>Iterations: Control statements for decision making: (i) Branching: if statement, else. if statement, (does the writer mean if-else or nested ifs) switch statement. (ii) Looping: while loop, do... While, for loop. (iii) Jump statements: break, continue and goto</p>	
Unit II	<p>Arrays: (One and two dimensional), declaring array variables, initialization of arrays, accessing array elements. Compare array types of C with list and tuple types of Pythons.</p> <p>Data Input and Output functions: Character I/O format: getch(), getche(), getchar(), getc(), gets(), putchar(), putc(), puts().</p> <p>Manipulating Strings: Declaring and initializing String variables, Character and string handling functions. Compare with Python strings.</p> <p>Functions: Function declaration, function definition, Global and local variables, return statement, calling a function by passing values.</p> <p>Recursion: Definition, Recursive functions.</p>	15 L
Unit III	<p>Pointer: Fundamentals, Pointer variables, Referencing and de-referencing, Pointer Arithmetic, Using Pointers with Arrays, Using Pointers with Strings, Array of Pointers, Pointers as function arguments, Functions returning pointers.</p> <p>Dynamic Memory Allocation: malloc (), calloc (), realloc (), free () and sizeof operator. Compare with automatic garbage collection in Python.</p> <p>Structure: Declaration of structure, reading and assignment of structure variables, Array of structures, arrays within structures, structures within structures. Compare C structures with Python tuples.</p> <p>Unions: Defining and working with unions.</p> <p>File handling: Different types of files like text and binary, Different types of functions: fopen (), fclose (), fgetc (), fputc (), fgets (), fputs (), fscanf (), fprintf (), getw (), putw (), fread (), fwrite (), fseek ().</p>	15 L
	<p>Textbooks:</p> <p>1. Programming in ANSI C (Third Edition): E Balagurusamy, TMH</p> <p>Additional References:</p> <p>1. Pradip Dey, Manas Ghosh, “Programming in C”, second edition, Oxford University Press</p> <p>2. Yashavant P. Kanetkar. “Let Us C”, BPB Publications</p>	

Sr. No.	Practicals of Programming with C
1	Programs to understand the basic data types and I/O.
2	Programs on Operators and Expressions
3	Programs on decision statements
4	Programs on looping.
5	Programs on arrays.
6	Programs on functions.
7	Programs on structures and unions.
8	Programs on pointers
9	Programs on string manipulations.
10	Programs on basic file operations.

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Introduction to basic concepts of C	15h	1	1	1
2	Array Implementation	15h	2	1	2
3	Pointer Implementation	15h	3	1	1

Database Management Systems-I

Course Description	
Semester	I
Course Name	Database Management Systems-I
Course Code	UCS1DM1
Credit	2
Hours	45

Course Objectives:

1. The objective of this course is to introduce the concept of the DBMS with respect to the relational model, to specify the functional and data requirements for a typical database application and to understand creation, manipulation and querying of data in databases

Course Outcome:

After completing the course, students will be able to

1. Evaluate business information problem and the requirements of a problem in terms of data
2. Design the database schema with the use of appropriate data types for storage of data in database
3. Create, manipulate, query and back up the databases
4. Analyze various security mechanisms required for database protection

Course Code UCS1DM1	Course Title Database Management System-I	Credits 02
Unit I	<p>Introduction to DBMS: Database, DBMS–Definition, Overview of DBMS, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture</p> <p>Data models: Client/Server Architecture, Object Based Logical Model, Record Based Logical Model (relational, hierarchical, network)</p> <p>Entity Relationship Model: Entities, attributes, entity sets, relations, relationship sets, Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization, Conceptual Design using ER (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER)</p> <p>Relational data model: Domains, attributes, Tuples and Relations, Relational Model Notation, Characteristics of Relations, Relational Constraints - primary key, referential integrity, unique constraint, Null constraint, Check constraint</p>	15 L
Unit II	<p>ER to Table: Entity to Table, Relationship to tables with and without key constraints.</p> <p>Schema refinement and Normal forms: Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition.</p> <p>Relational Algebra: operations (selection, projection, set operations union, intersection, difference, cross product, Joins –conditional, equi join and natural joins, division)</p> <p>DDL Statements: Creating Databases, Using Databases, datatypes, Creating Tables (with integrity constraints – primary key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables, Backing Up and Restoring databases</p>	15 L
Unit III	<p>DML Statements: Viewing the structure of a table insert, update, delete, select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having clause</p> <p>Functions: String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse) Joining Tables: inner join, outer join (left outer, right outer, full outer)</p> <p>Subqueries: subqueries with IN, EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL clause, correlated subqueries</p> <p>Database Protection: Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control</p> <p>Views: (creating, altering dropping, renaming and manipulating views)</p> <p>DCL Statements: (creating/dropping users, privileges introduction, granting/revoking privileges, viewing privileges)</p>	15 L

Textbooks:

- 1) Ramez Elmasri & Shamkant B.Navathe, Fundamentals of Database Systems, Pearson Education, Sixth Edition, 2010
- 2) Ramakrishnam, Gehrke, Database Management Systems, McGraw-Hill, 2007
- 3) Joel Murach, Murach's MySQL, Murach, 2012

Additional References:

- 1) Robert Sheldon, Geoff Moes, Begning MySQL, Wrox Press, 2005.

Sr. No.	Practicals of Database Management System
1	For given scenario <ul style="list-style-type: none">• Draw an E-R diagram and convert entities and relationships to tables.
2	Write relational algebra queries on the tables created in Practical-1.
3	Perform the following: <ul style="list-style-type: none">• Viewing all databases• Creating a Database• Viewing all Tables in a Database• Creating Tables (With and Without Constraints)• Inserting/Updating/Deleting Records in a Table• Saving (Commit) and Undoing (rollback)
4	Perform the following: <ul style="list-style-type: none">• Altering a Table• Dropping/Truncating/Renaming Tables• Backing up / Restoring a Database
5	Perform the following: <ul style="list-style-type: none">• Simple Queries• Simple Queries with Aggregate functions• Queries with Aggregate functions (group by and having clause)
6	Queries involving <ul style="list-style-type: none">• Date Functions• String Functions• Math Functions
7	Join Queries <ul style="list-style-type: none">• Inner Join• Outer Join
8	Subqueries <ul style="list-style-type: none">• With IN clause• With EXISTS clause
9	Views <ul style="list-style-type: none">• Creating Views (with and without check option)• Dropping views• Selecting from a view
10	DCL statements <ul style="list-style-type: none">• Granting and revoking permissions

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Introduction to DBMS	15h	1	1	2
2	Schema refinement and normal forms	15h	2	2	3
3	Database Protection	15h	4	3	4

Discrete Mathematics

Course Description	
Semester	I
Course Name	Discrete Mathematics
Course Code	UCS1DMA
Credit	2
Hours	45

Course Objectives:

1. The purpose of the course is to familiarize the prospective learners with mathematical structures that are fundamentally discrete.
2. This course introduces sets and functions, forming and solving recurrence relations and different counting principles. These concepts are useful to study or describe objects or problems in computer algorithms and programming languages.

Course Outcome:

After completing the course, Student will be able to

1. Explain function and relation
2. Solve the problems on recurrence relation
3. Solve the problems by using the permutation, combination and counting principle
4. Examine the properties of graph, application of graph and tree

Course Code: UCS1DMA_	Course Title Discrete Mathematics	Credits 02
UNIT I	<p>Functions: Definition of function. Domain, co domain and the range of a function. Direct and inverse images. Injective, surjective and bijective functions. Composite and inverse functions.</p> <p>Relations: Definition and examples. Properties of relations, Partial Ordering sets, Linear Ordering Hasse Daigrams , Maximum and Minimum elements, Lattices</p> <p>Recurrence Relations: Definition of recurrence relations, formulating recurrence</p>	15L

	relations, solving recurrence relations- Back tracking method, Linear homogeneous recurrence relations with constant coefficients. Solving linear homogeneous recurrence relations with constant coefficients of degree two when characteristic equation has distinct roots and only one root, Particular solutions of nonlinear homogeneous recurrence relation, Solution of recurrence relation by the method of generation functions, Applications- Formulate and solve recurrence relation for Fibonacci numbers, Tower of Hanoi, Intersection of lines in a plane, Sorting Algorithms	
Unit II	<p>Counting Principles Permutations and Combinations: Partition and Distribution of objects, Permutation with distinct and indistinct objects, Binomial numbers, Combination with identities: Pascal Identity, Vandermonde's Identity, Pascal triangle, Binomial theorem, Combination with indistinct objects.</p> <p>Counting Principles: Sum and Product Rules, Two-way counting, Tree diagram for solving counting problems, Pigeonhole Principle (without proof); Simple examples, Inclusion Exclusion Principle (Sieve formula) (Without proof).</p>	15 L
Unit III	<p>Graphs : Definition and elementary results, Adjacency matrix, path matrix, representing relations using diagraphs, Warshall's algorithm- shortest path, Linked representation of a graph, Operations on graph with algorithms – searching in a graph; Insertion in a graph, Deleting from a graph, Traversing graph- Breadth First search and Depth-First search.</p> <p>Trees: Definition and elementary results. Ordered, rooted tree, Binary tree, Complete and extended binary trees, representing binary trees in memory, traversing binary trees, binary search tree, Algorithms for searching and inserting in binary search trees, Algorithms for deleting in a binary search tree.</p>	15 L

Textbooks:

1. Discrete Mathematics and Its Applications, Seventh Edition by Kenneth H. Rosen, McGraw Hill Education (India) Private Limited. (2011)
2. Norman L. Biggs, Discrete Mathematics, Revised Edition, Clarendon Press, Oxford 1989.
3. Data Structures Seymour Lipschutz, Schaum's out lines, McGraw- Hill Inc.

Additional References:

1. Elements of Discrete Mathematics: C.L. Liu, Tata McGraw- Hill Edition
 2. Concrete Mathematics (Foundation for Computer Science): Graham, Knuth, Patashnik Second Edition, Pearson Education.
 3. Discrete Mathematics: Semyour Lipschutz, Marc Lipson, Schaum's outlines, McGraw- Hill Inc.
- Foundations in Discrete Mathematics: K.D. Joshi, New Age Publication, New Delhi.

Sr. No.	Practical of Discrete Mathematics
1	Graphs of standard functions such as absolute value function, inverse function, logarithmic and exponential functions, flooring and ceiling functions, trigonometric functions over suitable intervals.
2	Equivalence Relation and Partial ordering sets.
3	Hasse diagram and Lattices.
4	Recurrence relation.

5	Permutations and Combinations.
6	Different counting principles.
7	Shortest Path algorithms.
8	Operations on graph.
9	Breadth and Depth First search algorithms.
10	Concept of searching, inserting and deleting from binary search trees.

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Recurrence Relations	15h	1,2		6
2	Counting Principles	15h	3		1
3	Graphs and Trees	15h	4		1

Descriptive Statistics

Course Description	
Semester	I
Course Name	Descriptive Statistics
Course Code	UCS1DST
Credit	2
Hours	45

Course Objectives:

The purpose of this course is to familiarize students with the basics of Statistics. This will be essential for prospective researchers and professionals to know these basics.

Course Outcome:

After completing the course, students will be able to

1. Understand and present data using table and graphs
2. Apply measures of central tendency and dispersion to draw conclusions
3. Apply the basic probability rules and theorem in problem-solving
4. Apply the method of least squares to estimate the parameters in a regression model

Course Code UCS1STS	Course Title Descriptive Statistics	Credits 02
Unit I	<p>Data types and Data presentation: Data Types: attribute, variable, discrete and continuous variable, Different types of scales: nominal, ordinal, interval and ratio. Data presentation: frequency distribution, histogram o gives, curves, stem and leaf display.</p> <p>Introduction to R: Data input, Arithmetic Operators, Vector Operations, Matrix Operations, Data Frames, Built-in Functions. Frequency Distribution, Grouped Frequency Distribution, Diagrams and Graphs, Summary statistics for raw data and grouped frequency distribution.</p> <p>Measures of Central tendency: Mean, Median, mode for raw data, discrete, grouped frequency distribution. Partition Values: Quartiles, Deciles and Percentiles - examples for ungrouped and grouped data.</p>	15 L
Unit II	<p>Measures dispersion: Concept of dispersion, Absolute and Relative measure of dispersion, characteristics of good measure of dispersion. Range, Semi-interquartile range, Quartile deviation, Standard deviation - Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, merits and demerits. Combined standard deviation, Variance. Coefficient of range, Coefficient of quartile deviation and Coefficient of variation (C.V.)</p> <p>Moments: Concept of Moments, Raw moments, Central moments, Relation between raw and central moments.</p> <p>Measures of Skewness and Kurtosis: Concept of Skewness and Kurtosis, measures based on moments, quartiles.</p>	15h
Unit III	<p>Time-series: Concepts and components of a time series. Representation of trend by freehand curve method, estimation of trend using the moving average method and least-squares methods.</p> <p>Correlation: Concept of correlation, Types and interpretation, Measure of Correlation: Scatter diagram and interpretation; Karl Pearson's coefficient of correlation (r): Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, properties; Spearman's rank correlation coefficient: Definition, examples of with and without repetition. Concept of Multiple correlation.</p> <p>Regression: Concept of dependent (response) and independent (predictor) variables, the concept of regression, Types and prediction, difference between correlation and regression, Relation between correlation and regression</p>	15h

Textbooks:

1. Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. and Sons, New Delhi
2. Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta.

Additional References:

1. Mood, A. M. and Graybill, F. A. and Boes D.C. (1974). Introduction to the Theory of Statistics, Ed. 3, McGraw Hill Book Company.
2. Hoel P. G. (1971). Introduction to Mathematical Statistics, John Wiley and Sons, New York.

3. Hogg, R.V. and Craig R.G. (1989). Introduction to Mathematical Statistics, Ed. MacMillan Publishing Co., New York.
4. Walpole R. E., Myers R. H. and Myers S. L. (1985), Probability and Statistics for Engineers and Scientists Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, New Delhi

Sr. No.	Practical of Descriptive Statistics
1	Data entry using, functions, c(), scan (), Creating vectors, Mathematical Operations: ** +/*//^, exp, log, log10, etc., creating vector of text type.
2	Useful functions of R: data frame, matrix operations, seq(), split() etc.
3	Frequency distribution
4	Data presentation
5	Measures of central tendency
6	Measures of dispersion
7	Summary Statistics (measures of central tendency, dispersion)
8	Moments: Raw moments and central moments
9	Measures of skewness and kurtosis
10	Correlation and regression

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Data types and Data presentation, Introduction to R, Measures of Central tendency	15h	1, 2	2	1
2	Measures dispersion, Moments, Measures of Skewness and Kurtosis	15h	2	2	7
3	Time-series, Correlation, Regression	15h	4	3	2

Course Description	
Semester	I
Course Name	Soft Skill Development
Course Code	UCS1SSD
Credit	2
Hours	45

Course Objectives:

- Understand the significance and essence of a wide range of soft skills
- Learn how to apply soft skills in a wide range of routine social and professional settings
- Learn how to employ soft skills to improve interpersonal relationships
- Learn how to employ soft skills to enhance employability and ensure workplace and career success

Course Outcomes

After completing the course, students will be able to

- Learners will be able to understand the importance and types soft skills
- Learners will develop skills for Academic and Professional Presentations.
- Learners will able to understand Leadership Qualities and Ethics.
- Ability to understand the importance of stress management in their academic & professional life.

Course Code UCS1SSD	Course Title Soft Skill Development	Credits 02
Unit I	<p>Introduction to Soft Skills Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Personality Development: Knowing Yourself, Positive Thinking, Johari’s Window, Physical Fitness Emotional Intelligence: Meaning and Definition, Need for Emotional Intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, Competencies of Emotional Intelligence, Skills to Develop Emotional Intelligence Positivity and Motivation: Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels Etiquette and Mannerism: Introduction, Professional Etiquette, Technology Etiquette Ethical Values: Ethics and Society, Theories of Ethics, Correlation between Values and Behavior, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics and Graphs, Summary statistics for raw data and grouped frequency distribution.</p>	15 L
Unit II	<p>Basic Skills in Communication: Components of effective communication: Communication process and handling them, Composing effective messages, Non – Verbal Communication: its importance and nuances: Facial Expression, Posture, Gesture, Eye contact, appearance (dress code). Communication Skills: Spoken English, Phonetics, Accent, Intonation Employment Communication: Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter Job Interviews: Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Changes in the Interview Process, FAQ During Interviews</p>	15h

	<p>Group Discussion: Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion, Individual Traits</p>	
Unit III	<p>Academic and Professional Skills: Professional Presentation: Nature of Oral Presentation, planning a Presentation, Preparing the Presentation, Delivering the Presentation</p> <p>Creativity at Workplace: Introduction, Current Workplaces, Creativity, Motivation, Nurturing Hobbies at Work, The Six Thinking Hat Method.</p> <p>Capacity Building: Learn, Unlearn and Relearn: Capacity Building, Elements of Capacity Building, Zones of Learning, Ideas for Learning, Strategies for Capacity Building</p> <p>Leadership and Team Building: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams.</p> <p>Decision Making and Negotiation: Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts</p> <p>Stress and Time Management: Stress, Sources of Stress, Ways to Cope with Stress</p>	15h

Textbooks:

1. Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2017.
2. Soft Skills: An Integrated Approach to Maximize Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India

Additional References:

1. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press
2. Business Communication, ShaliniKalia, Shailja Agrawal, Wiley India
3. Cornerstone: Developing Soft Skills, Sherfield, Pearson India

Semester II

Object Oriented Programming using C++

Semester	II
Course Name	Object Oriented Programming with C++
Course Code	UCS2OOP
Credit	2
Hours	3

Course Objectives

The objective of course is to develop programming skills of students, using object oriented programming concepts, learn the concept of class and object using C++ and develop classes for simple applications.

Course Outcomes

After completing the course, Student will be able to

1. Understand object-oriented programming and the difference between structured oriented and object-oriented programming features.
2. Explain use of objects and classes for developing programs.
3. Apply virtual and pure virtual function & complex programming situations.
4. Illustrate various object-oriented concepts to solve different problems.

Course Code UCS2OOP	Course Title Object Oriented Programming using C++	Credits 02
Unit I	<p>Introduction to Programming Concepts: Object oriented programming paradigm, basic concepts of object oriented programming, benefits of object oriented programming, object oriented languages, applications of object oriented programming. Tokens-keywords, identifiers, constants-integer, real, character and string constants, backslash constants, features of C++ and its basic structure, simple C++ program without class, compiling and running C++program.</p> <p>Data Types, Data Input Output and Operators: Basic data types, variables, rules for naming variables, programming constants, the type cast operator, implicit and explicit type casting, cout and cin statements, operators, precedence of operators.</p> <p>Decision Making, Loops, Arrays and Strings: Conditional statements-if, if...else, switch loops- while, do...while, for, types of arrays and string and string manipulations</p> <p>Unified Modeling Language (UML): Introduction to UML & class diagrams. Classes, Abstraction & Encapsulation: Classes and objects, Dot Operator, data members, member functions, passing data to functions, scope and visibility of variables in function</p>	15L
Unit II	<p>Constructors and Destructors: Default constructor, parameterized constructor, copy constructor, private constructor, destructors.</p> <p>Working with objects: Accessor - mutator methods, static data and static function, access specifiers, array of objects.</p> <p>Polymorphism - Binding-static binding & overloading, constructor overloading function overloading, operator overloading, overloading unary and binary operators.</p> <p>Modelling Relationships in Class Diagrams: Association, Aggregation Composition and examples covering these principles</p>	15L
Unit III	<p>Inheritance: Defining base class and its derived class, access specifiers, types of inheritance-single, multiple, hierarchical, multilevel, hybrid inheritance, friend function and friend class, constructors in derived classes.</p> <p>Modelling Relationships: Generalization-Specialization and examples covering these principles Run time Polymorphism - Dynamic Binding, Function overriding, virtual function, pure virtual function, virtual base class, abstract class.</p> <p>Pointers: Introduction to pointers, * and & operators, assigning addresses to pointer variables, accessing values using pointers, pointers to objects & this pointer, pointers to derived classes File Handling: File Stream classes, opening and closing file-file opening modes, text file handling, binary file handling.</p> <p>Applying OOP to solve real life applications: To cover case studies like library management, order management etc. to design classes covering all relationships</p>	15L

Textbooks:

1. Object Oriented Programming with C++, Balagurusamy E., 8th Edition, McGraw Hill Education India.
2. UML & C++: A Practical Guide to Object Oriented Development, Lee/Tepfenhart, Pearson Education, 2nd Edition 2015

Additional References:

1. Mastering C++ by Venugopal, Publisher: McGraw-Hill Education, 2017
2. Let Us C++ by Kanetkar Yashwant, Publisher: BPB Publications, 2020
3. Object Oriented Analysis and Design by Timothy Budd TMH, 2001

Practicals of Object Oriented Programming Using C++	
Sr. No.	
1.	Classes and methods
	a. Design an employee class for reading and displaying the employee information, the getInfo() and displayInfo() methods will be used respectively. Where getInfo() will be private method
	b. Design the class student containing getData() and displayData() as two of its methods which will be used for reading and displaying the student information respectively. Where getData() will be private method
2.	Classes and methods
	a. Design the class Demo which will contain the following methods: readNo(), factorial() for calculating the factorial of a number, reverseNo() will reverse the given number, isPalindrome() will check the given number is palindrome, isArmstrong() which will calculate the given number is armStrong or not.
	b. Write a program to demonstrate function definition outside class and accessing class members in function definition.
3.	Using friend functions
	a. Write a friend function for adding the two complex numbers, using a single class.
	b. Write a friend function for adding the two different distances and display its sum, using two classes
4.	Constructors and method overloading
	a. Design a class Geometry containing the methods area() and volume() and also overload the area() function .
	b. Design a class Complex for adding the two complex numbers and also show the use of constructor.
5.	Operator Overloading
	a. Overload the operator unary(-) for demonstrating operator overloading.
	b. Overload the + for concatenating the two strings. For e.g., "Py" + "thon" = Python.

6.	Inheritance
	a. Design a class for single level inheritance.
	b. Design a class for multiple inheritance.
	c. Implement hierarchical inheritance.
7.	Virtual functions and abstract classes
	a. Implement the concept of method overriding.
	b. Show the use of virtual functions.
	c. Show the implementation of abstract class.
8.	Exception handling
	a. Show the implementation of exception handling.
	b. Show the implementation for exception handling for strings.
9.	Multi-Threading
	Program to demonstrate multithreading concept.
10.	Mini project on OOPs/ Case Study

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
Unit I	Introduction to OOP's	15L	1	2	2
Unit II	Core Concepts of OOP's	15L	2	2	6
Unit III	Advance Concepts of OOP's	15L	3	2	9

Programming with Python-II

Course Description	
Semester	II
Course Name	Programming with Python –II
Course Code	UCS2PP2
Credit	2
Hours	3

Course Objectives:

1. Use Python to read and write files
2. Make their code robust by handling errors and exceptions properly
3. Work with the Python standard library
4. Explore Python's object-oriented features
5. Search text using regular expressions

Course Outcomes:

1. Demonstrate programs using simple Python statements and expressions.
2. Explain files, exceptions, modules and packages in Python for solving problems.
3. To develop the skill of designing Graphical user Interfaces in Python
4. To Learn how to import modules and packages and game development using Python and the use of Database Connectivity.

Module/Unit	Course Title Programming With Python II	Credits 02
Unit I	<p>Python File Input-Output: Opening and closing files, various types of file modes, reading and writing to files, manipulating directories.</p> <p>Iterables: iterators and their problem-solving applications.</p> <p>Exception handling: What is an exception, various keywords to handle exceptions such try, catch, except, else, finally, raise.</p> <p>Regular Expressions: Concept of regular expression, various types of regular expressions, using match function.</p>	15L
Unit II	<p>GUI Programming in Python (using Tkinter/wxPython/Qt) What is GUI, Advantages of GUI, Introduction to GUI library. Layout management, events and bindings, fonts, colors, drawing on canvas (line, oval, rectangle, etc.) Widgets such as : frame, label, button, check button, entry, list box, message, radio button, text, spin box etc.</p>	15L
Unit III	<p>Database connectivity in Python: Installing MySQL connector, accessing connector module, using connect, cursor, execute & close functions, reading single & multiple results of query execution, executing different types of statements, executing transactions, understanding exceptions in database connectivity</p> <p>Game Design: - Introduction to google collab notebook, Introduction to Jupiter notebook, Pygame:-, how to create the game window, Creating Basic Movements and key Press, changing title and background color, adding images, Adding Sounds Adding Effects etc.</p>	15L

Textbooks:

Paul Gries , Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 2/E 2014

Additional References:

1. James Payne , Beginning Python: Using Python 2.6 and Python 3, Wiley India, 2010
2. A. Lukaszewski, MySQL for Python: Database Access Made Easy, Pact Publisher, 2010
3. Making Games with Python & Pygame

Sr. No.	Practicals of Programming with Python-II
1	Programs to read and write files.
2	Programs with iterables and iterators.
3	Program to demonstrate exception handling
4	Program to demonstrate the use of regular expressions
5	Program to show draw shapes & GUI controls.:- a. Advance Calculator b. Simple Interest Form
6	Program to show draw shapes & GUI controls.:- a. Pizza Ordering GUI Form b. BMI Calculator GUI Form
7	Write a Python Program on database connectivity to illustrate the use of DML statements such as update & table
8	Create a Python Game in Google-Collaboratory notebook.
9	Create a Python Game in Jupyter Notebook

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1.	Python File Input-Output	15h	2	2	2
2.	GUI	15h	3	2	2
3.	Database Connectivity& Game Design	15h	4	2	3

Linux

Course Description	
Semester	II
Course Name	Linux
Course Code	UCS2LIN
Credit	2
Hours	3

Course Objectives:

1. This course introduces various tools and techniques commonly used by Linux programmers, system administrators and end users to achieve their day-to-day work in Linux environment.
2. It is designed for computer students who have limited or no previous exposure to Linux.

Course Outcomes:

After completing the course, Student will be able to

1. Explain the Importance of Linux in Software Ecosystem and Architecture of Linux
2. Apply various command line utilities.
3. Design Network using IP address, DNS and different network protocols.
4. Apply System Administrative task on network.

Course Code UCS2LIN	Course Title Linux	Credits 02
Unit I	<p>Introduction: History of Linux, Philosophy, Community, Terminology, Distributions, Linux kernel vs distribution. Why learn Linux? Importance of Linux in software ecosystem: web servers, supercomputers, mobile, servers.</p> <p>Installation: Installation methods, Hands on Installation using CD/DVD or USB drive.</p> <p>Linux Structure: Linux Architecture, Filesystem basics, The boot process, init scripts, runlevels, shutdown process, very basic introductions to Linux processes, Packaging methods: rpm/deb, Graphical Vs Command line.</p>	15L
Unit II	<p>Graphical Desktop: Session Management, Basic Desktop Operations, Network Management, Installing and Updating Software, Text editors: gedit, vi, vim, emacs, Graphics editors, Multimedia applications.</p> <p>Command Line: Command line mode options, Shells, Basic Commands, General Purpose Utilities, Installing Software, User management, Environment variables, Command aliases.</p> <p>Linux Documentation: man pages, GNU info, help command, More documentation sources.</p> <p>File Operations: Filesystem, Filesystem architecture, File types, File attributes, Working with files, Backup, compression</p>	15L
Unit III	<p>Security: Understanding Linux Security, Uses of root, sudo command, working with passwords, Bypassing user authentication, Understanding ssh</p> <p>Networking: Basic introduction to Networking, Network protocols: http, ftp etc., IP address, DNS, Browsers, Transferring files. ssh, telnet, ping, traceroute, route, hostname, networking GUI.</p> <p>Basic Shell Scripting: Features and capabilities, Syntax, Constructs, modifying files, Sed, awk command, File manipulation utilities, dealing with large files and Text, String manipulation, Boolean expressions, File tests, Case, Debugging, Regular expressions</p>	15L

Textbooks:

1. "Linux Command line and Shell Scripting Bible", Richard Blum, Wiley India.
2. "Unix: Concepts and Applications", Sumitabha Das, 4th Edition, McGraw Hill.
3. "Official Ubuntu Book", Matthew Helmke & Elizabeth K. Joseph with Jose Antonio Rey and Philips Ballew, 8th Ed.

Additional References:

1. "Linux Administration: A Beginner's Guide", Fifth Edition, Wale Soyinka, Tata McGraw-Hill, 2008.
2. "Linux: Complete Reference", Richard Petersen, 6th Edition, Tata McGraw-Hill
3. "Beginning Linux Programming", Neil Mathew, 4th Edition, Wiley Publishing, 2008.

Sr. No.	Practicals of Linux
1.	Installation of Ubuntu Linux operating system. a. Booting and Installing from (USB/DVD) b. Using Ubuntu Software center / Using Synaptic Explore useful software packages.
2	Becoming an Ubuntu power user a. Administering system and User setting b. Learning Unity keyboard c. Using the Terminal d. Working with windows programs
3	File System Commands: touch, help, man, more, less, pwd, cd, mkdir, rmdir, ls, find, ls, etc File handling Commands: cat, cp, rm, mv, more, file, wc, od, cmp, diff, comm, chmod, chown, chgrp, gzip and gunzip, zip and unzip, tar, ln, umask,, chmod, chgrp, chown, etc
4.	General purpose utility Commands: cal, date, echo, man, printf, passwd, script, who, uname, tty, stty, etc Simple Filters and I/O redirection: head, tail, cut paste, sort, grep family, tee, uniq, tr, etc. Networking Commands: who, whoami, ping, telnet, ftp, ssh, etc
5.	Editors: vi, sed, awk
6.	Working and Managing with processes- sh, ps, kill, nice, at and batch etc.
7.	Shell scripting I: Defining variables, reading user input, exit and exit status commands, , expr, test, [], if conditional, logical operators
8.	Shell scripting II: Conditions (for loop, until loop and while loop) arithmetic operations, examples
9.	Shell scripting III: Redirecting Input / Output in scripts, creating your own Redirection
10.	Installation of C/C++/Java/Python Compiler and creating an environment for app development. Basic programming using C and Python Languages.

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1.	Introduction, Installation, Linux Structure	15h	1	3	1
2.	Graphical Desktop, Command Line , Linux Documentation, File Operations	15h	2	2	1
3.	Security, Networking, Basic Shell Scripting	15h	3	3	3

Data Structures

Course Description	
Semester	II
Course Name	Data Structures
Course Code	UCS2DST
Credit	2
Hours	45

Course Objectives:

1. Explain data structures and different abstract data types.
2. Learn how to implement linked and linear structures.
3. Discuss various probing techniques and clustering.
4. Demonstrate binary tree traversals, heap and search trees.

Course Outcomes:

1. Describe data structures and different abstract data types.
2. Apply implementation of linked and linear structures.
3. Differentiate linear probing, rehashing and clustering.
4. Evaluate different binary tree traversals, heap and search trees and its implementation.

Course Code: UCS2DST	Course Title Data Structure	Credits 02
Unit I	<p>Abstract Data Types: Introduction, The Date Abstract Data Type, Bags, Iterators. Application</p> <p>Arrays: Array Structure, Python List, Two Dimensional Arrays, Matrix Abstract Datatype, Application</p> <p>Sets and Maps: Sets-Set ADT, Selecting Data Structure, List based Implementation, Maps-Map ADT, List Based Implementation, Multi-Dimensional Arrays-Multi-Array ADT, Implementing Multiarray, Application</p> <p>Algorithm Analysis: Complexity Analysis-Big-O Notation, Evaluating Python Code, Evaluating Python List, Amortized Cost, Evaluating Set ADT, Application</p> <p>Searching and Sorting: Searching-Linear Search, Binary Search, Sorting-Bubble, Selection and Insertion Sort, Working with Sorted Lists-Maintaining Sorted List, Maintaining sorted Lists</p>	15 L

<p>Unit II</p>	<p>Linked Structures: Introduction, Singly Linked List-Traversing, Searching, Prepending and Removing Nodes, Bag ADT-Linked List Implementation. Comparing Implementations, Linked List Iterators, More Ways to Build Linked Lists, Applications-Polynomials.</p> <p>Stacks: Stack ADT, Implementing Stacks-Using Python List, Using Linked List, Stack Applications-Balanced Delimiters, Evaluating Postfix Expressions.</p> <p>Queues: Queue ADT, Implementing Queue-Using Python List, Circular Array, Using List, Priority Queues- Priority Queue ADT, Bounded and unbounded Priority Queues.</p> <p>Advanced Linked List: Doubly Linked Lists-Organization and Operation, Circular Linked List-Organization and Operation, Multi Lists</p>	<p>15 L</p>
<p>Unit III</p>	<p>Recursion: Recursive Functions, Properties of Recursion, Its working, Recursive Applications.</p> <p>Hash Table: Introduction, Hashing-Linear Probing, Clustering, Rehashing, Separate Chaining, Hash Functions Advanced Sorting: Merge Sort, Quick Sort, Radix Sort, Sorting Linked List</p> <p>Binary Trees: Tree Structure, Binary Tree-Properties, Implementation and Traversals, Expression Trees, Heaps and Heapsort, Search Trees</p>	<p>15 L</p>

Textbooks:

1. Data Structure and algorithm Using Python, Rance D. Necaie, 2016 Wiley India Edition
2. Data Structure and Algorithm in Python, Michael T. Goodrich, Robertom Tamassia, M. H. Goldwasser, 2016 Wiley India Edition

Additional References:

1. Data Structure and Algorithmic Thinking with Python- Narasimha Karumanchi, 2015, Careermonk Publications
2. Fundamentals of Python: Data Structures, Kenneth Lambert, Delmar Cengage Learning

Sr.No.	Practicals of Data Structure
1	Implement Linear Search to find an item in a list.
2	Implement binary search to find an item in an ordered list
3	Implement Sorting Algorithms <ol style="list-style-type: none"> a. Bubble sort b. Insertion sort c. Quick sort d. Merge sort
4	Implement use of Sets and various operations on Sets.
5	Implement working of Stacks. (pop method to take the last item added off the stack and a push method to add an item to the stack)
6	Implement Program for <ol style="list-style-type: none"> a. Infix to Postfix conversion b. Postfix Evolution
7	Implement the following <ol style="list-style-type: none"> a. A queue as a list which you add and delete items from. b. A circular queue. (The beginning items of the queue can be reused).

8	Implement Linked list and demonstrate the functionality to add and delete items in the linked list.
9	Implement Binary Tree and its traversals.
10	Recursive implementation of a. Factorial b. Fibonacci c. Tower of Hanoi

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Introduction to data structures and ADTs	15h	1	1	1
2	Linked and linear structures	15h	2	1	2
3	Clustering, Binary tree	15h	4	1	2

Calculus

Course Description	
Semester	II
Course Name	Calculus
Course Code	UCS2CAL
Credit	2
Hours	45

Course Objectives:

The course is designed to have a grasp of important concepts of Calculus in a scientific way. It covers topics from as basic as definition of functions to partial derivatives of functions in a gradual and logical way. The learner is expected to solve as many examples as possible to get complete clarity and understanding of the topics covered.

Course Outcome:

After completing the course, Student will be able to

1. Recall the limit, continuity and derivative of a function
2. Analyze the properties of Functions
3. Evaluate partial derivatives, directional derivatives, maxima and minima of functions of two variables
4. Classify the first order differential equation

Course Code: UCS2CAL	Course Title Calculus	Credits 02
Unit I	Derivatives and its applications: Review of Functions, limit of a function, continuity of a function, derivative of a function. Derivative in Graphing and Applications: Analysis of Functions: Increasing, Decreasing, Concavity, Relative Extrema. Graphing Polynomials, Rational Functions, Cusps and Vertical Tangents. Absolute Maxima and Minima, Applied Maximum and Minimum Problems, Newton's Method.	15 L
Unit II	Partial derivatives and its applications: Functions of Two or More Variables, Limits and Continuity, Partial Derivatives, Differentiability, Differentials and Local Linearity, Chain Rule, Directional Derivatives and Gradients, Tangent Planes and Normal Vectors, Maxima and Minima of Functions of Two Variables.	15 L
Unit III	First order first degree differential equations: Solutions of homogeneous and non-homogeneous differential equations of first order and first degree, Notion of partial derivative, solving exact differential equations. Rules for finding integrating factor (I.F) (without proof) for non-exact equations such as: (a) $1Mx+Ny$ is an I.F., if $Mx+Ny=0$ and $Mdx+Ndy$ is homogeneous (b) $1Mx-Ny$ is an I.F., if $Mx-Ny=0$ and $Mdx+Ndy$ is of the type $f_1xyydx+f_2xyxdy=0$ (c) e^fxdx is an I.F., if $N=0$ and $1N\partial M\partial y-\partial N\partial x$ is a function of x alone say $f(x)$ (d) e^gydy is an I.F., if $M=0$ and $1M\partial N\partial x-\partial M\partial y$ is a function of y alone say $g(y)$ Finding solutions of first order differential equations of the type $dydx+Pxy=Q(x)y^n$, for $n\neq 0$. Applications to orthogonal trajectories, population growth, and finding the current at a given time.	15 L

Textbooks:

1. Calculus: Early Transcendental (10th Edition): Howard Anton , Irl Bivens, Stephen Davis, John Wiley & sons, 2012

Additional References:

1. Calculus and analytic geometry (9th Edition) : George B Thomas, Ross L Finney, Addison Wesley, 1995
2. Calculus: Early Transcendental (8th Edition): James Stewart, Brooks Cole, 2015
3. Calculus (10th Edition): Ron Larson, Bruce H. Edwards, Cengage Learning, 2013
4. Thomas Calculus (13th Edition): George B. Thomas, Maurice D. Weir, Joel R. Hass, Pearson, 2014

Sr. No.	Practicals of Calculus
1	Continuity of functions, Derivative of Functions
2	Increasing, Decreasing, Concave up and Concave down functions
3	Relative maxima, relative minima, absolute maxima, absolute minima
4	Newton's method to find approximate solution of an equation
5	Calculation of Partial derivatives of functions
6	Local linear approximation and directional derivatives

7	Maxima and minima of functions of two variables
8	Solution of a Homogeneous, Non-Homogeneous differential equation
9	Solution of a Exact, Non-exact differential equation
10	Solution of a first order first degree differential equation by using integrating factor

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Derivatives and its applications	15h	1,2		6
2	Partial derivatives and its applications	15h	3		6
3	First order first degree differential equations	15h	4		6

Statistical Methods

Course Description	
Semester	II
Course Name	Statistical Methods
Course Code	UCS2STM
Credit	2
Hours	45

Course Objectives

1. The purpose of this course is to familiarize students with the basics of Statistics this will be essential for prospective researchers and professionals to know these basics.

Course Outcomes

After completing the course, Students will be able to

1. Illustrate different probability functions with respect to discrete and continuous random variables.
2. Determine the hypotheses and validate using appropriate statistical tests.
3. Recognize when analysis of variance (ANOVA) is appropriate and be able to perform one-way and two-way ANOVAs.
4. CO4 Comparison of parametric and nonparametric tests and identification of applications where nonparametric approaches are appropriate.

Course Code UCS1STM	Course Title Statistical Methods	Credits 02
Unit I	<p>Probability: Random experiment, sample space, events types and operations of events, Probability definition: classical, axiomatic, Elementary Theorems of probability (without proof). Conditional probability, Bayes' theorem, independence, Examples on Probability.</p> <p>Random Variables: Concept and definition of a discrete random variable and continuous random variable. Probability mass function, Probability density function and cumulative distribution function of discrete and continuous random variable, Properties of cumulative distribution function.</p>	15 L
Unit II	<p>Mathematical Expectation and Variance: Expectation of a function, Variance and S.D of a random variable, properties.</p> <p>Standard Probability distributions: Introduction, properties, examples and applications of each of the following distributions: Binomial distribution, Normal distribution, Chi-square distribution, t distribution, F distribution</p>	15h
Unit III	<p>Hypothesis testing: one-sided, two-sided hypothesis, critical region, p-value, tests based on t, Normal and F, confidence intervals.</p> <p>Analysis of variance: one-way, two-way analysis of variance</p> <p>Non-parametric tests: need of non-parametric tests, sign test, Wilcoxon's signed rank test, run test, Kruskal-Wallis tests.</p>	15h

Textbooks:

- Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. and Sons, New Delhi
- Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta.

Additional References:

- Mood, A. M. and Graybill, F. A. and Boes D.C. (1974). Introduction to the Theory of Statistics, Ed. 3, McGraw Hill Book Company.
- Hoel P. G. (1971). Introduction to Mathematical Statistics, John Wiley and Sons, New York.
- Hogg, R.V. and Craig R.G. (1989). Introduction to Mathematical Statistics, Ed. MacMillan Publishing Co., New York.
- Walpole R. E., Myers R. H. and Myers S. L. (1985), Probability and Statistics for Engineers and Scientists
- Agarwal, B. L. (2003). Programmed Statistics, Ed 2, New Age International Publishers, New Delhi.

Sr. No.	Practicals of Statistical Methods
1	Probability a. Examples based on Probability definition: classical, axiomatic b. Examples based on elementary Theorems of probability
2	Conditional probability and independence a. Examples based on Conditional probability b. Examples based on Bayes' theorem c. Examples based on independence
3	Problems based on binomial distribution

4	Problems based on normal distribution
5	Discrete random variable- a. Probability distribution of discrete random variable. b. Probability mass function.
6	Continuous random variable- a. Probability distribution of continuous random variable. b. Probability density function.
7	t test, normal test, F test
8	Analysis of Variance
9	Non parametric tests- I
10	Non- Parametric tests – II

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
I	Probability, Random Variables	15h	1	2	1
II	Mathematical Expectation and Variance, Standard Probability distributions	15h	1	2	1, 2
III	Hypothesis testing, Analysis of variance, Non-parametric tests	15h	2, 3, 4	2, 3	2, 7

Digital Marketing

Course Description	
Semester	II
Course Name	Digital Marketing
Course Code	UCS2DIM
Credit	2
Hours	45

Course Objectives:

1. To understand the key concepts of social media and Digital Marketing
2. To understand Legal and Ethical issues in digital marketing
3. To learn various tools of social media and Digital Marketing
4. To acquaint with the techniques of SEO and SEM

Course Outcome:

After completion of this course, student will be able to:

1. Explain use of Digital Media in Marketing.
2. Aware about cyber laws related to digital marketing
3. Explain benefits of digital marketing over traditional marketing
4. Summarize various tools of social media and Digital Marketing
5. Use SEO and SEM techniques to improve website's performance.

Course Code USCDIM	Course Title Digital Marketing	Credits 02
Unit I	<p>Introduction of Digital Marketing: Definition of digital marketing, origin of digital Marketing, Benefits of Digital marketing, The Digital Landscape, P-O-E-M Framework, Digital Advertising Market in India, Segmenting and Customizing Messages, Digital Marketing Plan</p> <p>Digital Marketing VS Traditional Marketing : Difference between digital marketing and traditional marketing. Benefits of Traditional Marketing, The Downside to Traditional Marketing. Why Digital Marketing Wins Over Traditional Marketing, How We Use Both Digital & Traditional marketing?</p> <p>Digital marketing and law: Legal and Ethical issues in digital marketing, Privacy, Digital property and Digital protection, Security of clients and service provider, Cyber laws- Relevant provisions of information Technology Act 2000</p>	15L
Unit II	<p>Tools of Social Media Marketing: Meaning, Purpose, types of social media websites, social media engagement, Target audience</p> <p>Facebook Marketing: Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tool</p> <p>LinkedIn Marketing: Introduction and Importance of LinkedIn Marketing , Framing LinkedIn Strategy ,Lead Generation through LinkedIn ,Content Strategy, Analytics and Targeting</p> <p>Twitter Marketing: Introduction to Twitter Marketing How Twitter Marketing is different than other forms of digital marketing, Framing content strategy , Twitter Advertising Campaigns</p> <p>Content Marketing: Introduction, Content marketing statistics, Types of Content, Types of Blog posts, Content Creation, Content Optimization, Content Management & Distribution, Content Marketing strategy, Content creation tools and apps, Challenges of Content Marketing.</p>	15L
Unit III	<p>Mobile Advertising: Forms of Mobile Marketing, Features, Mobile Campaign Development, Mobile Advertising Analytics</p> <p>Email marketing: Types of Emails, Mailing List, Email Marketing tools, Email Deliverability & Email Marketing automation</p> <p>Search Engine optimization and Search Engine Marketing</p> <p>Meaning, Common SEO techniques, Understanding Search Engines, basics of Keyword search, Google rankings, Link Building, Steps to optimize website</p> <p>Search Engine Marketing: Introduction to SEM, Introduction to Ad words-Google Ad Words, Ad Words fundamentals, Ad Ranks, Creating Ad Campaigns, display marketing, Buying Models cost per Click (CPC), Cost per Milli (CPM), Cost per Lead (CPL), Cost per Acquisition (CPA).</p>	15L

Textbooks:

1. “Digital Marketing” : Seema Gupta, McGraw Hill Education 2nd Edition
2. “Introduction to Digital Marketing 101” : Cecilia Figuera, bpb Publications
3. “The Art of Digital Marketing “ : Ian Dodson , Wile Publication

Additional References:

1. “Moving from Traditional to Digital”: Philip Kotler Marketing 4.0, Wile Publications
2. “Fundamentals of Digital Marketing “, Puneet Singh Bhatia, Pearson Edition
3. “Digital Social Media Marketing” , Prof. Nitin C. Kamat, Mr. Chinmay Nitin Kama, Himalaya Publishing House Pvt. Ltd.
4. “Social Media Marketing: A Strategic Approach” , Melissa S. Barker, Donald I. Barker, Nicholas F. Bormann, Debra Zahay, Mary Lou Roberts , Cengage Publication

Module/Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Introduction of Digital Marketing	15L	1,2,3	2	3,11
2	Tools of Social Media Marketing	15L	4	2	7
3	Search Engine optimization and Search Engine Marketing	15L	5	2	6



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW
PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

**Program: B.Sc
Revised Syllabus of S.Y.B.Sc. Computer Science
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2020-21**

Preamble

The revised and restructured curriculum for the Three-year integrated course is systematically designed considering the current industry needs in terms of skills sets demanded under new technological environment. It also endeavors to align the programme structure and course curriculum with student aspirations and corporate expectations. The proposed curriculum is more contextual, industry affable and suitable to cater the needs of society and nation in present day context.

Second year of this course is about studying core computer science subjects. Theory of Computation course provides understanding of grammar, syntax and other elements of modern language designs. It also covers developing capabilities to design formulations of computing models and its applications in diverse areas.

The course in Operating System satisfies the need of understanding the structure and functioning of system. Programming holds key indispensable position in any curriculum of Computer Science. It is essential for the learners to know how to use object oriented paradigms. There is also one dedicated course Android Developer Fundamentals as a skill enhancement catering to modern day needs of Mobile platforms and applications. The syllabus has Database Systems courses in previous semesters. The course in Database Management Systems is its continuation in third semester. The course has objectives to develop understanding of concepts and techniques for data management along with covers concepts of database at advance level.

The course of Combinatorics and Graph Theory in third semester and the course of Linear Algebra in fourth semester take the previous courses in Mathematics. Graph theory is rapidly moving into the mainstream mainly because of its applications in diverse fields which include can further open new opportunities in the areas of genomics, communications networks and coding theory, algorithms and computations and operations research.

Introducing one of the upcoming concepts Physical Computing and IoT programming will definitely open future area as Embedded Engineer, involvement in IoT projects, Robotics and many more. The RasPi is a popular platform as it offers a complete Linux server in a tiny platform for a very low cost and custom-built hardware with minimum complex hardware builds which is easier for projects in education domain.

Objectives of the Course

- Open new opportunities in the areas of genomics, communications networks and coding theory, algorithms and computations and operations research.
- To learn the elements of modern language designs.
- To develop understanding of concepts and techniques for data management along with covers concepts of database at advance level.
- Introducing one of the upcoming concepts Physical Computing and IoT programming

Course Outcomes:

- Syllabus gives more contextual, industry affable and suitable to cater the needs of society and nation in present day context.
- Able to develop the capabilities to design formulations of computing models and its applications in diverse areas.
- Understand how to use object oriented paradigms.
- Able to learn custom-built hardware with minimum complex hardware builds which is easier for projects in education domain.

Scheme of Examination

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Continuous Assessment	20 Marks

Question Paper Pattern for Continuous Assessment (Total Marks 20 to be converted in 10 marks)

Marks	Group Project*/ Individual Project	Presentation and write- up	Practical Skills	Open book test	Quiz
5	Hypothesis/Topic of the project	Presentation skill	Demonstration of skill	High order thinking questions (HOTS)	Quiz on application of subject in real life
5	Actual laboratory work/Field work	Knowledge	Viva		
5	Result/output	Quality of ppt	Report		
5	Dissertation/Report	Writing skill	Problem solving ability		

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
<ol style="list-style-type: none"> 1. There shall be four questions each of 15 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

I. Practical Examination : – 300 (50 marks x 6 core papers)

II. Each core subject carries :- 50 Marks

Sr. No.	Particulars of External	Marks
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	50

Minimum 75 % practical from each core subjects are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Exam) -----

S.Y.B.Sc. (Semester III and IV)
Computer Science Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2020-2021
SEMESTER III

CODE	COURSE TYPE	SUBJECT	SCHEME OF INSTRUCTION		SCHEME OF EXAMINATION			NO. OF CREDITS
			(PERIOD PER WEEK)		(MAX MARKS)			
			TH	LAB	CA	EA	TOTAL	
UCS3TOC	Core Subject	Theory of Computation	3		40	60	100	2
UCS3CJV	Core Subject	Core JAVA	3		40	60	100	2
UCS3OPS	Core Subject	Operating System	3		40	60	100	2
UCS3DMS	Core Subject	Database Management Systems	3		40	60	100	2
UCS3CGT	Core Subject	Combinatorics and Graph Theory	3		40	60	100	2
UCS3IOT	Core Subject	Physical Computing and IoT Programming	3					2
UCS3WBP	Skill Enhancement	Skill Enhancement: Web Programming	3					2
UCS3PR1	Core Subject Practical	Practical of UCS3CJV+ UCS3OPS + UCS3DMS		9	150			3
UCS3PR2	Core Subject Practical	Practical of UCS3CGT + UCS3IOT + UCS3WBP		9	150			3
TOTAL					1000			20

SEMESTER IV

CODE	COURSE TYPE	SUBJECT	SCHEME OF INSTRUCTION		SCHEME OF EXAMINATION			NO. OF
			(PERIOD PER WEEK)		(MAX MARKS)			CRE DITS
			TH	LAB	CA	EA	TOTAL	
UCS4FOA	Core Subject	Fundamentals of Algorithms	3					2
UCS4AJV	Core Subject	Advanced JAVA	3	-	40	60	100	2
UCS4CNT	Core Subject	Computer Networks	3	-	40	60	100	2
UCS4SEN	Core Subject	Software Engineering	3	-	40	60	100	2
UCS4LAP	Core Subject	Linear Algebra using Python	3	-	40	60	100	2
UCS4NET	Core Subject	.Net Tehnologies	3					2
UCS4ADF	Skill Enhancement	Skill Enhancement: Android Developer Fundamentals		-	40	60	100	2
UCS4PR1	Core Subject Practical	Practical of UCS4FOA+ UCS4AJV + UCS4CNT	-	9			150	3
UCS4PR2	Core Subject Practical	Practical of UCS4LAP + UCS4NET + UCS4ADF	-	9			150	3
TOTAL							1000	20

SEMESTER III**THEORY**

Course: UCS3TOC	TOPICS (Credits : 02 Lectures/Week:03) Theory of Computation	
<p>Objectives:</p> <p>To provide the comprehensive insight into theory of computation by understanding grammar, languages and other elements of modern language design. Also to develop capabilities to design and develop formulations for computing models and identify its applications in diverse areas.</p> <p>Expected Learning Outcomes:</p> <ol style="list-style-type: none"> 1. Understand Grammar and Languages 2. Learn about Automata theory and its application in Language Design 3. Learn about Turing Machines and Pushdown Automata 4. Understand Linear Bound Automata and its applications 		
Unit I	<p>Automata Theory: Defining Automaton, Finite Automaton, Transitions and Its properties, Acceptability by Finite Automaton, Nondeterministic Finite State Machines, DFA and NFA equivalence, Mealy and Moore Machines, Minimizing Automata.</p> <p>Formal Languages: Defining Grammar, Derivations, Languages generated by Grammar, Chomsky Classification of Grammar and Languages, Recursive Enumerable Sets, Operations on Languages, Languages and Automata</p>	15L
Unit II	<p>Regular Sets and Regular Grammar: Regular Grammar, Regular Expressions, Finite automata and Regular Expressions, Pumping Lemma and its Applications, Closure Properties, Regular Sets and Regular Grammar</p> <p>Context Free Languages: Context-free Languages, Derivation Tree, Ambiguity of Grammar, CFG simplification, Normal Forms, Pumping Lemma for CFG</p> <p>Pushdown Automata: Definitions, Acceptance by PDA, PDA and CFG</p>	15L

Unit III	<p>Linear Bound Automata: The Linear Bound Automata Model, Linear Bound Automata and Languages.</p> <p>Turing Machines: Turing Machine Definition, Representations, Acceptability by Turing Machines, Designing and Description of Turing Machines, Turing Machine Construction, Variants of Turing Machine,</p> <p>Undecidability: The Church-Turing thesis, Universal Turing Machine, Halting Problem, Introduction to Unsolvable Problems</p>	15L
<p>Tutorials :</p> <ol style="list-style-type: none"> 1. Problems on generating languages for given simple grammar 2. Problems on DFA and N DFA equivalence 3. Problems on generating Regular Expressions 4. Problems on drawing transition state diagrams for Regular Expressions 5. Problems on Regular Sets and Regular Grammar 6. Problems on Ambiguity of Grammar 7. Problems on working with PDA 8. Problems on working with Turing Machines 9. Problems on generating derivation trees 10. Problems on Linear Bound Automata/Universal Turing Machine 		
<p>Textbook(s):</p> <ol style="list-style-type: none"> 1) Theory of Computer Science, K. L. P Mishra, Chandrasekharan, PHI, 3rd Edition 2) Introduction to Computer Theory, Daniel Cohen, Wiley, 2nd Edition 3) Introductory Theory of Computer Science, E.V. Krishnamurthy, Affiliated East-West Press. <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1) Theory of Computation, Kavi Mahesh, Wiley India 2) Elements of The Theory of Computation, Lewis, Papadimitriou, PHI 3) Introduction to Languages and the Theory of Computation, John E Martin, McGraw-Hill Education 4) Introduction to Theory of Computation, Michel Sipser, Thomson 		

Course: UCS3CJV	TOPICS (Credits : 02 Lectures/Week:03) Core Java	
Objectives: The objective of this course is to teach the learner how to use Object Oriented paradigm to develop code and understand the concepts of Core Java and to cover-up with the pre-requisites of Core java. Expected Learning Outcomes: <ol style="list-style-type: none"> 1. Object oriented programming concepts using Java. 2. Knowledge of input, its processing and getting suitable output. 3. Understand, design, implement and evaluate classes and applets. 4. Knowledge and implementation of AWT package. 		
Unit I	The Java Language: Features of Java, Java programming format, Java Tokens, Java Statements, Java Data Types, Typecasting, Arrays OOPS: Introduction, Class, Object, Static Keywords, Constructors, this Key Word, Inheritance, super Key Word, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Interfaces String Manipulations: String, String Buffer, String Tokenizer Packages: Introduction to predefined packages (java.lang, java.util, java.io, java.sql, java.swing), User Defined Packages, Access specifiers	15L
Unit II	Exception Handling: Introduction, Pre-Defined Exceptions, Try-Catch-Finally, Throws, throw, User Defined Exception examples Multithreading: Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, Wait() notify() notify all() methods I/O Streams: Introduction, Byte-oriented streams, Character- oriented streams, File, Random access File, Serialization Networking: Introduction, Socket, Server socket, Client –Server Communication	15L
	Wrapper Classes: Introduction, Byte, Short, Integer, Long, Float, Double, Character, Boolean classes Collection Framework: Introduction, util Package interfaces, List, Set, Map, List interface & its classes, Set interface & its classes, Map interface & its classes	

Unit III	<p>Inner Classes: Introduction, Member inner class, Static inner class, Local inner class, Anonymous inner class</p> <p>AWT: Introduction, Components, Event-Delegation-Model, Listeners, Layouts, Individual components Label, Button, CheckBox, Radio Button, Choice, List, Menu, Text Field, Text Area</p>	15L
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Textbook(s):

- 1) Herbert Schildt, Java The Complete Reference, Ninth Edition, McGraw-Hill Education, 2014

Additional Reference(s):

- 1) E. Balagurusamy, Programming with Java, Tata McGraw-Hill Education India, 2014
- 2) Programming in JAVA, 2nd Ed, Sachin Malhotra & Saurabh Choudhary, Oxford Press
- 3) The Java Tutorials: <http://docs.oracle.com/javase/tutorial/>

<p>Course: UCS3OPS</p>	<p>TOPICS (Credits : 02 Lectures/Week:03) Operating System</p>	
<p>Objectives: Learners must understand proper working of operating system. To provide a sound understanding of Computer operating system, its structures, functioning and algorithms.</p> <p>Expected Learning Outcomes:</p> <ol style="list-style-type: none"> 1. To provide a understanding of operating system, its structures and functioning 2. Develop and master understanding of algorithms used by operating systems for various purposes. 		
Unit I	<p>Introduction and Operating-Systems Structures: Definition of Operating system, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments</p> <p>Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure</p> <p>Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication</p>	15L

	Threads: Overview, Multicore Programming, Multithreading Models	
Unit II	<p>Process Synchronization: General structure of a typical process, racecondition, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors</p> <p>CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling), Thread Scheduling</p> <p>Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock</p>	15L
Unit III	<p>Main Memory: Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table</p> <p>Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing</p> <p>Mass-Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management</p> <p>File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing</p> <p>File-System Implementation: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management</p>	15L
<p>Textbook(s):</p> <ol style="list-style-type: none"> 1. Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts, Wiley, 8th Edition <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1. Achyut S. Godbole, Atul Kahate, Operating Systems, Tata McGraw Hill 2. Naresh Chauhan, Principles of Operating Systems, Oxford Press 3. Andrew S Tanenbaum, Herbert Bos, Modern Operating Systems, 4e Fourth Edition, Pearson Education, 2016 		

Course: UCS3DMS	TOPICS (Credits : 02 Lectures/Week:03) Database Management Systems	
Objectives: To develop understanding of concepts and techniques for data management and learn about widely used systems for implementation and usage. Expected Learning Outcomes: <ol style="list-style-type: none"> 1. Master concepts of stored procedure and triggers and its use. 2. Learn about using PL/SQL for data management 3. Understand concepts and implementations of transaction management and crash recovery 		
Unit I	<p>Stored Procedures: Types and benefits of stored procedures, creating stored procedures, executing stored procedures, altering stored procedures, viewing stored procedures.</p> <p>Triggers: Concept of triggers, Implementing triggers – creating triggers, Insert, delete, and update triggers, nested triggers, viewing, deleting and modifying triggers, and enforcing data integrity through triggers.</p> <p>Sequences: creating sequences, referencing, altering and dropping asequence.</p> <p>File Organization and Indexing: Cluster, Primary and secondary indexing, Index data structure: hash and Tree based indexing, Comparison of file organization: cost model, Heap files, sorted files, clustered files. Creating, dropping and maintaining indexes.</p>	15L
	<p>Fundamentals of PL/SQL: Defining variables and constants, PL/SQL expressions and comparisons: Logical Operators, Boolean Expressions, CASE Expressions Handling, Null Values in Comparisons and Conditional Statements, PL/SQL Datatypes: Number Types, Character Types, Boolean Type, Datetime and Interval Types.</p>	

Unit II	Overview of PL/SQL Control Structures: Conditional Control: IF and CASE Statements, IF-THEN Statement, IF-THEN-ELSE Statement, IFTHEN-ELSIF Statement, CASE Statement, Iterative Control: LOOP and EXIT Statements, WHILE-LOOP, FOR-LOOP, Sequential Control: GOTO and NULL Statements	15L
Unit III	<p>Transaction Management: ACID Properties, Serializability, Two-phase Commit Protocol, Concurrency Control, Lock Management, Lost Update Problem, Inconsistent Read Problem , Read-Write Locks, Deadlocks Handling, Two Phase Locking protocol.</p> <p>DCL Statements: Defining a transaction, Making Changes Permanent with COMMIT, Undoing Changes with ROLLBACK, Undoing Partial Changes with SAVEPOINT and ROLLBACK</p> <p>Crash Recovery: ARIES algorithm. The log based recovery, recovery related structures like transaction and dirty page table, Write-ahead log protocol, check points, recovery from a system crash, Redo and Undo phases.</p>	15L

Textbook(s):

- 1) Ramakrishnam, Gehrke, Database Management Systems, Bayross, McGraw-Hill, 3rd Edition
- 2) Abraham Silberschatz, Henry F. Korth, S. Sudarshan , Database System Concepts, 6th Edition
- 3) Ivan Bayross, "SQL, PL/SQL -The Programming language of Oracle", B.P.B. Publications

Additional Reference(s):

- 1) Ramez Elmasri & Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education
- 2) Robert Sheldon, Geoff Moes, Begning MySQL, Wrox Press.
- 3) Joel Murach, Murach's MySQL, Murach

Course: UCS3CGT	TOPICS (Credits : 02 Lectures/Week: 03) Combinatorics and Graph Theory	
<p>Objectives: To give the learner a broad exposure of combinatorial Mathematics through applications especially the Computer Science applications.</p> <p>Expected Learning Outcomes:</p> <ol style="list-style-type: none"> 1. Appreciate beauty of combinatorics and how combinatorial problems naturally arise in many settings. 2. Understand the combinatorial features in real world situations and Computer Science applications. 3. Apply combinatorial and graph theoretical concepts to understand Computer Science concepts and apply them to solve problems 		
Unit I	<p>Introduction to Combinatorics: Enumeration, Combinatorics and Graph Theory/ Number Theory/Geometry and Optimization, Sudoku Puzzles.</p> <p>Strings, Sets, and Binomial Coefficients: Strings- A First Look, Combinations, Combinatorial, The Ubiquitous Nature of Binomial Coefficients, The Binomial, Multinomial Coefficients.</p> <p>Induction: Introduction, The Positive Integers are Well Ordered, The Meaning of Statements, Binomial Coefficients Revisited, Solving Combinatorial Problems Recursively, Mathematical Induction, and Inductive Definitions Proofs by Induction. Strong Induction</p>	15L
Unit II	<p>Graph Theory: Basic Notation and Terminology, Multigraphs: Loops and Multiple Edges, Eulerian and Hamiltonian Graphs, Graph Coloring, Planar Counting, Labeled Trees, A Digression into Complexity Theory. Applying Probability to Combinatorics, Small Ramsey Numbers, Estimating Ramsey Numbers, Applying Probability to Ramsey Theory, Ramsey's Theorem The Probabilistic Method</p>	15L
Unit III	<p>Network Flows: Basic Notation and Terminology, Flows and Cuts, Augmenting Paths, The Ford-Fulkerson Labeling Algorithm,</p>	15L

	<p>A Concrete Example, Integer Solutions of Linear Programming Problems. Combinatorial Applications of Network Flows: Introduction, Matching in Bipartite Graphs, Chain partitioning, Pólya's Enumeration Theorem: Coloring the Vertices of a Square.</p>	
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Textbook(s):

- 1) Applied Combinatorics, Mitchel T. Keller and William T. Trotter, 2016, <http://www.rellek.net/appcomb>.

Additional Reference(s):

- 1) Applied Combinatorics, sixth.edition, Alan Tucker, Wiley; (2016)
- 2) Graph Theory and Combinatorics, Ralph P. Grimaldi, Pearson Education; Fifth edition (2012)
- 3) Combinatorics and Graph Theory, John Harris, Jeffrey L. Hirst, Springer(2010).
- 4) Graph Theory: Modeling, Applications and Algorithms, Agnarsson, Pearson Education India (2008).

<p>Course: UCS3IOT</p>	<p>TOPICS (Credits : 02 Lectures/Week:03) Physical Computing and IoT Programming</p>
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Objectives:

To learn about SoC architectures; Learn how Raspberry Pi. Learn to program Raspberry Pi. Implementation of internet of Things and Protocols.

Expected Learning Outcomes:

1. Enable learners to understand System On Chip Architectures.
2. Introduction and preparing Raspberry Pi with hardware and installation.
3. Learn physical interfaces and electronics of Raspberry Pi and program them using practical's
4. Learn how to make consumer grade IoT safe and secure with proper use of protocols.

Unit I	<p>SoC and Raspberry Pi</p> <p>System on Chip: What is System on chip? Structure of System on Chip.</p> <p>SoC products: FPGA, GPU, APU, Compute Units.</p> <p>ARM 8 Architecture: SoC on ARM 8. ARM 8 Architecture Introduction</p> <p>Introduction to Raspberry Pi: Introduction to Raspberry Pi, Raspberry Pi Hardware, Preparing your raspberry Pi.</p> <p>Raspberry Pi Boot: Learn how this small SoC boots without BIOS. Configuring boot sequences and hardware.</p>	15L
Unit II	<p>Programming Raspberry Pi</p> <p>Raspberry Pi and Linux: About Raspbian, Linux Commands, Configuring Raspberry Pi with Linux Commands</p> <p>Programing interfaces: Introduction to Node.js, Python.</p> <p>Raspberry Pi Interfaces: UART, GPIO, I2C, SPI</p> <p>Useful Implementations: Cross Compilation, Pulse Width Modulation, SPI for Camera.</p>	15L
Unit III	<p>Introduction to IoT: What is IoT? IoT examples, Simple IoT LED Program.</p> <p>IoT and Protocols</p> <p>IoT Security: HTTP, UPnp, CoAP, MQTT, XMPP.</p> <p>IoT Service as a Platform: Clayster, Thinger.io, SenseIoT, carriots and Node RED.</p> <p>IoT Security and Interoperability: Risks, Modes of Attacks, Tools for Security and Interoperability.</p>	15L
<p>Textbook(s):</p> <ol style="list-style-type: none"> 1) Learning Internet of Things, Peter Waher, Packt Publishing(2015) 2) Mastering the Raspberry Pi, Warren Gay, Apress(2014) <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1) Abusing the Internet of Things, Nitesh Dhanjani, O'Reilly 		

Course: UCS3WBP	TOPICS (Credits : 02 Lectures/Week: 03) Web Programming	
Objectives: <p>To provide insight into emerging technologies to design and develop state of - the art web applications using client-side scripting, server-side scripting, and database connectivity.</p> Expected Learning Outcomes: <ol style="list-style-type: none"> 1. To design valid, well-formed, scalable, and meaningful pages using emerging technologies. 2. Understand the various platforms, devices, display resolutions, viewports, and browsers that render websites 3. To develop and implement client-side and server-side scripting language programs. 4. To develop and implement Database Driven Websites. 5. Design and apply XML to create a markup language for data and document centric applications. 		
Unit I	HTML5: Fundamental Elements of HTML, Formatting Text in HTML, Organizing Text in HTML, Links and URLs in HTML, Tables in HTML, Images on a Web Page, Image Formats, Image Maps, Colors, FORMs in HTML, Interactive Elements, Working with Multimedia - Audio and Video File Formats, HTML elements for inserting Audio / Video on a web page CSS: Understanding the Syntax of CSS, CSS Selectors, Inserting CSS in an HTML Document, CSS properties to work with background of a Page, CSS properties to work with Fonts and Text Styles, CSS properties for positioning an Element	15L
Unit II	JavaScript: Using JavaScript in an HTML Document, Programming Fundamentals of JavaScript – Variables, Operators, Control Flow Statements, Popup Boxes, Functions – Defining and Invoking a Function, Defining Function arguments, Defining a Return Statement, Calling Functions with Timer, JavaScript Objects - String, RegExp, Math, Date, Browser Objects - Window, Navigator, History, Location, Document, Cookies, Document Object Model, Form Validation using JavaScript XML: Comparing XML with HTML, Advantages and Disadvantages of XML,	15L

	Structure of an XML Document, XML Entity References, DTD, XSLT: XSLT Elements and Attributes - xsl:template, xsl:apply-templates, xsl:import, xsl:call-template, xsl:include, xsl:element, xsl:attribute, e xsl:attribute-set, xsl:value-of	
Unit III	<p>AJAX: AJAX Web Application Model, How AJAX Works, XMLHttpRequest Object – Properties and Methods, Handling asynchronous requests using AJAX</p> <p>PHP: Variables and Operators, Program Flow, Arrays, Working with Files and Directories, Working with Databases, Working with Cookies, Sessions and Headers</p> <p>Introduction to jQuery: Fundamentals, Selectors, methods to access HTML attributes, methods for traversing, manipulators, events, effects</p>	15L
<p>Text Book(s):</p> <ol style="list-style-type: none"> 1) HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, AJAX, PHP and jQuery, 2ed, Dreamtech Press 2) Web Programming and Interactive Technologies, scriptDemics, StarEdu Solutions India. 3) PHP: A Beginners Guide, Vikram Vaswani, TMH <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1) HTML, XHTML, and CSS Bible Fifth Edition, Steven M. Schafer, WILEY 2) Learn to Master HTML 5, scriptDemics, StarEdu Solutions Pvt Ltd. 3) Learning PHP, MySQL, JavaScript, CSS & HTML5, Robin Nixon, O'Reilly 4) PHP, MySQL, JavaScript & HTML5 All-in-one for Dummies, Steve Suehring, Janet Valade Wiley 		

Suggested List of Practical- SEMESTER III

Course: UCS3PR1	(Credits : 03 Lectures/Week: 09) UCS3CJV +UCS3OPS + UCS3DMS	
UCS3CJV: Core JAVA		
<ol style="list-style-type: none"> 1. Demonstrate the concept of instance variable. 2. Demonstrate the concept of array. 3. Demonstrate the use of various string methods. 4. Demonstrate the concept of package creation and its usage. 5. Demonstrate Java inheritance using extends keyword. 6. Demonstrate method overloading and method overriding in Java. 7. Demonstrate creating your own exception in Java. 8. Using various swing components design Java application to accept a student's resume. (Design form) 9. Demonstrate the concept of Collection Framework like List, Map etc. 10. Design simple calculator GUI application using AWT components. 		
UCS3OPS: Operating System		
<i>Practical can be implemented either in JAVA or any other programming language.</i>		
<ol style="list-style-type: none"> 1. Process Communication: <ol style="list-style-type: none"> (i) Give solution to the producer–consumer problem using shared memory. (ii) Give solution to the producer–consumer problem using message passing. (iii) One form of communication in a Client–Server Systems environment is Remote method invocation (RMI). RMI is a Java feature similar to RPCs. RMI allows a thread to invoke a method on a remote object. Objects are considered remote if they reside in a different Java virtual machine (JVM). Demonstrate RMI program for adding/subtracting/multiplying/dividing two numbers. 2. Threads: <ol style="list-style-type: none"> (i) The Java version of a multithreaded program that determines the summation of a 		

non-negative integer. The Summation class implements the Runnable interface. Thread creation is performed by creating an object instance of the Thread class and passing the constructor a Runnable object.

- (ii) Write a multithreaded Java program that outputs prime numbers. This program should work as follows: The user will run the program and will enter a number on the command line. The program will then create a separate thread that outputs all the prime numbers less than or equal to the number entered by the user.
- (iii) The Fibonacci sequence is the series of numbers 0, 1, 1, 2, 3, 5, 8, ... Formally, it can be expressed as: $fib_0 = 0$, $fib_1 = 1$, $fib_n = fib_{n-1} + fib_{n-2}$ Write a multithreaded program that generates the Fibonacci sequence using either the Java,

3. Synchronization:

- (i) Give Java solution to Bounded buffer problem.
- (ii) Give solution to the readers-writers problem using Java synchronization.
- (iii) The Sleeping-Barber Problem: A barber shop consists of awaiting room with n chairs and a barber room with one barber chair. If there are no customers to be served, the barber goes to sleep. If a customer enters the barbershop and all chairs are occupied, then the customer leaves the shop. If the barber is busy but chairs are available, then the customer sits in one of the free chairs. If the barber is asleep, the customer wakes up the barber. Write a program to coordinate the barber and the customers using Java synchronization.

- 4. Implement FCFS scheduling algorithm in Java.
- 5. Implement SJF (with no preemption) scheduling algorithm in Java
- 6. Implement RR scheduling algorithm in Java
- 7. Write a Java program that implements the banker's algorithm
- 8. Write a Java program that implements the FIFO page-replacement algorithm.
- 9. Write a Java program that implements the LRU page-replacement algorithm.
- 10. Design a File System in Java.

UCS3DMS: Database Management Systems	
<ol style="list-style-type: none"> 1. Creating and working with Insert/Update/Delete Trigger using Before/After clause. 2. Writing PL/SQL Blocks with basic programming constructs by including following: <ol style="list-style-type: none"> a. Sequential Statements b. unconstrained loop 3. Sequences: <ol style="list-style-type: none"> a. Creating simple Sequences with clauses like START WITH, INCREMENT BY, MAXVALUE, MINVALUE, CYCLE NOCYCLE, CACHE NOCACHE, ORDER NOORDER. b. Creating and using Sequences for tables. 4. Writing PL/SQL Blocks with basic programming constructs by including following: <ol style="list-style-type: none"> a. If...then...Else, IF...ELSIF...ELSE... END IF b. Case statement 5. Writing PL/SQL Blocks with basic programming constructs for following Iterative Structure: <ol style="list-style-type: none"> a. While-loop Statements b. For-loop Statements. 6. Writing PL/SQL Blocks with basic programming constructs by including a GoTO to jump out of a loop and NULL as a statement inside IF 7. Writing Procedures in PL/SQL Block <ol style="list-style-type: none"> a. Create an empty procedure, replace a procedure and call procedure b. Create a stored procedure and call it c. Define procedure to insert data d. A forward declaration of procedure 8. Writing Functions in PL/SQL Block. <ol style="list-style-type: none"> a. Define and call a function b. Define and use function in select clause, c. Call function in dbms_output.put_line d. Recursive function e. Count Employee from a function and return value back f. Call function and store the return value to a variable 9. Writing a recursive Functions in PL/SQL Block 10. Study of transactions and locks 	

1. Creating and working with Insert/Update/Delete Trigger using Before/After clause.
2. Writing PL/SQL Blocks with basic programming constructs by including following:
 - a. Sequential Statements
 - b. unconstrained loop
3. Sequences:
 - a. Creating simple Sequences with clauses like START WITH, INCREMENT BY, MAXVALUE, MINVALUE, CYCLE | NOCYCLE, CACHE | NOCACHE, ORDER | NOORDER.
 - b. Creating and using Sequences for tables.
4. Writing PL/SQL Blocks with basic programming constructs by including following:
 - a. If...then...Else, IF...ELSIF...ELSE... END IF
 - b. Case statement
5. Writing PL/SQL Blocks with basic programming constructs for following Iterative Structure:
 - a. While-loop Statements
 - b. For-loop Statements.
6. Writing PL/SQL Blocks with basic programming constructs by including a GoTO to jump out of a loop and NULL as a statement inside IF
7. Writing Procedures in PL/SQL Block
 - a. Create an empty procedure, replace a procedure and call procedure
 - b. Create a stored procedure and call it
 - c. Define procedure to insert data
 - d. A forward declaration of procedure
8. Writing Functions in PL/SQL Block.
 - a. Define and call a function
 - b. Define and use function in select clause,
 - c. Call function in dbms_output.put_line
 - d. Recursive function
 - e. Count Employee from a function and return value back
 - f. Call function and store the return value to a variable
9. Writing a recursive Functions in PL/SQL Block
10. Study of transactions and locks

Course: UCS3PR2	(Credits : 03 Lectures/Week: 09) UCS3CGT + UCS3IOT +UCS3WBP	
UCS3CGT: Combinatorics and Graph Theory		
<ol style="list-style-type: none"> 1. Solving problems on strings, sets and binomial coefficients. 2. Solving problems using induction. 3. Solving problems on Eulerian and Hamiltonian graphs. 4. Solving problems on Chromatic number and coloring 5. Solving problems using Kruskal's Algorithm 6. Solving problems using Prim's Algorithm 7. Solving problems using Dijkstra's Algorithm 8. Solving problems of finding augmenting paths in network flows. 9. Solving problems on network flows using Ford-Fulkerson Labeling Algorithm 10. Solving problems on posets and their associated networks. 		
UCS3IOT: Physical Computing and IoT Programming		
<ol style="list-style-type: none"> 1. Preparing Raspberry Pi: Hardware preparation and Installation 2. Linux Commands: Exploring the Raspbian 3. GPIO: Light the LED with Python 4. GPIO: LED Grid Module: Program the 8X8 Grid with Different Formulas 5. SPI: Camera Connection and capturing Images using SPI 6. Real Time Clock display using PWM. 7. Stepper Motor Control: PWM to manage stepper motor speed. 8. Node RED: Connect LED to Internet of Things 9. Stack of Raspberry Pi for better Computing and analysis Create a simple Web server using Raspberry Pi 		
UCS3WBP : Web Programming		
<ol style="list-style-type: none"> 1. Design a webpage that makes use of <ol style="list-style-type: none"> a. Document Structure Tags b. Various Text Formatting Tags c. List Tags d. Image and Image Maps 2. Design a webpage that makes use of <ol style="list-style-type: none"> a. Table tags b. Form Tags (forms with various form elements) c. Navigation across multiple pages d. Embedded Multimedia elements 3. Design a webpage that make use of Cascading Style Sheets with <ol style="list-style-type: none"> a. CSS properties to change the background of a Page 		

- b. CSS properties to change Fonts and Text Styles
 - c. CSS properties for positioning an element
4. Write JavaScript code for
 - a. Performing various mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number
 - b. Validating the various Form Elements
5. Write JavaScript code for
 - a. Demonstrating different JavaScript Objects such as String, RegExp, Math, Date
 - b. Demonstrating different JavaScript Objects such as Window, Navigator, History, Location, Document,
 - c. Storing and Retrieving Cookies
6. Create a XML file with Internal / External DTD and display it using
 - a. CSS
 - b. XSL
7. Design a webpage to handle asynchronous requests using AJAX on
 - a. Mouseover
 - b. button click
8. Write PHP scripts for
 - a. Retrieving data from HTML forms
 - b. Performing certain mathematical operations such as calculating factorial / finding Fibonacci Series / Displaying Prime Numbers in a given range / Evaluating Expressions / Calculating reverse of a number
 - c. Working with Arrays
 - d. Working with Files (Reading / Writing)
9. Write PHP scripts for
 - a. Working with Databases (Storing Records / Retrieving Records and Display them)
 - b. Storing and Retrieving Cookies
 - c. Storing and Retrieving Sessions
10. Design a webpage with some jQuery animation effects.

SEMESTER IV**THEORY**

Course: UCS4FOA	TOPICS (Credits : 02 Lectures/Week:03) Fundamentals of Algorithms	
Objectives: <ol style="list-style-type: none"> 1. To understand basic principles of algorithm design and why algorithm analysis is important 2. To understand how to implement algorithms in Python 3. To understand how to transform new problems into algorithmic problems with efficient solutions 4. To understand algorithm design techniques for solving different problems Expected Learning Outcomes: <ol style="list-style-type: none"> 1. Understand the concepts of algorithms for designing good program 2. Implement algorithms using Python 		
Unit I	Introduction to algorithm, Why to analysis algorithm, Running time analysis, How to Compare Algorithms, Rate of Growth, Commonly Used Rates of Growth, Types of Analysis, Asymptotic Notation, Big-O Notation, Omega- Ω Notation, Theta- Θ Notation, Asymptotic Analysis, Properties of Notations, Commonly used Logarithms and Summations, Performance characteristics of algorithms, Master Theorem for Divide and Conquer, Divide and Conquer Master Theorem: Problems & Solutions, Master Theorem for Subtract and Conquer Recurrences, Method of Guessing and Confirming	15L
Unit II	Tree algorithms: What is a Tree? Glossary, Binary Trees, Types of Binary Trees, Properties of Binary Trees, Binary Tree Traversals, Generic Trees (N-ary Trees), Threaded Binary Tree Traversals, Expression Trees, Binary Search Trees (BSTs), Balanced Binary Search Trees, AVL (Adelson-Velskii and Landis) Trees Graph Algorithms: Introduction, Glossary, Applications of Graphs, Graph Representation, Graph Traversals, Topological Sort, Shortest Path Algorithms, Minimal Spanning Tree	15L

	Selection Algorithms: What are Selection Algorithms? Selection by Sorting, Partition-based Selection Algorithm, Linear Selection Algorithm - Median of Medians Algorithm, Finding the K Smallest Elements in Sorted Order	
Unit III	Algorithms Design Techniques: Introduction, Classification, Classification by Implementation Method, Classification by Design Method Greedy Algorithms: Introduction, Greedy Strategy, Elements of Greedy Algorithms, Advantages and Disadvantages of Greedy Method, Greedy Applications, Understanding Greedy Technique Divide and Conquer Algorithms: Introduction, What is Divide and Conquer Strategy? Divide and Conquer Visualization , Understanding Divide and Conquer, Advantages of Divide and Conquer, Disadvantages of Divide and Conquer, Master Theorem , Divide and Conquer Applications Dynamic Programming: Introduction, What is Dynamic Programming Strategy? Properties of Dynamic Programming Strategy, Problems which can be solved using Dynamic Programming, Dynamic Programming Approaches, Examples of Dynamic Programming Algorithms, Understanding Dynamic Programming, Longest Common Subsequence	15L

Textbook(s):

1. Data Structure and Algorithmic Thinking with Python, Narasimha Karumanchi , CareerMonk Publications, 2016
2. Introduction to Algorithm, Thomas H Cormen, PHI

Additional References(s):

1. Data Structures and Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, 2016, Wiley
2. Fundamentals of Computer Algorithms, Sartaj Sahni and Sanguthevar Rajasekaran Ellis Horowitz, Universities Press

Course: UCS4AJV	TOPICS (Credits : 02 Lectures/Week: 03) Advanced Java	
Objectives: Explore advanced topic of Java programming for solving problems. Expected Learning Outcomes: <ol style="list-style-type: none"> 1) Understand the concepts related to Java Technology 2) Explore and understand use of Java Server Programming 		
Unit I	Swing: Need for swing components, Difference between AWT and swing, Components hierarchy, Panes, Swing components: JLabel, JTextField and JPasswordField, JTextAres, JButton, JCheckBox, JRadioButton, JComboBox and JList JDBC: Introduction, JDBC Architecture, Types of Drivers, Statement, ResultSet, Read Only ResultSet, Updatable ResultSet, Forward Only ResultSet, Scrollable ResultSet, PreparedStatement, Connection Modes, SavePoint, Batch Updatations, CallableStatement, BLOB & CLOB	15L
Unit II	Servlets: Introduction, Web application Architecture, Http Protocol & Http Methods, Web Server & Web Container, Servlet Interface, GenericServlet, HttpServlet, Servlet Life Cycle, ServletConfig, ServletContext, Servlet Communication, Session Tracking Mechanisms JSP: Introduction, JSP LifeCycle, JSP Implicit Objects & Scopes, JSP Directives, JSP Scripting Elements, JSP Actions: Standard actions and customized actions,	15L
Unit III	Java Beans: Introduction, JavaBeans Properties, Examples Struts 2: Basic MVC Architecture, Struts 2 framework features, Struts 2 MVC pattern, Request life cycle, Examples, Configuration Files, Actions, Interceptors, Results & Result Types, Value Stack/OGNL JSON: Overview, Syntax, DataTypes, Objects, Schema, Comparison with XML, JSON with Java	15L

Textbook(s):

- 1) Cay S. Horstmann, Gary Cornell, Core Java™ 2: Volume II–Advanced Features Prentice Hall PTR,9th Edition
- 2) Herbert Schildt, Java2: The Complete Reference, Tata McGraw-Hill,5th Edition
- 3) Joe Wigglesworth and Paula McMillan, Java Programming: Advanced Topics, Thomson Course Technology (SPD) ,3rd Edition

Additional Reference(s):

- 1) Advanced Java Programming, Uttam K. Roy, Oxford University Press
- 2) *The Java Tutorials: <http://docs.oracle.com/javase/tutorial/>*
- 3) The Java Tutorials of Sun Microsystems Inc

Course: UCS4CNT	TOPICS (Credits :02 Lectures/Week:03) Computer Networks	
Objectives: In this era of Information, its computation and its exchange techniques, Learner should be able to conceptualize and understand the framework and working of communication networks. And on completion, will be able to have a firm grip over this very important segment of Internet.		
Expected Learning Outcomes : <ol style="list-style-type: none"> 1. Learner will be able to understand the concepts of networking, which are important for them to be known as a „<i>networking professionals</i>“. 2. Useful to proceed with industrial requirements and International vendor certifications. 		
Unit I	Introduction Network Models: Introduction to data communication, Components, Data Representation, Data Flow, Networks, Network Criteria, Physical Structures, Network types, Local Area Network, Wide Area Network, Switching, The Internet, Accessing the Internet, standards and administration Internet Standards. Network Models, Protocol layering, Scenarios, Principles of Protocol Layering, Logical Connections, TCP/IP Protocol Suite, Layered Architecture, Layers in the TCP/IP Protocol Suite, Encapsulation and Decapsulation, Addressing, Multiplexing and Demultiplexing. Detailed introduction to Physical Layer, Detailed introduction to Data-Link Layer, Detailed introduction to Network	15L

	Layer, Detailed introduction to Transport Layer, Detailed introduction to Application Layer. Data and Signals, Analog and Digital Data, Analog and Digital Signals, Sine Wave Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth, Digital Signal, Bit Rate, Bit Length, Transmission of Digital Signals, Transmission Impairments, Attenuation, Distortion, Noise, Data Rate Limits, Performance, Bandwidth, Throughput, Latency (Delay)	
Unit II	<p>Introduction to Physical Layer and Data-Link Layer:</p> <p>Digital Transmission digital-to-digital conversion, Line Coding, Line Coding Schemes, analog-to-digital conversion, Pulse Code Modulation (PCM), Transmission Modes, Parallel Transmission, Serial Transmission. Analog Transmission, digital-to-analog Conversion, Aspects of Digital-to-Analog Conversion, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, analog-to-analog Conversion, Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation (PM), Multiplexing, Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Time-Division Multiplexing. Transmission Media, Guided Media, Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable. Switching, Three Methods of Switching , Circuit Switched Networks, Packet Switching.</p> <p>Introduction to Data-Link Layer, Nodes and Links, Services, Two Sub-layers, Three Types of addresses, Address Resolution Protocol (ARP). Error Detection and Correction, introduction, Types of Errors, Redundancy, Detection versus Correction,</p>	
Unit III	<p>Network layer, Transport Layer</p> <p>Media Access Control (MAC), random access, CSMA, CSMA/CD, CSMA/CA, controlled access, Reservation, Polling, Token Passing, channelization, FDMA, TDMA, CDMA. Connecting Devices and Virtual LANs, connecting devices, Hubs, Link-Layer</p>	15L

	<p>Switches, Routers, Introduction to Network Layer, network layer services, Packetizing, Routing and Forwarding, Other Services, IPv4 addresses, Address Space, Classful Addressing.</p> <p>Unicast Routing, General Idea, Least-Cost Routing, Routing Algorithms, Distance-Vector Routing, Link-State Routing, Path-Vector Routing, Introduction to Transport Layer, Transport-Layer Services, Connectionless and Connection-Oriented Protocols.</p> <p>Transport-Layer Protocols, Service, Port Numbers, User Datagram Protocol, User Datagram, UDP Services, UDP Applications, Transmission Control Protocol, TCP Services, TCP Features, Segment.</p>	
<p>Textbook(s):</p> <ol style="list-style-type: none"> 1) Data Communications and Networking, Behrouz A. Forouzan, Fifth Edition, TMH, 2013. 2) Computer Network, Andrew S. Tanenbaum, David J. Wetherall, Fifth Edition, Pearson Education, 2011. <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1) Computer Network, Bhushan Trivedi, Oxford University Press 2) Data and Computer Communication, William Stallings, PHI 		

<p>Course: UCS4SEN</p>	<p>TOPICS (Credits : 02 Lectures/Week: 03) Software Engineering</p>	
<p>Unit I</p>	<p>Introduction: The Nature of Software, Software Engineering, The Software Process, Generic Process Model, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, Component-Based Development, The Unified Process Phases, Agile Development- Agility, Agile Process, Extreme Programming</p> <p>Requirement Analysis and System Modeling: Requirements Engineering, Eliciting Requirements, SRS Validation, Components of</p>	<p>15L</p>

	SRS, Characteristics of SRS , Object-oriented design using the UML - Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram	
Unit II	<p>System Design: System/Software Design, Architectural Design, Low-Level Design Coupling and Cohesion, Functional-Oriented Versus The Object-Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for Design</p> <p>Software Measurement and Metrics: Product Metrics – Measures, Metrics, and Indicators, Function-Based Metrics, Metrics for Object-Oriented Design, Operation-Oriented Metrics, User Interface Design Metrics, Metrics for Source Code, Halstead Metrics Applied to Testing, Metrics for Maintenance, Cyclomatic Complexity, Software Measurement - Size-Oriented, Function-Oriented Metrics, Metrics for Software Quality</p> <p>Software Project Management: Estimation in Project Planning Process –Software Scope And Feasibility, Resource Estimation, Empirical Estimation Models – COCOMO II, Estimation for Agile Development, The Make/Buy Decision, Project Scheduling - Basic Principles, Relationship Between People and Effort, Effort Distribution, Time-Line Charts</p>	15L
Unit III	<p>Risk Management - Software Risks, Risk Identification, Risk Projection and Risk Refinement, RMMM Plan</p> <p>Software Quality Assurance: Elements of SQA, SQA Tasks, Goals, and Metrics, Formal Approaches to SQA, Six Sigma, Software Reliability, The ISO 9000 Quality Standards, Capability Maturity Model</p> <p>Software Testing : Verification and Validation, Introduction to Testing, Testing Principles, Testing Objectives, Test Oracles, Levels of Testing, White-Box Testing/Structural Testing, Functional/Black-Box Testing, Test Plan, Test-Case Design</p>	15L

	<p>Tutorial:</p> <ol style="list-style-type: none"> 1. Preparing Software Requirements Specifications 2. E-R Modeling 3. Modeling UML Class and Object Diagrams 4. Modeling UML Use Case Diagrams and Capturing Use Case Scenarios 5. Modeling Sequence diagram 6. Modeling Collaboration diagram, 7. Modeling State chart diagram 8. Modeling Activity diagram 9. Modeling Component diagram 10. Modeling Deployment diagram 	
<p>Text book(s):</p> <p>1) Software Engineering, A Practitioner's Approach, Roger S, Pressman.(2014)</p> <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1) Software Engineering, Ian Sommerville, Pearson Education 2) Software Engineering: Principles and Practices”,Deepak Jain,OXFORD University Press, 3) Fundamentals of Software Engineering, Fourth Edition, Rajib Mall, PHI 4) Software Engineering: Principles and Practices, Hans Van Vliet, John Wiley & Sons 5) A Concise Introduction to Software Engineering, Pankaj Jalote, Springer 		

<p>Course: UCS4LAP</p>	<p>TOPICS (Credits : 02 Lectures/Week: 03) Linear Algebra using Python</p>	
<p>Objectives: To offer the learner the relevant linear algebra concepts through computer science applications.</p> <p>Expected Learning Outcomes:</p> <ol style="list-style-type: none"> 1. Appreciate the relevance of linear algebra in the field of computer science. 2. Understand the concepts through program implementation 3. Instill a computational thinking while learning linear algebra. 		

Unit I	<p>Field: Introduction to complex numbers, numbers in Python, Abstracting over fields, Playing with GF(2), Vector Space: Vectors are functions, Vector addition, Scalar-vector multiplication, Combining vector addition and scalar multiplication, Dictionary-based representations of vectors, Dot-product, Solving a triangular system of linear equations. Linear combination, Span, The geometry of sets of vectors, Vector spaces, Linear systems, homogeneous and Otherwise</p>	15L
Unit II	<p>Matrix: Matrices as vectors, Transpose, Matrix-vector and vector-matrix multiplication in terms of linear combinations, Matrix-vector multiplication in terms of dot-products, Null space, Computing sparse matrix-vector product, Linear functions, Matrix-matrix multiplication, Inner product and outer product, From function inverse to matrix inverse</p> <p>Basis: Coordinate systems, Two greedy algorithms for finding a set of generators, Minimum Spanning Forest and GF(2), Linear dependence, Basis, Unique representation, Change of basis, first look, Computational problems involving finding a basis</p> <p>Dimension: Dimension and rank, Direct sum, Dimension and linear functions, The annihilator</p>	15L
Unit III	<p>Gaussian elimination: Echelon form, Gaussian elimination over GF(2), Solving a matrix-vector equation using Gaussian elimination, Finding a basis for the null space, Factoring integers,</p> <p>Inner Product: The inner product for vectors over the reals, Orthogonality,</p> <p>Orthogonalization: Projection orthogonal to multiple vectors, Projecting orthogonal to mutually orthogonal vectors, Building an orthogonal set of generators, Orthogonal complement,</p> <p>Eigenvector: Modeling discrete dynamic processes, Diagonalization of the Fibonacci matrix, Eigenvalues and eigenvectors, Coordinate representation in terms of eigenvectors, The Internet worm, Existence of eigenvalues, Markov chains, Modeling a web surfer: PageRank.</p>	15L

Textbook(s):

- 1) Coding the Matrix Linear Algebra through Applications to Computer Science Edition 1, PHILIP N. KLEIN, Newtonian Press (2013)

Additional References:

- 1) Linear Algebra and Probability for Computer Science Applications, Ernest Davis, A K Peters/CRC Press (2012).
- 2) Linear Algebra and Its Applications, Gilbert Strang, Cengage Learning, 4th Edition (2007).
- 3) Linear Algebra and Its Applications, David C Lay, Pearson Education India; 3rd Edition (2002)

Course:**TOPICS (Credits : 02 Lectures/Week: 03)****UCS4NET****.Net Technologies****Objectives:**

To explore .NET technologies for designing and developing dynamic, interactive and responsive web applications.

Expected Learning Outcomes:

1. Understand the .NET framework
2. Develop a proficiency in the C# programming language
3. Proficiently develop ASP.NET web applications using C#
4. Use ADO.NET for data persistence in a web application

Unit I

The .NET Framework:.NET Languages, Common Language Runtime, .NET Class Library

C# Language Basics: Comments, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods, Classes, Value Types and Reference Types, Namespaces and Assemblies, Inheritance, Static Members, Casting Objects, Partial Classes

ASP.NET: Creating Websites, Anatomy of a Web Form - Page Directive, Doctype, Writing Code - Code-Behind Class, Adding Event Handlers, Anatomy of an ASP.NET Application - ASP.NET File Types, ASP.NET Web Folders,

HTML Server Controls - View State, HTML Control Classes, HTML Control Events, HtmlControl Base Class, HtmlContainerControl Class,

15 L

	HtmlInputControl Class, Page Class, global.asax File, web.config File	
Unit II	<p>Web Controls: Web Control Classes, WebControl Base Class, List Controls, Table Controls, Web Control Events and AutoPostBack, Page Life Cycle</p> <p>State Management: ViewState, Cross-Page Posting, Query String, Cookies, Session State, Configuring Session State, Application State</p> <p>Validation: Validation Controls, Server-Side Validation, Client-Side Validation, HTML5 Validation, Manual Validation, Validation with Regular Expressions</p> <p>Rich Controls: Calendar Control, AdRotator Control, MultiView Control</p> <p>Themes and Master Pages: How Themes Work, Applying a Simple Theme, Handling Theme Conflicts, Simple Master Page and Content Page, Connecting Master pages and Content Pages, Master Page with Multiple Content Regions, Master Pages and Relative Paths</p> <p>Website Navigation: Site Maps, URL Mapping and Routing, SiteMapPath Control, TreeView Control, Menu Control</p>	15L
Unit III	<p>ADO.NET: Data Provider Model, Direct Data Access - Creating a Connection, Select Command, DataReader, Disconnected Data Access</p> <p>Data Binding: Introduction, Single-Value Data Binding, Repeated-Value Data Binding, Data Source Controls – SqlDataSource</p> <p>Data Controls: GridView, DetailsView, FormView</p> <p>Working with XML: XML Classes – XMLTextWriter, XMLTextReader</p> <p>Caching: When to Use Caching, Output Caching, Data Caching</p> <p>LINQ: Understanding LINQ, LINQ Basics,</p> <p>ASP.NET AJAX: ScriptManager, Partial Refreshes, Progress Notification, Timed Refreshes</p>	15L

Textbook(s):

- 1) Beginning ASP.NET 4.5 in C#, Matthew MacDonald, Apress(2012)

Additional Reference(s):

- 1) The Complete Reference ASP .NET, MacDonald, Tata McGraw Hill
- 2) Beginning ASP.NET 4 in C# and VB Imar Spanajaars, WROX

Course:	TOPICS (Credits : 02 Lectures/Week: 03)	
UCS4ADF	Android Developer Fundamentals	
Objectives:		
To provide the comprehensive insight into developing applications running on smart mobile devices and demonstrate programming skills for managing task on mobile. To provide systematic approach for studying definition, methods and its applications for Mobile-App development.		
Expected Learning Outcomes:		
<ol style="list-style-type: none"> 1) Understand the requirements of Mobile programming environment. 2) Learn about basic methods, tools and techniques for developing Apps 3) Explore and practice App development on Android Platform 4) Develop working prototypes of working systems for various uses in daily lives. 		
Unit I	What is Android? Obtaining the required tools, creating first android app, understanding the components of screen, adapting display orientation, action bar, Activities and Intents, Activity Lifecycle and Saving State, Basic Views: TextView, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton, and RadioGroup Views, ProgressBar View, AutoCompleteTextView, TimePicker View, DatePicker View, ListView View, Spinner View	15L

<p>Unit II</p>	<p>User Input Controls, Menus, Screen Navigation, RecyclerView, Drawables, Themes and Styles, Material design, Providing resources for adaptive layouts, AsyncTask and AsyncTaskLoader, Connecting to the Internet, Broadcast receivers, Services, Notifications, Alarm managers, Transferring data efficiently</p>	<p>15L</p>
<p>Unit III</p>	<p>Data - saving, retrieving, and loading: Overview to storing data, Shared preferences, SQLite primer, store data using SQLite database, ContentProviders, loaders to load and display data, Permissions, performance and security, Firebase and AdMob, Publish your app</p>	<p>15L</p>

Textbook(s):

- 1) “Beginning Android 4 Application Development”, Wei-Meng Lee, March 2012, WROX.

Additional Reference(s):

- 1) <https://developers.google.com/training/courses/android-fundamentals>
- 2) <https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-practicals/details>

Suggested List of Practical – SEMESTER IV

Course: UCS4PR1	(Credits : 03 Lectures/Week:09) UCS4FOA+ UCS4AJV + UCS4CNT	
UCS4FOA: Fundamentals of Algorithms		
<ol style="list-style-type: none"> 1. Write Python program to perform matrix multiplication. Discuss the complexity of algorithm used. 2. Write Python program to sort n names using Quick sort algorithm. Discuss the complexity of algorithm used. 3. Write Python program to sort n numbers using Merge sort algorithm. Discuss the complexity of algorithm used. 4. Write Python program for inserting an element into binary tree. 5. Write Python program for deleting an element (assuming data is given) from binary tree. 6. Write Python program for checking whether a given graph G has simple path from source s to destination d. Assume the graph G is represented using adjacent matrix. 7. Write Python program for finding the smallest and largest elements in an array A of size n using Selection algorithm. Discuss Time complexity. 8. Write Python program for finding the second largest element in an array A of size n using Tournament Method. Discuss Time complexity. 9. Write Python program for implementing Huffman Coding Algorithm. Discuss the complexity of algorithm. 10. Write Python program for implementing Strassen's Matrix multiplication using Divide and Conquer method. Discuss the complexity of algorithm. 		
UCS4AJV: Advanced JAVA		
<ol style="list-style-type: none"> 1. Develop the presentation layer of Library Management software application with suitable menus. 2. Design suitable database for Library Management System. 3. Develop business logic layer for Library Management System. 4. Develop Java application to store image in a database as well as retrieve image from database. 		

5. Write a Java application to demonstrate servlet life cycle.
6. Design database for student administration. Develop servlet(s) to perform CRUD operations.
7. Create Employees table in EMP database. Perform select, insert, update, and delete operations on Employee table using JSP.
8. Write a Student class with three properties. The useBean action declares a JavaBean for use in a JSP. Write Java application to access JavaBeans Properties.
9. Design application using Struts2. Application must accept user name and greet user when command button is pressed.
10. Write Java application to encoding and decoding JSON in Java.

UCS4CNT: Computer Networks

1. Understanding the working of NIC cards, Ethernet/Fast Ethernet/Gigabit Ethernet.
2. Problem solving with IPv4, which will include concept of Classful addressing. (supportive Hint: use Cisco Binary Game)
3. Using, linux-terminal or Windows-cmd, execute following networking commands and note the output: ping, traceroute, netstat, arp, ipconfig.
4. Using Packet Tracer perform the following
 - A. Create a basic network of two computers using appropriate network wire.
 - B. Connect multiple (min.6) computers using layer 2 switch.
 - C. Connect a network in triangular shape with three layer two switches and every switch will have four computer. Verify their connectivity with each other
5. Using Packet Tracer, create a wireless network of multiple PCs using appropriate access point.
6. Using Wireshark, network analyzer, set the filter for ICMP, TCP, HTTP, UDP, FTP and perform respective protocol transactions to show/prove that the network analyzer is working.
7. Configure IP routing using RIP and OSPF.
8. Configuring UDP and TCP.
9. Configure DHCP and DNS.
10. Configure FTP, HTTP, Run, TELNET and SSH..

Course: UCS4PR2	(Credits : 03 Lectures/Week:09) UCS4LAP + UCS4NET + UCS4ADF	
UCS4LAP: Linear Algebra using Python		
<ol style="list-style-type: none"> 1. Write a program which demonstrates the following: <ul style="list-style-type: none"> • Addition of two complex numbers • Displaying the conjugate of a complex number • Plotting a set of complex numbers • Creating a new plot by rotating the given number by a degree 90, 180, 270 degrees and also by scaling by a number $a=1/2$, $a=1/3$, $a=2$ etc. 2. Write a program to do the following: <ul style="list-style-type: none"> • Enter a vector u as a n-list • Enter another vector v as a n-list • Find the vector $au+bv$ for different values of a and b • Find the dot product of u and v 3. Write a program to do the following: <ul style="list-style-type: none"> • Enter two distinct faces as vectors u and v. • Find a new face as a linear combination of u and v i.e. $au+bv$ for a and b in \mathbb{R}. • Find the average face of the original faces. 4. Write a program to do the following: <ul style="list-style-type: none"> • Enter an r by c matrix M (r and c being positive integers) • Display M in matrix format • Display the rows and columns of the matrix M • Find the scalar multiplication of M for a given scalar. • Find the transpose of the matrix M. 5. Write a program to do the following: <ul style="list-style-type: none"> • Find the vector-matrix multiplication of a r by c matrix M with an c-vector u. • Find the matrix-matrix product of M with a c by p matrix N. 6. Write a program to enter a matrix and check if it is invertible. If the inverse exists, find the inverse. 7. Write a program to convert a matrix into its row echelon form. 		

8. Write a program to do the following:
 - Enter a positive number N and find numbers a and b such that $a^2 - b^2 = N$
 - Find the gcd of two numbers using Euclid's algorithm.
9. Write a program to do the following:
 - Enter a vector b and find the projection of b orthogonal to a given vector u.
 - Find the projection of b orthogonal to a set of given vectors
10. Write a program to enter a given matrix and an eigen value of the same. Find its eigen vector.

UCS4NET : .NET Technologies

1. Write C# programs for understanding C# basics involving
 - a. Variables and Data Types
 - b. Object-Based Manipulation
 - c. Conditional Logic
 - d. Loops
 - e. Methods
2. Write C# programs for Object oriented concepts of C# such as:
 - a. Program using classes
 - b. Constructor and Function Overloading
 - c. Inheritance
 - d. Namespaces
3. Design ASP.NET Pages with
 - a. Server controls.
 - b. Web controls and demonstrate the use of AutoPostBack
 - c. Rich Controls (Calendar / Ad Rotator)
4. Design ASP.NET Pages for State Management using
 - a. Cookies
 - b. Session State
 - c. Application State
5. Perform the following activities
 - a. Design ASP.NET page and perform validation using various Validation Controls
 - b. Design an APS.NET master web page and use it other (at least 2-3) content pages.
 - c. Design ASP.NET Pages with various Navigation Controls
6. Performing ADO.NET data access in ASP.NET for
 - a. Simple Data Binding
 - b. Repeated Value Data Binding
7. Design ASP.NET application for Interacting (Reading / Writing) with XML documents
8. Design ASP.NET Pages for Performance improvement using Caching
9. Design ASP.NET application to query a Database using LINQ
10. Design and use AJAX based ASP.NET pages.

UCS4ADF:Android Developer Fundamentals

1. Install Android Studio and Run Hello World Program.
2. Create an android app with Interactive User Interface using Layouts.
3. Create an android app that demonstrates working with TextView Elements.
4. Create an android app that demonstrates Activity Lifecycle and Instance State.
5. Create an android app that demonstrates the use of Keyboards, Input Controls, Alerts, and Pickers.
6. Create an android app that demonstrates the use of an Options Menu.
7. Create an android app that demonstrate Screen Navigation Using the App Bar and Tabs.
8. Create an android app to Connect to the Internet and use BroadcastReceiver.
9. Create an android app to show Notifications and Alarm manager.
10. Create an android app to save user data in a database and use of different queries.



CHANGU KANA THAKUR

**ARTS, COMMERCE & SCIENCE COLLEGE, NEW
PANVEL (AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC

**'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.Sc

Revised Syllabus of T.Y.B.Sc. Computer Science

Choice Based Credit & Grading System (60:40)

w.e.f. Academic Year 2020-21

Preamble

This is the third year curriculum in the subject of Computer Science. The revised structure is designed to transform students into technically competent, socially responsible and ethical Computer Science professionals. In these Semesters we have made the advancements in the subject based on the previous Semesters Knowledge.

In the first year basic foundation of important skills required for software development is laid. Second year of this course is about studying core computer science subjects. The third year is the further advancement which covers developing capabilities to design formulations of computing models and its applications in diverse areas.

The proposed curriculum contains two semesters, each Semester contains two Electives: Elective-I and II. Every Elective contains three papers based on specific areas of Computer Science. It also includes one Skill Enhancement paper per semester, helps the student to evaluate his/her computer science domain specific skills and also to meet industry expectations. This revised curriculum has not only taken the specific areas of computer science into consideration but will also give the opportunity to the student to prove his/her ability in the subject practically through the Project Implementation. In Semester V and Semester VI student has to undertake a Project. It can boost his/her confidence and also can encourage the student to perform innovations in the subject as the choice of the Project topic is kept open covering most of the areas of Computer Science subject as per the students interest and the subject they have learned during the Course.

Proposed Curriculum contains challenging and varied subjects aligned with the current trend with the introduction of Machine Intelligence specific subject such as Artificial Intelligence, Information Retrieval. Data Management related subjects such as Cloud Computing and Data Science. Image processing topics such as Game Programming, Digital Image Processing. Introduction of physical world through Architecting of IoT and Wireless Sensor Networks and Mobile Communication. Security domain is also evolved by the introduction of Ethical Hacking, Cyber Forensic and Information and Network Security. To get the hands on experience Linux Server Administration and Web Services topics are included.

In essence, the objective of this syllabus is to create a pool of technologically savvy, theoretically strong, innovatively skilled and ethically responsible generation of computer science professionals. Hope that the teacher and student community of University of Mumbai will accept and appreciate the efforts.

Objectives of the Course

- Open new opportunities in the areas of genomics, communications networks and coding theory, algorithms and computations and operations research.
- To learn the elements of modern language designs.
- To develop understanding of concepts and techniques for data management along with covers concepts of database at advance level.
- Introducing one of the upcoming concepts Physical Computing and IoT programming

Course Outcomes

- Syllabus gives more contextual, industry affable and suitable to cater the needs of society and nation in present day context.
- Able to develop the capabilities to design formulations of computing models and its applications in diverse areas.
- Understand how to use object oriented paradigms.
- Able to learn custom-built hardware with minimum complex hardware builds which is easier for projects in education domain.

Scheme of Examination

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Continuous Assessment	20 Marks

Question Paper Pattern for Continuous Assessment (Total Marks 20 to be converted in 10 marks)

Marks	Group Project*/ Individual Project	Presentation and write-up	Practical Skills	Open book test	Quiz
5	Hypothesis/Topic of the project	Presentation skill	Demonstration of skill	High order thinking questions (HOTS)	Quiz on application of subject in real life
5	Actual laboratory work/Field work	Knowledge	Viva		
5	Result/output	Quality of ppt	Report		
5	Dissertation/Report	Writing skill	Problem solving ability		

B) Semester End Examination: 60 %

60 Marks

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
<ol style="list-style-type: none"> 1. There shall be four questions each of 15 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

I. Practical Examination : – 300 (50 marks x 6 core papers)

II. Each core subject carries: - 50 Marks

Sr. No.	Particulars of External	Marks
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	50

Minimum 75 % practical from each core subjects are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Exam)

T.Y.B.Sc. (Semester V and VI)
Computer Science Syllabus
Credit Based Semester and Grading System

To be implemented from the Academic year 2021-22

SEMESTER V			
Course	TOPICS	Credits	L / Week
	Elective-I (Select Any Two)		
UCS5AIN	Artificial Intelligence	3	3
UCS5LSA	Linux Server Administration	3	3
UCS5SQA	Software Testing and Quality Assurance	3	3
	Elective-II (Select Any Two)		
UCS5INS	Information and Network Security	3	3
UCS5IOT	Architecting of IoT	3	3
UCS5WEB	Web Services	3	3
	Skill Enhancement		
UCS5GPG	Game Programming	2	3
	Practical		
UCS5PR1	Practical of Elective-I	2	6
UCS5PR2	Practical of Elective-II	2	6
UCS5PRJ	Project Implementation	1	3
UCS5PR3	Practical of Skill Enhancement : UCS5GPG	1	3

SEMESTER VI			
Course	TOPICS	Credits	L / Week
	Elective-I (Select Any Two)		
UCS6WMC	Wireless Sensor Networks and Mobile Communication	3	3
UCS6CLC	Cloud Computing	3	3
UCS6CFR	Cyber Forensics	3	3
	Elective-II (Select Any Two)		
UCS6INR	Information Retrieval	3	3
UCS6DIP	Digital Image Processing	3	3
UCS6DSC	Data Science	3	3
	Skill Enhancement		
UCS6ETH	Ethical Hacking	2	3
	Practical		
UCS6PR1	Practical of Elective-I	2	6
UCS6PR2	Practical of Elective-II	2	6
UCS6PRJ	Project Implementation	1	3
UCS6PR3	Practical of Skill Enhancement : UCS6ETH	1	3

SEMESTER V

THEORY

Course: UCS5AIN	TOPICS (Credits : 03 Lectures/Week:03) Artificial Intelligence	
<p>Objectives: Artificial Intelligence (AI) and accompanying tools and techniques bring transformational changes in the world. Machines capability to match, and sometimes even surpass human capability, make AI a hot topic in Computer Science. This course aims to introduce the learner to this interesting area.</p> <p>Expected Learning Outcomes: After completion of this course, learner should get a clear understanding of AI and different search algorithms used for solving problems. The learner should also get acquainted with different learning algorithms and models used in machine learning.</p>		
Unit I	<p>What Is AI: Foundations, History and State of the Art of AI. Types of AI</p> <p>Intelligent Agents: Agents and Environments, Nature of Environments, Structure of Agents.</p> <p>Problem Solving by searching: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Heuristic Functions.</p>	15L
Unit II	<p>Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning</p>	
Unit III	<p>Learning probabilistic models: Statistical Learning, Learning with Complete Data, Learning with Hidden Variables: The EM Algorithm. Reinforcement learning: Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, Applications of Reinforcement Learning.</p>	
<p>Textbook(s): 1) Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson, 2010.</p> <p>Additional Reference(s): 1) Artificial Intelligence: Foundations of Computational Agents, David L Poole, Alan K. Mackworth, 2nd Edition, Cambridge University Press, 2017. 2) Artificial Intelligence, Kevin Knight and Elaine Rich, 3rd Edition, 2017 3) The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer, 2013</p>		

Course: UCS5LSA	TOPICS (Credits : 03 Lectures/Week:03) Linux Server Administration	
<p>Objectives:</p> <p>Demonstrate proficiency with the Linux command line interface, directory & file management techniques, file system organization, and tools commonly found on most Linux distributions. Effectively operate a Linux system inside of a network environment to integrate with existing service solutions. Demonstrate the ability to troubleshoot challenging technical problems typically encountered when operating and administering Linux systems.</p> <p>Expected Learning Outcomes:</p> <p>Learner will be able to develop Linux based systems and maintain. Learner will be able to install appropriate service on Linux server as per requirement. Learner will have proficiency in Linux server administration.</p>		
Unit I	<p>Introduction:</p> <p>Technical Summary of Linux Distributions, Managing Software</p> <p>Single-Host Administration:</p> <p>Managing Users and Groups, Booting and shutting down processes, File Systems, Core System Services, Process of configuring, compiling, Linux Kernel</p> <p>Networking and Security:</p> <p>TCP/IP for System Administrators, basic network Configuration, Linux Firewall (Netfilter), System and network security</p>	15L
Unit II	<p>Internet Services:</p> <p>Domain Name System (DNS), File Transfer Protocol (FTP), Apache web server, Simple Mail Transfer Protocol (SMTP), Post Office Protocol and Internet Mail Access Protocol (POP and IMAP), Secure Shell (SSH), Network Authentication, OpenLDAP Server, Samba and LDAP, Network authentication system (Kerberos), Domain Name Service (DNS), Security</p>	15L
Unit III	<p>Intranet Services:</p> <p>Network File System (NFS), Samba, Distributed File Systems (DFS), Network Information Service (NIS), Lightweight Directory Access Protocol (LDAP), Dynamic Host Configuration Protocol (DHCP), MySQL, LAMP Applications</p> <p>File Servers, Email Services, Chat Applications, Virtual Private Networking.</p>	15L

Textbook(s):

- 1) Linux Administration: A Beginner's Guide, Wale Soyinka, Seventh Edition, McGraw-Hill Education, 2016
- 2) Ubuntu Server Guide, Ubuntu Documentation Team, 2016

Additional Reference(s):

- 1) Mastering Ubuntu Server, Jay LaCroix, PACKT Publisher, 2016

Course: UCS5SQA	TOPICS (Credits : 03 Lectures/Week:03) Software Testing and Quality Assurance	
Objectives: To provide learner with knowledge in Software Testing techniques. To understand how testing methods can be used as an effective tools in providing quality assurance concerning for software. To provide skills to design test case plan for testing software		
Expected Learning Outcomes: Understand various software testing methods and strategies. Understand a variety of software metrics, and identify defects and managing those defects for improvement in quality for given software. Design SQA activities, SQA strategy, formal technical review report for software quality control and assurance.		
Unit I	Software Testing and Introduction to quality : Introduction, Nature of errors, an example for Testing, Definition of Quality , QA, QC, QM and SQA , Software Development Life Cycle, Software Quality Factors Verification and Validation : Definition of V &V , Different types of V & V Mechanisms, Concepts of Software Reviews, Inspection and Walkthrough Software Testing Techniques : Testing Fundamentals, Test Case Design, White Box Testing and its types, Black Box Testing and its types	15L
Unit II	Software Testing Strategies : Strategic Approach to Software Testing, Unit Testing, Integration Testing, Validation Testing, System Testing, Automated Testing, Grey Box testing. Software Metrics : Concept and Developing Metrics, Different types of Metrics, Complexity metrics Defect Management: Definition of Defects, Defect Management Process, Defect Reporting, Metrics Related to Defects, Using Defects for Process Improvement.	15L

Unit III	<p>Software Quality Assurance : Quality Concepts, Quality Movement, Background Issues, SQA activities, Software Reviews, Formal Technical Reviews, Formal approaches to SQA, Statistical Quality Assurance, Software Reliability, The ISO 9000 Quality Standards, , SQA Plan , Six sigma, Informal Reviews</p> <p>Quality Improvement : Introduction, Pareto Diagrams, Cause-effect Diagrams, Scatter Diagrams, Run charts</p> <p>Quality Costs : Defining Quality Costs, Types of Quality Costs, Quality Cost Measurement, Utilizing Quality Costs for Decision-Making</p>	15L
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Textbook(s):

1. Software Engineering for Students, A Programming Approach, Douglas Bell, 4th Edition,, Pearson Education, 2005
2. Software Engineering – A Practitioners Approach, Roger S. Pressman, 5th Edition, Tata McGraw Hill, 2001
3. Quality Management, Donna C. S. Summers, 5th Edition, Prentice-Hall, 2010.
4. Total Quality Management, Dale H. Besterfield, 3rd Edition, Prentice Hall, 2003.

Additional Reference(s):

1. Software engineering: An Engineering approach, J.F. Peters, W. Pedrycz , John Wiley,2004
2. Software Testing and Quality Assurance Theory and Practice, Kshirsagar Naik, Priyadarshi Tripathy , John Wiley & Sons, Inc. , Publication, 2008
3. Software Engineering and Testing, B. B. Agarwal, S. P. Tayal, M. Gupta, Jones and Bartlett Publishers, 2010

Course: UCS5INS	TOPICS (Credits : 03 Lectures/Week:03) Information and Network Security	
<p>Objectives:</p> <p>To provide students with knowledge of basic concepts of computer security including network security and cryptography.</p> <p>Expected Learning Outcomes:</p> <p>Understand the principles and practices of cryptographic techniques. Understand a variety of generic security threats and vulnerabilities, and identify & analyze particular security problems for a given application. Understand various protocols for network security to protect against the threats in a network</p>		
Unit I	<p>Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms</p> <p>Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, AES (round details not expected), Multiple Encryption and Triple DES, Block Cipher Modes of Operation, Stream Ciphers</p> <p>Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, The RSA Algorithm</p>	15L
Unit II	<p>Key Management: Public-Key Cryptosystems, Key Management, Diffie Hellman Key Exchange</p> <p>Message Authentication and Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and Macs, Secure Hash Algorithm, HMAC</p> <p>Digital Signatures and Authentication: Digital Signatures, Authentication Protocols, Digital Signature Standard</p> <p>Authentication Applications: Kerberos, X.509 Authentication, Public-Key Infrastructure</p>	15L

Unit III	<p>Electronic Mail Security: Pretty Good Privacy, S/MIME</p> <p>IP Security: Overview, Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management</p> <p>Web Security: Web Security Considerations, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction</p> <p>Intrusion: Intruders, Intrusion Techniques, Intrusion Detection</p> <p>Malicious Software: Viruses and Related Threats, Virus Countermeasures, DDOS, Salami Attack</p> <p>Firewalls: Firewall Design Principles, Types of Firewalls</p>	15L
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Textbook(s):

- 1) Cryptography and Network Security: Principles and Practice 5th Edition, William Stallings Pearson, 2010

Additional Reference(s):

- 1) Cryptography and Network Security, Atul Kahate, Tata McGraw-Hill, 2013.
- 2) Cryptography and Network, Behrouz A Fourouzan, Debdeep Mukhopadhyay, 2nd Edition, TMH, 2011

Course: UCS5WMC	<p>TOPICS (Credits : 03 Lectures/Week: 03)</p> <p>Wireless Sensor Networks and Mobile Communication</p>
<p>Objectives:</p> <p>In this era of wireless and adhoc network, connecting different wireless devices and understanding their compatibility is very important. Information is gathered in many different ways from these devices. Learner should be able to conceptualize and understand the framework. On completion, will be able to have a firm grip over this very important segment of wireless network. Expected Learning Outcomes:</p> <p>After completion of this course, learner should be able to list various applications of wireless sensor networks, describe the concepts, protocols, design, implementation and use of wireless sensor networks. Also implement and evaluate new ideas for solving wireless sensor network design issues.</p>	

<p>Unit I</p>	<p>Introduction: Introduction to Sensor Networks, unique constraints and challenges.</p> <p>Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc NETWORKS (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks.</p> <p>Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to TinyOS and nesC. Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.</p>	<p>15L</p>
<p>Unit II</p>	<p>Medium Access Control Protocols: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study.</p> <p>Routing Protocols : Data Dissemination and Gathering, Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks.</p> <p>Transport Control Protocols : Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols.</p>	<p>15L</p>
<p>Unit III</p>	<p>Introduction, Wireless Transmission and Medium Access Control: Applications, A short history of wireless communication. Wireless Transmission: Frequency for radio transmission, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.</p> <p>Telecommunication, Satellite and Broadcast Systems: GSM: Mobile services, System architecture, Radio interface, Protocols, Localization And Calling, Handover, security, New data services; DECT: System architecture, Protocol architecture; ETRA, UMTS and IMT- 2000.</p> <p>Satellite Systems: History, Applications, Basics: GEO, LEO, MEO; Routing, Localization, Handover.</p>	<p>15L</p>

Textbook(s):

- 1) Protocols and Architectures for Wireless Sensor Network, Holger Kerl, Andreas Willig, John Wiley and Sons, 2005
- 2) Wireless Sensor Networks Technology, Protocols, and Applications ,Kazem Sohraby, Daniel Minoli and TaiebZnati, John Wiley & Sons, 2007
- 3) Mobile communications, Jochen Schiller, 2nd Edition, Addison wisely , Pearson Education, 2012

Additional Reference(s):

- 1) Fundamentals of Wireless Sensor Networks, Theory and Practice, Walteneus Dargie, Christian Poellabauer , Wiley Series on wireless Communication and Mobile Computing, 2011
- 2) Networking Wireless Sensors, Bhaskar Krishnamachari , Cambridge University Press, 2005

Course: UCS5WEB	TOPICS (Credits : 03 Lectures/Week:03) Web Services	
Objectives: <p>To understand the details of web services technologies like SOAP, WSDL, and UDDI. To learn how to implement and deploy web service client and server. To understand the design principles and application of SOAP and REST based web services (JAX-Ws and JAX-RS).To understand WCF service. To design secure web services and QoS of Web Services</p> Expected Learning Outcomes: <p>Emphasis on SOAP based web services and associated standards such as WSDL. Design SOAP based / RESTful / WCF services Deal with Security and QoS issues of Web Services</p>		
Unit I	Web services basics : What Are Web Services? Types of Web Services Distributed computing infrastructure, overview of XML, SOAP, Building Web Services with JAX-WS, Registering and Discovering Web Services, Service Oriented Architecture, Web Services Development Life Cycle, Developing and consuming simple Web Services across platform, Jersey webservices	15L
Unit II	The REST Architectural style : Introducing HTTP, The core architectural elements of a RESTful system, Description and discovery of RESTful web services, Java tools and frameworks for building RESTful web services, JSON message format and tools and frameworks around JSON, Build RESTful web services with JAX-RS APIs, The Description and Discovery of RESTful Web Services, Design guidelines for building RESTful web services, Secure RESTful web services	15L

Unit III	Developing Service-Oriented Applications with WCF : What Is Windows Communication Foundation, Fundamental Windows Communication Foundation Concepts, Windows Communication Foundation Architecture, WCF and .NET Framework Client Profile, Basic WCF Programming , WCF Feature Details. Web Service QoS	15L
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Textbook(s):

- 1) Web Services: Principles and Technology, Michael P. Papazoglou, Pearson Education Limited, 2008
- 2) RESTful Java Web Services, Jobinesh Purushothaman, PACKT Publishing, 2nd Edition, 2015
- 3) Developing Service-Oriented Applications with WCF, Microsoft, 2017
<https://docs.microsoft.com/en-us/dotnet/framework/wcf/index>

Additional Reference(s):

- 1) Leonard Richardson and Sam Ruby, RESTful Web Services, O'Reilly, 2007
- 2) The Java EE 6Tutorial, Oracle, 2013

Course: UCS5GPG	TOPICS (Credits : 03 Lectures/Week: 03) Game Programming
<p>Objectives:</p> <p>Learner should get the understanding computer Graphics programming using DirectX or OpenGL. Along with the VR and AR they should also be aware of GPU, newer technologies and programming using most important API for windows.</p> <p>Expected Learning Outcomes:</p> <p>Learner should study Graphics and gaming concepts with present working style of developers where everything remains on internet and they need to review it, understand it, be a part of community and learn.</p>	

<p>Unit I</p>	<p>Mathematics for Computer Graphics, DirectX Kickstart:</p> <p>Cartesian Coordinate system: The Cartesian XY-plane, Function Graphs, Geometric Shapes, Polygonal Shapes, Areas of Shapes, Theorem of Pythagoras in 2D, Coordinates, Theorem of Pythagoras in 3D, 3D Polygons, Euler’s Rule</p> <p>Vectors: Vector Manipulation, multiplying a Vector by a Scalar, Vector Addition and Subtraction, Position Vectors, Unit Vectors, Cartesian Vectors, Vector Multiplication, Scalar Product, Example of the Dot Product, The Dot Product in Lighting Calculations, The Dot Product in Back-Face Detection, The Vector Product, The Right-Hand Rule, deriving a Unit Normal Vector for a Triangle Areas, Calculating 2D Areas</p> <p>Transformations: 2D Transformations, Matrices, Homogeneous Coordinates, 3D Transformations, Change of Axes, Direction Cosines, rotating a Point about an Arbitrary Axis, Transforming Vectors, Determinants, Perspective Projection, Interpolation</p> <p>DirectX: Understanding GPU and GPU architectures. How they are different from CPU Architectures? Understanding how to solve by GPU?</p>	<p>15L</p>
<p>Unit II</p>	<p>DirectX Pipeline and Programming:</p> <p>Introduction To DirectX 11: COM, Textures and Resources Formats, The swap chain and Page flipping, Depth Buffering, Texture Resource Views, Multisampling Theory and MS in Direct3D, Feature Levels</p> <p>Direct3D 11 Rendering Pipeline: Overview, Input Assembler Stage (IA), Vertex Shader Stage (VS), The Tessellation Stage (TS), Geometry Shader Stage (GS), Pixel Shader Stage (PS), Output merger Stage (OM)</p> <p>Understanding Meshes or Objects, Texturing, Lighting, Blending. Interpolation and Character Animation:</p> <p>Trigonometry: The Trigonometric Ratios, Inverse Trigonometric Ratios, Trigonometric Relationships, The Sine Rule, The Cosine Rule, Compound Angles, Perimeter Relationships</p> <p>Interpolation: Linear Interpolant, Non-Linear Interpolation, Trigonometric Interpolation, Cubic Interpolation, Interpolating Vectors, Interpolating Quaternions</p> <p>Curves: Circle, Bezier, B-Splines</p> <p>Analytic Geometry: Review of Geometry, 2D Analytic Geometry, Intersection Points, Point in Triangle, and Intersection of circle with straight line.</p>	<p>15L</p>

Unit III	<p>Introduction to Rendering Engines: Understanding the current market Rendering Engines. Understanding AR, VR and MR.Depth Mappers, Mobile Phones, Smart Glasses, HMD's</p> <p>Unity Engine: Multi-platform publishing, VR + AR: Introduction and working in Unity, 2D, Graphics, Physics, Scripting, Animation, Timeline, Multiplayer and Networking, UI, Navigation and Pathfinding, XR, Publishing.</p> <p>Scripting: Scripting Overview, Scripting Tools and Event</p> <p>Overview XR: VR, AR, MR, Conceptual Differences. SDK, Devices</p>	15L
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Text Book(s):

- 1) Mathematics for Computer Graphics, John Vince, Springer-Verlag London, 5th Edition,2017
- 2) Mathematics for 3D Game Programming and Computer Graphic, Eric Lengyel, Delmar Cengage Learning, Delmar Cengage Learning,2011
- 3) Introduction To 3D Game Programming With Directx® 11, Frank D Luna, Mercury Learning And Information,2012.
- 4) <https://docs.unity3d.com/Manual/index.html> - Free

Additional Reference(s):

- 1) Computer Graphics, C Version, Donald Hern and Pauline Baker, Pearson Education, 2nd Edition, 1997
- 2) HLSL Development Cookbook, Doron Feinstein, PACKT Publishing,2013

Suggested List of Practical- SEMESTER V

Course: UCS5PR1	(Credits : 02 Lectures/Week: 06) Practical of Elective-I	
UCS5AIN: Artificial Intelligence		
<p><i>Practical shall be implemented in python</i></p> <ol style="list-style-type: none">1. Implement Breadth first search algorithm for Romanian map problem.2. Implement Iterative deep depth first search for Romanian map problem.3. Implement A* search algorithm for Romanian map problem.4. Implement recursive best-first search algorithm for Romanian map problem.5. Implement decision tree learning algorithm for the restaurant waiting problem.6. Implement feed forward back propagation neural network learning algorithm for the restaurant waiting problem.7. Implement Adaboost ensemble learning algorithm for the restaurant waiting problem.8. Implement Naive Bayes' learning algorithm for the restaurant waiting problem.9. Implement passive reinforcement learning algorithm based on adaptive dynamic programming (ADP) for the 3 by 4 world problem10. Implement passive reinforcement learning algorithm based on temporal differences (TD) for 3 by 4 world problem.		
UCS5LSA: Linux Server Administration		
<p><i>- Practical shall be performed using any Linux Server (with 8GB RAM).</i></p> <p><i>- Internet connection will be required so that Linux server (command line mode) can be connected to Internet.</i></p> <ol style="list-style-type: none">1. Install DHCP Server in Ubuntu 16.042. Initial settings: Add a User, Network Settings, Change to static IP address, Disable IPv6 if not needed, Configure Services, display the list of services which are running, Stop and turn OFF auto-start setting for a service if you don't need it, Sudo Settings3. Configure NTP Server (NTPd), Install and Configure NTPd, Configure NTP Client (Ubuntu and Windows)4. SSH Server : Password Authentication		

Configure SSH Server to manage a server from the remote computer, SSH Client : (Ubuntu and Windows)

5. Install DNS Server BIND, Configure DNS server which resolves domain name or IP address, Install BIND 9, Configure BIND, Limit ranges you allow to access if needed.
6. Configure DHCP Server, Configure DHCP (Dynamic Host Configuration Protocol) Server, Configure NFS Server to share directories on your Network, Configure NFS Client. (Ubuntu and Windows Client OS)
7. Configure LDAP Server, Configure LDAP Server in order to share users' accounts in your local networks, Add LDAP User Accounts in the OpenLDAP Server, Configure LDAP Client in order to share users' accounts in your local networks. Install phpLDAPadmin to operate LDAP server via Web browser.
8. Configure NIS Server in order to share users' accounts in your local networks, Configure NIS Client to bind NIS Server.
9. Install MySQL to configure database server, Install phpMyAdmin to operate MySQL on web browser from Clients.
10. Install Samba to share folders or files between Windows and Linux.

UCS5SQA: Software Testing and Quality Assurance

1. Install Selenium IDE; Write a test suite containing minimum 4 test cases for different formats.
2. Conduct a test suite for any two web sites.
3. Install Selenium server (Selenium RC) and demonstrate it using a script in Java/PHP.
4. Write and test a program to login a specific web page.
5. Write and test a program to update 10 student records into table into Excel file
6. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects).
7. Write and test a program to provide total number of objects present / available on the page.
8. Write and test a program to get the number of items in a list / combo box.
9. Write and test a program to count the number of check boxes on the page checked and unchecked count.
10. Load Testing using JMeter, Android Application testing using Appium Tools, Bugzilla Bug tracking tools.

Course: UCS5PR2	(Credits : 02 Lectures/Week: 06) Practical of Elective-II	
UCS5INS: Information and Network security		
<p>1. Write programs to implement the following Substitution Cipher Techniques: - Caesar Cipher - Monoalphabetic Cipher</p> <p>2 Write programs to implement the following Substitution Cipher Techniques: - Vernam Cipher - Playfair Cipher</p> <p>3 Write programs to implement the following Transposition Cipher Techniques: - Rail Fence Cipher - Simple Columnar Technique</p> <p>4 Write program to encrypt and decrypt strings using - DES Algorithm - AES Algorithm</p> <p>5 Write a program to implement RSA algorithm to perform encryption / decryption of a given string.</p> <p>6 Write a program to implement the Diffie-Hellman Key Agreement algorithm to generate symmetric keys.</p> <p>7 Write a program to implement the MD5 algorithm compute the message digest.</p> <p>8 Write a program to calculate HMAC-SHA1 Signature</p> <p>9 Write a program to implement SSL.</p> <p>10 Configure Windows Firewall to block: - A port - An Program - A website</p>		
UCS5WMC: Wireless Sensor Networks and Mobile Communication		
<p><i>Practical experiments require software tools like INET Framework for OMNeT++, NetSim , TOSSIM, Cisco packet tracer 6.0 and higher version.</i></p>		

1. Understanding the Sensor Node Hardware. (For Eg. Sensors, Nodes(Sensor mote), Base Station, Graphical User Interface.)
2. Exploring and understanding TinyOS computational concepts:- Events, Commands and Task. - nesC model
 - nesC Components
3. Understanding TOSSIM for
 - Mote-mote radio communication
 - Mote-PC serial communication
4. Create and simulate a simple adhoc network
5. Understanding, Reading and Analyzing Routing Table of a network.
6. Create a basic MANET implementation simulation for Packet animation and Packet Trace.
7. Implement a Wireless sensor network simulation.
8. Create MAC protocol simulation implementation for wireless sensor Network.
9. Simulate Mobile Adhoc Network with Directional Antenna
10. Create a mobile network using Cell Tower, Central Office Server, Web browser and Web Server. Simulate connection between them.

UCS5WEB: Web Services

1. Write a program to implement to create a simple web service that converts the temperature from Fahrenheit to Celsius and vice a versa.
2. Write a program to implement the operation can receive request and will return a response in two ways. a) One - Way operation b) Request –Response
3. Write a program to implement business UDDI Registry entry.
4. Develop client which consumes web services developed in different platform. 5. Write a JAX-WS web service to perform the following operations. Define a Servlet / JSP that consumes the web service.
6. Define a web service method that returns the contents of a database in a JSON string. The contents should be displayed in a tabular format.
7. Define a RESTful web service that accepts the details to be stored in a database and performs CRUD operation.
8. Implement a typical service and a typical client using WCF.

9. Use WCF to create a basic ASP.NET Asynchronous JavaScript and XML (AJAX) service. 10. Demonstrates using the binding attribute of an endpoint element in WCF.

Course:
UCS5PRJ

(Credits : 01 Lectures/Week: 02)
Project Implementation

Please Refer to Project Implementation Guidelines

Course:
UCS5PR3

(Credits : 01 Lectures/Week: 02)
Practical of Skill Enhancement

UCS5GPG: Game Programming

1. Setup DirectX 11, Window Framework and Initialize Direct3D Device
2. Buffers, Shaders and HLSL (Draw a triangle using Direct3D 11)
3. Texturing (Texture the Triangle using Direct 3D 11)
4. Lightning (Programmable Diffuse Lightning using Direct3D 11)
5. Specular Lightning (Programmable Spot Lightning using Direct3D 11)
6. Loading models into DirectX 11 and rendering.

Perform following Practical using online content from the Unity Tutorials Web-- sites: <https://unity3d.com/learn/tutorials/s/interactive-tutorials>

7. <https://unity3d.com/learn/tutorials/s/2d-ufo-tutorial>
8. <https://unity3d.com/learn/tutorials/s/space-shooter-tutorial>
9. <https://unity3d.com/learn/tutorials/s/roll-ball-tutorial>
10. <https://unity3d.com/learn/tutorials/topics/vr/introduction?playlist=22946>

SEMESTER VI

THEORY

Course: UCS6IOT	TOPICS (Credits : 03 Lectures/Week:03) Architecting of IoT	
<p>Objectives: Discovering the interconnection and integration of the physical world. Learner should get knowledge of the architecture of IoT.</p> <p>Expected Learning Outcomes: Learners are able to design & develop IoT Devices. They should also be aware of the evolving world of M2M Communications and IoT analytics.</p>		
Unit I	<p>IoT-An Architectural Overview: Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.</p> <p>IoT Architecture-State of the Art : Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views</p>	15 L
Unit II	<p>IoT Data Link Layer and Network Layer Protocols:</p> <p>PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART,Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy DASH7</p> <p>Network Layer:IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP</p>	15 L
Unit III	<p>Transport layer protocols :</p> <p>Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) Session layer:</p> <p>Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT</p> <p>Service layer protocols:</p> <p>Service Layer -oneM2M, ETSI M2M, OMA, BBF</p>	15 L
<p>Textbook(s):</p> <ol style="list-style-type: none"> From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle,1st Edition, Academic Press, 2014. 		

2. Learning Internet of Things, Peter Waher, PACKT publishing, BIRMINGHAM – MUMBAI,2015

Additional References(s):

1. Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Daniel Minoli, Wiley Publications,2013
2. Internet of Things (A Hands-onApproach), Vijay Madiseti and ArshdeepBahga,1st Edition, VPT, 2014.
3. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

<p>Course: UCS6CLC</p>	<p>TOPICS (Credits : 03 Lectures/Week: 03) Cloud Computing</p>	
<p>Objectives: To provide learners with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture, implantations and applications. To expose the learners to frontier areas of Cloud Computing, while providing sufficient foundations to enable further study and research.</p> <p>Expected Learning Outcomes: After successfully completion of this course, learner should be able to articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing using open source technology. Learner should be able to identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc. They should explain the core issues of cloud computing such as security, privacy, and interoperability.</p>		
<p>Unit I</p>	<p>Introduction to Cloud Computing, Characteristics and benefits of Cloud Computing, Basic concepts of Distributed Systems, Web 2.0, Service Oriented Computing, Utility-Oriented Computing. Elements of Parallel Computing.</p> <p>Elements of Distributed Computing. Technologies for Distributed Computing. Cloud Computing Architecture. The cloud reference model. Infrastructure</p> <p>as a service. Platform as a service. Software as a service. Types of clouds</p>	<p>15L</p>

Unit II	Characteristics of Virtualized Environments. Taxonomy of Virtualization Techniques. Virtualization and Cloud Computing. Pros and Cons of Virtualization. Virtualization using KVM, Creating virtual machines, oVirt - management tool for virtualization environment. Open challenges of Cloud Computing	15L
Unit III	Introduction to OpenStack, OpenStack test-drive, Basic OpenStack operations, OpenStack CLI and APIs, Tenant model operations, Quotas, Private cloud building blocks, Controller deployment, Networking deployment, Block Storage deployment, Compute deployment, deploying and utilizing OpenStack in production environments, Building a production environment, Application orchestration using OpenStack Heat	15L
<p>Textbook(s):</p> <ol style="list-style-type: none"> 1) Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, Tata McGraw Hill Education Private Limited, 2013 2) OpenStack in Action, V. K. CODY BUMGARDNER, Manning Publications Co, 2016 <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1) OpenStack Essentials, Dan Radez, PACKT Publishing, 2015 2) OpenStack Operations Guide, Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, and Joe Topjian, O'Reilly Media, Inc., 2014 3) https://www.openstack.org 		

Course: UCS6CFR	TOPICS (Credits :03 Lectures/Week:03) Cyber Forensics	
<p>Objectives:</p> <p>To understand the procedures for identification, preservation, and extraction of electronic evidence, auditing and investigation of network and host system intrusions, analysis and documentation of information gathered</p> <p>Expected Learning Outcomes :</p> <p>The student will be able to plan and prepare for all stages of an investigation - detection, initial response and management interaction, investigate various media to collect evidence, report them in a way that would be acceptable in the court of law.</p>		
Unit I	<p>Computer Forensics :</p> <p>Introduction to Computer Forensics and standard procedure, Incident Verification and System Identification ,Recovery of Erased and damaged data, Disk Imaging and Preservation, Data Encryption and Compression, Automated Search Techniques, Forensics Software</p> <p>Network Forensic :</p> <p>Introduction to Network Forensics and tracking network traffic, Reviewing Network Logs, Network Forensics Tools, Performing Live Acquisitions, Order of Volatility, Standard Procedure</p> <p>Cell Phone and Mobile Device Forensics: Overview, Acquisition Procedures for Cell Phones and Mobile Devices</p>	15L
Unit II	<p>Internet Forensic :</p> <p>Introduction to Internet Forensics, World Wide Web Threats, Hacking and Illegal access, Obscene and Incident transmission, Domain Name Ownership Investigation, Reconstructing past internet activities and events</p> <p>E-mail Forensics : e-mail analysis, e-mail headers and spoofing, Laws against e-mail Crime, Messenger Forensics: Yahoo Messenger</p> <p>Social Media Forensics: Social Media Investigations</p> <p>Browser Forensics: Cookie Storage and Analysis, Analyzing Cache and temporary internet files, Web browsing activity reconstruction</p>	15L

Unit III	<p>Investigation, Evidence presentation and Legal aspects of Digital Forensics: Authorization to collect the evidence , Acquisition of Evidence, Authentication of the evidence, Analysis of the evidence, Reporting on the findings, Testimony Introduction to Legal aspects of Digital Forensics: Laws & regulations, Information Technology Act, Giving Evidence in court, Case Study – Cyber Crime cases, Case Study – Cyber Crime cases like online fraud, Phishing attack etc.</p>	15L
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<p>Textbook(s):</p> <ol style="list-style-type: none"> 1. Guide to computer forensics and investigations, Bill Nelson, Amelia Philips and Christopher Steuart, course technology,5th Edition,2015 <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1. 2. Incident Response and computer forensics, Kevin Mandia, Chris Prorise, Tata McGrawHill,2nd Edition,2003

<p>Course: UCS61NR</p>	<p>TOPICS (Credits : 03 Lectures/Week: 03) Information Retrieval</p>
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<p>Objectives:</p> <p>To provide an overview of the important issues in classical and web information retrieval. The focus is to give an up-to- date treatment of all aspects of the design and implementation of systems for gathering, indexing, and searching documents and of methods for evaluating systems.</p> <p>Expected Learning Outcomes:</p> <p>After completion of this course, learners should get an understanding of the field of information retrieval and its relationship to search engines. It will give the learner an understanding to apply information retrieval models.</p>
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Unit I	<p>Introduction to Information Retrieval: Introduction, History of IR, Components of IR, Types of IR models and Issues related to IR, Boolean retrieval, Dictionaries and tolerant retrieval.</p> <p>Text Classification and Clustering:</p> <p>Characterization of text classification, Unsupervised and supervised algorithm, Organizing the classes, Applications of clustering, Types of clustering. Information Retrieval models, Text Classification and Clustering</p>	15L
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<p>Unit II</p>	<p>Link Analysis and Specialized Search: Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Similarity, Hadoop & Map Reduce, Evaluation, Personalized search, Collaborative filtering and content-based recommendation of documents and products, handling “invisible” Web, Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval.</p>	<p>15L</p>
<p>Unit III</p>	<p>Web Search Engine: Web search overview, web structure, the user, paid placement, search engine optimization/spam, Web size measurement, search engine optimization/spam, Web Search Architectures.</p> <p>XML retrieval: Basic XML concepts, Challenges in XML retrieval, A vector space model for XML retrieval, Evaluation of XML retrieval, Text-centric versus data-centric XML retrieval</p>	<p>15L</p>
<p>Text book(s):</p> <ol style="list-style-type: none"> 1) Introduction to Information Retrieval, C. Manning, P. Raghavan, and H. Schütze, Cambridge University Press, 2008 2) Modern Information Retrieval: The Concepts and Technology behind Search, Ricardo Baeza -Yates and Berthier Ribeiro – Neto, 2nd Edition, ACM Press Books 2011. 3) Search Engines: Information Retrieval in Practice, Bruce Croft, Donald Metzler and Trevor Strohman, 1st Edition, Pearson, 2009. <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1) Information Retrieval Implementing and Evaluating Search Engines, Stefan Büttcher, Charles L. A. Clarke and Gordon V. Cormack, The MIT Press; Reprint edition (February 12, 2016) 		

Course: UCS6DIP	TOPICS (Credits : 03 Lectures/Week: 03) Digital Image Processing	
<p>Objectives: To study two-dimensional Signals and Systems. To understand image fundamentals and transforms necessary for image processing. To study the image enhancement techniques in spatial and frequency domain. To study image segmentation and image compression techniques.</p> <p>Expected Learning Outcomes: Learner should review the fundamental concepts of a digital image processing system. Analyze the images in the frequency domain using various transforms. Evaluate the techniques for image enhancement and image segmentation. Apply various compression techniques. They will be familiar with basic image processing techniques for solving real problems.</p>		
Unit I	<p>Introduction to Image-processing System : Introduction, Image Sampling, Quantization, Resolution, Human Visual Systems, Elements of an Image-processing System, Applications of Digital Image Processing</p> <p>2D Signals and Systems : 2D signals, separable sequence, periodic sequence, 2D systems, classification of 2D systems, 2D Digital filter</p> <p>Convolution and Correlation : 2D Convolution through graphical method, Convolution through 2D Z—transform, 2D Convolution through matrix analysis, Circular Convolution, Applications of Circular Convolution, 2D Correlation</p> <p>Image Transforms: Need for transform, image transforms, Fourier transform, 2D Discrete Fourier Transform, Properties of 2D DFT, Importance of Phase, Walsh transform, Hadamard transform, Haar transform, Slant transform, Discrete Cosine transform, KL transform</p>	15 L

Unit II	<p>Image Enhancement :Image Enhancement in spatial domain, Enhancement through Point operations, Histogram manipulation, Linear and nonlinear Gray Level Transformation, local or neighborhood operation, Median Filter, Spatial domain High pass filtering, Bit-plane slicing, Image Enhancement in frequency domain, Homomorphic filter, Zooming operation, Image Arithmetic</p> <p>Binary Image processing :Mathematical morphology, Structuring elements, Morphological image processing, Logical operations, Morphological operations, Dilation and Erosion, Distance Transform</p> <p>Colour Image processing :Colour images, Colour Model, Colour image quantization, Histogram of a colour image</p>	15L
Unit III	<p>Image Segmentation: Image segmentation techniques, Region approach, Clustering techniques, Thresholding, Edge-based segmentation, Edge detection, Edge Linking, Hough Transform</p> <p>Image Compression: Need for image compression, Redundancy in images, Image-compression scheme, Fundamentals of Information Theory, Run-length coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Transform-based compression, Image-compression standard</p>	15L
<p>Textbook(s):</p> <p>1) Digital Image Processing, S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw-Hill Education Pvt. Ltd., 2009</p> <p>Additional Reference(s):</p> <p>1) Digital Image Processing 3rd Edition, Rafael C Gonzalez, Richard E Woods, Pearson, 2008</p> <p>2) Scilab Textbook Companion for Digital Image Processing, S. Jayaraman, S. Esakkirajan And T. Veerakumar, 2016 (https://scilab.in/textbook_companion/generate_book/125)</p>		

Course: UCS6DS C	TOPICS (Credits : 03 Lectures/Week: 03) Data Science	
<p>Objectives:</p> <p>Understanding basic data science concepts. Learning to detect and diagnose common data issues, such as missing values, special values, outliers, inconsistencies, and localization. Making aware of how to address advanced statistical situations, Modeling and Machine Learning.</p> <p>Expected Learning Outcomes:</p> <p>After completion of this course, the students should be able to understand & comprehend the problem; and should be able to define suitable statistical method to be adopted.</p>		
Unit I	<p>Introduction to Data Science: What is Data? Different kinds of data, Introduction to high level programming language + Integrated Development Environment (IDE), Exploratory Data Analysis (EDA) + Data Visualization, Different types of data sources,</p> <p>Data Management: Data Collection, Data cleaning/extraction, Data analysis & Modeling</p>	15L
Unit II	<p>Data Curation: Query languages and Operations to specify and transform data, Structured/schema based systems as users and acquirers of data Semi-structured systems as users and acquirers of data, Unstructured systems in the acquisition and structuring of data, Security and ethical considerations in relation to authenticating and authorizing access to data on remote systems, Software development tools, Large scale data systems, Amazon Web Services (AWS)</p>	15L

Unit III	<p>Statistical Modelling and Machine Learning:</p> <p>Introduction to model selection: Regularization, bias/variance tradeoff e.g. parsimony, AIC, BIC, Cross validation, Ridge regressions and penalized regression e.g. LASSO</p> <p>Data transformations: Dimension reduction, Feature extraction, Sampling, Rejection Sampling, Importance Sampling, Particle Filtering Smoothing and aggregating</p> <p>Supervised Learning: Regression, linear models, Regression trees, Time-series Analysis, Forecasting, Classification: classification trees, Logistic regression, separating hyperplanes, k-NN</p> <p>Unsupervised Learning: Principal Components Analysis (PCA), k-means clustering, Hierarchical clustering, Ensemble methods</p>	15L
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<p>Textbook(s):</p> <ol style="list-style-type: none"> 1) Doing Data Science, Rachel Schutt and Cathy O’Neil, O’Reilly,2013 2) Mastering Machine Learning with R, Cory Lesmeister, PACKT Publication,2015 <p>Additional Reference(s):</p> <ol style="list-style-type: none"> 1) Hands-On Programming with R, Garrett Grolemund,1st Edition, 2014 2) An Introduction to Statistical Learning, James, G., Witten, D., Hastie, T., Tibshirani, R.,Springer,2015

<p>Course: UCS6ETH</p>	<p>TOPICS (Credits : 02 Lectures/Week: 03) Ethical Hacking</p>
<p>Objectives:</p> <p>To understand the ethics, legality, methodologies and techniques of hacking.</p> <p>Expected Learning Outcomes:</p> <p>Learner will know to identify security vulnerabilities and weaknesses in the target applications. They will also know to test and exploit systems using various tools and understand the impact of hacking in real time machines.</p>	

<p>Unit I</p>	<p>Information Security : Attacks and Vulnerabilities</p> <p>Introduction to information security : Asset, Access Control, CIA, Authentication, Authorization, Risk, Threat, Vulnerability, Attack, Attack Surface, Malware, Security-Functionality-Ease of Use Triangle Types of malware :Worms, viruses, Trojans, Spyware, Rootkits Types of vulnerabilities : OWASP Top 10 : cross-site scripting (XSS), cross site request forgery (CSRF/XSRF), SQL injection, input parameter manipulation, broken authentication, sensitive information disclosure, XML External Entities, Broken access control, Security Misconfiguration, Using components with known vulnerabilities, Insufficient Logging and monitoring, OWASP Mobile Top 10, CVE Database</p> <p>Types of attacks and their common prevention mechanisms : Keystroke Logging, Denial of Service (DoS /DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, Session Hijacking, Clickjacking, Cookie Theft, URL Obfuscation, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs</p> <p>Case-studies : Recent attacks – Yahoo, Adult Friend Finder, eBay, Equifax, WannaCry, Target Stores, Uber, JP Morgan Chase, Bad Rabbig</p>	<p>15L</p>
<p>Unit II</p>	<p>Ethical Hacking – I (Introduction and pre-attack)</p> <p>Introduction: Black Hat vs. Gray Hat vs. White Hat (Ethical) hacking, Why is Ethical hacking needed?, How is Ethical hacking different from security auditing and digital forensics? Guidelines for Ethical Hacking, Signing NDA, Compliance and Regulatory concerns, Black box vs. White box vs. Black box, Vulnerability assessment and Penetration Testing.</p> <p>Approach : Planning - Threat Modeling, set up security verification standards, Set up security testing plan – When, which systems/apps, understanding functionality, black/gray/white, authenticated vs. unauthenticated, internal vs. external PT, Information gathering, Perform Manual and automated (Tools: WebInspect/Qualys, Nessus, Proxies, Metasploit) VA and PT, How WebInspect/Qualys tools work: Crawling/Spidering, requests forging, pattern matching to known vulnerability database and Analyzing results, Preparing report, Fixing security gaps following the report</p> <p>Enterprise strategy : Repeated PT, approval by security testing team, Continuous Application Security Testing,</p> <p>Phases: Reconnaissance/foot-printing/Enumeration, Phases: Scanning, Sniffing</p>	<p>15L</p>

Unit III	<p>Ethical Hacking :Enterprise Security</p> <p>Phases : Gaining and Maintaining Access : Systems hacking – Windows and Linux – Metasploit and Kali Linux, Keylogging, Buffer Overflows, Privilege Escalation, Network hacking - ARP Poisoning, Password Cracking, WEP Vulnerabilities, MAC Spoofing, MAC Flooding, IPspoofing, SYN Flooding, Smurf attack, Applications hacking : SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Input Manipulation, Brute force attack, Unsecured login mechanisms, SQL injection, XSS, Mobile apps security, Malware analysis : Netcat Trojan, wrapping definition, reverse engineering Phases : Covering your tracks : Steganography, Event Logs alteration Additional Security Mechanisms : IDS/IPS, Honeypots and evasion techniques, Secure Code Reviews (Fortify tool, OWASP Secure Coding Guidelines)</p>	15L
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Textbook(s):

1) Certified Ethical Hacker Study Guide v9, Sean-Philip Oriyano, Sybex; Study Guide Edition,2016

2) CEH official Certified Ethical Hacking Review Guide, Wiley India Edition,

2007 Additional Reference(s):

1) Certified Ethical Hacker: Michael Gregg, Pearson Education,1st Edition,

2013 2) Certified Ethical Hacker: Matt Walker, TMH,2011

3) http://www.pentest-standard.org/index.php/PTES_Technical_Guidelines

4)

https://www.owasp.org/index.php/Category:OWASP_Top_Ten_2017_Project

5) https://www.owasp.org/index.php/Mobile_Top_10_2016-Top_10

6) https://www.owasp.org/index.php/OWASP_Testing_Guide_v4_Table_of_Contents 7)

https://www.owasp.org/index.php/OWASP_Secure_Coding_Practices_-_Quick_Reference_Guide

8) <https://cve.mitre.org/>

9) <https://access.redhat.com/blogs/766093/posts/2914051>

10) <http://resources.infosecinstitute.com/applications-threat-modeling/#gref>

11) <http://www.vulnerabilityassessment.co.uk/Penetration%20Test.html>

Suggested List of Practical – SEMESTER VI

Course: UCS6PR1	(Credits : 02 Lectures/Week:06) Practical of Elective-I	
UCS6IOT: Architecting of IoT		
<ol style="list-style-type: none">1. a) Edit text files with nano and cat editor, Learn sudo privileges and Unix shell commands such as cd , ls , cat, etcb) Learn to set dynamic and static IP. Connect to and Ethernet and WiFi network. Learn to vnc and ssh into a raspberry pi using vnc and putty from a different computer on the network.c) Write a basic bash script to open programs in kiosk mode. Learn how to autostart programs on boot.2. Run the node red editor and run simple programs and trigger gpios. Use basic nodes such as inject, debug, gpio3. Open the python idle editor and run simple Python scripts such as to print Fibonacci numbers, string functions. Learn how to install modules using Pip and write functions4. Setup a physical button switch and trigger an led in node red and python w debounce5. Write simple JavaScript functions in Node-Red simple HTTP server page using node red6. Setup a TCP server and client on a raspberry pi using Python modules to send messages and execute shell commands from within python such as starting another application7. Trigger a set of led Gpios on the pi via a Python Flask web server8. Interface the raspberry pi with a 16x2 LCD display and print values.9. Setup a Mosquitto MQTT server and client and write a Python script to communicate data between Pi's.10. Interface with an Accelerometer Gyro Mpu6050 on the i2c bus and send sensor values over the internet via mqtt.		
UCS6CLC: Cloud Computing		
<ol style="list-style-type: none">1. Study and implementation of Infrastructure as a Service.2. Installation and Configuration of virtualization using KVM.3. Study and implementation of Infrastructure as a Service		

4. Study and implementation of Storage as a Service
5. Study and implementation of identity management
6. Study Cloud Security management
7. Write a program for web feed.
8. Study and implementation of Single-Sign-On.
9. User Management in Cloud.
10. Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform

UCS6CFR: Cyber Forensics

1. Creating a Forensic Image using FTK Imager/Encase Imager :
 - Creating Forensic Image
 - Check Integrity of Data
 - Analyze Forensic Image
2. Data Acquisition:
 - Perform data acquisition using:
 - USB Write Blocker + Encase Imager
 - SATA Write Blocker + Encase Imager
 - Falcon Imaging Device
3. Forensics Case Study:
 - Solve the Case study (image file) provide in lab using Encase Investigator or Autopsy
4. Capturing and analyzing network packets using Wireshark (Fundamentals) :
 - Identification the live network
 - Capture Packets
 - Analyze the captured packets
 - 5. Analyze the packets provided in lab and solve the questions using Wireshark : - What web server software is used by www.snopes.com?
 - About what cell phone problem is the client concerned?
 - According to Zillow, what instrument will Ryan learn to play?
 - How many web servers are running Apache?

- What hosts (IP addresses) think that jokes are more entertaining when they are explained?
- 6. Using Sysinternals tools for Network Tracking and Process Monitoring :
 - Check Sysinternals tools
 - Monitor Live Processes
 - Capture RAM
 - Capture TCP/UDP packets
 - Monitor Hard Disk
 - Monitor Virtual Memory
 - Monitor Cache Memory
- 7. Recovering and Inspecting deleted files
 - Check for Deleted Files
 - Recover the Deleted Files
 - Analyzing and Inspecting the recovered files
 - Perform this using recovery option in ENCASE and also Perform manually through command line
- 8. Acquisition of Cell phones and Mobile devices
- 9. Email Forensics
 - Mail Service Providers
 - Email protocols
 - Recovering emails
 - Analyzing email header
- 10. Web Browser Forensics
 - Web Browser working
 - Forensics activities on browser
 - Cache / Cookies analysis
 - Last Internet activity

Course: UCS6PR2	(Credits : 02 Lectures/Week:06) Practical of Elective-II	
UCS6INR: Information Retrieval		
<i>Practical may be done using software/tools like Python / Java / Hadoop</i>		
<ol style="list-style-type: none">1. Write a program to demonstrate bitwise operation.2. Implement Page Rank Algorithm.3. Implement Dynamic programming algorithm for computing the edit distance between strings s1 and s2. (Hint. Levenshtein Distance)4. Write a program to Compute Similarity between two text documents.5. Write a map-reduce program to count the number of occurrences of each alphabetic character in the given dataset. The count for each letter should be case-insensitive (i.e., include both upper-case and lower-case versions of the letter; Ignore non alphabetic characters).6. Implement a basic IR system using Lucene.7. Write a program for Pre-processing of a Text Document: stop word removal.8. Write a program for mining Twitter to identify tweets for a specific period and identify trends and named entities.9. Write a program to implement simple web crawler.10. Write a program to parse XML text, generate Web graph and compute topic specific page rank.		

UCS6DIP: Digital Image Processing

Practical need to be performed using Scilab under Linux or Windows

1. 2D Linear Convolution, Circular Convolution between two 2D matrices
2. Circular Convolution expressed as linear convolution plus alias
3. Linear Cross correlation of a 2D matrix, Circular correlation between two signals and Linear auto correlation of a 2D matrix, Linear Cross correlation of a 2D matrix 4. DFT of 4x4 gray scale image
5. Compute discrete cosine transform, Program to perform KL transform for the given 2D matrix 6. Brightness enhancement of an image, Contrast Manipulation, image negative 7. Perform threshold operation, perform gray level slicing without background 8. Image Segmentation
9. Image Compression
10. Binary Image Processing and Colour Image processing

UCS6DSC:Data Science

Practical shall be performed using R

1. Practical of Data collection, Data curation and management for Unstructured data (NoSQL)
2. Practical of Data collection, Data curation and management for Large-scale Data system (such as MongoDB)
3. Practical of Principal Component Analysis
4. Practical of Clustering
5. Practical of Time-series forecasting
6. Practical of Simple/Multiple Linear Regression
7. Practical of Logistics Regression
8. Practical of Hypothesis testing
9. Practical of Analysis of Variance
10. Practical of Decision Tree

Course:

UCS6PRJ

(Credits : 01 Lectures/Week: 02)

Project Implementation

Please Refer to Project Implementation Guidelines

Course:
UCS6PR3

(Credits : 01 Lectures/Week: 02)
Practical of Skill Enhancement

UCS6GPG : Ethical Hacking

1. Use Google and Whois for Reconnaissance
2. a) Use CrypTool to encrypt and decrypt passwords using RC4 algorithm
b) Use Cain and Abel for cracking Windows account password using Dictionary attack and to decode wireless network passwords
3. a) Run and analyze the output of following commands in Linux – ifconfig, ping, netstat, traceroute
b) Perform ARP Poisoning in Windows
4. Use NMap scanner to perform port scanning of various forms – ACK, SYN, FIN, NULL, XMAS
5. a) Use Wireshark (Sniffer) to capture network traffic and analyze
b) Use Nemesy to launch DoS attack
6. Simulate persistent cross-site scripting attack
7. Session impersonation using Firefox and Tamper Data add-on
8. Perform SQL injection attack
9. Create a simple keylogger using python
10. Using Metasploit to exploit (Kali Linux)

Project Implementation Guidelines

1. A learner is expected to carry out two different projects: one in Semester V and another in Semester VI.
2. A learner can choose any topic which is covered in Semester I- semester VI or any other topic with the prior approval from head of the department/ project in charge.
3. The Project has to be performed individually.
4. A learner is expected to devote around three months of efforts in the project. 5. The project can be application oriented/web-based/database/research based. 6. It has to be an implemented work; just theoretical study will not be acceptable. 7. A learner can choose any programming language, computational techniques and tools which have been covered during BSc course or any other with the prior permission of head of the department/ project guide.
8. A learner may implement one research paper as project to improve research study. 9. A project guide should be assigned to a learner. He/she will assign a schedule for the project and hand it over to a learner. The guide should oversee the project progress on a weekly basis by considering the workload of 3 lectures as assigned.
10. The quality of the project will be evaluated based on the novelty of the topic, scope of the work, relevance to the computer science, adoption of emerging techniques/technologies and its real-world application.
11. A learner has to maintain a project report with the following subsections a)

Title Page

b) Certificate

A certificate should contain the following information –

- The fact that the student has successfully completed the project as per the syllabus and that it forms a part of the requirements for completing the BSc degree in computer science of University of Mumbai.
- The name of the student and the project guide
- The academic year in which the project is done
- Date of submission,
- Signature of the project guide and the head of the department with date along with the department stamp,

T.Y.B.Sc. Computer Science

- Space for signature of the university examiner and date on which the project is evaluated.

c) Self-attested copy of Plagiarism Report from any open source tool.

d) Index Page detailing description of the following with their subsections:

- Title: A suitable title giving the idea about what work is proposed.
 - Introduction: An introduction to the topic giving proper back ground of the topic. - Requirement Specification: Specify Software/hardware/data requirements. - System Design details : Methodology/Architecture/UML/DFD/Algorithms/protocols etc. used(whichever is applicable)
 - System Implementation: Code implementation
 - Results: Test Cases/Tables/Figures/Graphs/Screen shots/Reports etc.
 - Conclusion and Future Scope: Specify the Final conclusion and future scope -
- References: Books, web links, research articles, etc.

12. The size of the project report shall be around twenty to twenty five pages, excluding the code.
13. The Project report should be submitted in a spiral bound form
14. The Project should be certified by the concerned Project guide and Head of the department.
15. A learner has to make a presentation of working project and will be evaluated as per the Project evaluation scheme

॥ विद्या विनयेन शोभते ॥



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: Masters in Science (M. Sc.)

Total Credits:96

SYLLABUS

(Approved in the Academic council meeting held on-----)

M.Sc.-I Computer Science

Revised as per

Choice Based Credit & Grading System (60:40)

w. e. f. Academic Year 2022-23

MASTERS IN SCIENCE (M. Sc.)

Programme Outcomes

After completion of M.Sc. programme students will acquire

Sr. No.	After completion of M.Sc. program students will acquire	Graduate Attribute
PO1	An ability to identify and describe broadly accepted methodologies of science, and different modes of reasoning.	Disciplinary knowledge
PO2	An ability to demonstrate proficiency in various instrumentation, modern tools, advanced techniques and ICT to meet industrial expectations and research outputs.	Disciplinary knowledge/Digital literacy
PO3	An ability to identify problems, formulates, and proves hypotheses by applying theoretical knowledge and skills relevant to the discipline.	Problem-solving
PO4	An ability to articulate thoughts, research ideas, information, scientific outcomes in oral and in written presentation to a range of audience.	Communication skills
PO5	A capacity for independent, conceptual and creative thinking, analysis and problem solving through the existing methods of enquiry.	Problem solving
PO6	Skills required for cutting edge research, investigations, field study, documentation, networking, and ability to build logical arguments using scholarly evidence.	Research skills
PO7	An ability to portray good interpersonal skills with ability to work collaboratively as part of a team undertaking a range of different team roles	Teamwork
PO8	The ability to understand ethical responsibilities and impact of scientific solutions in global, societal and environmental context and contribute to the sustainable development	Moral and ethical awareness/ multicultural competence
PO9	An ability to demonstrate leadership, to take action and to get others involved.	Leadership
PO10	An openness to and interest in, life-long learning through directed and self-directed study	Self-directed learning
PO11	An ability to translate the knowledge and demonstrate the skills required to be employed and successful professional development.	Life-long learning

Masters in Science (Computer) Syllabus for Semester I and II

Preamble:

M.Sc. in Computer Science is a two-year post-graduate programme with the objective to develop human resources with core competence in various thrust areas of Computer Science. It will provide students with opportunities to develop and hone core competency in the field of computer science and encourage them to make a mark in the much sought-after IT industry.

The Syllabus of this Course creates a unique identity for M.Sc. in Comp Science distinct from similar degrees in other related subjects, focuses on core Computer Science subjects, incorporate advanced and most recent trends, Identify and nurture research temper among students, Offer provision for internship with industry and Focus, as far as possible, only on open-source software

The syllabus for the semester I and semester II has tried to initiate steps to meet these goals. By extending the syllabus to semester III and semester IV, it is assumed that these goals will be met to a larger extent. The syllabus proposes to have four core compulsory courses in Semester I and Semester II. UNIT -1 of Paper I of Semester - I and Semester - II are ABILITY ENHANCEMENT UNITS and UNIT- 4 of all papers of Semester - I and Semester - II is SKILL ENHANCEMENT UNIT. Semester III and Semester IV proposes electives courses based on a recent and emerging area. Inclusion of Project as part of the internal assessment is an attempt to translate theory into practice. It is assumed that, with this back ground, a student can take up challenging research project in the semester III and semester IV and will be better fit for industry as he or she will have strong foundation on fundamentals and exposure to advanced and emerging trends.

We thank all the members of BOS in Computer Science; who have given their valuable comments and suggestions, which we tried to incorporate. Thank you to all stakeholders who provided feedback and suggested changes as well as University of Mumbai. Thanks to one and all who have directly or indirectly helped in this venture.

PROGRAMME SPECIFIC OUTCOME (PSO)

PSO	Description After completing Master's Degree in Computer Science learners will be able to:
PSO 1	Understand the core and advanced subjects of Computer Science and its logical application to solve real-life case studies using Emerging technologies
PSO 2	Identify, analyze, and solve research based interdisciplinary computational problems
PSO 3	Get exposure to modern software tools and lifelong learning for professional development

Semester – I

[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Analysis of algorithm and Research Computing	Core	PCS1A RC	4	40	60	100	4
Design and Implementation of Modern Compilers	Core	PCS1D MC	4	40	60	100	4
Advanced Database Management System	Core	PCS1A DS	4	40	60	100	4
Robotics	Core	PCS1R OB	4	40	60	100	4

Practical of PCS1ARC+ PCS1DMC	Core	PCS1P PR1	4	--	100	100	4
Practical of PCS1ADS+ PCS1ROB	Core	PCS1P PR2	4	--	100	100	4

Semester – II

[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Cloud Computing-I	Core	PCS2C L1	4	40	60	100	4
Natural Language Processing	Core	PCS2N LP	4	40	60	100	4
Business Intelligence and Big Data Analytics – I (Business Intelligence)	Core	PCS+2 BI1	4	40	60	100	4
Machine Intelligence(Fundamentals of Machine Intelligence)	Core	PCS2M IN	4	40	60	100	4
Practical of PCS2CL1+ PCS2NLP	Core	PCS2P PR1	4	--	100	100	4
Practical of PCS2BI1+ PCS2MIN	Core	PCS2P PR2	4	--	100	100	4

Examination Scheme

**A) Internal Assessment: 40 %
40 Marks**

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Continuous Assessment	20 Marks

Question Paper Pattern for Continuous Assessment (Total Marks 20 to be converted in 10 marks)

Marks	Group Project*/ Individual Project	Presentation and write-up	Practical Skills	Open book test	Quiz
5	Hypothesis/Topic of the project	Presentation skill	Demonstration of skill	High order thinking questions (HOTS)	Quiz on application of subject in real life
5	Actual laboratory work/Field work	Knowledge	Viva		
5	Result/output	Quality of ppt	Report		
5	Dissertation/Report	Writing skill	Problem solving ability		

External Examination: 60 Marks

- There shall be five questions each of 12 marks.
- All questions shall be compulsory with internal options.
- Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Question	Based on	Marks
Q.1	Unit I	12
Q.2	Unit II	12

Q.3	Unit III	12
Q.4	Unit IV	12
Q.5	Unit I,II,III,IV	12

Practical Examination: 50 Marks

Sr. No.	Particulars of External	Marks
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	50

Course Description	
Semester	I
Course Name	Analysis of Algorithm and Research Computing
Course Code	PCS1ARC
Eligibility for Course	B.Sc.
Credit	4
Hours	60

Course Objectives

1. Understand designing and backtracking techniques of an algorithm.
2. Understand analysis techniques, number theoretic and Np completeness aspects of an algorithm.
3. Analyze various research problems and ways to solve specific problems.
4. Develop an approach towards research and implementation in the form of a research paper.

Course Outcomes

1. Describe designing and advanced strategies of an algorithm.
2. Discuss the analysis techniques, number theoretic and NP completeness perspectives of an algorithm.
3. Discover a research problem and find a way to solve a specific research problem.
4. Create a research paper with professional skills.

Course Code: PCS1ARC	Course Title	Credits 04
	Analysis of Algorithm and Research Computing	
Unit I	Design and Advanced design strategies The Role of Algorithms in Computing: Algorithms as a technology. Analyzing algorithms, Designing algorithms. Growth of Functions: Standard notations and common functions.	15L

	<p>Divide-and-Conquer: The maximum-subarray problem, Probabilistic Analysis and Randomized Algorithms: The hiring problem, Indicator random variables, Randomized algorithms. Dynamic Programming: Rod cutting, Elements of dynamic programming Greedy Algorithms: An activity-selection problem, Elements of the greedy strategy. Backtracking algorithm: 8 queen problem.</p>	
Unit II	<p>Analysis Techniques , Number-Theoretic Algorithms and NP – Completeness</p> <p>Elementary Graph Algorithms: Representations of graphs, Minimum Spanning Trees: Growing a minimum spanning tree, Algorithms of Kruskal. Single-Source Shortest Paths: The Bellman-Ford algorithm, Single-source shortest paths in directed acyclic graphs, Dijkstra’s algorithm. Elementary number-theoretic notions, Greatest common divisor, Modular arithmetic, Solving modular linear equations, The Chinese remainder theorem, Powers of an element, NP-Completeness: Polynomial time, Polynomial-time verification, NP-completeness and reducibility, NP-complete problems.</p>	15L
Unit III	<p>Introduction of Research</p> <p>Meaning of research, objectives of research, types of research, research approaches, significance of research, research methods versus methodology, research methods vs methodology, research and scientific method, research process, Criteria of good research, Problems encountered by researchers in India. What is research Problem? Selecting the problem, techniques involved in defining a problem, Different research designs: Exploratory research studies, Descriptive and Diagnostic Research Studies, Hypothesis testing research studies. Sample design, quantitative and qualitative data, experiments and surveys, data preparation, Degree of freedom, standard error.</p>	15L

<p>Unit IV</p>	<p>Research Computing</p> <p>Interpretation and report: Techniques of Interpretation, Precautions of interpretation, Significance of report writing, Different steps in writing report, Layout of research report, types of reports, oral presentation, Mechanics of research writing, Precautions for writing research report and conclusion, accuracy, confusion matrix, sensitivity and specificity, ROC curve, t-test.</p> <p>Research paper: What is research paper, Understand assignment, Choose a research paper topic, conduct preliminary research, Develop a thesis statement, create research paper outline, draft of research paper: introduction, a compelling body, the conclusion, the second draft, revision process, research paper checklist.</p>	<p>15L</p>
	<p>Text book:</p> <ul style="list-style-type: none"> ● Introduction to Algorithms, Third Edition, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, PHI Learning Pvt. Ltd-New Delhi (2009) ● Researching Information Systems and Computing, Brinoy J Oates, Sage Publications India Pvt Ltd (2006) 	
	<p>References:</p> <ul style="list-style-type: none"> ● Algorithms, Sanjoy Dasgupta, Christos H. Papadimitriou, Umesh Vazirani, McGraw-Hill Higher Education (2006). ● Grokking Algorithms: An illustrated guide for programmers and other curious people, MEAP, Aditya Bhargava, http://www.manning.com/bhargava ● Research Methodology, Methods and Techniques, Kothari, C.R., 1985, third edition, New Age International (2014) ● Basic of Qualitative Research (3rd Edition), Juliet Corbin & Anselm Strauss, Sage Publications (2008). ● Research Methodology, third edition by C. R. Kothari, Gaurav Garg 	

Practical Course on Analysis of Algorithm & Research Computing	
Sr. No	List of Practical Experiments on Analysis of Algorithm and Research Computing
1	Write a program to implement the Rod Cutting problem.
2	Write a program to implement a merge sort algorithm. Compare the time and memory complexity.
3	Given an array of numbers of length l. Write a program to generate a random permutation of the array using (i) permute-by-sorting () and (ii) permute-by-cyclic ().
4	Write a program to implement Longest Common Subsequence (LCS) algorithm.
5	Write a program to implement Kruskal's algorithm.
6	Write a program to implement Dijkstrass's algorithm.
7	Write a program to implement Euclid's algorithm to implement gcd of two non-negative integers a and b. Extend the algorithm to find x and y such that $\text{gcd}(a,b) = ax+by$. Compare the running time and recursive calls made in each case.
8	Write a program to verify (i) Euclid's theorem (ii) Fermat's theorem.
9	Write a program to implement greedy set cover algorithm to solve set covering problem.
10	Write a research paper.

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Designing strategies of an algorithm	15h	1	1	2
2	Analysis techniques of an algorithm	15h	2	1	2
3	Discover a research problem	15h	3	2	3
4	Create a research paper	15h	4	3	4

Course Description	
Semester	I
Course Name	Design and Implementation of Modern Compiler
Course Code	PCS2DMC
Eligibility for Course	B.Sc.
Credit	4
Hours	60

Course Objectives

1. Apply the basic concepts and methods of Compiler Design.
2. Understand the Structure of Compilers.
3. Improving designing and optimization of source programs.
4. Explore concepts of converting source program to target program.

Course Outcomes

1. Describe the Phases of Compiler.
2. Explain step by step transformation of source code to target code.
3. Explain Methods for Code Optimization.
4. Evaluate data flow, logic flow, liveness of variables through the program.

Course Code PCS2BI1	Course Title	Credits 04
	Design and Implementation of Modern Compiler	
Unit I	Introduction to Compilers The structure of a compiler, A simple approach to the design of lexical analyzers, Regular expressions, Finite automata, From regular expressions to finite automata, Minimizing the number of states of a DFA, Context-free grammars, Derivations and Parse trees, Parsers,	15 L

	Shift-reduce parsing, Operator-precedence parsing, Top- down parsing, Predictive parsers.	
Unit II	Automatic Construction of Efficient Parsers LR parsers, The canonical collection of LR(0) items, Constructing SLR parsing tables, Constructing canonical LR parsing tables, Constructing LALR parsing tables, Using ambiguous grammars, An automatic parser generator, Implementation of LR parsing tables, Constructing LALR sets of items.	15 L
Unit III	Advanced syntax analysis and basic semantic analysis Syntax-directed translation schemes, Implementation of syntax-directed translators, Initial introduction to the ongoing Tiger compiler, bindings for the Tiger compiler, type- checking expressions, type-checking declarations, activation records, stack frames, frames in the Tiger compiler, translation to intermediate code, intermediate representation trees, translation into trees, declarations, basic blocks and traces, taming conditional branches, liveness analysis, solution of dataflow equations, liveness in the Tiger compiler, interference graph construction	15 L
Unit-IV	Dataflow analysis and loop optimization The principle sources of optimization, Loop optimization: The DAG representation of basic blocks, Dominators, Reducible flow graphs, Depth-first search, Loop-invariant computations, Induction variable elimination, Some other loop optimizations. Dataflow Analysis: intermediate representation for flow analysis, various dataflow analyses, transformations using dataflow analysis, speeding up dataflow analysis, alias analysis.	15 L

Text book:

- Compilers: Principles, Techniques and Tools 2nd edition, Alfred V. Aho , Monica
- S. Lam , Ravi Sethi , Jeffrey D. Ullman , Pearson (2011)

- Modern Compiler Implementation in Java, Second Edition, Andrew Appel and Jens Palsberg, Cambridge University Press (2004).

Reference:

- Principles of Compiler Design, Alfred Aho and Jeffrey D. Ullman, Addison Wesley (1997).
- Compiler design in C, Allen Holub, Prentice Hall (1990)

Sr. No.	List of Practical Experiments on Design and Implementation of Modern Compiler
1	Write a program to convert the given N DFA to DFA.
2	Write a program to convert the given Right Linear Grammar to Left Linear Grammar form.
3	Write a program to illustrate the generation on SPM for the input grammar.
4	Write a program to illustrate the generation on OPM for the input operator grammar
5	Implement a simple program analyzer and interpreter for the straight-line programming language
6	Add semantic actions to your parser to produce abstract syntax for the MiniJava language together with a PrettyPrintVisitor
7	Design a set of visitors, which translate a MiniJava program into intermediate representation trees
8	Implement the translation to Assem instructions for your favorite instruction set (let μ stand for Sparc, Mips, Alpha, Pentium, etc.) using maximal munch.
9	Write a code to generate the DAG for the input arithmetic expression.
10	Write a program to demonstrate loop unrolling and loop splitting for the given code sequence containing loop.

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.

1	Introduction to Compilers	15h	1	1	2
2	Automatic Construction of Efficient Parsers	15h	2	2	3
3	Advanced syntax analysis and basic semantic analysis	15h	3	2	5
4	Dataflow analysis and loop optimization	15h	4	3	5

Course Description	
Semester	I
Course Name	Advanced Database Systems
Course Code	PCS1ADS
Eligibility for the Course	B.Sc.
Credit	4
Hours	60

Course Objectives

This course will help the students to acquire the theoretical foundation of Database Management Systems. It includes concepts relating to various advanced database models, and concepts like database mining and warehousing. This course also describes in major details about the advanced concepts of relation database management systems. The course also provides sample database management system architecture. Thus, this is an advanced course, which will further develop the knowledge and skill acquired by the students at the basic level.

Course Outcomes

After completing the course, Student will be able to

1. Describe the concept of distributed database systems.
2. Analyze database management in a centralized and distributed environment.
3. Illustrate data modeling and database development processes for object-oriented, Temporal, and Spatial databases.
4. Explain the use of deductive, active, and multimedia databases.

Course Code : PCS1ADS	Course Title Advanced Database Systems	Credits 04
Unit I	<p>Distributed Database Concepts</p> <p>Definition of Distributed databases and Distributed Database Management System (DDBMS), Distributed transparent system. DDBMS Architecture: DBMS standardization, Global, Local, External, and Internal Schemas, Architectural models for DDBMS. Distributed database design: Design problem of distributed systems, Design, strategies (top-down, bottom-up), Fragmentation, Allocation and replication of fragments. Query Processing Overview, Query Optimization.</p>	15L
Unit II	<p>Transaction Processing in Distributed databases and Parallel databases: Transaction Management: Definition and examples, formalization of a transaction, ACID properties, classification of transaction. Concurrency Control: definition, execution schedules, examples, locking based algorithms, timestamp ordering algorithms, deadlock management. DBMS reliability: Definitions and Basic Concepts, Local Recovery Management, In-place update, out-of-place update, Distributed Reliability Protocols, Two phase</p>	15L

	<p>commit protocol, Three phases commit protocol. Parallel Database System: Definition of Parallel Database Systems. Parallel query evaluation: Speed up and scale up, Query Parallelism: I/O Parallelism (Data Partitioning) Intra-query Parallelism, Inter –Query Parallelism, Intra Operation Parallelism, Inter Operation Parallelism.</p>	
Unit III	<p>Object Oriented, Temporal and Spatial Databases:</p> <p>Object Oriented Database: Object Identity, Object structure, Type Constructors, Encapsulation of Operations, Methods, Persistence, Type and Class Hierarchies, Inheritance, Complex Objects, Object-oriented DBMS, Languages and Design: ODMG Model, Object Definition Languages (ODL), Object Query Languages (OQL). Temporal and Spatial Database: Introduction to Temporal Database: Time ontology, structure, and granularity, Temporal data models, Temporal relational algebras. Introduction to Spatial Database: Definition, Types of spatial data, Geographical Information Systems (GIS), Conceptual Data Models for spatial databases, Logical data models for spatial databases: raster and vector model. Physical data models for spatial databases: Clustering methods (space filling curves), Storage methods (R-tree). Query processing.</p>	15L
Unit IV	<p>Deductive, Active, Multimedia and XML Databases</p> <p>Deductive Database: Introduction to recursive queries, Datalog Notation, Clause Form and Horn Clauses, Interpretation of model: Least Model semantics, The fixed point operator, safe Datalog program, recursive query with negation. Active Database: Languages for rule specification: Events, Conditions, Actions. XML and Database: Structure of XML Data, XML Document Schema, Querying and Transformation, Storage of XML Data. Introduction to multimedia database systems.</p>	15L

	<p>Text book:</p> <ul style="list-style-type: none"> ● Distributed Database; Principles & Systems By Publications, Stefano Ceri and Giuseppe Pelagatti,, McGraw-Hill International Editions (1984) ● Database Management Systems, 3rd edition, Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill (2002). ● Fundamentals of Database Systems, 6thEdition, Elmasri and ● Navathe, Addison. Wesley (2003). ● Unifying temporal data models via a conceptual model, C.S. Jensen, M.D. Soo, and R.T. Snodgrass: Information Systems, vol. 19, no. 7, pp. 513-547, 1994. ● Spatial Databases: A Tour by Shashi Shekhar and Sanjay Chawla, Prentice Hall, 2003 (ISBN 013-017480-7) ● Principles of Multimedia Database Systems, Subramanian V. S. Elsevier Publishers, 2013 	
	<p>References:</p> <ul style="list-style-type: none"> ● Principles of Distributed Database Systems; 2nd Edited By M. Tamer Ozsu and Patrick Valduriez, Person Education Asia. · Database System Concepts, 5th edition, Avi Silberschatz , Henry F. Korth , S. Sudarshan: McGraw-Hill (2010) ● Database Systems: Concepts, Design and Applications, 2nd edition, Shio Kumar Singh, Pearson Publishing, (2011). ● Multi-dimensional aggregation for temporal data. M. Böhlen, J. Gamper, and C.S. Jensen. In Proc. of EDBT-2006, pp. 257-275, (2006). ● Moving objects databases (chapter 1 and 2), R.H. Güting and M. Schneider: Morgan Kaufmann Publishers, Inc., (2005) ● Advanced Database Systems, (chapter 5, 6, and 7), Zaniolo et al.: Morgan Kaufmann Publishers, Inc., (1997) 	

Practical Course on Advanced Database Systems

Sr No	List of Practical Experiments on Advanced Database Systems
1	For a given a global conceptual schema, divide the schema into vertical fragments and Place the replication of the global conceptual schema on different nodes and execute queries that will demonstrate a distributed database environment.
2	Create different types that include attributes and methods. Define tables for these types by adding a sufficient number of tuples. Demonstrate insert, update and delete operations on these tables. Execute queries on them
3	For a given global conceptual schema, divide the schema into horizontal fragments and place them on different nodes. Execute queries on these fragments that will demonstrate distributed databases environment.
4	Place the replication of global conceptual schema on different nodes and execute queries that will demonstrate distributed databases environment.
5	Create a nested table and insert a sufficient number of tuples and execute queries
6	Create a table with multimedia attribute and issue queries on it.
7	Create a temporal database and issue queries on it.
8	Create a table that stores spatial data and issue queries on it.
9	Formulate a database using active rules with row and statement levels.
10	Create an XML database and demonstrate insert, update and delete operations on these tables. Issue queries on it.

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Distributed Database Concepts	15h	1	1	1
2	Transaction Processing in Distributed databases and Parallel databases	15h	2	3	2,3
3	Object Oriented, Temporal and Spatial Databases:	15h	3	3	2,3
4	Deductive, Active, Multimedia and XML Databases	15h	4	2	1,2

Course Description	
Semester	I
Course Name	Robotics
Course Code	PCS1RBT
Eligibility for Course	B.Sc.
Credit	4
Hours	60

Course Objectives

1. Understand the working principles of physical components of robotic system
2. Learn the internal and external perceptions of the robot based on different types of sensors
3. To impart the knowledge about planning, mapping, and navigation of robot
4. Provide hands-on practice to build actual robot

Course Outcomes

1. Describe the concepts of robotics and its components
2. Analyze the internal and external perceptions of the robot based on different types of sensors

3. Evaluate the planning, mapping, and navigation of robots
4. Construct a robot using Raspberry Pi

Course Code: PCS1RB T	Course Title Robotics	Credits 4
Unit I	<p>Introduction to Robotics:</p> <p>What is a Robot? Definition, History of Robots: Control Theory, Cybernetics, Grey Walter Tortoise, Analog Electronic Circuit, Reactive Theory, Braitenberg's Vehicle, Artificial Intelligence, Vision Based Navigation, Types of Robot Control. Robot Components: Embodiment, Sensors, States, Action, Brains and Brawn, Autonomy, Arms, Legs, Wheels, Tracks, and What really drives them effectors and actuators: Effector, Actuator, Passive and Active Actuation, Types of Actuator, Motors, Degree of freedom Locomotion: Stability, Moving and Gaits, Wheels and Steering, Staying on the path. Manipulators: End effectors, Teleoperation, Why is manipulation hard? Sensors: Types of Sensors, Levels of Processing, Passive and Active sensors, Switches, Light sensors, Resistive position sensor.</p>	15 L
Unit II	<p>Sonar, Lasers and Cameras:</p> <p>Ultrasonic and Sonar sensing, Specular Reflection, Laser Sensing, Visual Sensing, Cameras, Edge Detection, Motion Vision, Stereo Vision, Biological Vision, Vision for Robots, Feedback or Closed Loop Control: Example of Feedback Control Robot, Types of feedback control, Feed forward or Open loop control.</p>	15 L
Unit III	<p>Languages for Programming Robot:</p> <p>Algorithm, Architecture, The many ways to make a map, What is planning, Cost of planning, Reactive systems, Action selection, Subsumption architecture, How to sequence behavior through world, hybrid control,</p>	15 L

	Behavior based control and Behavior Coordination, Behavior Arbitration, Distributed mapping, Navigation and Path planning.	
Unit-IV	Building Robots With Raspberry Pi and Python: Hardware components of Raspberry pi, installation of Raspberry pi, Building Robot- ,Required Components, Assembling robot, Robot Movement-H-bridge, Programme Robot with predefined route, Line following using TCRT5000 sensor , Avoiding Obstacles-Ultrasonic sensors for analog object detection,HC-SR04 working and mounting, Measuring short distance	15 L
References		
<ol style="list-style-type: none"> 1. The Robotics Primer by Maja J Matarić, MIT press Cambridge, Massachusetts, London, England (2007). 2. Learn Robotics With Raspberry Pi , Matt Timmons –Brown 		

Practical Course on Robotics	
Sr. No.	List of Practical Experiments on Robotics
Perform following practical's using Robosim and JGameGrid	
1	Write a program to create a robot (i) With gear (ii) Without gear and move it forward, left, right
2	Write a program to create a robot with a two motor and move it forward, left, right
3	Write a program to do a square using a while loop, doing steps with a for loop, to change directions based on condition, controlling motor speed using switch case
4	Write a program to create a robot with light sensors to follow a line
5	Write a program to create a robot that does a circle using 2 motors
6	Write a program to create a path following robot
7	Write a program to register obstacles
Perform following practical's using Raspberry Pi	
8	Build and assemble a robot using Raspberry Pi
9	Implement Line following using TCRT5000 sensor

10	Implement Object detection using HC-SR04 sensor
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Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Introduction to Robotics	15h	1	1	1
2	Sonar, Lasers and Cameras	15h	2	3	2
3	Languages for Programming Robot	15h	3	3	2
4	Building Robots With Raspberry Pi and Python	15h	4	2	6

Semester II

Course Description	
Semester	II
Course Name	Cloud Computing
Course Code	PCS2CLD
Eligibility for Course	B.Sc.
Credit	4
Hours	60

Course Objectives:

1. To provide comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, and architecture
2. To analyze different cloud computing platforms for implementing solutions
3. To expose the students to frontier areas of Cloud Computing Management services
4. To make students aware of security threats in cloud computing

Course Outcomes: Learners will be able to

1. Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
2. Identify problems, and explain, analyze, and evaluate various cloud computing platforms for the solution
3. Implement different types of Service Oriented Architecture systems
4. Analyze the issues in Resource provisioning and Security governance in clouds

Course Code: PCS2E1A	Course Title	Credits 04
	Cloud Computing-I	
Unit I	Introduction Introduction, Roots of Cloud Computing: From mainframe to Cloud, Benefits of Cloud Computing SOA, Web services, Web 2.0, Mashups, Grid computing, Utility computing, Hardware virtualization, Essentials of Cloud characteristics, Challenges, Cloud economics, Role of Networks in Cloud Computing: Cloud types and service models.	15L

<p>Unit II</p>	<p>Cloud Platforms:</p> <p>Features of Cloud and Grid Platforms: Cloud Capabilities and Platform Features, Traditional Features Common To Grids and Clouds, Data Features and Databases, Programming and Runtime Support. Parallel and Distributed Programming Paradigms: Parallel Computing and Programming Paradigms, MapReduce, Twister and Iterative MapReduce, Hadoop Library from Apache.</p> <p>Examples: Openstack, Opennimbus, Eucalyptus Primary Cloud Service models, GAE, AWS, and Azure: Public Clouds and Service Offerings, Google App Engine (GAE), Amazon Web Service (AWS), Microsoft Windows Azure</p>	<p>15L</p>
<p>Unit III</p>	<p>Management of cloud services</p> <p>Reliability, availability, and security of services deployed from the cloud. Performance and scalability of services, tools, and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud-based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)</p>	<p>15L</p>
<p>Unit IV</p>	<p>Security in Cloud Computing</p> <p>Introduction, Global Risk and Compliance aspects in cloud environments and key security terminologies, Technologies for Data security, Data security risk, Cloud computing and identity, Digital identity and access management, Content level security, Security-As-A-Cloud Service</p>	<p>15L</p>
<p>Text book:</p> <ul style="list-style-type: none"> ● Rajkumar Buyya, “Cloud computing principles and paradigms”, Wiley ● Gautam Shroff, Enterprise Cloud Computing, Cambridge ● Rajkumar Buyya, “Mastering Cloud computing”, McGraw Hill ● Tim Mather, Subra K, Shahid L., Cloud Security and Privacy, Oreilly, ISBN-13 		

978-81-8404-815-5

- Distributed and cloud computing from parallel processing to the internet of things by Kai Hwang, Geoffrey C. Fox, and Jack J. Dongarra

References:

- Kai Hwang, Jack Dongarra, Geoffrey Fox: Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, MK Publishers, 2012. 2.
- Michael Miller, Cloud Computing: Web-Based Applications that change the Way you work and collaborate Online, Pearson Publication, 2012.
- Dr. Kumar Saurabh, "Cloud Computing", Wiley Publication

Course Code: PCS2PR2	Practical Experiments on Cloud Computing
	List of Practical Experiments on Cloud Computing
1	Develop Applications using Google AppEngine
2	Implement MapReduce and Hadoop
3	Implement private cloud with Xen server
4	Creating a Failover Cluster using Failover Cluster Manager
5	Implement private cloud with Exi server
6	Installation and Configuration of virtualization using KVM
7	Study and implement Cloud Security management with Two-Factor Authentication
8	Study and implementation of Single-Sing-On
9	Managing Hyper-V environment with SCVVM 2012
10	Using Data Protection Manager for Backup and Recovery

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Introduction	15h	1	1	1
2	Cloud Platforms	15h	2	2	2
3	Management of cloud services	15h	3	3	3

4	Security in Cloud Computing	15h	4	2	8
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Course Description	
Semester	II
Course Name	Natural Language Processing
Course Code	PCS2NLP
Eligibility for Course	B.Sc.
Credit	4
Hours	60

Course objectives:

1. To understand natural language processing and to learn how to apply basic algorithms in this field
2. To get acquainted with the basic concepts and algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics
3. To design and implement applications based on natural language processing
4. To implement various language Models

Course outcomes: On successful completion of the course, the learner should:

1. Have a broad understanding of the field of natural language processing
2. Have a sense of the capabilities and limitations of current natural language technologies,
3. Be able to model linguistic phenomena with formal grammar
4. Understand the mathematical and linguistic foundations underlying approaches to the various areas in NLP

5. Be able to apply NLP techniques to design real-world NLP applications such as machine translation, text categorization, text summarization, information extraction, etc.

Course Code:	Course Title	Credits
PCS2NLP	Natural Language Processing	04
Unit I	Introduction to NLP Introduction to NLP History of NLP, Generic NLP system, levels of NLP, Knowledge in Speech and language processing, Ambiguity in Natural language, stages in NLP, challenges of NLP, Applications of NLP	15L
Unit II	Word Level Analysis An Outline of English Syntax Words- The Elements of Simple Noun Phrases Verb Phrases and Simple Sentences Noun Phrases Revisited Adjective Phrases Adverbial Phrases, Grammars and Sentence Structure What Makes a Good Grammar A Top-Down Parser A Bottom-Up Chart Parser Top-Down Chart Parsing Finite State Models and Morphological Processing Grammars and Logic Programming Parsing tools such as Stanford Parser. N-Grams- N-gram language model, N-gram for spelling correction.	15L
Unit III	Syntax Analysis Part-Of-Speech tagging(POS)- Tag set for English (Penn Treebank), Rule-based POS tagging, Stochastic POS tagging, Issues –Multiple tags & words, Unknown words. Introduction to CFG, Sequence labeling: Hidden Markov Model (HMM), Maximum Entropy, and Conditional Random Field (CRF).	15L
Unit IV	Semantic Analysis Lexical Semantics, Attachment for the fragment of English-Sentences, Noun phrases, Verb phrases, Prepositional phrases,	15L

Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, WordNet, Word Sense Disambiguation (WSD) Applications: Named Entity Recognition, Information retrieval, Question answers system, Machine translation.

Sentiment Analysis

What is Sentiment Analysis, Types of Sentiment Analysis, Importance of Sentiment Analysis, Challenges of Sentiment Analysis.

Text Books:

1. Daniel Jurafsky, James H. Martin —Speech and Language Processing|| Second Edition, Prentice Hall, 2008.
2. Christopher D.Manning and Hinrich Schutze, — Foundations of Statistical Natural Language Processing —, MIT Press, 1999.
3. D. Jurafsky, J. H. Martin, “Speech and Language Processing”, Pearson Education, 2002.

Reference Books:

1. Siddiqui and Tiwary U.S., Natural Language Processing and Information Retrieval, Oxford University Press (2008).
2. <https://monkeylearn.com/sentiment-analysis>
3. Daniel M Bikel and Imed Zitouni — Multilingual natural language processing applications|| Pearson, 2013
4. Alexander Clark (Editor), Chris Fox (Editor), Shalom Lappin (Editor) — The Handbook of Computational Linguistics and Natural Language Processing — ISBN: 978-1-118
5. Steven Bird, Ewan Klein, Natural Language Processing with Python, O’Reilly
6. Brian Neil Levine, An Introduction to R Programming
7. Niel J le Roux, Sugnet Lubbe, A step by step tutorial: An introduction into R application and programming
8. Christopher D. Manning, Hinrich Schutze, Foundations of Statistical Natural Language Processing, The MIT Press, Cambridge, Massachusetts, 1999.

Course Code: PCS2PR1	Course Title
	Practical Course on Natural Language Processing
<p>Note: - The following set of practicals can be performed using any Python Libraries for NLP such as NLTK, spaCy, genism: Link: -https://www.python.org/downloads/</p>	
Sr. No.	List of Practical Experiments on Natural Language Processing
1	Write a program to implement sentence segmentation and word tokenization
2	Write a program to Implement stemming and lemmatization
3	Write a program to Implement a tri-gram model
4	Write a program to Implement PoS tagging using HMM & Neural Model
5	Write a program to Implement syntactic parsing of a given text
6	Write a program to Implement dependency parsing of a given text
7	Write a program to Implement Named Entity Recognition (NER)
8	Write a program to Implement Text Summarization for the given sample text

Module /Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Introduction to NLP	15h	1	1	1
2	Word Level Analysis	15h	2	2	3
3	Syntax Analysis	15h	3	2	3
4	Semantic Analysis	15h	4	2	3

Course Description	
Semester	II
Course Name	Business Intelligence and Big data Analytics
Course Code	PCS2BI1
Eligibility for Course	B.Sc.
Credit	4
Hours	60

Course Objectives

1. Apply the basic concepts and methods of business analytics
2. Understand the basic concepts of Business Data Warehouse
3. Improving strategic decision-making by designing Data Warehouse model.
4. To explore data mining concepts and solutions.

Course Outcomes

1. Describe the concepts of Business Intelligence
2. Explain business Data Warehouse
3. Build business Data Warehouse
4. Evaluate data mining process and Association analysis

Course Code: PCS2BI1	Course Title	Credits 04
	Business Intelligence and Big Data Analytics	

Unit I	Introduction to Business Intelligence: Operational and Decision Support System, Data-Information-Knowledge- Decision making-Action cycle. Basic definitions- Business Intelligence; Data warehousing, Business Intelligence architecture, Use and benefits of Business Intelligence. Knowledge Discovery in Databases: KDD process model, Data Pre-processing: Cleaning: Missing Values; Noisy Values; Inconsistent values; redundant values. Outliers, Integration, transformation, reduction, Discretization: Equal Width Binning; Equal Depth Binning, Normalization, Smoothing	15 L
Unit II	Introduction to Business Data Warehouse: Definition of Data warehouse, Logical architecture of Data Warehouse, Data Warehouse model- Enterprise warehouse; Data Marts; Virtual warehouse. Populating business Data Warehousing: data integration and extract, transform, load (ETL).	15 L
Unit III	Designing Business Data Warehouse: OLTP and OLAP systems, Designing business information warehouse: Principles of dimensional modeling, Data cubes, Data cube operations, data cube schemas.	15 L
Unit-IV	Introduction to Data Mining: Data mining definitions and process: business and data understanding. Association Analysis: Definition of association rule, General issues: Support; Confidence; Lift; Conviction, Frequent Item sets: APriori Algorithm; Issues with APriori Algorithm, Data structures: Hash tree and FP tree.	15 L

Text book:

- Business Intelligence (2nd Edition), Efraim Turban, Ramesh Sharda, Dursun Delen, David King, Pearson (2013)
- Business Intelligence for Dummies, Swain Scheps, Wiley Publications (2008).
- Building the Data Warehouse, Inmon: Wiley (1993).
- Data Mining: Introductory and Advanced Topics, Dunham, Margaret H, Prentice Hall (2006)
- Data Mining: Practical Machine Learning Tools and Techniques, Second Edition, Witten, Ian and Eibe Frank, Morgan Kaufmann (2011)

Reference:

- Business Intelligence Road Map, Larissa T. Moss, Shaku Atr, Addison-Wesley
- Data Modeling Techniques for Data Warehousing by IBM; International Technical Support Organization, Chuck Ballard, Dirk Herreman, Don Schau, Rhonda Bell, Eunsang Kim, Ann Valencic: <http://www.redbooks.ibm.com>
- Data Mining: Concepts and Techniques, The Morgan Kaufmann Series in Data Management Systems, Han J. and Kamber M. Morgan Kaufmann Publishers, (2000).
- Data Mining with Microsoft SQL Server 2008, MacLennan Jamie, Tang ZhaoHui and Crivat Bogdan, Wiley India Edition (2009).

Sr. No.	List of Practical Experiments on Business Intelligence & Big Data Analytics (Business Intelligence)
1	Import the legacy data from different sources such as (Excel , SqlServer, Oracle etc.) and load in the target system. (You can download sample database such as Adventureworks, Northwind, foodmart etc.)
2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.
3	a. Create the Data staging area for the selected database. b. Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.

4	a.Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the datawarehouse.
5	a. Import the datawarehouse data in Microsoft Excel and create the Pivot table and Pivot Chart. 57 b. Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.
6	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the datawarehouse data
7	Develop an application to pre process data imported from external sources.
8	Create association rules by considering suitable parameters.
9	Write a program in Python based on Hash Tree
10	Write a program in Python based on FP Tree

The BI tools such as Tableau / Power BI / BIRT / R / Excel or any other can be used.

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Introduction to Business Intelligence	15h	1	1	2
2	Introduction to Business Data Warehouse	15h	2	1	1
3	Designing Business Data Warehouse	15h	3	2	5
4	Introduction to Data Mining	15h	4	3	6

Course Description	
Semester	II
Course Name	Machine Intelligence
Course Code	PCS2MI1
Eligibility for Course	B.Sc.
Credit	4
Hours	60

Course Objectives:

1. To be able to formulate machine learning problems corresponding to different applications
2. To understand various machine learning algorithms along with their advantages and disadvantages
3. To be able to apply machine learning algorithms to solve problems of moderate complexity.

Course Outcomes:

1. Identify basic concepts and types of learning from data
2. Describe dimensionality reduction technique for attribute reduction
3. Create ensemble models using different Machine Learning techniques
4. Build probabilistic and unsupervised learning models for handling unknown patterns

Course Code: PCS2MI1	Course Title	Credits 04
	Machine Intelligence	

<p>Unit I</p>	<p>Learning-Standard Linear methods: Statistical Learning: What Is Statistical Learning, Assessing Model Accuracy. Linear Regression: Simple Linear Regression, Multiple Linear Regressions, Other Considerations in the Regression Model, The Marketing Plan, Comparison of Linear Regression with K-Nearest Neighbors. Classification: An Overview of Classification, Why Not Linear Regression? , Logistic Regression, Linear Discriminant Analysis, ,A Comparison of Classification Methods.</p>	<p>15 L</p>
<p>Unit II</p>	<p>Selection and improvements of linear learning methods: Resampling Methods: Cross-Validation, The Bootstrap. Linear Model Selection and Regularization: Subset Selection, Shrinkage Methods, Dimension Reduction Methods, Considerations in High Dimensions.</p>	<p>15 L</p>
<p>Unit III</p>	<p>Non-Linear Learning methods: Polynomial Regression, Step Functions, Basis Functions, Regression Splines, Smoothing Splines, Local Regression, Generalized Additive Models, Tree-Based Methods: The Basics of Decision Trees. Bagging, Random Forests, Boosting.</p>	<p>15 L</p>
<p>Unit-IV</p>	<p>Support Vector machines, Principle Component Analysis and Clustering: Support Vector Machines: Maximal Margin Classifier. Support Vector Classifiers: Support Vector Machines, SVMs with More than Two Classes Relationship to Logistic Regression. Unsupervised Learning: The Challenge of Unsupervised Learning, Principal Components Analysis, Clustering, Methods: K-Means Clustering, Hierarchical Clustering, Practical Issues in Clustering.</p>	<p>15 L</p>

Text book:

- An Introduction to Statistical Learning with Applications in R: Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer 2013.
- The Elements of Statistical Learning: Data Mining, Inference, and Prediction (Second Edition) : Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer (2008).

Reference:

- Introduction to Machine Learning (Second Edition): Ethem Alpaydm, The MIT Press (2010).
- Pattern Recognition and Machine Learning: Christopher M. Bishop, Springer (2006)
- Bayesian Reasoning and Machine Learning: David Barber, Cambridge University Press (2012)
- Machine Learning: The Art and Science of Algorithms that Make Sense of Data: Peter Flach, Cambridge University Press (2012) Machine Learning for Hackers: Drew Conway and John Myles White, O'Reilly (2012)
- Machine Learning in Action: Peter Harrington, Manning Publications (2012).
- Machine Learning with R: Brett Lantz, Packt Publishing (2013)
- <https://class.coursera.org/ml-005/lecture/preview>
- <https://github.com/josephmisiti/awesome-machine-learning>.

Sr. No.	List of Practical Experiments on Machine Intelligence (Fundamentals of Machine Intelligence)
1	Implement simple linear regression model on a standard data set and plot the least square regression fit. Comment on the result. [One may use inbuilt data sets like Boston, Auto etc]
2	Implement multiple regression model on a standard data set and plot the least square regression fit. Comment on the result. [One may use inbuilt data sets like Carseats, Boston etc].
3	Fit a classification model using following: (i) logistic regression (ii) Linear Discriminant Analysis (LDA) and (iii) Quadratic Discriminant Analysis (QDA)

	on a standard data set and compares the results. [Inbuilt datasets like Smarket, Weekly, Auto, Boston etc may be used for the purpose].
4	Fit a classification model using K Nearest Neighbour (KNN) Algorithm on a given data set. [One may use data sets like Caravan, Smarket, Weekly, Auto and Boston].
5	Use bootstrap to give an estimate of a given statistic. [Datasets like Auto, Portfolio and Boston etc may be used for the purpose].
6	For a given data set, split the data into two training and testing and fit the following on the training set: (i) Linear model using least squares (ii) Ridge regression model (iii) Lasso model (iv) PCR model (v) PLS model Report test errors obtained in each case and compare the results. [Data sets like College, Boston etc may be used for the purpose].
7	For a given data set, perform the following: (i) Perform the polynomial regression and make a plot of the resulting polynomial fit to the data. (ii) Fit a step function and perform cross validation to choose the optimal number of cuts. Make a plot of the fit to the data. [Use data set like Wage for the purpose].
8	For a given data set, do the following: (i) Fit a classification tree (ii) Fit a regression tree [One may choose data sets like Carseats, Boston etc for the purpose].
9	For a given data set, split the dataset into training and testing. Fit the following models on the training set and evaluate the performance on the test set: (i) Boosting (ii) Bagging (iii) Random Forest [Data sets like Boston may be used for the purpose].
10	Fit a support vector classifier for a given data set. [Data sets like Car, Khan, Boston etc may be used for the purpose].
11	Perform the following on a given data set: (i) Principal Component Analysis (ii) Hierarchical clustering. [Data set like NC160, USArrests etc may be used for the purpose].

Note: The above practical experiments require the R Software

Module /Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Learning-Standard Linear methods:	15h	1	1	1
2	Selection and improvements of linear learning methods:	15h	2	2	2
3	Non-Linear Learning methods:	15h	3	1	1
4	Support Vector machines, Principle Component Analysis and Clustering:	15h	4	2	2



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW
PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
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'Best College Award' by University of Mumbai**

**Program: M.Sc.
Revised Syllabus of M.Sc.-II Computer Science
Choice Based Credit & Grading System (60:40)
w.e.f. Academic Year 2020-21**

Preamble

This syllabus is an extension of the syllabus for semester - I and semester – II of MSc Computer Science, which came into existence in the academic year 2019-2020. As mentioned in the syllabus of semester I and II, the intended philosophy of the new syllabus is to meet following guidelines:

- Give strong foundation on core Computer Sciences subjects.
- Expose student to emerging trends in a gradual and incremental way.
- Prepare student community for the demands of ICT industry.
- Offer specialization on a chosen area.
- Create research temper among students in the whole process.

This syllabus for the semester - III and semester – IV has tried to continue the steps initiated in the semester- I and semester –II to meet the goals set. This proposes two core compulsory subjects in semester III. The student has to continue with the tracks they have taken in the semester II as elective subjects. The syllabus also includes project proposal as part of the practical course in elective subjects.

The semester – IV will have one compulsory subject. Student can choose one subject as specialization out of the two electives he or she has been pursuing since the semester – II. That means, there will be four specializations in the semester IV as mentioned below:

- Cloud Computing
- Cyber and Information Security
- Business Intelligence and Big Data Analytics
- Machine Learning

The syllabus also offers an internship and project implementation in the semester – IV, each of which has weights equivalent to a full course. By introducing different electives as tracks in semester –II, espousing more of that tracks in the semester –III and offering

the opportunity to choose the specialization based on the tracks pursued in semester –IV will give the student the added advantage of high level competency in the advanced and emerging areas of computer science. This will definitely equip the student with industry readiness as internship in an IT or IT-related organization gives a practical exposure to what is learned and what is practiced. The strong foundation given in the core courses in different semesters will give enough confidence to the learner to face and adapt to the changing trends and requirements of industry and academia.

As one can easily notice, the syllabus offers lots of emphasis on student driven learning and learning through experience. Research is embedded in the course structure. By introducing Researching Computing in semester – I, Case study in semester – II, Project Proposal in semester – III and Project Implementation in semester– IV (which together has a weightage equivalent to almost two theory courses), the syllabus prepares a strong army of budding computer science researchers. The syllabus designed on the firm believe that by focusing on student driven research on cutting edge and emerging trends with lots of practical experience will make the learning more interesting and stimulating. It is hoped that the student community and teacher colleagues will appreciate the thrust, direction and treatment given in the syllabus.

We thank all our colleagues in the University of Mumbai for their inputs, suggestions and critical observations. We acknowledge the contributions of experts from premier institutions and industry for making the syllabus more relevant. We thank the chairperson and members of the present and previous Adhoc Board of Studies in Computer Science of University for their constant support. Thanks to one and all who have directly or indirectly helped in this venture.

- **Objectives of the Course:**

- Offer specialization on a chosen area.
- Promote research based projects/activities in the emerging areas of technologyconvergence.
- To develop the confidence to the learners to face and adapt to the changing trends andrequirements of industry and academia.
- Offer provision for internship and field work.

- **Course Outcomes:**

- Gain the knowledge of current technologies by internship.
- Hands on training on specialized subjects.
- Can get job opportunities like Software Developer, Network administrator, IT expertetc.
- Prepares strong army of budding computer science researchers.

A) Internal Assessment: 40 %**40 Marks**

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Continuous Assessment	20 Marks

Question Paper Pattern for Continuous Assessment (Total Marks 20 to be converted in 10 marks)

Marks	Group Project*/ Individual Project	Presentation and write- up	Practical Skills	Open book test	Quiz
5	Hypothesis/Topic of the project	Presentation skill	Demonstration of skill	High order thinking questions (HOTS)	Quiz on application of subject in real life
5	Actual laboratory work/Field work	Knowledge	Viva		
5	Result/output	Quality of ppt	Report		
5	Dissertation/Report	Writing skill	Problem solving ability		

B) Semester End Examination: 60 %**60 Marks**

- Duration: The examination shall be of 2.5 hours duration.

<ol style="list-style-type: none"> 1. There shall be five questions each of 12 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.
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➤ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

I. Practical Examination : – 50 Marks Each core subject carries

Sr. No.	Particulars of External	Marks
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	50

Minimum 75 % practical from each core subjects are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Exam) -----

M.Sc. Computer Science Syllabus
Credit Based System and Grading System
Academic year 2020-21
SEMESTER - III

CODE	COURSE TYPE	SUBJECT	SCHEME OF INSTRUCTION		SCHEME OF EXAMINATION			NO. OF
			(PERIOD PER WEEK)		(MAX MARKS)			CREDITS
			TH	LAB	CA	EA	TOTAL	
PCS3UBC	CORE	Ubiquitous Computing	4	-	40	60	100	4
PCS3SNA	CORE	Social Network Analysis	4	-	40	60	100	4
PCS3CL2	Elective-I	Track A: Cloud Computing – II (Cloud Computing Technologies)	4	-	40	60	100	4
PCS3CI2	Elective-I	Track B: Cyber and Information Security- II (Cyber Forensics)						
PCS3BI2	Elective-II	Track C: Business Intelligence and Big Data Analytics –II (Mining Massive Data sets)	4	-	40	60	100	4
PCS3ML2	Elective-II	Track D: Machine Learning –II (Advanced Machine Learning)						
PCS3PPR1	CORE SUBJECT PRACTICAL	PCS3UBC+ PCS3SNA	-	4	100			4
PCS3PPR2	ELECTIVE SUBJECT PRACTICAL	PCS3CI2+PCS3BI2	-	4	100			4
TOTAL							600	24

SEMESTER - IV

CODE	CO URSE TYPE	SUBJECT	SCHEME OF INSTRUCTION		SCHEME OF EXAMINATION			NO. OF CREDITS
			(PERIOD PER WEEK)		(MAX MARKS)			
			TH	LAB	CA	EA	TOTAL	
PCS4SIM	CORE	Simulation and Modeling	4	-	40	60	100	4
PCS4CL3	Elective	Specialization - Track A: Cloud Computing –III (Building Clouds and Services)	4	-	40	60	100	4
PCS4CI3		Specialization - Track B: Cyber and Information Security- II (Cryptography and Crypt Analysis)						
PCS4BI3		Specialization - Track C: Business Intelligence and Big Data Analytics –III (Intelligent Data Analysis)						
PCS4ML3		Specialization - Track D: Machine Learning –III (Computational Intelligence)						
PCS4PPR1	Practical of Simulation & Modeling and Specialization	PCS4SIM+ PCS4BI3	4				100	4
PCS4PPR2	Internship with industry		6				150	6
PCS4PPR3	Project Implementation		6				150	6
TOTAL							600	24

Structure of the syllabus

This is the syllabus for the semester–III and semester–IV of MSc Computer Science program of University of Mumbai to be implemented from the year 2020-21

Semester-III

The syllabus offers four theory courses and two practical courses in semester-III. Of the four theory courses, two are compulsory courses. The remaining two are electives. Each elective course has two tracks (track A and track B for elective I and track C and track D for elective II). A student is expected to continue with the track they have chosen in semester-II.

The syllabus proposes four subjects in semester-III. Each subject has theory and practical components.

Semester–III: Theory courses

The four theory courses offered in semester-III are:

- (i) Ubiquitous Computing
- (ii) Social Network Analysis
- (iii) Elective -I
 - (a) Track A: Cloud Computing – II (Cloud Computing Technologies)
 - (b) Track B: Cyber and Information Security – II (Cyber Forensics)
- (iv) Elective –II
 - (a) Track C: Business Intelligence and Big Data Analytics – II (Mining Massive Data sets)
 - (b) Track D: Machine Learning – II (Advanced Machine Learning)

A student is expected to continue with the same tracks he or she has taken in semester-II for elective –I and elective –II. Each of these theory courses (compulsory as well as elective) is of four credits each and is expected to complete in 60 hours. The details are shown in the following table.

Semester III – Theory courses

Course Code	Course Nomenclature	Lecture In Hours	Credits
PCS3UBC	Ubiquitous Computing	60	4
PCS3SNA	Social Network Analysis	60	4
PCS3CL2	Elective I - Track A: Cloud Computing –II(Cloud Computing Technologies)	60	4
PCS3CI2	Elective I -Track B: Cyber and Information Security- II (CyberForensics)		
PCS3BI2	Elective II - Track C: Business Intelligence and Big Data Analytics –II (Mining Massive Data sets)	60	4
PCS3ML2	Elective II - Track D: Machine Learning –II (Advanced Machine Learning)		
Total Credits for Theory courses in Semester III			16

Semester–III: Practical Laboratory Courses

The syllabus proposes two laboratory courses of 4 credits each. The laboratory experiments from the first two theory courses (PSCS301 and PSCS302) are combined together and are proposed as the first practical course (PSCSP5). Similarly, the laboratory experiments from the elective courses are combined together and taken as the second practical course (PSCSP6). The following table summarizes the details of the practical courses in the semester –III.

Semester-III: Practical Laboratory Courses

Course Code	Course Title	No of hours	Credits
PCS3PPR1	Ubiquitous Computing and Social Network Analysis	60+60= 120	04
PCS3PPR2	Elective I and Elective II	60+60= 120	04
Total Credits for Practical Laboratory courses in Semester-III			08

Project Proposal: The syllabus introduces a project proposal in the semester-III under lab course PSCSP6. As per this, a student is expected to select a topic for project based on the specialization he or she is planning to take in the semester-IV. Needless to say, the project proposal will be based on a topic related to the elective the student has been pursuing in semester –II and semester-III and intends to continue in semester- IV as specialization.

The proposal will contain introduction, related works, objectives and methodology. The implementation, experimental results and analysis will be part of the Project implementation in the semester-IV.

Semester –IV

The syllabus proposes two subjects in semester-IV, each with theory and practical components. In addition, there will be internship with industry and a project implementation. The important feature of the semester-IV is the specialization a student can choose. A student can choose a specialization based on the electives one has been pursuing since semester–II. Since there are two electives in semester-III, a student can drop one and choose the other as the specialization in semester–IV.

Semester–IV: Theory courses

The two theory courses offered in semester-IV are:

- (i) Simulation and Modeling
- (ii) Specialization
 - (a) Track A: Cloud Computing – III (Building Clouds and Services)
 - (b) Track B: Cyber and Information Security–III (Cryptography and Crypt Analysis)
 - (c) Track C: Business Intelligence and Big Data Analytics – III (Intelligent Data Analysis)
 - (d) Track D: Machine Learning – III (Computational Intelligence)

Each of these courses (core as well as the specialization) is expected to complete in 60 hours. The details are given in the following table.

Semester-IV: Theory courses

Course Code	Course Nomenclature	Lecture In Hours	Credits
PCS4SIM	Simulation and Modeling	60	4
PCS4CL3	Specialization - Track A: Cloud Computing – III (Building Clouds and Services)	60	4
PCS4CI3	Specialization - Track B: Cyber and Information Security- II (Cryptography and Crypt Analysis)		
PCS4BI3	Specialization - Track C: Business Intelligence and Big Data Analytics –III (Intelligent Data Analysis)		
PCS4ML3	Specialization - Track D: Machine Learning –III (Computational Intelligence)		
Total Credits for Theory courses in Semester-IV			08

Semester–IV: Practical Laboratory courses

The syllabus proposes one laboratory course of 4 credits. The laboratory experiments from the two theory courses are combined together and are proposed as the first practical course (PSCSP7).

Semester-IV: Practical course

Course Code	Course Title	No of hours	Credits
PCS4PPR1	Simulation & Modeling and Specialization	60+60= 120	04

Semester–IV: Internship with industry

The syllabus proposes an internship for about 8 weeks to 12 weeks to be done by a student. It is expected that a student chooses an IT or IT-related industry and formally works as a full time intern during the period. The student should subject oneself with an internship evaluation with proper documentation of the attendance and the type of work he or she has done in the chosen organization. Proper certification (as per the guidelines given in Appendix 1 and 2) by the person, to whom the student was reporting, with Organization's seal should be attached as part of the documentation.

Semester–IV: Internship

Course Code	Course Title	No of hours	Credits
PCS4PPR2	Internship with industry	300	06

Semester–IV: Project Implementation

The syllabus proposes project implementation as part of the semester–IV. The project implementation is continuation of the project proposal the students has submitted and evaluated in semester-III. The student is expected to continue with the proposal made and examined in the semester-III and implement the same in the semester–IV. In addition, experimental set up, analysis of results, comparison with results of related works, conclusion and future prospects will be part of the project implementation. A student is expected to make a project implementation report and appear for a project viva. He or she needs to spend around 200 hours for the project implementation, which fetches 6 credits. The details are given below:

Semester–IV: Project Implementation

Course Code	Course Title	No of hours	Credits
PCS4PPR3	Project Implementation	200	06

Detailed syllabus of semester– III

Course Code	Course Title	Credits
PCS3UBC	Ubiquitous Computing	04
<p>Unit I: Basics of Ubiquitous Computing Examples of Ubiquitous Computing Applications, Holistic Framework for UbiCom: Smart DEI, Modeling the Key Ubiquitous Computing Properties, Ubiquitous System Environment Interaction, Architectural Design for UbiCom Systems: Smart DEI Model, Smart Devices and Services, Service Architecture Models, Service Provision Life Cycle.</p>		
<p>Unit II: Smart Mobiles, Cards and Device Networks Smart Mobile Devices, Users, Resources and Code, Operating Systems for Mobile Computers and Communicator Devices, Smart Card Devices, Device Networks. Human–Computer Interaction (HCI): Explicit HCI, Implicit HCI, User Interfaces and Interaction for Devices, Hidden UI Via Basic Smart Devices, Hidden UI Via Wearable and Implanted Devices, Human Centered Design (HCD).</p>		
<p>Unit III: Smart Environments Tagging, Sensing and Controlling, Tagging the Physical World, Sensors and Sensor Networks, Micro Actuation and Sensing: MEMS, Embedded Systems and Real Time Systems, Control Systems.</p>		
<p>Unit IV: Ubiquitous Communication Audio Networks, Data Networks, Wireless Data Networks, Universal and Transparent Audio, Video and Alphanumeric Data Network Access, Ubiquitous Networks, Network Design Issues.</p>		
<p>Text book:</p> <ul style="list-style-type: none"> • Ubiquitous Computing Smart Devices, Environments and Interactions, Stefan Poslad, Wiley,2009. 		

References:

- Ubiquitous Computing Fundamentals. John Krumm, Chapman & Hall/CRC2009.
- Ambient intelligence, wireless networking and ubiquitous computing, Vasilakos, A., & Pedrycz, W. ArtechHouse, Boston, 2006.
- <http://www.eecs.qmul.ac.uk/~stefan/ubicom>.

Practical Course on Ubiquitous Computing	
Sr. No.	List of practical Experiments on Ubiquitous Computing
1	Design and develop location based messaging app
2	Design and develop chat messaging app which is a location-based
3	Design and develop app demonstrating Simple Downstream Messaging
4	Design and develop app demonstrating Send Upstream Messages
5	Design and develop app for Device Group Messaging
6	Implementing GCM Network Manager
7	Demonstrate use of OpenGTS (Open Source GPS Tracking System)
8	Context-Aware system Context-awareness is a key concept in ubiquitous computing. The Java Context-Awareness Framework (JCAF) is a Java-based context-awareness infrastructure and programming API for creating context-aware applications
9	Develop application demonstrating Human Computer Interaction
10	Write a Java Card applet

Course Code	Course Title	Credits
PCS3SNA	Social Network Analysis	04
<p>Unit I: Introduction to social network analysis (SNA)</p> <p>Introduction to networks and relations- analyzing relationships to understand people and groups, binary and valued relationships, symmetric and asymmetric relationships, multimode relationships, Using graph theory for social networks analysis- adjacency matrices, edge-lists, adjacency lists, graph traversals and distances, depth-first traversal, breadth-first traversal paths and walks, Dijkstra's algorithm, graph distance and graph diameter, social networks vs. link analysis, ego-centric and socio-centric density.</p>		
<p>Unit II: Networks, Centrality and centralization in SNA</p> <p>Understanding networks- density, reachability, connectivity, reciprocity, group-external and group-internal ties in networks, ego networks, extracting and visualizing ego networks, structural holes, Centrality- degree of centrality, closeness and betweenness centrality, local and global centrality, centralization and graph centers, notion of importance within network, Google pagerank algorithm, Analyzing network structure- bottom-up approaches using cliques, N- cliques, N-clans, K-plexes, K-cores, F-groups and top-down approaches using components, blocks and cut-points, lambda sets and bridges, and factions.</p>		
<p>Unit III: Measures of similarity and structural equivalence in SNA</p> <p>Approaches to network positions and social roles- defining equivalence or similarity, structural equivalence, automorphic equivalence, finding equivalence sets, brute force and Tabu search, regular equivalence, equivalence of distances: Maxsim, regular equivalence, Measuring similarity/dissimilarity- valued relations, Pearson correlations covariance and cross-products, Understanding clustering- agglomerative and divisive clusters, Euclidean, Manhattan, and squared distances, binary relations, matches: exact, Jaccard, Hamming,</p>		
<p>Unit IV: Two-mode networks for SNA</p> <p>Understanding mode networks- Bi-partite data structures, visualizing two-mode data, quantitative analysis using two-mode Singular value decomposition (SVD) analysis,</p>		

two-mode factor analysis, two-mode correspondence analysis, qualitative analysis using two-mode core-periphery analysis, two-mode factions analysis, affiliation and attribute networks.

Text book:

- || Introduction to Social Network Methods: Robert A. Hanneman, Mark Riddle, University of California, 2005 [Published in digital form and available at <http://faculty.ucr.edu/~hanneman/nettext/index.html>].
- || Social Network Analysis for Startups- Finding connections on the social web: Maksim Tsvetovat, Alexander Kouznetsov, O'Reilly Media, 2011.
- ⌋ Social Network Analysis- 3rd edition, John Scott, SAGE Publications, 2012.

Reference book:

- Exploratory Social Network Analysis with Pajek, Second edition: Wouter de Nooy, Andrej Mrvar, Vladimir Batagelj, Cambridge University Press, 2011.
- Analyzing Social Networks, Stephen P Borgatti, Martin G. Everett, Jeffrey C. Johnson, SAGE Publications, 2013.
- Statistical Analysis of Network Data with R: Eric D. Kolaczyk, Gábor Csárdi, Springer, 2014.
- Network Analysis: Methodological Foundations, (Editors) Ulrik Brandes, Thomas Erlebach. Springer, 2005.
- Models and Methods in Social Network Analysis: (Editors) Peter J. Carrington, John Scott, Stanley Wasserman, Cambridge University Press, 2005.

Practical Course on Social Network Analysis	
Sr No	List of Practical Experiments on Social Network Analysis
1	Write a program to compute the following for a given a network: (i) number of edges, (ii) number of nodes; (iii) degree of node; (iv) node with lowest degree; (v) the adjacency list; (vi) matrix of the graph.
2	Perform following tasks: (i) View data collection forms and/or import one-mode/two-mode datasets; (ii) Basic Networks matrices transformations
3	Compute the following node level measures: (i) Density; (ii) Degree; (iii) Reciprocity; (iv) Transitivity; (v) Centralization; (vi) Clustering.
4	For a given network find the following: (i) Length of the shortest path from a given node to another node; (ii) the density of the graph; (iii) Draw egocentric network of node G with chosen configuration parameters.
5	Write a program to distinguish between a network as a matrix, a network as an edge list, and a network as a sociogram (or “network graph”) using 3 distinct networks representatives of each.
6	Write a program to exhibit structural equivalence, automatic equivalence, and regular equivalence from a network.
7	Create sociograms for the persons-by-persons network and the committee-by-committee network for a given relevant problem. Create one-mode network and two-node network for the same.
8	Perform SVD analysis of a network.
9	Identify ties within the network using two-mode core periphery analysis.
10	Find “factions” in the network using two-mode faction analysis.

Course Code	Course Title	Credits
PCS3CL2	Elective I- Track A: Cloud Computing -II (Cloud Computing Technologies)	04
Unit I: Parallel and Distributed Computing Elements of parallel computing, elements of distributed computing, Technologies for distributed computing: RPC, Distributed object frameworks, Service oriented computing Virtualization – Characteristics, taxonomy, virtualization and cloud computing.		
Unit II: Computing Platforms Cloud Computing definition and characteristics, Enterprise Computing, The internet as a platform, Cloud computing services: SaaS, PaaS, IaaS, Enterprise architecture, Types of clouds.		
Unit III: Cloud Technologies Cloud computing platforms, Web services, AJAX, mashups, multi-tenant software, Concurrent computing: Thread programming, High-throughput computing: Task programming, Data intensive computing: Map-Reduce programming.		
Unit IV: Software Architecture Dev 2.0 platforms, Enterprise software: ERP, SCM, CRM Custom enterprise applications and Dev 2.0, Cloud applications.		
Text book: <ul style="list-style-type: none"> • Enterprise Cloud Computing Technology, Architecture, Applications, GautamShroff, Cambridge University Press, 2010 • Mastering In Cloud Computing, RajkumarBuyya, Christian VecchiolaAndThamariSelvi S, Tata Mcgraw-Hill Education,2013 • Cloud Computing: A Practical Approach, Anthony T Velte, Tata Mcgraw Hill, 2009 		
References: <ul style="list-style-type: none"> • Architecting the Cloud: Design Decisions for Cloud Computing ServiceModels (SaaS,PaaS, and IaaS), Michael J. Kavis, Wiley CIO,2014 • Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models,Mobile, Securityand More, Kris Jamsa, Jones & Bartlett Learning,2013 		

Practical Course on Elective I-Track A:Cloud Computing-II (Cloud Computing Technologies)	
Sr. No.	List of Practical Experiments on Elective I-Track A:Cloud Computing-II (Cloud Computing Technologies)
1	Execute & check the performance of existing algorithms using CloudSim.
2	Install a Cloud Analyst and Integrate with Eclipse/Netbeans. Monitor the performance of an Existing Algorithms.
3	Build an application on private cloud.
4	Demonstrate any Cloud Monitoring tool.
5	Evaluate a Private IAAS Cloud using TryStack.
6	Implement FOSS-Cloud Functionality - VDI (Virtual Desktop Infrastructure)
7	Implement FOSS-Cloud Functionality VSI (Virtual Server Infrastructure) Infrastructure as aService (IaaS)
8	Implement FOSS-Cloud Functionality - VSI Platform as a Service (PaaS)
9	Implement FOSS-Cloud Functionality - VSI Software as a Service (SaaS)
10	Explore FOSS-Cloud Functionality- Storage Cloud

Course Code	Course Title	Credits
PCS3CI2	Elective I- Track B: Cyber and Information Security- II (Cyber Forensics)	04
<p>Unit I: Computer Forensic Fundamentals: Introduction to Computer Forensics and objective, the Computer Forensics Specialist, Use of Computer Forensic in Law Enforcement, Users of Computer Forensic Evidence, Case Studies, Information Security Investigations. Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised, Internet Tracing Methods, Security and Wireless Technologies. Types of Computer Forensics Systems: Study different Security System: Internet, Intrusion Detection, Firewall, Storage Area, Network Disaster Recovery, Public Key Infrastructure, Wireless Network, Satellite Encryption, Instant Messaging (IM), Net Privacy, Identity Management, Biometric, Identity Theft.</p>		
<p>Unit II: Data Recovery: Data Recovery and Backup, Role of Data Recovery, Hiding and Recovering Hidden Data. Evidence Collection: Need to Collect the Evidence, Types of Evidences, The Rules of Evidence, Collection Steps. Computer Image Verification and Authentication: Special Needs of Evidence Authentication. Identification of Data: Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices, Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files.</p>		
<p>Unit III: Network Forensics: Sources of Network Based Evidence, Principles of Internetworking, Internet Protocol Suite. Evidence Acquisition: Physical Interception, Traffic Acquisition Software, Active Acquisition. Traffic Analysis: Protocol Analysis, Packet Analysis, Flow Analysis, Higher-Layer Traffic analysis. Statistical Flow Analysis: Sensors, Flow Record Export Protocols, Collection and Aggregation, Analysis. Wireless: the IEEE Layer 2 Protocol Series, Wireless Access Point, Wireless Traffic Capture and Analysis, Common Attacks, Locating Wireless Devices. Network Intrusion Detection and</p>		

Analysis: NIDS/NIPS Functionality, Modes of Detection, Types of NIDS/NIPS, NIDS/NIPS Evidence Acquisition.

Unit IV: Network Devices and Mobile Phone Forensics: Sources of Logs, Network Architecture, Collecting and Analyzing Evidence, switches, routers, firewalls, interfaces Web Proxies: Need to Investigate Web Proxies, Functionality, Evidence, Squid, **Web Proxy Analysis, Encrypted Web Traffic. Mobile Phone Forensics: Crime and Mobile Phones,** Voice, SMS and Identification of Data Interception in GSM, Mobile Phone Tricks, SMS Security, Mobile Forensic.

Text book:

- Computer Forensics Computer Crime Scene Investigation, John R. Vacca, Second Edition, 2005.
- Network Forensics, Sherri Davidoff, Jonathan HAM, Prentice Hall, 2012.
- Mobile Phone Security and Forensic: A Practical Approach, Second Edition, Iosif I. Androulidkis, Springer, 2012.

References:

- Digital forensics: Digital evidence in criminal investigation”, Angus M. Marshall, John – Wiley and Sons, 2008.
- Computer Forensics with FTK, Fernando Carbone, PACKT Publishing, 2014.
- Practical Mobile Forensics, SatishBommisetty, RohitTamma, Heather Mahalik, PACKT Publishing, 2014.

Practical Course on Elective I-Track B: Cyber and Information Security- II (Cyber Forensics)	
Sr. No.	List of Practical Experiments on Elective I-Track B: Cyber and Information Security- II (Cyber Forensics)
1	Write a program to take backup of mysql database
2	Write a program to restore mysql database
3	Use Drive Image XML to image a hard drive
4	Write a program to create a log file
5	Write a program to find a file in a directory
6	Write a program to find a word in a file
7	Create forensic images of digital devices from volatile data such as memory using Imager for: (i) Computer System; (ii) Server; (iii) MobileDevice
8	Access and extract relevant information from Windows Registry for investigation process using Registry View, perform data analysis and bookmark the findings with respect to: (i) Computer System; (ii) Computer Network; (iii) Mobile Device; (iv) Wireless Network
9	Generate a report based on the analysis done using Registry View for different case scenario of the following: (i) Computer System; (ii) Computer Network; (iii) Mobile Device; (iv) Wireless Network
10	Create a new investigation case using Forensic Tool: (i) Computer System; (ii) Computer Network; (iii) Mobile Device ;(iv) Wireless Network.

Course Code	Course Title	Credits
PCS3BI2	Elective I- Track C: Business Intelligence and Big Data Analytics –II (Mining Massive Data sets)	04

Unit I: Introduction To Big Data

Big data: Introduction to Big data Platform, Traits of big data, Challenges of conventional systems, Web data, Analytic processes and tools, Analysis vs Reporting, Modern data analytic tools, Statistical concepts: Sampling distributions, Re-sampling, Statistical Inference, Prediction error. Data Analysis: Regression modeling, Analysis of time Series: Linear systems analysis, Nonlinear dynamics, Rule induction, Neural networks: Learning and Generalization, Competitive Learning, Principal Component Analysis and Neural Networks, Fuzzy Logic: Extracting Fuzzy Models from Data, Fuzzy Decision Trees, Stochastic Search Methods.

Unit II: MAP REDUCE

Introduction to Map Reduce: The map tasks, Grouping by key, The reduce tasks, Combiners, Details of Map Reduce Execution, Coping with node failures. Algorithms Using Map Reduce: Matrix-Vector Multiplication, Computing Selections and Projections, Union, Intersection, and Difference, Natural Join. Extensions to Map Reduce: Workflow Systems, Recursive extensions to Map Reduce, Common map reduce algorithms.

Unit III: SHINGLING OF DOCUMENTS

Finding Similar Items, Applications of Near-Neighbor Search, Jaccard similarity of sets, Similarity of documents, Collaborative filtering as a similar-sets problem, Documents, k-Shingles, Choosing the Shingle Size, Hashing Shingles, Shingles built from Words. Similarity-Preserving Summaries of Sets, Locality-Sensitive hashing for documents. The Theory of Locality-Sensitive functions. Methods for high degrees of similarity.

Unit IV: MINING DATA STREAMS

Introduction to streams concepts – Stream data model and architecture, Stream computing, Sampling data in a stream, Filtering streams, Counting distinct elements in a stream, Estimating moments, Counting oneness in a Window, Decaying window, Real time analytics Platform(RTAP).

Text book:

- Mining of Massive Datasets, AnandRajaraman and Jeffrey David Ullman, CambridgeUniversity Press,2012.
- BigData,BigAnalytics:EmergingBusinessIntelligenceandAnalyticTrendsfor Today's Businesses, Michael Minelli, Wiley, 2013

References:

- Big Data for Dummies, J. Hurwitz, et al., Wiley,2013
- Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data, Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, McGraw-Hill,2012.
- Big data: The next frontier for innovation, competition, and productivity, James Manyika,Michael Chui, Brad Brown, Jacques Bughin, Richard Dobbs, Charles Roxburgh, Angela Hung Byers, McKinsey Global Institute May2011.
- Big Data Glossary, Pete Warden, O'Reilly,2011.
- Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools,Techniques,NoSQL,andGraph,DavidLoshin,MorganKaufmannPublishers, 2013

Practical Course on Elective II-Track C: Business Intelligence and Big Data Analytics - II	
(Mining Massive Data sets -I)	
Sr. No	List of Practical Experiments on Elective II-Track C: Business Intelligence and Big Data Analytics – II (Mining Massive Data sets –I)
1	Generate regression model and interpret the result for a given data set.
2	Generate forecasting model and interpret the result for a given data set.
3	Write a map-reduce program to count the number of occurrences of each alphabetic character in the given dataset. The count for each letter should be case-insensitive (i.e., include both upper-case and lower-case versions of the letter; Ignore non-alphabetic characters).
4	Write a map-reduce program to count the number of occurrences of each word in the given dataset. (A word is defined as any string of alphabetic characters appearing between non-alphabetic characters like natures is two words. The count should be case-insensitive. If a word occurs multiple times in a line, all should be counted)
5	Write a map-reduce program to determine the average ratings of movies. The input consists of a series of lines, each containing a movie number, user number, rating and a timestamp.
6	Write a map-reduce program: (i) to find matrix-vector multiplication; (ii) to compute selections and projections;(iii)to find union, intersection, difference, natural Join for a given dataset.
7	Write a program to construct different types of k-shingles for given document.
8	Write a program for measuring similarity among documents and detecting passages which have been reused.
9	Write a program to compute the n- moment for a given stream where n is given.
10	Write a program to demonstrate the Alon-Matias-Szegedy Algorithm for second moments.
Note: The experiments may be done using software/tools like Hadoop / WEKA / R / Java etc.	

Course Code	Course Title	Credits
PCS3ML2	Elective I- Track D: Machine Intelligence - II (Advanced Machine Learning Techniques)	04
<p>Unit I: Probability A brief review of probability theory, Some common discrete distributions, Some common continuous distributions, Joint probability distributions, Transformations of random variables, Monte Carlo approximation, Information theory. Directed graphical models (Bayes nets): Introduction, Examples, Inference, Learning, Conditional independence properties of DGMs. Mixture models and EM algorithm: Latent variable models, Mixture models, Parameter estimation for mixture models, The EM algorithm.</p>		
<p>Unit II: Kernels Introduction, kernel function, Using Kernel inside GLMs, kernel trick, Support vector machines, Comparison of discriminative kernel methods. Markov and hidden Markov models: Markov models, Hidden Markov Models (HMM), Inference in HMMs, Learning for HMMs. Undirected graphical models (Markov random fields): Conditional independence properties of UGMs, Parameterization of MRFs, Examples of MRFs, Learning, Conditional random fields (CRFs), applications of CRFs.</p>		
<p>Unit III: Monte Carlo inference Introduction, Sampling from standard distributions, Rejection sampling, Importance sampling, Particle filtering, Applications: visual object tracking, time series forecasting, Rao-Blackwellised Particle Filtering (RBPF). Markov chain Monte Carlo (MCMC) inference: Gibbs sampling, Metropolis Hastings algorithm, Speed and accuracy of MCMC.</p>		
<p>Unit IV: Graphical model structure learning Structure learning for knowledge discovery, Learning tree structures, Learning DAG structure with latent variables, Learning causal DAGs, Learning undirected Gaussian graphical models, Learning undirected discrete graphical models. Deep learning: Deep generative models, Deep neural networks, Applications of deep networks</p>		

Text book:

- Machine Learning: A Probabilistic Perspective: Kevin P Murphy, The MIT Press Cambridge(2012).

References:

- Introducing Monte Carlo Methods with R, Christian P. Robert, George Casella, Springer, 2010
- Introduction to Machine Learning (Third Edition): Ethem Alpaydın, The MIT Press (2015).
- Pattern Recognition and Machine Learning: Christopher M. Bishop, Springer (2006)
- Bayesian Reasoning and Machine Learning: David Barber, Cambridge University Press(2012).
- Statistical And Machine Learning Approaches For Network Analysis, Edited By Matthias Dehmer, Subhash C. Basak: John Wiley & Sons, Inc(2012)
- Practical Graph Mining with R: Edited by Nagiza-F-Samatova et al, CRC Press (2014)
- <https://class.coursera.org/pgm/lecture/preview>

Note:

One may use programming languages like R, Python, Pajek etc and open software/tools like (i)EGONet; (ii)Ora; (iii) Netlogo; (iv)Pajek; and (v)Net Draw; to do the practical experiments.

Practical Course on Elective II- Track D:Machine Intelligence-II(Advanced Machine Learning Techniques)	
Sr. No	List of Practical Experiments on Elective II- Track D:Machine Intelligence-II(Advanced Machine Learning Techniques)
1	Find probability density function or probability mass function, cumulative distribution function and joint distribution function to calculate probabilities and quantiles for standard statistical distributions.
2	Create a Directed Acyclic Graph (DAG) using (i) set of formulae (ii) set of vectors and (iii) set of matrices. Find parents and children of nodes. Read conditional independence from DAG. Add and remove edges from graph.
3	Create a Bayesian network for a given narrative. Set findings and ask queries [One may use narratives like 'chest clinic narrative' and package gRain for the purpose+.
4	Implement EM algorithm.
5	Use string kernel to find the similarity of two amino acid sequence where similarity is defined as the number of a substring uncommon.
6	Demonstrate SVM as a binary classifier.
7	Create a random graph and find its page rank.
8	Apply random walk technique to a multivariate time series.
9	Implement two stage Gibbs Sampler.
10	Implement Metropolis Hastings algorithm.

Detailed syllabus of semester – IV

Course Code	Course Title	Credits
PCS4SIM	Simulation and Modeling	04
<p>Unit I: Introduction Introduction to Simulation, Need of Simulation, Time to simulate, Inside simulation software: Modeling the progress of Time, Modeling Variability, Conceptual Modeling: Introduction to Conceptual modeling, Defining conceptual model, Requirements of the conceptual model, Communicating the conceptual model, Developing the Conceptual Model: Introduction, A framework for conceptual modeling, methods of model simplification.</p>		
<p>Unit II: Model Verification and Validation Data Collection and Analysis: Introduction, Data requirements, Obtaining data, Representing unpredictable variability, Selecting statistical distributions. Obtaining Accurate Results: Introduction, The nature of simulation models and simulation output, Issues in obtaining accurate simulation results, example model, dealing with initialization bias: warm-up and initial conditions, Selecting the number of replications and run-length. Searching the Solution Space: Introduction, The nature of simulation experimentation, Analysis of results from a single scenario, Comparing alternatives, Search experimentation, and Sensitive analysis. Verification, Validation and Confidence: Introduction, Defining Verification and Validation, The difficulties of verification and validation, Methods of verification and validation, Independent verification and validation.</p>		

Unit III: Modeling and simulation modeling

Types of models, Analytical vs Simulation modeling, Application of simulation modeling, Level of abstraction, Simulation Modeling. Methods, System Dynamics, Discrete Event Modeling, Agent Based modeling: Introduction to Agent, Agent-based modeling, Time in agent based models, Space in agent based models, Discrete space, Continuous space movement in continuous space, Communication between agents, Dynamic creation and destruction of agents, Statics on agent population, Condition triggered events and transition in agents. Building agents based models: The problem statement, Phases of modeling, Assumptions, 3 D animation. Dynamics Systems: Stock and flow diagrams, examples of stock and flow diagrams. Multi-method modeling: Architecture, Technical aspects of combining modeling methods, Examples.

Unit IV: Design and behavior of models

Designing state-based behavior: Statecharts, State transitions, Viewing and debugging Statecharts at runtime, Statecharts for dynamic objects. Discrete events and Event model object: Discrete event, Event-the simplest low level model object, Dynamic events, and Exchanging data with external world. Presentation and animation: Working with shapes, groups and colors, Designing interactive models: using controls, Dynamic properties of controls, 3D Animation. Randomness in Models: Probability distributions, sources of randomness in the model, randomness in system dynamics model, random number generators, Model time, date and calendar: Virtual and real time: The model time, date and calendar, Virtual and real-time execution modes.

Text book:

- Simulation: The Practice of Model Development and Use by Stewart Robinson, John Wiley and Sons, Ltd,2004.
- TheBigBookofSimulationModeling:MultiMethodModelingbyAndrei Borshchev, 2013.

References:

- Agent Based Modeling and Simulation, Taylor S,2014.
- Simulation Modeling Handbook: A Practical Approach, Christopher A. Chung, 2003.
- Object Oriented Simulation: A Modeling and Programming Perspective, Garrido, José M,2009.
- Simulation, Modeling and Analysis, Averill MLaw and W. David Kelton, "Tata McGrawHill, Third Edition,2003.
- Process Control: Modeling, Design and Simulation, Wayne Bequette W,Prentice Hall of India, 2003.

Practical course on Simulation and modeling

Sr. No	List of Practical Experimentson Simulation and modeling
1	<p>Design and develop agent based model by</p> <ul style="list-style-type: none"> • Creating the agentpopulation • Defining the agentbehavior • Add a chart to visualize the modeloutput. <p>[Use a case scenario like grocery store, telephone call center etc for the purpose].</p>

2	<p>Design and develop agent based model by</p> <ul style="list-style-type: none"> • Creating the agentpopulation • Defining the agentbehavior • Adding a chart to visualize the modeloutput • Adding word of moutheffect • Considering productdiscards
3	<p>Design and develop agent based model by</p> <ul style="list-style-type: none"> • Creating the agentpopulation • Defining the agentbehavior • Adding a chart to visualize the modeloutput • Adding word of moutheffect • Considering productdiscards • Consider deliverytime • Simulating agentimpatience • Comparing model runs with different parameter values <p>[Use a scenario like marketmodel]</p>
4	<p>Design and develop System Dynamic modelby</p> <ul style="list-style-type: none"> • Creating a stock and flowdiagram • Adding a plot to visualizedynamics • ParameterVariation • Calibration <p>[Use a case scenario like spread of contagious disease for the purpose]</p>
5	<p>Design and develop a discrete-event model that will simulate process by:</p> <ul style="list-style-type: none"> • Creating a simple model • Adding resources • Creating 3Danimation • Modeling delivery <p>*Use a case situation like a company's manufacturing and shipping+.</p>

6	Design and develop time-slice simulation for a scenario like airport model to design how passengers move within a small airport that hosts two airlines, each with their own gate. Passengers arrive at the airport, check in, pass the security checkpoint and then go to the waiting area. After boarding starts, each airline's representatives check their passengers' tickets before they allow them to board.
7	Verify and validate a model developed like bank model or manufacturing model
8	Create defense model to stimulate aircraft behavior
9	Stimulate the travelling sales man problem to compute the shortest path.
10	Stimulate the Urban dynamics to address the scenarios like: (a) The problem of public transport line (b) To compute the time taken for train to enter the station

Course Code	Course Title	Credits
PCS4CL3	Specialization: Cloud Computing - III(Building Clouds and Services)	04
<p>Unit I: Specialized Cloud Mechanisms: Automated Scaling listener, Load Balancer, SLA monitor, Pay-per-use monitor, Audit monitor, fail over system, Hypervisor, Resource Centre, Multi device broker, State Management Database.</p>		
<p>Unit II: Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture. Advanced Cloud Architectures: Hypervisor Clustering Architecture, Load Balanced Virtual Server Instances Architecture, Non-Disruptive Service Relocation Architecture, Zero Downtime Architecture, Cloud Balancing Architecture, Resource Reservation Architecture, Dynamic Failure Detection and Recovery Architecture, Bare-Metal Provisioning Architecture, Rapid Provisioning Architecture, Storage Workload Management Architecture</p>		
<p>Unit III: Cloud Management: System Center 2012 and Cloud OS, Provisioning Infrastructure: Provisioning Infrastructure with Virtual Machine Designing, Planning and Implementing. Managing Hyper-V Environment with VMM 2012. Provisioning Self-service with App Controller.</p>		
<p>Unit IV: Implementing Monitoring: Real-time monitoring with Operations Manager, Proactive monitoring with Advisor, Operations Design, Planning, Implementation, Administration, Monitoring, Alerting, Operations and Security reporting. Building private clouds: Standardization with service manager, Service Manager 2012: Design, Planning, Implementing, Incident Tracking, Automation with orchestrator, System Orchestrator 2012.</p>		

Text book:

- Cloud Computing Concepts, Technology & Architecture, Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, Prentice Hall, 2013.
- Cloud Security - A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley Publishing, Inc., 2010.
- Open Stack Cloud Computing Cookbook, Kevin Jackson, Cody Bunch, Egle Sigler, Packt Publishing, Third Edition, 2015.

Reference:

- Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, and Joe, Topjian, OpenStack Operations Guide, O'Reilly Media, Inc, 2014.
- NIST Cloud Computing Standards Roadmap, Special Publication 500-291, Version 2, NIST, July 2013, http://www.nist.gov/itl/cloud/upload/NIST_SP-500-291_Version-2_2013_June18_FINAL.pdf
- <https://www.openstack.org>
- <http://cloudstack.apache.org>
- <http://www.foss-cloud.org/en/wiki/FOSS-Cloud>
- <http://www.ubuntu.com/cloud/openstack/autopilot>

**Practical Course on Cloud Computing
-III
(Building Clouds and Services)**

Sr. No	List of Practical Experiments on Cloud Computing -III (Building Clouds and Services)
1	Managing private cloud with App Controller
2	Perform the practical Using Orchestrator for automation
3	Implement Windows Azure Pack
4	Implement VMWareESXi Server

5	Managing and working of XEN for server virtualization
6	Implement Hyper-V server virtualization using server 2012
7	Managing vmware ESXi with vCentre server
8	Perform Practical to Manage xen server or Xen center
9	Design and Understanding blade server with cisco UCS/HP eva simulator
10	Perform Provisioning Self-service with App Controller

Course Code	Course Title	Credits
PCS4CI3	Specialization: Cyber and Information Security (Cryptography and Crypt Analysis)	04

Unit I: Introduction to Number Theory

Topics in Elementary Number Theory: O and notations, time estimates for doing arithmetic-divisibility and the Euclidean algorithm, Congruence: Definitions and properties, linear congruence, residue classes, Euler's phi function, Fermat's Little Theorem, Chinese Remainder Theorem, Applications to factoring, finite fields, quadratic residues and reciprocity: Quadratic residues, Legendre symbol, Jacobi Symbol. (proofs of the theorems are not expected to cover).

Unit II: Simple Cryptosystems

Shift Cipher, Substitution Cipher, Affine Cipher, Vigenère Cipher, Vernam Cipher, Hill Cipher, Permutation Cipher, Stream Cipher, Cryptanalysis of Affine Cipher, Substitution Cipher, Vigenère Cipher and Hill Cipher, Block Ciphers, Algorithm Modes, DES, Double DES, Triple DES, Meet-in-Middle Attack, AES, IDEA algorithm. Cryptographic Hash Functions: Hash Functions and Data Integrity, Security of Hash Functions, Secure Hash Algorithm, Message Authentication Code, Nested MACs, HMAC.

Unit III: RSA Cryptosystem

The RSA Algorithm, Primarily Testing, Legendre and Jacobi Symbols, The Solovay- Strassen Algorithm, The Miller-Rabin Algorithm, Factoring Algorithm: The pollard p-1 Algorithm, Dixon's Random Squares Algorithm, Attacks on RSA, **The Rabin Cryptosystem**. Public Key Cryptosystems: The idea of public key Cryptography, **The Diffie-Hellman Key Agreement**, ElGamal Cryptosystem, The Pollard Rho Discrete Logarithm Algorithm, Elliptic Curves, **Knapsack problem**.

Unit IV: Key Distribution and Key Agreement Scheme

Diffie-Hellman Key distribution and Key agreement scheme, Key Distribution Patterns, Mitchell-Piper Key distribution pattern, Station-to-station protocol, MTI Key Agreement scheme. Public-Key Infrastructure: What is PKI?, Secure **Socket Layer**, **Certificates**, **Certificate Life cycle**, **Trust Models**: Strict Hierarchy Model, Networked PKIs, The web browser Model, Pretty Good Privacy.

Text book:

- Discrete Mathematics and Its Applications, Kenneth H. Rosen, 7th Edition, McGrawHill,2012.
- Cryptography Theory and Practice, 3rd Edition, Douglas R. Stinson,2005.

Reference:

- Network Security and Cryptography, AtulKahate, McGraw Hill,2003.
- Cryptography and Network Security: Principles and Practices, William Stalling, FourthEdition, Prentice Hall, 2013.
- Introduction to Cryptography with coding theory, second edition, Wade Trappe, Lawrence C. Washington, Pearson, 2005.

Practical Course on Specialization: Cyber & Information Security (Cryptography and Crypt Analysis)	
Sr. No	List of Practical Experiments on Specialization: Cyber & Information Security (Cryptography and Crypt Analysis)
1	Write a program to implement following: <ul style="list-style-type: none"> • Chinese Remainder Theorem • Fermat's Little Theorem
2	Write a program to implement the (i) Affine Cipher (ii) Rail Fence Technique (iii) Simple Columnar Technique (iv) Verman Cipher (v) Hill Cipher to perform encryption and decryption.
3	Write a program to implement the (i) RSA Algorithm to perform encryption and decryption.
4	Write a program to implement the (i) Miller-Rabin Algorithm (ii) pollard p-1 Algorithm to perform encryption and decryption.
5	Write a program to implement the ElGamal Cryptosystem to generate keys and perform encryption and decryption.
6	Write a program to implement the Diffie-Hellman Key Agreement algorithm to generate symmetric keys.
7	Write a program to implement the MD5 algorithm compute the message digest.
8	Write a program to implement different processes of DES algorithm like (i) Initial Permutation process of DES algorithm, (ii) Generate Keys for DES algorithm, (iii) S-Box substitution for DES algorithm.
9	Write a program to encrypt and decrypt text using IDEA algorithm.
10	Write a program to implement HMAC signatures.

Course Code	Course Title	Credits
PCS4BI3	Specialization: Business Intelligence and Big Data Analytics (Intelligent Data Analysis)	04
<p>Unit I: Clustering Distance/Similarity, Partitioning Algorithm: K-Means; K-Medoids, Partitioning Algorithm for large data set: CLARA; CLARANS, Hierarchical Algorithms: Agglomerative (AGNES); Divisive (DIANA), Density based clustering: DBSCAN, Clustering in Non- Euclidean Spaces, Clustering for Streams and Parallelism.</p>		
<p>Unit II: Classification Challenges, Distance based Algorithm: K nearest Neighbors and kD-Trees, Rules and Trees based Classifiers, Information gain theory, Statistical based classifiers: Bayesian classification, Document classification, Bayesian Networks. Introduction to Support</p>		
<p>Vector Machines, Evaluation: Confusion Matrix, Costs, Lift Curves, ROC Curves, Regression/model trees: CHAID (Chi Squared Automatic Interaction Detector). CART (Classification And Regression Tree).</p>		
<p>Unit III: Dimensionality Reduction Introduction to Eigen values and Eigen vectors of Symmetric Matrices, Principal- Component Analysis, Singular- Value Decomposition, CUR Decomposition.</p>		
<p>Unit IV: Link Analysis And Recommendation Systems Link analysis: PageRank, Efficient Computation of PageRank, Topic-Sensitive PageRank, Link Spam. Recommendation Systems: A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering, Dimensionality Reduction.</p>		
<p>Text book:</p> <ul style="list-style-type: none"> • Mining of Massive Datasets, AnandRajaraman and Jeffrey David Ullman, Cambridge University Press, 2012. • Data Mining: Introductory and Advanced Topics, Margaret H. Dunham, Pearson, 2013. 		

Reference:

- Big Data for Dummies, J. Hurwitz, et al., Wiley,2013.
- Networks, Crowds, and Markets: Reasoning about a Highly Connected World, DavidEasley and Jon Kleinberg, Cambridge University Press, 2010.
- Lecture Notes in Data Mining, Berry, Browne, World Scientific,2009.
- Data Mining: Concepts and Techniques third edition, Han and Kamber, Morgan Kaufmann,2011.
- Data Mining Practical Machine Learning Tools and Techniques, Ian H. Witten, Eibe Frank, The Morgan Kaufmann Series in Data Management Systems,2005.
- Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL and Graph, David Loshin, Morgan Kaufmann Publishers, 2013.

Practical Course on Specialization: Business Intelligence & Big Data Analytics

(Intelligent Data Analysis)

Sr. No.	List of Practical Experiments on Specialization: Business Intelligence & Big Data Analytics (Intelligent Data Analysis)
1	Pre-process the given dataset and hence apply clustering techniques like K-Means, K-Medoids. Interpret the result.
2	Pre-process the given data set and hence apply partition clustering algorithms. Interpret the result
3	Pre-process the given data set and hence apply hierarchical algorithms and density based clustering techniques. Interpret the result.

4	Pre-process the given data set and hence classify the resultant data set using tree classification techniques. Interpret the result.
5	Pre-process the given data set and hence classify the resultant data set using Statistical based classifiers. Interpret the result.
6	Pre-process the given data set and hence classify the resultant data set using support vector machine. Interpret the result.
7	Write a program to explain different functions of Principal Components.
8	Write a program to explain CUR Decomposition technique.
9	Write a program to explain links to establish higher-order relationships among entities in Link Analysis.
10	Write a program to implement step-by-step a Collaborative Filtering Recommender System.
The experiments may be done using software/ tools like R/Weka/Java etc.	

Course Code	Course Title	Credits
PCS4ML3	Specialization: Machine Learning - III(Computational Intelligence)	04

Unit I: Artificial Neural Networks

The Artificial Neuron, Supervised Learning Neural Networks, Unsupervised Learning Neural Networks, Radial Basis Function Networks, Reinforcement Learning, Performance Issues.

Unit II: Evolutionary Computation

Introduction to Evolutionary Computation, Genetic Algorithms, Genetic Programming, Evolutionary Programming, Evolution Strategies, Differential Evolution, Cultural Algorithms, Co - evolution.

Unit III: Computational Swarm Intelligence

Particle Swarm Optimization(PSO) - Basic Particle Swarm Optimization, Social Network Structures, Basic Variations and parameters, Single-Solution PSO. Advanced Topics and applications. Ant Algorithms- Ant Colony Optimization Meta-Heuristic, Cemetery Organization and Brood Care, Division of Labor, Advanced Topics and applications.

Unit IV: Artificial Immune systems, Fuzzy Systems and Rough Sets

Natural Immune System, Artificial Immune Models, Fuzzy Sets, Fuzzy Logic and Reasoning, Fuzzy Controllers, Rough Sets.

Text book:

- Computational Intelligence- An Introduction (Second Edition): Andries P.Engelbrecht, John Wiley & Sons Publications(2007).

Reference:

- Computational Intelligence And Feature Selection: Rough And Fuzzy Approaches, Richard Jensen QiangShen, IEEE Press Series On Computational Intelligence, A John Wiley & Sons, Inc., Publication,2008.
- Computational Intelligence And Pattern Analysis In Biological Informatics, (Editors).UjjwalMaulik,SanghamitraBandyopadhyay,JasonT.L.Wang,John Wiley & Sons, Inc, 2010.

- Neural Networks for Applied Sciences and Engineering: From Fundamentals to Complex Pattern Recognition 1st Edition, Sandhya Samarasinghe, Auerbach Publications, 2006.
- Introduction to Evolutionary Computing (Natural Computing Series) 2nd ed, A.E. Eiben, James E Smith, Springer; 2015.
- Swarm Intelligence, 1st Edition, Russell C. Eberhart, Yuhui Shi, James Kennedy, Morgan Kaufmann, 2001
- Artificial Immune System: Applications in Computer Security, Ying Tan, Wiley-IEEE Computer Society, 2016.
- Computational Intelligence and Feature Selection: Rough and Fuzzy Approaches 1st Edition, Richard Jensen, Qiang Shen, Wiley-IEEE Press, 2008

**Practical Course on Specialization:
Machine Intelligence (Computational
Intelligence)**

Sr No	List of Practical Experiments on Specialization: Machine Intelligence (Computational Intelligence)
1	Implement feed forward neural network for a given data.
2	Implement Self Organizing Map neural network.
3	Implement Radial Basis Function neural network with gradient descent.
4	Implement a basic genetic algorithm with selection, mutation and crossover as genetic operators.
5	Implement evolution strategy algorithm.
6	Implement general differential evolution algorithm.
7	Implement gbest and lbest of PSO.
8	Implement simple Ant colony optimization algorithm.
9	Implement basic artificial immune system algorithm.
10	Apply different defuzzification methods for centroid calculation of a given fuzzy rule base.

Note: The above practical experiments may use programming languages like C, Java, R etc.

Scheme of Examination for Practical Courses

There will not be any internal examination for practical courses.

External Examination for practical courses:

The evaluation of the external examination of practical course is given below:

Sr No	Semester	Course Code	Particular	No of questions	Marks per question	Total Marks
1	III	PCS3PPR1	Laboratory experiment Question	2	40	80
			Journal	-	10	10
			Viva	-	10	10
		Marks for each course			100	
2	III	PCS3PPR2	Laboratory experiment Question	2	25	50
			Journal	-	10	10
			Viva	-	10	10
			viva on Project Proposal	Documentation	10	30
		Presentation	10			
		Viva	10			
Total Marks			100			

Sr No	Semester	Course Code	Particular		No of questions	Marks per question	Total Marks
1	IV	PCS4PPR1	Laboratory experiment question		2	40	80
			Journal		-	10	10
			Viva		-	10	10
		Total Marks				100	
2	IV	PCS4PPR2	Intern-ship	Internship conduct	Quality and relevance	40	100
					Documentation	30	
				Presentation	30		
			Internship Viva	50	50		
Total Marks				150			
3	IV	PCS4PPR3	Project Implementation	Project conduct	Quality and relevance	40	100
					Documentation	30	
				Presentation	30		
			Project viva	50	50		
Total Marks				150			

Guide lines for maintenance of journals:

A student should maintain a journal with at least six practical experiments for each part of the practical course. Certified journals need to be submitted at the time of the practical examination.

Guidelines for Project Proposal in Semester - III

- Student should take a topic related to the specialization he or she is planning to take in Semester-IV.
- Should have studied the related topics in the elective he or she has chosen in semester-II and semester-III
- A student is expected to devote at least 2 to 3 months of study as part of topic selection and its documentation.
- The student should be comfortable to implement the proposal in the semester – IV.

Guidelines for Documentation of Project Proposal –III

Student is expected to make a project proposal documentation which should contain the following:

- **Title:** A suitable title giving the idea about what work is proposed.
- **Introduction:** An introduction to the topic of around 3-5 pages, giving proper background of the topic discussed.
- **Related works:** A detailed survey of the relevant works done by others in the domain. Student is expected to refer at least 5 research papers in addition to text books and web-links in the relevant topic. It may be around 7 to 10pages.
- **Objective:** A detailed objective of the proposal is needed. It may be of 1 to 2 pages.
- **Methodology:** A proper and detailed procedure of how to solve the problem discussed. It shall contain the techniques, tools, software and data to be used. It shall be of around 3 to 5pages.

The report may be of around 20 pages, which needs to be signed by the teacher in charge and head of the Department. Students should submit the signed project proposal documentation at the time of viva as part of the University examination.

Guidelines for internship in Semester - IV

- Internship should be of 2 to 3 months with 8 to 12 weeks duration.
- A student is expected to find internship by himself or herself. However, the institution should assist their students in getting internship in good organizations.
- The home institution cannot be taken as the place of internship.
- A student is expected to devote at least 300 hours physically at the organization.
- Internship can be on any topic covered in the syllabus mentioned in the syllabus, not restricted to the specialization.
- Internship can be done, in one of the following, but not restricted to, types of organizations:
 - Software development firms
 - Hardware/ manufacturing firms
 - Any small scale industries, service providers like banks
 - Clinics/ NGOs/professional institutions like that of CA, Advocate etc
 - Civic Depts like Ward office/post office/police station/punchayat.
 - Research Centres/ University Depts/ College as research Assistant for research projects or similar capacities.

Guidelines for making Internship Report in Semester –IV

A student is expected to make a report based on the internship he or she has done in an organization. It should contain the following:

- **Certificate:** A certificate in the prescribed Performa (given in appendix 1) from the organization where the internship done.
- **Evaluation form:** The form filled by the supervisor or to whom the intern was reporting, in the prescribed Performa (given in appendix2).

- **Title:** A suitable title giving the idea about what work the student has performed during the internship.
- **Description of the organization:** A small description of 1 to 2 pages on the organization where the student has interned
- **Description about the activities done by the section where the intern has worked:** A description of 2 to 4 pages about the section or cell of the organization where the intern actually worked. This should give an idea about the type of activity a new employee is expected to do in that section of the organization.
- **Description of work allotted and actually done by the intern:** A detailed description of the work allotted and actual work performed by the intern during the internship period. Intern may give a weekly report of the work by him or her if needed. It shall be of around 7 to 10pages.
- **Self-assessment:** A self-assessment by the intern on what he or she has learnt during the internship period. It shall contain both technical as well as inter personal skills learned in the process. It shall be of around 2 to 3pages.

The internship report may be around 15 pages and this needs to be submitted to the external examiner at the time of University examination.

Guidelines for Research Implementation in Semester - IV

- Student should continue with topic proposed and evaluated at the semester –III.
- The topic has to be related with the specialization he or she has chosen in the semester – IV.
- A student is expected to devote at least 3 to 4 months of efforts for the implementation.
- Student should submit a detailed project implementation report at the time of viva.

Guidelines for Documentation of Project Proposal in Semester –IV

A Student should submit project implementation report with following details:

- **Title:** Title of the project (Same as the one proposed and evaluated at the semester II examination).
- **Implementation details:** A description of how the project has been implemented. It shall be of 2 to 4pages.
- **Experimental set up and results:** A detailed explanation on how experiments were conducted, what software used and the results obtained. Details like screen shots, tables and graphs can come here. It shall be of 6 to 10pages.
- **Analysis of the results:** A description on what the results means and how they have been arrived at. Different performing measures or statistical tools used etc may be part of this. It shall be of 4 to 6pages.
- **Conclusion:** A conclusion of the project performed in terms of its outcome (May be half a page).
- **Future enhancement:** A small description on what enhancement can be done when more time and resources are available (May be half a page).
- **Program code:** The program code may be given as appendix.

The report may be of around 20 pages (excluding program code), which needs to be signed by the teacher in charge and head of the Department. Student should submit the signed project implementation report along with evaluated copy of the project proposal documentation (of semester –III) at the time of Project evaluation and viva as part of the University examination.

Appendix 1

(Proforma for the certificate for internship in official letter head)

This is to certify that Mr/Ms _____ of _____ College/Institution worked as an intern as part of her MSc course in Computer Science of University of Mumbai. The particulars of internship are given below:

Internship starting date: _____

Internship ending date: _____

Actual number of days worked: _____

Tentative number of hours worked: _____ Hours

Broad area of work: _____

A small description of work done by the intern during the period:

Signature:

Name:

Designation:

Contact number:

Email:

(seal of the organization)

Appendix 2

(Proforma for the Evaluation of the intern by the supervisor/to whom the intern was reporting in the organization)

Professional Evaluation of intern

Name of intern: _____

College/institution: _____

[Note: Give a score in the 1-5 scale by putting \surd in the respective cells]

Sr No	Particular	Excellent	Very Good	Good	Moderate	Satisfactory
1	Attendance					
2	Punctuality					
3	Adaptability					
4	Ability to shoulder responsibility					
5	Ability to work in a team					
6	Written and oral communication skills					
7	Problem solving skills					
8	Ability to grasp new concepts					
9	Ability to complete task					
10	Quality of work done					

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Comments:

Signature:

Name:

Designation:

Contact number:

Email:

(seal of the organization)



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

Re-accredited „A+“ Grade by NAAC
„College with Potential for Excellence“ Status Awarded by UGC
„Best College Award“ by University of Mumbai

Program: M. Sc. in Data Analytics

SYLLABUS

M.Sc. in Data Analytics

As per

Choice Based Credit System (60:40)

w. e. f. Academic Year 2022-23

M. Sc. in Data Analytics

Programme Outcomes

SR. NO.	After completion of M.Sc. in Data Analytics program students will acquire following programme outputs	Graduate Attributes
PO1	An ability to identify and describe broadly accepted methodologies of science, and different modes of reasoning.	Disciplinary knowledge
PO2	An ability to demonstrate proficiency in various instrumentation, modern tools, advanced techniques and ICT to meet industrial expectations and research outputs.	Disciplinary knowledge/Digital literacy
PO3	An ability to identify problems, formulates, and proves hypotheses by applying theoretical knowledge and skills relevant to the discipline.	Problem-solving
PO4	An ability to articulate thoughts, research ideas, information, scientific outcomes in oral and in written presentation to a range of audience.	Communication skills
PO5	A capacity for independent, conceptual and creative thinking, analysis and problem solving through the existing methods of enquiry.	Problem solving
PO6	Skills required for cutting edge research, investigations, field study, documentation, networking, and ability to build logical arguments using scholarly evidence.	Research skills
PO7	An ability to portray good interpersonal skills with ability to work collaboratively as part of a team undertaking a range of different team roles	Teamwork
PO8	The ability to understand ethical responsibilities and impact of scientific solutions in global, societal and environmental context and contribute to the sustainable development	Moral and ethical awareness/ multicultural competence
PO9	An ability to demonstrate leadership, to take action and to get others involved.	Leadership
PO10	An openness to and interest in, life-long learning through directed and self-directed study	Self-directed learning
PO11	An ability to translate the knowledge and demonstrate the skills required to be employed and successful professional development.	Life-long learning

M. Sc. in Data Analytics

Syllabus for Semester I and II

Preamble:

The M.Sc. Data Analytics programme has been designed with an aim to make the learners employable and impart industry-oriented training. The curriculum for the two-year integrated course is systematically designed considering the current industry needs in terms of set of skills demanded under the new technological environment. It also endeavors to align the programme structure and course curriculum with student's aspirations and corporate expectations. The proposed curriculum is more contextual and industry oriented in the present perspective.

First year of this programme is about studying fundamentals of data analytics. Statistical methods and Probability distribution acquaints the learners with some basic concepts in Statistics. It also covers analysis of the statistical methods using R along with collecting, visualizing and presenting the data. It is essential for the learners to explore object oriented concepts and develop the designing skills. The course Python Programming satisfies the need of being able to build programming logic and development skills. The course Big Data analytics introduces the tools required to manage and analyze big data like Hadoop. It will enable the learners to have skills that will help them to solve complex real-world problems for decision making process. There is also a dedicated course Cloud Computing and virtualization which explains the core concepts of the cloud computing paradigm and the virtualization technologies. It also caters to the modern days need of being able to identify security issues in cloud computing and apply the fundamental concepts in data center. Advanced Statistical Methods and Testing of Hypotheses introduce the concepts of hypotheses testing. It helps the learners to understand statistical analysis and interpret the data analysis using R.

Introducing one of the upcoming and popular programme in Data Science will definitely open a future area as a data scientist. This programme develops an in-depth understanding of the key technologies in data science and business analytics which includes data mining, machine learning, visualization techniques, predictive modeling, and statistics.

Considering the present day need of having knowledge of future database technologies required to handle big data Next Generation Database have been included as a separate course. It provides in-depth knowledge of the next generation of databases and future database technologies from NoSQL to MongoDB. The course of Machine Learning enables the understanding and application of various machine learning algorithms to solve problems of moderate complexity.

Programme Objectives:

The main objectives of the programme are:

- To gather sufficient relevant data, conduct data analytics using scientific methods and make appropriate and powerful connections between quantitative analysis and real world problems.
- To apply their knowledge and skills to be employed and excel in the field of Data Analytics.
- To be proficient with the tools and techniques required to work with and analyze today's increasingly complex data sets.
- To use advanced techniques to conduct thorough and insightful analysis, and interpret the results correctly with detailed and useful information.
- To show substantial understanding of real problems, conduct deep analytics using correct methods and draw reasonable conclusions with sufficient explanation and elaboration.
- To manifest industry-oriented education in data science and analytics.

PROGRAMME SPECIFIC OUTCOMES (PSOs')

PSO	After completing Master's Degree in Data Analytics learners will be able to:
PSO 1	Achieve data analytics job opportunities from a variety of industries which match specific skills, and interests.
PSO 2	Improve one's decision making power in multiple development areas and deduce cost effective solutions.
PSO 3	Identify applications of Data Science Technologies in real world.

Choice Based Credit System (CBCS)
M. Sc. in Data Analytics Syllabus
To be implemented from the Academic year 2022-2023

Course Structure

No. of Courses	Semester I	Credits	No. of Courses	Semester II	Credits
1	Core Courses (CC)		1	Core Courses (CC)	
1	Statistical Methods and probability distribution	04	1	Advanced Statistical Methods and Testing of Hypothesis	04
2	Python Programming	04	2	Data Science	04
3	Practical of Statistical Methods and probability distribution + Practical of Python Programming	04	3	Practical of Advanced Statistical Methods and Testing of Hypothesis + Practical of Data Science	04
2	Ability Enhancement Courses (AEC)		2	Ability Enhancement Courses (AEC)	
2A	Ability Enhancement Compulsory Course (AECC)		2A	Ability Enhancement Compulsory Course (AECC)	
4	Business Intelligence and Big Data Analytics	04	4	Next generation Technology	04
2B	*Skill Enhancement Courses (SEC)		2B	*Skill Enhancement Courses (SEC)	
5	Cloud Computing and Virtualization	04	5	Machine Learning	04
6	Practical of Business Intelligence and Big Data Analytics + Practical of Cloud Computing and Virtualization	04	6	Practical of Next generation Technology + Practical of Machine Learning	04
Total Credits		24	Total Credits		24

Semester – I

[Under CBCS Scheme]

Sr.no	Course	Course Type	Course Code	Hrs/week	Assessment			Credits
					Internal Assessment (40 %)	Semester-End Examination (60%)	Total (100%)	
1	Statistical Methods and probability distribution	Core	PDA1SMP	4	40	60	100	4
2	Python Programming	Core	PDA1PYP	4	40	60	100	4
3	Business Intelligence and Big Data Analytics	Ability Enhancement Courses	PDA1BDA	4	40	60	100	4
4	Cloud Computing and Virtualization	Skill Enhancement Courses (SEC)	PDA1CCV	4	40	60	100	4
5	Practical of PDA1SMP + PDA1PYP	Core	PDA1PPR1	4	--	100	100	4
6	Practical of PDA1BDA + PDA1CCV	Skill Enhancement Courses (SEC)	PDA1PPR2	4	--	100	100	4
Total							600	24

Semester – II

[Under CBCS Scheme]

Sr. No	Course	Course Type	Course code	Hrs/ week	Assessment			Credits
					Internal Assessment (40 %)	Semester-End Examination (60%)	Total (100%)	
1	Advanced Statistical Methods and Testing of Hypothesis	Core	PDA2SMT	4	40	60	100	4
2	Data Science	Core	PDA2DTS	4	40	60	100	4
3	Next generation Technology	Ability Enhancement Courses	PDA2ADB	4	40	60	100	4
4	Machine Learning	Skill Enhancement Courses (SEC)	PDA2MLG	4	40	60	100	4
5	Practical of PDA2SMT + PDA2DTS	Core	PDA2PPR1	4	--	100	100	4
6	Practical of PDA2NGD+ PDA2MLG	Skill Enhancement Courses (SEC)	PDA2PPR2	4	--	100	100	4
Total							600	24

Examination Scheme

I. Continuous Internal Examination: 40 % - 40 Marks

Marks	Group Project*/ Individual Project	Presentation and write-up	Practical Skills	Open book test	Quiz
5	Hypothesis/Topic of the project	Presentation skill	Demonstration of skill	High order thinking questions (HOTS)	Quiz on application of subject in real life
5	Actual laboratory work/Field work	Knowledge	Viva		
5	Result/output	Quality of ppt	Report		
5	Dissertation/Report	Writing skill	Problem solving ability		

II. External Examination: 60% - 60 Marks

Question Paper Pattern

<ul style="list-style-type: none"> ● There shall be five questions each of 12 marks. ● All questions shall be compulsory with internal options. ● Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit. 		
Question	Based on	Marks
Q.1	Unit I	12
Q.2	Unit II	12
Q.3	Unit III	12
Q.4	Unit IV	12
Q.5	Unit I,II,III,IV	12

III. Practical Examination: 50 Marks

Sr. No.	Particulars of External	Marks
1	Laboratory Work	40
2	Journal	05
3	Viva	05
	TOTAL	50

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

SEMESTER I

Paper I

Course Description	
Semester	I
Course Name	Statistical methods and Probability distribution
Course Code	PGDA1SMP
Credit	4
Hours	60

Course Objectives

1. To acquaint learners with some basic concepts in Statistics
2. To fit various probability distributions and to study various real-life situations
3. To analyze the statistical methods using R.
4. To collect, visualize and present the data.

Course Outcomes:

Learners will be able to :

1. Apply the descriptive statistical concepts.
2. Categorize the data by making displays, summaries and tables.
3. Apply the standard discrete probability distributions to various situations.
4. Evaluate various continuous probability distributions.

Course Code:	Course Title	Credits
PGDA1SMP	Statistical methods and Probability distribution	04
Unit I	Descriptive Statistics: Measures of central tendency: Mean, Median, Mode. Measures of dispersion: Variance, standard deviation, coefficient of variation. Partition Values: Quartiles, Deciles, Percentiles, Box Plot. Skewness and Kurtosis.	15L

<p>Unit II</p>	<p>Data Collection & Data Visualization: Concepts of measurement, scales of measurement, design of data collection formats with illustration, data quality and issues with data collection systems with examples from business, cleaning and treatment of missing data, principles of data visualization, and different methods of presenting data in business analytics.</p>	<p>15L</p>
<p>Unit III</p>	<p>Introduction to Probability: Probability - classical definition, probability models, axioms of probability, probability of an event. Concepts and definitions of conditional probability, independent events, multiplication theorem, Bayes' theorem (without proof). Discrete Distribution: Definition, Probability density function, cumulative distribution function, mathematical expectation: Binomial distribution, Poisson distribution, Multinomial distribution, Negative binomial distribution, uniform distribution.</p>	<p>15L</p>
<p>Unit IV</p>	<p>Continuous Distribution: Definition, Probability density function, cumulative distribution function, mathematical expectation: Continuous Uniform distribution, Normal distribution, Exponential distribution, Gamma distribution, Weibull distribution, Pareto distribution, Log normal distribution, Laplace distribution, Cauchy distribution, Logistic applications.</p>	<p>15L</p>
	<p>Textbooks:</p> <ul style="list-style-type: none"> ● Gupta S. C., & Kapoor V. K., Fundamental of Mathematical Statistics, Sultan Chand & Sons, 2002. ● STATISTICS by Murray R. Spiegel, Larry J. Stephens. McGRAW HILL INTERNATIONAL FOURTH edition 	
	<p>References:</p> <ul style="list-style-type: none"> ● FUNDAMENTAL OF MATHEMATICAL STATISTICS by S.C. GUPTA and V.K. KAPOOR SULTAN CHAND and SONS ELEVENTH REVISED 2011 ● A Practical Approach using R by R.B. Patil, H.J. Dand and R. Bhavsar, SPD, 1st, 2017 ● James G., Witten D., Hastie T., & Tibshirani R, An introduction to statistical learning: with Applications in R, Springer, 2013. ● The visual display of Quantitative Information: Edward Tufte, Graphics Press, 2001. ● Best Practices in Data Cleaning: Jason W. Osborne, Sage Publications 2012. 	

Practical Course on Statistical methods and Probability distribution	
Sr. No	List of Practical Experiments on Statistical methods and Probability distribution
1	Execute the basic commands, array, list and frames in R.
2	Defining functions and making reports in markdown.
3	Loading dataset and visualizing data in R.
4	Using R Execute the statistical functions: mean, median, mode, quartiles, range, inter quartile range.
5	Using R import the data from Excel and perform the above functions.
6	Using R import the data from Excel and calculate the standard deviation, variance, co-variance.
7	Using R import the data from Excel and draw the skewness.
8	Computing probabilities in R.
9	Using R perform the binomial and normal distribution on the data.
10	Functions for probability distributions in R.

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Descriptive Statistics	15	1	3	3
2	Data Collection & Data Visualization	15	2	3	3
3	Introduction to Probability, Discrete Distribution	15	3	3	3
4	Continuous Distribution	15	4	3	3

Paper-II

Course Description	
Semester	I
Course Name	Python Programming
Course Code	PDA1PYP
Credit	4
Hours	60

Course Objectives

1. To build programming logic and development skills in Python
2. To create user-defined functions and apply core concepts in Python
3. To explore object-oriented concepts in Python
4. To develop the designing skills and implement database concepts in Python

Course Outcomes

Learners will be able to :

1. Explain the core concepts of the python programming language
2. Create the python programs using compound data types
3. Explain facts of object-oriented concepts & modules
4. Design and implement GUI & Database applications

Course Code: PDA1PYP	Course Title	Credits 04
	Python Programming	
Unit I	<p>Introduction: The Python Programming Language, History, features, Installing Python, Running Python program, Debugging: Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses, Variables, and Expressions Values and Types, Variables, Variable Names and Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.</p> <p>Conditional Statements: if, if-else, nested if-else</p> <p>Looping: for, while, nested loops</p> <p>Control statements: Terminating loops, skipping specific conditions</p>	15L
Unit II	<p>Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Defining and Adding New Functions, Void and lambda Functions</p>	15L

	<p>Strings: Creating a String, String Slices, Searching, Looping and Counting Strings, String Methods, The in Operator, String Comparison, String Operations.</p> <p>Compound Data Types: str, set, tuple, and list (enclosed in quotes, parentheses, and brackets, respectively). Indexing individual elements within these types, Built-in functions, and methods of these types, enumerate the methods of strings, sets, tuples, lists, and dictionaries.</p> <p>Arrays: Creating Arrays, Indexing, and Slicing of Arrays, Basic Array Operations, Arrays Processing, Mathematical Operations on Array, Aliasing Arrays, Attributes of an Array, The ndim Attribute, The shape Attribute, The size Attribute, The itemsize Attribute.</p>	
Unit III	<p>Python File Input-Output: Opening and closing file, Various types of file modes, reading and writing to files, manipulating directories</p> <p>Exception Handling: Concept of exception, Various keywords to handle exception such try, catch, except, else, finally, raise</p> <p>Regular Expressions: Concept of the regular expression, various types of regular expressions, using match function.</p> <p>Classes and Objects: Overview of OOP (Object Oriented Programming, Inheritance, Method Overriding, Data Encapsulation, Data Hiding</p> <p>Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module</p> <p>Libraries: Introduction to NumPy, Matplotlib, TensorFlow, SciPy, Keras, Pandas, Scikit-learn</p>	15L
Unit IV	<p>Creating the GUI Form and Adding Widgets:</p> <p>Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, Text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessageBox.</p> <p>Layout Management: Designing GUI applications with proper Layout Management features.</p> <p>Database connectivity in Python: Installing MySQL connector, accessing connector module, using connect, cursor, execute & close functions, reading single & multiple results of query execution, executing different types of statements.</p>	15L
	<p>Textbooks:</p> <ul style="list-style-type: none"> • An Introduction to Computer Science using Python 3 Jason Montojo, Jennifer Campbell, Paul SPD 1st 2014 • Michael Urban and Joel Murach, Python Programming, Shroff/Murach,2016. 	

	<p>References:</p> <ul style="list-style-type: none"> ● Think Python, Allen Downey O'Reilly, 1st 2012 ● Python GUI Programming Cookbook Burkhard A. Meier Packt 2015 ● A. Lukaszewski, MySQL for Python: Database Access Made Easy, Pact Publisher, 2010 ● James Payne, Beginning Python: Using Python 2.6 and Python 3, Wiley India, 2010 	
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Practical Course on Python Programming	
Sr. No	List of Practical Experiments on Python Programming
1	Write a Python Program to demonstrate the use of control and conditional statements
2	Write a Python Program to demonstrate the use of regular expressions in Strings
3	Write a Python Program to demonstrate string manipulation
4	Write a Python Program for demonstration of an Array
5	Write a Python program using the built-in methods of the set, tuple, list and dictionary classes
6	Write a Python Program for demonstration of Object-Oriented Programming concepts
7	Write Python programs to implement exception handling
8	Write Python programs to implement file handling
9	Write a program to show draw shapes & GUI controls
10	Write a Program to implement Database Connectivity

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Introduction to Python Programming	15	1	2	2
2	Functions, Strings, Array, List, Set, Tuples	15	2	2	1
3	Object-oriented concepts, File Handling, Exception Handling, Regular expression, and modules	15	3	2	3
4	GUI & Database applications	15	4	2	3

Paper III

Course Description	
Semester	I
Course Name	Business Intelligence and Big Data Analytics
Course Code	PDA1BDA
Credit	4
Hours	60

Course Objectives:

1. To provide brief knowledge of Business Intelligence and Data Preprocessing
2. To provide aspects of Data warehouse and Data mining
3. To introduce Big Data and its analytical methods
4. To introduce the Hadoop tool for managing and analyzing Big Data

Course Outcomes:

Learners will be able to:

1. Understand the basic concept of Business Intelligence and data Preprocessing in the real world
2. Understand the concept of Data warehouse and Data mining
3. Implement Analytical methods of Big Data
4. Explore Big Data applications using Hadoop tools

Course Code: PDA1BDA	Course Title	Credits 04
	Business Intelligence and Big Data Analytics	
Unit I	<p>Introduction to Business Intelligence: Operational and Decision Support System, Definition of BI, Characteristics of BI, Benefits of BI, Approaches of BI , Capabilities of BI, Business Intelligence architecture, Applications of BI, Ethics of BI, Difference between Decision Support System and BI</p> <p>Knowledge Discovery in Databases: KDD process model</p> <p>Data Pre-processing: Cleaning, Missing Values, Noisy Values, Inconsistent values, redundant values, Outliers, Integration, transformation, reduction</p> <p>Discretization: Equal Width Binning, Equal Depth Binning, Normalization, Smoothing</p>	15L
Unit II	<p>Introduction to Data Warehouse and Data Mining:</p> <p>Data Warehouse: DW architectures and its types , Relation between BI and DW , OLAP (Online analytical processing) model , OLTP (Online transactional processing) model, Difference between OLAP and OLTP , Cubes, Drill-down and roll-up , slice and dice or rotation Schemas: Stars, snowflakes and fact constellations</p> <p>Data Mining: Definition, benefits of Data Mining, Applications of Data Mining, Classification of DM Systems , DM task primitives, Implementation process of Data Mining, Data Mining techniques, Data Mining tools, Technologies used in Data Mining, Challenges of implementation of Data Mining</p>	15L
Unit III	<p>Introduction to Big Data and Analytical Methods:</p> <p>Introduction to Big Data: Definition, Evolution, Characteristics, Types of Big Data, Importance of Big Data, Traditional Business Intelligence vs Big Data, Data Warehouse vs Big Data, Classification of Analytics, Big Data Analytics Challenges, Terminologies used in Big Data Environments, Top Analytics Tools, Data Analytics Life Cycle</p> <p>Analytical Theory and Methods: Classification , Diagnostics of Classifiers, Regression, Clustering, Association Rules, Candidate rules, Apriori algorithm, Decision Trees, Time Series Analysis, Box Jenkins methodology, ARIMA Model, Text Analysis, Collecting Raw Text, Representing Text, Term Frequency-Inverse Document Frequency (TFIDF)</p>	15L

Unit IV	Introduction to Hadoop: Hadoop and its Ecosystem, Hadoop Distributed File System Basics: HDFS Design Features, Components, HDFS User Commands, MapReduce Framework and Programming Model, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hadoop Yarn, Hadoop Tools: Using Apache Pig, Hive, Sqoop, Flume, Oozie, HBase	15L
	Textbooks: <ul style="list-style-type: none"> ● Swain Scheps, “Business Intelligence for Dummies”, Willey Publishing Inc. ● PaulrajPonnian, “Data Warehousing Fundamentals”, John Willey ● M. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education ● Seema Acharya, SubhashiniChellappan, “Big Data and Analytics”, Wiley Publications, First Edition, 2015 ● Benjamin Bengfort and Jenny Kim, “Data Analytics with Hadoop An Introduction for Data Scientists”, O’Reilly, First Edition , 2016 ● V.K Jain, “Big Data and Hadoop ”, Khanna Publishing, First Edition, 2018 ● Rick Sherman , “Business Intelligence Guidebook: From Data Integration to Analytics” , 2014 	
	References: <ul style="list-style-type: none"> ● Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, “Big data for dummies”, John Wiley & Sons, 2013 ● Tom White, “Hadoop The Definitive Guide”, O’Reilly Publications, Fourth Edition, 2015 ● Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, “Hadoop For Dummies”, Wiley Publications, 2014 ● Cindi Howson , “Successful Business Intelligence , Second Edition : Unlock the value of BI and Big Data “ , 2013 	

Practical Course on Business Intelligence and Big Data Analytics	
Sr. No.	List of Practical Experiments on Business Intelligence and Big Data Analytics
1	Perform data modeling operations like import data , ETL and data visualization using Power BI

2	Develop an application to creating a fact table and measures in a cube
3	Develop an application to create dimension tables in a cube and form star schema/snowflake schema
4	Develop an application to create a dimension table from Parent-Child schema
5	Develop an application to demonstrate operations like roll-up, drill-down, slice, and dice
6	Apply classification techniques, select a classifier, and test its performance
7	Generate a regression model and interpret the result for a given data set
8	Generate the clustering model for unsupervised classification and visualize the cluster data using R
9	Implement word count/frequency programs using MapReduce
10	Configure the Hive and implement the application in Hive

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Introduction to Big Data and Analytics	15	1	1	1
2	Analytical Theory and Methods	15	2	1	2
3	Introduction to Hadoop, MapReduce, Hive and Pig	15	3	3	2
4	Advanced Analytics Techniques	15	4	3	3

Paper IV

Course Description	
Semester	I
Course Name	Cloud Computing & Virtualization
Course Code	PDA1CCV
Credit	4
Hours	60

Course Objectives

1. To explain the core concepts of the cloud computing paradigm
2. To identify security issues in cloud computing and apply the fundamental concepts in data center
3. To describe the importance of virtualization along with their technologies
4. To design & develop backup strategies for cloud data based on features

Course Outcomes

Learners will be able to:

1. Define cloud computing principles.
2. Explain cloud security mechanism.
3. Differentiate between different types of virtualization.
4. Explain cloud computing services and their components.

Course Code: PDA1CCV	Course Title	Credits 04
	Cloud Computing & Virtualization	
Unit I	Introduction to Cloud Computing: Introduction, Historical developments, Building Cloud Computing Environments, Principles of Parallel and Distributed Computing: Eras of Computing, Parallel v/s distributed computing, Elements of Parallel Computing, Elements of distributed computing, Technologies for distributed computing.	15L
Unit II	Cloud Delivery Models: The Cloud Consumer Perspective, Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations, Service Quality Metrics and SLAs: Service Quality Metrics, SLA Guidelines. Cloud Security Mechanisms: Encryption, Hashing, Digital	15L

	Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single 12 11 Sign-On (SSO), Cloud-Based Security Groups, Hardened Virtual Server Images.	
Unit III	<p>Virtualization: Requirements Virtualization and its types, Bare metal versus hosted Hypervisors, Storage Virtualization, NetworkAttached Storage versus Storage Area Networks. Virtualization versus Containers, Network Virtualization and Software Defined Networks.</p> <p>Load Balancing Based Live Migration: Introduction, Classification of Load Balancing Techniques, Policy engine, Load balancing Algorithm, Resource Load Balancing, Load Balancing in Virtual Infrastructure Management Software.</p>	15L
Unit IV	<p>VMware Distributed Resource Scheduler. Cloud Computing in Practice:</p> <p>Globally reputed vendors and providers in categories of IaaS, PaaS, SaaS. Case studies of Amazon Web Services, Microsoft Azure, GoogleApp Engine. Salesforce and Dropbox. Launching Virtual machines and remote login using SSH, using SSH clients like Putty, Deploying server side applications using services like Amazon BeanStalk etc., Using Relational and Flat storage services, deploying Load balancers on cloud.</p>	15L
	<p>Textbooks:</p> <ul style="list-style-type: none"> ● Design and Use of Virtualization Technology in Cloud Computing by Das, PrashantaKumar, Deka, Ganesh Chandra , IGI Global ● Mastering Cloud Computing by Rajkumar Buyya and Christian Vecchiola , TataMcGraw-Hill Education ● Cloud Computing Concepts, Technology & Architecture Thomas Erl ,Zaigham Mahmood, and Ricardo Puttini Prentice Hall -2013 ● Distributed and Cloud Computing, From Parallel Processing to the Internet of ThingsKai Hwang, Jack Dongarra, Geoffrey Fox MK Publishers -- 2012VMware and Microsoft Platform in the Virtual Data center,2006,Auerbach. 	

	<p>References:</p> <ul style="list-style-type: none"> ● Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010 ● Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011 ● Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010 	
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Practical Course on Cloud Computing and Virtualization	
Sr. No	List of Practical Experiments on Cloud Computing and Virtualization
1	<p>Write a program for implementing a Client Server communication model using TCP.</p> <p>A) A client server based program using TCP to find if the number entered is prime.</p> <p>B) A client server TCP based chatting application</p>
2	<p>Write a program for implementing a Client Server communication model using UDP.</p> <p>A) A client server based program using UDP to find if the number entered is even or odd.</p> <p>B) A client server based program using UDP to find the factorial of the entered number</p> <p>C) A program to implement simple calculator operations like addition, subtraction, multiplication and division.</p> <p>D) A program that finds the square, square root, cube and cube root of the entered number.</p>
3	Implement a multicast Socket example.
4	<p>Write a program to show the object communication using RMI.</p> <p>A) A RMI based application program to display current date and time.</p> <p>B) A RMI based application program that converts digits to words, e.g. 123 will be converted to one two three.</p>
5	Show the implementation of web services.
6	Implement Xen virtualization and manage with XenCenter.

7	Implement virtualization using VMWareESXi Server and managing with vCenter.
8	Implement Windows Hyper V virtualization.
9	Develop an application for Microsoft Azure.
10	Develop an application for Google App Engine.

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Classify various service delivery models of a cloud computing architecture.	15	C01	PSO3	PO1
2	Define the types of clouds.	15	CO2	PSO3	PO2
3	Explain cloud security mechanism.	15	CO3	PSO3	PO3
4	Elaborate scalability architecture and service load balancing architecture.	15	CO4	PSO1	PO5

SEMESTER II

Paper I

Course Description	
Semester	II
Course Name	Advanced Statistical methods and Testing of hypothesis
Course Code	PGDA2SMT
Credit	4
Hours	60

Course Objectives

1. To learn elementary statistical methods of analysis of data
2. To understand the concepts of hypothesis testing.
3. To understand statistical analysis, inferences.
4. To interpret data analysis in R.

Course Outcomes:

Learners will be able to

1. Analyze the estimation theory.
2. Interpret sample and population distribution and their applications.
3. Examine various statistical tests to classify the data.
4. Evaluate regression and time series analysis.

Course Code: PGDA2SMT	Course Title	Credits 04
	Advanced Statistical methods and Testing of hypothesis	
Unit I	Estimation : Point Estimation, Method of moments, Likelihood function, Maximum likelihood equations, unbiased estimator. Mean square error, Minimum variance unbiased estimator, consistent estimator. Uniformly minimum variance unbiased estimator, efficient estimator, Sufficient estimator. Interval estimation, large sample confidence interval: one sample case.	15L
Unit II	Sampling theory: Sampling distribution of mean and proportions. Definitions: population, statistic, parameter, standard error of estimator. Concept of null hypothesis and alternative hypothesis, critical region, level of significance, type I and type II error, one sided and two-sided tests.	15L

Unit III	PARAMETRIC TEST: p-value, Large Sample Tests, Tests based on t, Chi-square and F-distribution, analysis of variance (one way ANOVA, two-way ANOVA), parametric tests for equality of means, post HOC ANOVA.	15L
Unit IV	Regression: simple and multiple regression, Multiple linear regression, forward, backward & stepwise regression, Logistic Regression. Introduction to Time Series: Meaning and Utility. Components of Time Series. Additive and Multiplicative models. Methods of estimating trend: moving average method, least squares method and exponential smoothing method. (single, double and triple) Elimination of trend using additive and multiplicative models. Simple time series models: AR (1), AR (2). Introduction to ARIMA Modeling.	15L
	Textbooks: <ul style="list-style-type: none"> • STATISTICS by Murray R. Spiegel, Larry J. Stephens. McGRAW HILL InTERNATIONAL FOURTH edition. 	
	References: <ul style="list-style-type: none"> • Gupta S. C., & Kapoor V. K., Fundamental of Applied Statistics, Sultan Chand & Sons, 2018. • Time Series Analysis and Its Applications: Robert H. Shumway and David S. Stoffer, Springer 2010. • FUNDAMENTAL OF MATHEMATICAL STATISTICS by S.C. GUPTA and V.K. KAPOOR SULTAN CHAND and SONS ELEVENTH REVISED 2011 • A Practical Approach using R by R.B. Patil,H.J. Dand and R. Bhavsar ,SPD,1st, 2017 • Introduction to Linear Regression Analysis: Douglas C. Montgomery, 2013 	

Practical Course on Advanced Statistical methods and Testing of hypothesis	
Sr. No	List of Practical Experiments on Advanced Statistical methods and Testing of hypothesis
1	Using R find ML estimates and least square estimates.
2	Using R construct confidence interval
3	Using R calculate the mean, standard deviation and probability of a sampling distribution.

4	Using R Compute large sample tests, small samples tests: t-test, paired t-test.
5	Import the data from Excel / .CSV and perform the hypothetical testing.
6	Import the data from Excel / .CSV and perform the Chi-squared Test.
7	Compute one-way and two-way ANOVA using R.
8	Perform the Linear and multiple Regression using R.
9	Perform logistics Regression using R.
10	Perform time series analysis using R.

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Estimation	15	1	3	3
2	Sampling Theory	15	2	3	3
3	Parametric tests	15	3	3	3
4	Regression and Time-series	15	4	3	3

Paper II

Course Description	
Semester	I
Course Name	Data Science
Course Code	PDA2DST
Credit	4
Hours	60

Course Objectives

1. Develop in depth understanding of the key technologies in data science
2. Practice problem analysis and decision-making.
3. Recognize and analyze ethical issues in business related to intellectual property, data security, integrity, and privacy.
4. Empowering students with tools and techniques used in data science

Course Outcomes

Learners will be able to :

1. Understand basic data science concepts.
2. Explain layered frameworks and technology stack in data science.
3. Elaborate management layers in data science and assess supersteps in data science.
4. Utilize, transform and report supersteps.

Course Code: PDA2DST	Course Title	Credits 04
	Data Science	
Unit I	<p>Introduction to Data Science:</p> <p>What is Data? Different kinds of data, 15L Introduction to high level programming language + Integrated Development Environment (IDE), Exploratory Data Analysis (EDA) + Data Visualization, Different types of data sources, Data Management: Data Collection, Data cleaning/extraction, Data analysis & Modeling</p> <p>Data Curation: Query languages and Operations to specify and transform data, Structured/schema-based systems as users and acquirers of data, Semi-structured systems as users and acquirers of data, Unstructured systems in the acquisition and structuring of data, Security and ethical considerations in relation to authenticating and authorizing access to data on remote systems, Software development tools, large scale data systems, Amazon Web Services (AWS)</p>	15L
Unit II	<p>Data Science Technology Stack: Rapid Information Factory Ecosystem, Data Science Storage Tools, Data Lake, Data Vault, Data Warehouse Bus Matrix, Data Science Processing Tools, Spark, Mesos, Akka, Cassandra, Kafka, Elastic Search, R, Scala, Python, MQTT, The Future</p> <p>Layered Framework: Definition of Data Science Framework, CrossIndustry Standard Process for Data Mining (CRISP-DM), Homogeneous Ontology for Recursive Uniform Schema, The Top Layers of a Layered Framework, Layered Framework for High-Level Data Science and Engineering</p> <p>Business Layer: Business Layer, Engineering a Practical Business Layer</p> <p>Utility Layer: Basic Utility Design, Engineering a Practical Utility Layer</p> <p>Three Management Layers: Operational Management Layer, Processing-Stream Definition and Management, Audit, Balance, and Control Layer, Balance, Control, Yoke Solution, Cause-and-Effect, Analysis System, Functional Layer, Data Science Process</p>	15L

Unit III	<p>Retrieve Superstep:Data Lakes, Data Swamps, Training the Trainer Model, Understanding the Business Dynamics of the Data Lake, Actionable Business Knowledge from Data Lakes, Engineering a Practical Retrieve Superstep, Connecting to Other Data Sources.</p> <p>Assess Superstep: Assess Superstep, Errors, Analysis of Data, Practical Actions, Engineering a Practical Assess Superstep</p> <p>Process Superstep : Vault, Time-Person-Object-Location-Event Data Vault, Data Science Process, Data Science, Transform Superstep : TransformSuperstep, Building a Data Warehouse, Transforming with Data Science, Hypothesis Testing, Overfitting and Underfitting, Precision-Recall, Cross-Validation Test.</p>	15L
Unit IV	<p>Transform Superstep: Univariate Analysis, Bivariate Analysis, Multivariate Analysis, Linear Regression, Logistic Regression, Clustering Techniques, ANOVA, Principal Component Analysis (PCA), Decision Trees, Support Vector Machines, Networks, Clusters, and Grids, Data Mining, Pattern Recognition, Machine Learning, Bagging Data, Random Forests, Computer Vision (CV), Natural Language Processing (NLP), 12 Neural Networks, TensorFlow.</p> <p>Organize and Report Supersteps : Organize Superstep, Report Superstep, Graphics, Pictures, Showing the Difference</p>	15L
	<p>Textbooks:</p> <ul style="list-style-type: none"> Practical Data Science: A Guide to Building the Technology Stack for Turning Data Lakes Into Business Assets Book by Andreas François Vermeulen 2018 	
	<p>References:</p> <ul style="list-style-type: none"> Doing Data Science, Straight Talk From The Frontline, Cathy O'Neil and Rachel Schutt, O'Reilly (2014). Principles of Data Science Sinan Ozdemir PACKT 2016. Data Science from Scratch first Principle in python Joel Grus Shroff Publishers 2017 	

Practical Course on Data Science	
Sr. No	List of Practical Experiments on Data Science
1	Practical of Data collection, Data curation and management for Unstructured data (NoSQL)
2	Practical of Data collection, Data curation and management for Large-scale Data system (such as MongoDB)

3	Practical of Principal Component Analysis
4	Practical of Clustering
5	Conversion from different formats to HOURS format A. Text delimited csv format. B. XML C. JSON D. MySQL Database E. Picture (JPEG) F. Video G. Audio
6	Practical of Utilities and Auditing
7	Practical of Retrieving Data
8	Practical of Assessing Data
9	Practical of Generating Reports
10	Practical of Data Visualisation with Power BI.

Module/ Unit	Course Description	Hrs.	CO No.	PSO No.	PO No.
1	Definition of data science, importance, basic applications and layered framework.	15	1	3	1
2	Understanding the functions, strings, tuples, dictionary, file handling & exception	15	2	3	2
3	plain Assess Superstep and Process Superstep	15	3	3	4
4	Explain Transform Superstep and Organize and Report Supersteps	15	4	3	4

Paper III

Course Description	
Semester	II
Course Name	Next Generation Technology
Course Code	PDA2NGT
Credit	4
Hours	60

Course Objectives:

1. To provide in-depth knowledge of the next generation of databases and future databass technologies from NoSQL to MongoDB, different databases like document, graph, columnar databases etc.

Course Outcomes:

Learners will be able to :

1. Relate the differences between Relational and NoSQL databases.
2. Understand graph databases like Neo4j and other technologies.
3. Implement relational databases alternatives means from a business perspective.
4. Make use of advanced database technologies/platforms like NoSQL, MongoDB for handling and managing data.

Course Code: PDA2NGT	Course Title	Credits 04
	Next Generation Technology	
Unit I	Database Revolution: Three Database Revolutions, Early Database Systems-The First Database Revolution, The Second Database Revolution- Relational theory, Transaction Models, The First Relational Databases, Client• server Computing, Object-oriented Programming and the OODBMS, The Relational Plateau, The Third Database Revolution, Google and Hadoop, The Rest of the Web, Cloud Computing, Document Database, The "NewSQL", The Non-relational Explosion. Google, Big Data, and Hadoop,Elastic Search.	15L

Unit II	<p>Introduction to NoSQL: SQL, NoSQL, Definition, A Brief History of NoSQL, ACID vs. BASE, CAP Theorem (Brewer's Theorem), The BASE, NoSQL Advantages and Disadvantages, Advantages of NoSQL, Disadvantages of NoSQL, SQL vs. NoSQL Databases, Categories of NoSQL Databases.</p> <p>Introduction to MongoDB: History, MongoDB Design Philosophy, Speed, Scalability, and Agility, Non-Relational Approach, JSON-Based Document Store, Performance vs. Features, Running the Database Anywhere, SQL Comparison.</p> <p>The MongoDB Data Model: The Data Model, JSON and BSON, The Identifier (_id), Capped Collection, Polymorphic Schemas, ObjectOriented Programming, Schema Evolution.</p>	15L
Unit III	<p>Graph Databases & Column Databases: What is a Graph? , RDBMS Patterns for Graphs, RDF and SPARQL, Property Graphs and Neo4j, Gremlin, Graph Database Internals, Graph Compute Engines. What is Column Databases, Why it used? The Columnar Alternative - Columnar Compression, Columnar Write Penalty, Sybase IQ, C-Store, and Vertica, Column Database Architectures -Projections, Columnar Technology in Other Databases.</p>	15L
Unit IV	<p>In-Memory Databases: What is In-Memory Databases?, The End of Disk?, Solid State Disk, The Economics of Disk ,SSD• Enabled Databases, In-Memory Databases-Examples: TimesTen, Redis, SAP HANA, VoltDB, Oracle 12c "in-Memory Database", Berkeley Analytics Data Stack and Spark, Spark Architecture.</p> <p>Databases of Future: The revolution revisited, counterrevolutionaries-have we come full circle?, can we have it all?• consistency models, database languages, storage, a vision for a converged database, other convergent databases, Disruptive database technologies-storage technologies.</p>	15L
	<p>Textbook:</p> <ul style="list-style-type: none"> ● Next Generation Databases- NoSQL, NewSQL and BigData, Guy Harrison. 	
	<p>References:</p> <ul style="list-style-type: none"> ● Graph Databases, Ian Robinson, Jim Webber. ● MongoDB Architecture Guide, MongoDB University. ● Practical MongoDB, Shakuntala Gupta, Edward, NavinSabharwa 	

Practical Course on Next Generation Technology	
Sr. No	List of Practical Experiments on Next Generation Technology
1	MongoDB Basics
a	Write a MongoDB query to create and drop database.
b	Write a MongoDB query to create, display and drop collection.
c	Write a MongoDB query to insert, query, update and delete a document.
2	Simple Queries
a	Write a MongoDB query to retrieve data from a document.
3	Implementing Aggregation
a	Write a MongoDB query to use sum, avg, min and max expression.
b	Write a MongoDB query to use push and addToSet expression.
c	Write a MongoDB query to use first and last expression.
4	Replication, Backup, Restore
a	Write a MongoDB query to create Replica of existing database.
b	Write a MongoDB query to create a backup of existing database.
c	Write a MongoDB query to restore database from the backup.
5	Java and MongoDB
a	Connecting Java with MongoDB and inserting, retrieving, updating and deleting.
6	PHP and MongoDB
a	Connecting PHP with MongoDB and inserting, retrieving, updating and deleting.
7	Python and MongoDB
a	Connecting Python with MongoDB and inserting, retrieving, updating and deleting.
8	Implement using NoSQL
9	Implement using Neo4j
10	Analyze data using Google Colab

Module/ Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Database Revolution	15	CO1	3	11
2	Introduction to NoSQL and MongoDB	15	CO2	3	11
3	Graph Databases & Column Databases	15	CO4	2	11
4	In-Memory Databases & Database future	15	CO3	3	11

Paper IV

Course Description	
Semester	II
Course Name	Machine Learning
Course Code	PDA2MAI
Credit	4
Hours	60

Course Objectives:

1. To be able to formulate machine learning problems corresponding to different applications.
2. To understand various machine learning algorithms along with their advantages and disadvantages.
3. To be able to apply machine learning algorithms to solve problems of moderate complexity.

Course Outcomes:

Learners will be able to :

1. Identify basic concepts and types of learning from data.
2. Describe dimensionality reduction technique for attribute reduction.
3. Create ensemble models using different Machine Learning techniques.
4. Build probabilistic and unsupervised learning models for handling unknown patterns.

Course Code: PDA2MAI	Course Title	Credits 04
Machine Learning		
Unit I	<p>Learning-Standard Linear methods: Statistical Learning: What Is Statistical Learning, Assessing Model Accuracy. Linear Regression: Simple Linear Regression, Multiple Linear Regressions, Other Considerations in the Regression Model, The Marketing Plan, Comparison of Linear Regression with K-Nearest Neighbors. Classification: An Overview of Classification, Why Not Linear Regression? , Logistic Regression, Linear Discriminant Analysis, ,A Comparison of Classification Methods.</p>	15 L
Unit II	<p>Selection and improvements of linear learning methods: Resampling Methods: Cross-Validation: K fold Cross validation, Leave one out Cross Validation, The Bootstrap. Linear Model Selection and Regularization: Subset Selection, Shrinkage Methods:Ridge Regression, Lasso Regression,Dimension Reduction Methods, Considerations in High Dimensions.</p>	15 L
Unit III	<p>Non-Linear Learning methods: Polynomial Regression, Step Functions, Basis Functions, Regression Splines, Smoothing Splines, Local Regression, Generalized Additive Models. Tree-Based Methods: The Basics of Decision Trees. Bagging, Random Forests, Boosting.</p>	15 L
Unit-IV	<p>Supervised Learning: Support Vector machines, Principle Component Analysis and Clustering, SVM Maximal Margin Classifier. Support Vector Classifiers: Support Vector Machines, SVMs with More than Two Classes Relationship to Logistic Regression. Unsupervised Learning: The Challenge of Unsupervised Learning, Principal Components Analysis, Clustering, Methods: K-Means Clustering, Hierarchical Clustering, Practical Issues in Clustering.</p>	15 L

	<p>Textbooks:</p> <ul style="list-style-type: none"> • An Introduction to Statistical Learning with Applications in R: Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer 2013. • The Elements of Statistical Learning: Data Mining, Inference, and Prediction (Second Edition) : Trevor Hastie, Robert Tibshirani, Jerome Friedman, Springer (2008). 	
	<p>References:</p> <ul style="list-style-type: none"> • Introduction to Machine Learning (Second Edition): EthemAlpaydın, The MIT Press (2010). • Pattern Recognition and Machine Learning: Christopher M. Bishop, Springer (2006) • Bayesian Reasoning and Machine Learning: David Barber, Cambridge University Press (2012) • Machine Learning: The Art and Science of Algorithms that Make Sense of Data: Peter Flach, Cambridge University Press (2012) • Machine Learning for Hackers: Drew Conway and John Myles White, O'Reilly (2012) • Machine Learning in Action: Peter Harrington, Manning Publications (2012). • Machine Learning with R: Brett Lantz, Packt Publishing (2013) • https://class.coursera.org/ml-005/lecture/preview • https://github.com/josephmisiti/awesome-machine-learning. 	

Practical Course on Machine Learning	
Sr. No.	List of Practical Experiments on Machine Learning
1	Implement simple linear regression model on a standard data set and plot the least square regression fit. Comment on the result. [One may use inbuilt data sets like Boston, Auto etc]
2	Implement multiple regression model on a standard data set and plot the least square regression fit. Comment on the result. [One may use inbuilt data sets like Carseats, Boston etc].

3	Fit a classification model using following: (i) logistic regression (ii) Linear Discriminant Analysis (LDA) and (iii) Quadratic Discriminant Analysis (QDA) on a standard data set and compares the results. [Inbuilt datasets like Smarket, Weekly, Auto, Bostonetc may be used for the purpose].
4	Fit a classification model using K Nearest Neighbour (KNN) Algorithm on a given data set. [One may use data sets like Caravan, Smarket, Weekly, Auto and Boston].
5	Use bootstrap to give an estimate of a given statistic. [Datasets like Auto, Portfolio and Boston etc may be used for the purpose].
6	For a given data set, split the data into two training and testing and fit the following on the training set: (i) Linear model using least squares (ii) Ridge regression model (iii) Lasso model (iv) PCR model (v) PLS model Report test errors obtained in each case and compare the results. [Data sets like College, Boston etc may be used for the purpose].
7	For a given data set, perform the following: (i) Perform the polynomial regression and make a plot of the resulting polynomial fit to the data. (ii) Fit a step function and perform cross validation to choose the optimal number of cuts. Make a plot of the fit to the data. [Use data set like Wage for the purpose].
8	For a given data set, do the following: (i) Fit a classification tree (ii) Fit a regression tree [One may choose data sets like Carseats, Boston etc for the purpose].
9	For a given data set, split the dataset into training and testing. Fit the following models on the training set and evaluate the performance on the test set: (i) Boosting (ii) Bagging (iii) Random Forest [Data sets like Boston may be used for the purpose].
10	Fit a support vector classifier for a given data set. [Data sets like Car, Khan, Bostonetc may be used for the purpose].

11	Perform the following on a given data set: (i) Principal Component Analysis (ii) Hierarchical clustering. [Data set like NC160, USArrestsetc may be used for the purpose].
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Note: The above practical experiments require the R Software

Module /Unit	Course Description	Hrs	CO No.	PSO No.	PO No.
1	Learning-Standard Linear methods:	15h	1	1	1
2	Selection and improvements of linear learning methods:	15h	2	2	2
3	Non-Linear Learning methods:	15h	3	1	1
4	Support Vector machines, Principle Component Analysis and Clustering:	15h	4	2	2



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: Bachelor's in Science (B. Sc.)

Information Technology

Credits: 132

SYLLABUS

F. Y. B. Sc. Information Technology

Revised as per

Choice Based Credit System (60:40)

w. e. f. Academic Year 2022-23

BACHELOR'S IN SCIENCE (B. Sc.)

Programme Outcomes

S. N.	After completion of B.Sc. program students will acquire	Graduate Attribute
PO1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO2	An ability to develop and conduct experiments, analyze, and interpret data and use scientific judgment to draw conclusions	Scientific reasoning
PO3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyze and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understanding values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Program Specific outcomes

Name of the Programme: B. Sc. I. T.	
	After completing the programme in Information Technology, Student will be able to:
PSO1	Gain proficiency in the field of Networking and Security.
PSO2	Develop Programming skills that help to meet the needs of the IT industry.
PSO3	Build soft skills for employability and personality development in the Industrial environment.

Preamble:

The B.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

Semester - I
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs. / week	Internal assessment	Semester -end examination	Total	Credits
Introduction to C++ Programming	Core Subject	UIT1CPT	5	40	60	100	2
Digital Electronics	Core Subject	UIT1DET	5	40	60	100	2
Operating Systems	Core Subject	UIT1OST	5	40	60	100	2
Discrete Mathematics	Core Subject	UIT1DMT	5	40	60	100	2
Communication Skill	Ability Enhancement Skill Course	UIT1CST	5	40	60	100	2
Course on Environmental Studies	Generic	USC1EVS	-	-	-	-	2
Introduction to C++ Programming Practical	Core Subject Practical	UIT1CPP	5	--	50	50	2
Digital Electronics Practical	Core Subject Practical	UIT1DEP	5	--	50	50	2
Operating Systems Practical	Core Subject Practical	UIT1OSP	5	--	50	50	2
Discrete Mathematics Practical	Core Subject Practical	UIT1DMP	5	--	50	50	2
Communication skill Practical	Ability Enhancement Skill Course	UIT1PCP	5	--	50	50	2

Semester - II
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester -end examination	Total	Credits
Object Oriented Programming	Core Subject	UIT2OPT	5	40	60	100	2
Microprocessor Architecture	Core Subject	UIT2MAT	5	40	60	100	2
Database Management System	Core Subject	UIT2DST	5	40	60	100	2
Numerical Methods	Core Subject	UIT2NMT	5	40	60	100	2
Web Programming	Ability Enhancement Skill Course Practical	UIT2WPT	5	40	60	100	2
Object Oriented Programming Practical	Core Subject Practical	UIT2OPP	5	40	60	100	2
Microprocessor Architecture Practical	Core Subject Practical	UIT2MAP	5	--	50	50	2
Database Management System Practical	Core Subject Practical	UIT2DSP	5	--	50	50	2
Numerical Methods Practical	Core Subject Practical	UIT2NMP	5	--	50	50	2
Web Programming Practical	Ability Enhancement Skill Course Practical	UIT2WPP	5	--	50	50	2
Effective Communication	Generic	UIT2ECS	-	-	-	-	2

Examination Scheme

Choice Based Credit System (CBCS)

➤ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Presentation and write up on the selected topics of the subjects / Case studies. 2. Quiz	20 Marks

- ❖ Maximum Marks: 20
- ❖ Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

Question Paper Pattern for Semester End Examination (Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

- Undergraduate Programmes for B.Sc. in Information Technology
 - Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern
<ol style="list-style-type: none"> 1. There shall be five questions each of 12 marks. 2. All questions shall be compulsory with internal options. 3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Question Paper Pattern for Continuous Assessment

Presentation and write-up	Quiz
Presentation skill	Quiz on application of subject in real life
Knowledge	
Quality of ppt.	
Writing skill	

Question Paper Pattern for Practical Examination

Sr. No.	Particular	Marks	
01	Practical	50 Marks	
	Practical Question		40 Marks
	Journal		5 Marks
	Viva		5 Marks

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	Introduction to C++ programming
Course Code	UIT1CPT
Credit	2
Hours	5 Hrs per week

Course Objectives	The objective of this course is to introduce the concept of the basic programming language with C++.
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Course Outcomes	After completing the course, Student will be able to:
	1) Define basic C++ programming concepts.
	2) Elaborate concepts of functions in C++.
	3) Explain derived data types such as Arrays and Pointers.
	4) Determine different string functions and concepts of structures.

Module/Unit	Course Description	Hrs.
I	<p>Programming Logic and techniques : Algorithms, Flow-charts, Program Design</p> <p>Introduction to C++: Origin of C++ C++ Program Structure, A Sample C++ program, Applications of C++, Variables and Assignments: variables, identifiers, variable declarations, local and global variables, Assignment Statements, reference variable, symbolic constant.</p> <p>Input and Output: cin, cout, escape sequences, include directives and Namespaces, Indenting and Comments, Data types, Expressions, Type compatibilities.</p> <p>Operators: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Operator Precedence.</p>	12hrs

II	<p>Manipulators: endl, setw, sizeof, Increment and decrement operators, Type Cast Operators, Scope resolution operators.</p> <p>Flow of Control: Compound statements, Loops: while, for, do while, nested loops, Decision making: if, if – else, nested if else, switch, break and continue.</p>	12hrs
III	<p>Functions: Function Definition, Function Declaration, Function Prototypes, built in functions and user defined functions, Call by reference, Call by value, const member functions. Inline Functions and recursive functions, Maths Library Functions.</p>	12hrs
IV	<p>Derived Data Types:</p> <p>Arrays: Declaring Arrays, Initializing Arrays, Types of Arrays, Arrays in functions.</p> <p>Pointers: Pointers, use of pointers, Void Pointers, Null Pointers, Pointer to pointer, Passing Pointers to Functions, constant pointer, Generic Pointer.</p>	12hrs
V	<p>Strings and Vectors: Strings, String functions: strcmp, strcat, strlen, strcpy. Vector Basics.</p> <p>Introduction to Structures: Declaring the structure, Structure Variables, Initialization, Structure Assignment, Nested Structure. Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.</p>	12hrs

References

1. “Let us C++” , Y.P.Kanetkar, Seventh edition, BPB publication
2. “Problem Solving with C++” , Walter Savitch, Sixth Edition, Pearson Education.
3. Schaum’s outlines “Programming with C++”, J.R.Hubbard, Second Edition, Tata McGrawHill
4. Object Oriented programming with C++ , E Balagurusamy , Third Edition ,Tata McGraw Hill.
5. Pure C++ programming , Amir Afzal, Pearson Education.
6. Computer Science – A structured Approach using C++ by B. Forouzan, R. F. Gilberg, Cengage Publication

Course Description BSc(Information Technology)	
Semester	I
Course Name	Digital Electronics
Course Code	UIT1DET
Credit	2
Hours	5Hrs per week

Course Objectives	The objective of this course is to acquire the basic knowledge of digital logic levels and the application of knowledge to understand digital electronics circuits. To prepare the learners to perform the analysis and design of various digital electronic circuits.
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Course Outcomes	After completing the course, Student will be able to:
	1) Define the various types of number systems & conversions.
	2) Explain the various types of logic gates along with the truth tables.
	3) Distinguish combinational and sequential logic circuits.
	4) Classify different types of flip-flops, registers and counters.

Module/ Unit	Course Description	Hrs
	<p>Number System: Analog System, digital system, numbering system, binary number system, octal number system, hexadecimal number system, conversion from one number system to another, floating point numbers, weighted codes binary coded decimal, non-weighted codes Excess – 3 code, Gray code, Alphanumeric codes –ASCII Code, EBCDIC, ISCII Code, Hollerith Code, Morse Code, Teletypewriter (TTY), Error detection and correction, Universal Product Code, Code conversion.</p> <p>Binary Arithmetic and Arithmetic Circuits: Binary addition, Binary subtraction, Negative number representation, Subtraction using 1's complement and 2's complement, Introduction to Arithmetic Circuits : Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractor, Multiplier, Comparator</p>	12hrs
II	<p>Boolean Algebra and Logic Gates: Introduction, Logic (AND OR NOT), Boolean theorems, Boolean Laws, De Morgan's Theorem, Perfect Induction, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal Logic gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level.</p> <p>Minterm, Maxterm and Karnaugh Maps: Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form,</p>	12hrs

	Reduction technique using Karnaugh maps – 2/3/4/5/6 variable K-maps, Grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression, Quine Mc Cluskey Method	
III	<p>Combinational Logic Circuits: Introduction, Multi-input, multi-output Combinational circuits, Code converters design and implementations</p> <p>Read only Memory : Diode Rom, Programmable ROMs, Erasable PROMs, Programmable array logic, Programmable Logic arrays</p>	12hrs
IV	<p>Multiplexer, Demultiplexer, ALU, Encoder and Decoder: Introduction, Multiplexer, Demultiplexer, Decoder, ALU, Encoders.</p> <p>Sequential Circuits: Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-flop, JK flipflop, Race-around condition, Master – slave JK flip-flop, T flip-flop, 12 14 Page conversion from one type of flip-flop to another, Application of flipflops</p> <p>Clocks And Timing Circuits : Introduction to clocks : Astable, Monostable, Bistable, 555 Timer</p>	12hrs
V	<p>Counters: Introduction, Asynchronous counter, Terms related to counters, IC 7493 (4-bit binary counter), Synchronous counter, Bushing, Type T Design, Type JK Design, Presettable counter, IC 7490, IC 7492, Synchronous counter ICs, Analysis of counter circuits.</p> <p>Shift Register: Introduction, parallel and shift registers, serial shifting, serial-in serial-out, serial-in parallel-out , parallel-in parallel-out, Ring counter, Johnson counter, Applications of shift registers, Pseudo-random binary sequence generator, IC7495, Seven Segment displays, analysis of shift counters.</p>	12hrs

References:

1. Digital Electronics and Logic Design, N. G. Palan, Technova
2. Make Electronics, Charles Platt, O'Reilly, 1st, 2010
3. Modern Digital Electronics, R. P. Jain, Tata McGraw Hill, 3rd
4. Digital Principles and Applications, Malvino and Leach, Tata McGraw Hill
5. Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley, 2007

Course Description: BSc(Information Technology)	
Semester	I
Course Name	Operating Systems
Course Code	UIT1OST
Credit	2
Hours	5Hrs per week

Course Objectives	To learn the fundamentals of Operating Systems, its functions and services. To learn the mechanisms of OS to handle processes and threads and their communication .To learn the mechanisms involved in memory management in contemporary OS.
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain the importance of Computer Systems, Process Management Policies.
	2) Define the memory management and its allocation policies.
	3) Elaborate the Cloud concepts, file systems, its structure and operations.
	4) Determine the requirement for process synchronization and coordination handled by the operating system.

Module/ Unit	Course Description	Hrs.
I	<p>Introduction: What is an operating system? History of operating system, computer hardware, different operating systems, operating system concepts, system calls, operating system structure. Examples of OS: Android OS, Linux OS, Windows OS.</p> <p>Processes and Threads: Processes, threads, interprocess communication, scheduling, IPC problems.</p>	12hrs
II	<p>Memory Management: No memory abstraction, memory abstraction: address spaces, virtual memory, page replacement algorithms, design issues for paging systems, implementation issues, and segmentation.</p>	12hrs
III	<p>File Systems: Files, directories, file system implementation, file-system management and optimization, MS-DOS file system, UNIX V7 file system, CD ROM file system.</p> <p>Protection of File Systems: Types of Access, Access Control, Other Protection Approaches.</p>	12hrs

IV	<p>Input-Output: Principles of I/O hardware, Principles of I/O software, I/O software layers, disks, clocks, user interfaces: keyboard, mouse, monitor, thin clients, power management.</p> <p>Deadlocks: Resources, introduction to deadlocks, the ostrich algorithm, deadlock detection and recovery, deadlock avoidance, deadlock prevention, issues.</p>	12hrs
V	<p>Virtualization: History, requirements for virtualization, type 1 and 2 hypervisors, techniques for efficient virtualization, hypervisor microkernel, memory virtualization, I/O virtualization, Virtual appliances, virtual machines on multicore CPUs</p> <p>Cloud: Introduction, Characteristics, Types of Clouds, Examples.</p>	12hrs

References:

1. Modern Operating Systems, Andrew S. Tanenbaum and Herbert Bos, 4th Edition, Pearson Publishers
2. Operating System Concepts, Abraham Silberschatz and Peter B. Galvineg Gagne, 8th Edition, Wiley Publishers
3. Operating Systems – Internals and Design Principles, Willaim Stallings, 8th Edition, Pearson Publishers
4. Operating Systems, Godbole and Kahate, 3rd Edition, McGraw Hill Publishers

Course Description: BSc(Information Technology)	
Semester	I
Course Name	Discrete Mathematics
Course Code	UIT1DMT
Credit	2
Hours	5Hrs per week

Course Objectives	The purpose of the course is to familiarise the prospective learners with mathematical structures that are fundamentally discrete. This course introduces sets and functions, forming and solving recurrence relations and different counting principles. These concepts are useful to study or describe objects or problems in computer algorithms and programming languages.
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Course Outcomes	After completing the course, Student will be able to:
	1) Recall basic set theory, logic, functions and relations.
	2) Solve problems using recurrence relations, counting principles and probability.
	3) Examine the properties of graphs, applications of graphs and trees.
	4) Solve the problems by using different methods of proofs, divisibility.

Module/Unit	Course Description	Hrs
I	<p>Set Theory: Definitions and the Element Method of Proof, Properties of Sets, Disproofs, Algebraic Proofs, Boolean Algebras, Russell's Paradox and the Halting Problem.</p> <p>The Logic of Compound Statements: Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments.</p> <p>Quantified Statements: Predicates and Quantified Statements, Statements with Multiple Quantifiers, Arguments with Quantified Statements.</p>	12hrs

II	<p>Functions: Functions Defined on General Sets, One-to-One and Onto, Inverse Functions, Composition of Functions, Cardinality with Applications to Computability.</p> <p>Relations: Relations on Sets, Reflexivity, Symmetry, and Transitivity, Equivalence Relations, Partial Order Relations</p> <p>Recursion Relation: Solving recurrence relations by iteration, Second order linear homogeneous recurrence relations with constant coefficients. general recursive definitions and structural induction.</p>	12hrs
III	<p>Counting Principles and probability: Introduction, Possibility Trees and the Multiplication Rule, Counting Elements of Disjoint Sets: The Addition Rule, The Pigeonhole Principle, Counting Subsets of a Set: Combinations, r-Combinations with Repetition Allowed, Mathematical Induction, Strong Mathematical Induction and the Well-Ordering Principle for the Integers .Probability Axioms and Expected Value, Conditional Probability, Bayes' Formula, and Independent Events.</p>	12hrs
IV	<p>Graphs and Trees: Definitions and Basic Properties, Trails, Paths, and Circuits, Matrix Representations of Graphs, Isomorphism of Graphs, Trees, Rooted Trees, Isomorphism of Graphs, Spanning trees and shortest paths.</p>	12hrs
V	<p>Elementary Number Theory and Methods of Proof: Introduction to Direct Proofs, Rational Numbers, Divisibility, Division into Cases and the Quotient-Remainder Theorem, Floor and Ceiling, Indirect Argument: Contradiction and Contraposition, Two Classical Theorems, Applications in algorithms.</p>	12hrs

References;

1. Discrete Mathematics with Applications, Sussana S. Epp, 4th Edition, 2010
2. Discrete Mathematics, Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson Tata MCGraw Hill 2007
3. Discrete Mathematics and its Applications , Kenneth H. Rosen , Tata MCGraw Hill
4. Discrete mathematical structures , B Kolman RC Busby, S Ross , PHI
5. Discrete structures , Liu , Tata MCGraw Hill

Course Description: BSc(Information Technology)	
Semester	I
Course Name	Communication Skills
Course Code	UIT1CMT
Credit	2
Hours	5Hrs per week

Course Objectives	To understand the basics of Professional as well as Business Communication Skills.
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Course Outcomes	After completing the course, Student will be able to:
	1) Elaborate examples on how to write business messages appropriately and propose the views in meetings and group discussions
	2) Develop Communication in different fields or departments.
	3) Design presentations and how to present one.

Module/Unit	Course Description	Hrs.
I	<p>Understanding Business Communication: Nature and Scope of Communication, process of communication, components</p> <p>The Seven Cs of Effective Communication: Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness</p> <p>Non-verbal communication: Personal appearance, facial expressions, movements, posture, gestures, eye contact, vocal communication techniques, voice, volume, pitch, rate of delivery, pronunciations, pause Communication barriers</p>	12hrs
II	<p>Effective writing, reading skills, listening skills</p> <p>Writtng: Notes making, Precis making</p> <p>Reading skill: mechanics of reading, guidelines to improving reading skills, types of readings, techniques of comprehension</p>	

III	<p>Writing Business Messages and Documents: Business writing, Business Correspondence, Instructions, Business Reports and Proposals, Career building, Job Application and Resume writing.</p> <p>Group Communication: Meetings and Conferences, Email correspondence Group Discussions and Team Presentations, Team Briefing, notices, agenda writing,</p>	12hrs
IV	<p>Understanding Specific Communication Needs: Corporate Communication, Persuasive Strategies in Business Communication, Ethics in Business Communication, Business Communication Aids</p>	12hrs
v	<p>Presentation Skills: Planning the presentations, executing the presentations, Impressing the audience by performing, Planning stage: Brainstorming, mind maps / concept maps, executing stage: chunking theory, creating outlines, Use of templates. Adding graphics to your presentation: Visual communication, Impress stage: use of font, colour, layout, Importance of practice and performance.</p>	12hrs

References:

1. Business Communication, Edited by Meenakshi Raman and Prakash Singh, Second Edition, Oxford University Press,
2. Professional Communication, ArunaKoneru, Tata McGraw Hill
3. Business Communication, Dr.Rishipal and Dr.JyotiSheoran, SPD
4. Strategies for improving your business communication, Prof. M. S. Rao, Shroff publishers and distributors
5. Graphics for Learning: Proven Guidelines for Planning, Designing, and Evaluating Visuals in Training Materials, Ruth C. Clark, Chopeta Lyons, Pfeiffer

Course Description: BSc(Information Technology)	
Semester	I
Course Name	Environmental Studies
Course Code	USC1EVS
Credit	2
Hours	30Hrs.

Course Objectives	To develop environmental consciousness among the students
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Course Outcomes	After completing the course, Student will be able to:
	1) Describe Environment
	2) Predict the consequences of human activities on the web of life
	3) Extend the values and responsibilities in solving current environmental problems and avoid future destruction

Module/ Unit	Course Description	Hrs.
1	Introduction to Environmental Studies	15hrs
1.1	Definition, scope and importance of environmental studies, Need for Public awareness	
1.2	Ecosystem 1.2.1. Concept of ecosystem 1.2.2. Types of ecosystems, structure, characteristics and functions: Forest, Grassland, Desert, Aquatic ecosystem	
1.3	Biodiversity and its conservation 1.3.1. Introduction – Definition: genetic, species and ecosystem diversity. 1.3.2. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values 1.3.3. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. 1.3.4. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	

2	Environmental Pollution and Control	
2.1	Environmental pollution 2.1.1 Definition 2.1.2 Cause, effects and control measures of – a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards 2.1.3 Role of an individual in prevention of pollution.	15hrs
2.2	Environment Protection Act.: Brief introduction	

Course Description: B.Sc.(Information Technology)	
Semester	I
Course Name	Introduction to C++ Programming Practical
Course Code	UIT1CPP
Credit	2
Hours	3Hrs per week

Course Objectives	The objective of this course is to introduce the concept of the basic programming language with C++.
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Course Outcomes	After completing the course, Student will be able to:
	1) Develop Simple C++ Programs.
	2) Construct C++ programs using conditional statements and loops.
	3) Make use of functions in C++ programs.
	4) Build C++ Programs using Arrays.

Module/Unit	Course Description	Hrs
1	Basic Programs of C++ <ol style="list-style-type: none"> a. Write a program to display the message HELLO WORLD. b. Write a program to declare some variables of type int, float and double. Assign some values to these variables & display these values. c. Write a program to find the addition, subtraction, multiplication and division of two numbers. 	3hrs

2	<p>Programs on variables</p> <ol style="list-style-type: none"> Write a program to swap two numbers using the third variable. Write a program to swap two numbers without using a third variable. Write a program to find the area of rectangle, square and circle. Write a program to find the volume of a cube, sphere, and cylinder. 	3hrs
3	<p>Conditional statements and loops(basic)</p> <ol style="list-style-type: none"> Write a program to enter a number from the user and display the month name. If number > 13 then display invalid input using switch case. Write a program to check whether the number is even or odd. Write a program to check whether the number is positive, negative or zero. Write a program to find the smallest of three numbers. 	3hrs
4	<p>Conditional statements and loops(advanced)</p> <ol style="list-style-type: none"> Write a program to find the sum of squares of digits of a number. Write a program to reverse the digits of an integer. Write a program to find the sum of numbers from 1 to 100. Write a program to print the Fibonacci series. 	3hrs
5	<p>Programs on patterns Programs on different patterns.</p>	3hrs
6	<p>Functions:</p> <ol style="list-style-type: none"> Programs on Functions. Write a program to demonstrate example of Inline Function 	3hrs
7	<p>Recursive functions</p> <ol style="list-style-type: none"> Write a program to find the factorial of a number using a recursive function. Write a program to find the sum of natural numbers using a recursive function. 	3hrs

8	<p>Arrays</p> <ul style="list-style-type: none"> a. Write a program to find the largest value that is stored in the array. b. Write a program to compute the sum of all elements stored in an array. c. Write a program to arrange the 'n' numbers stored in the array in ascending and descending order. d. Write a C++ program to rearrange a given sorted array of positive integers. 	3hrs
9	<p>String handling</p> <ul style="list-style-type: none"> a. String operations for string length , string concatenation b. String operations for string reverse, string comparison, c. Console formatting functions. 	3hrs
10	<p>Programs on Structures and Unions</p> <ul style="list-style-type: none"> a. Programs on structures. b. Programs on unions 	3hrs

References:

1. "Let us C++" , Y.P.Kanetkar, Seventh edition, BPB publication
2. "Problem Solving with C++" , Walter Savitch, Sixth Edition, Pearson Education.

Course Description: BSc(Information Technology)	
Semester	I
Course Name	Digital Electronics Practical
Course Code	UIT1DEP
Credit	2
Hours	3Hrs per week

Course Objectives	The objective of this course is to acquire the basic knowledge of digital logic levels and the application of knowledge to understand digital electronics circuits. To prepare the learners to perform the analysis and design of various digital electronic circuits.
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Course Outcomes	After completing the course, Student will be able to:
	1) Classify logic gates and their ICs and universal gates.
	2) Simplify the given Boolean expressions using a minimum number of logic gates and ICs.
	3) Build combinational circuits and code converters.
	4) Design Encoder, Decoder, Multiplexer and De-multiplexer

Module/Unit	Course Description	Hrs
1	<p>1. Study of Logic gates and their ICs and universal gates:</p> <p>a. Study of AND, OR, NOT, XOR, XNOR, NAND and NOR gates</p> <p>b. IC 7400, 7402, 7404, 7408, 7432, 7486, 74266</p> <p>c. Implement AND, OR, NOT, XOR, XNOR using NAND gates.</p> <p>d. Implement AND, OR, NOT, XOR, XNOR using NOR gates.</p>	3hrs

2	<p>Implement the given Boolean expressions using minimum number of gates.</p> <p>a. Verifying De Morgan's laws.</p> <p>b. Implement other given expressions using minimum number of gates.</p> <p>c. Implement other given expressions using minimum number of ICs</p>	3hrs
3	<p>Implement combinational circuits.</p> <p>a. Design and implement combinational circuit based on the problem given and minimizing using K-maps.</p>	3hrs
4	<p>Implement code converters.</p> <p>a. Design and implement Binary – to – Gray code converter.</p> <p>b. Design and implement Gray – to – Binary code converter. Design and implement Binary – to – BCD code converter</p> <p>d. Design and implement Binary – to – XS-3 code converter</p>	3hrs
5	<p>Implement Adder and Subtractor Arithmetic circuits.</p> <p>a. Design and implement Half adder and Full adder.</p> <p>b. Design and implement BCD adder.</p> <p>c. Design and implement XS – 3 adder.</p> <p>d. Design and implement binary subtractor.</p> <p>e. Design and implement BCD subtractor.</p> <p>f. Design and implement XS – 3 subtractor.</p>	3hrs
6	<p>Implement Arithmetic circuits.</p> <p>a. Design and implement a 2-bit by 2-bit multiplier.</p> <p>b. Design and implement a 2-bit comparator.</p>	3hrs

7	<p>Implement Encode and Decoder and Multiplexer and Demultiplexers.</p> <p>a. Design and implement 8:3 encoder.</p> <p>b. Design and implement 3:8 decoder.</p> <p>c. Design and implement 4:1 multiplexer. Study of IC 74153, 74157</p> <p>d. Design and implement 1:4 demultiplexer. Study of IC 74139</p> <p>e. Implement the given expression using IC 74151 8:1 multiplexer.</p> <p>f. Implement the given expression using IC 74138 3:8 decoder.</p>	3hrs
8	<p>Study of flip-flops and counters.</p> <p>a. Study of IC 7473.</p> <p>b. Study of IC 7474.</p> <p>c. Study of IC 7476.</p> <p>d. Conversion of Flip-flops.</p> <p>e. Design of 3-bit synchronous counter using 7473 and required gates.</p> <p>f. Design of 3-bit ripple counter using IC 7473.</p>	3hrs
9	<p>Study of counter ICs and designing Mod-N counters.</p> <p>a. Study of IC 7490, 7492, 7493 and designing mod-n counters using these.</p> <p>b. Designing mod-n counters using IC 7473 and 7400 (NAND gates)</p>	3hrs

<p style="text-align: center;">10</p>	<p>Design of shift registers and shift register counters.</p> <p>a. Design serial – in serial – out, serial – in parallel – out, parallel – in serial – out, parallel– in parallel – out and bidirectional shift registers using IC 7474.</p> <p>b. Study of ID 7495.</p> <p>c Implementation of digits using seven segment displays.</p>	<p style="text-align: center;">3hrs</p>
<p style="text-align: center;">11</p>	<p>Study of Diode ROM Array.</p>	<p style="text-align: center;">3hrs</p>
<p style="text-align: center;">12</p>	<p>Study of 555 Timer as an Astable multivibrator.</p>	<p style="text-align: center;">3hrs</p>

References:

1. Digital Electronics and Logic Design, N. G. Palan, Technova
2. Modern Digital Electronics, R. P. Jain, Tata McGraw Hill, 3rd
3. Digital Principles and Applications, Malvino and Leach, Tata McGraw Hill

Course Description: B.Sc.(Information Technology)	
Semester	I
Course Name	Operating Systems Practical
Course Code	UIT1OSP
Credit	2
Hours	3Hrs per week

Course Objectives	To make the learners familiar with the basics of different operating systems.
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Course Outcomes	After completing the course, Student will be able to:
	1) Build virtual operating system.
	2) Demonstrate linux commands.
	3) Make use of utilities of windows, linux and cloud.
	4) Choose windows commands for file, folder creation.

Module/Unit	Course Description	Hrs
1.	Installation of virtual machine software.	3hrs
2.	Installation of Linux operating system (RedHat / Ubuntu) on virtual machine.	3hrs
3.	Installation of Windows operating system on virtual machine.	3hrs
4.	Linux commands: Working with Directories: a. pwd, cd, absolute and relative paths, ls, mkdir, rmdir, b. file, touch, rm, cp, mv, rename, head, tail, cat, tac, more, less, strings, chmod	3hrs
5.	Linux commands: Working with files a. ps, top, kill, pkill, bg, fg, b. grep, locate, find, locate, c. date, cal, uptime, w, whoami, finger, uname, man, df, du, free, whereis, which. d. Compression: tar, gzip.	3hrs
6.	6. Windows (DOS) Commands – 1 a. Date, time, prompt, md, cd, rd, path. b. Chkdsk, copy, xcopy, format, fidsk, cls, defrag, del, move.	3hrs

7.	Windows (DOS) Commands – 2 a. Diskcomp, diskcopy, diskpart, doskey, echo b. Edit, fc, find, rename, set, type, ver Working with different Cloud Platform a. Google Drive b. Amazon web service	3hrs
8.	8. Working with Windows Desktop and utilities a. Notepad b. Wordpad c. Paint d. Taskbar e. Adjusting display resolution f. Using the browsers g. Configuring simple networking h. Creating users and shares	3hrs
9.	Working with Linux Desktop and utilities a. The vi editor. b. Graphics c. Terminal d. Adjusting display resolution e. Using the browsers f. Configuring simple networking g. Creating users and shares	3hrs
10.	Installing utility software on Linux and Windows. a) Protection in File System.	3hrs

References

1. UNIX Concepts and Applications- Sumitabha Das, 4th Edition , Tata McGraw Hill Publishers

Course Description: B.Sc.(Information Technology)	
Semester	I
Course Name	Discrete Mathematics Practical
Course Code	UIT1DMP
Credit	2
Hours	3Hrs per week

Course Objectives	To familiarize the students with the fundamental concepts of scilab and develop programming skill to effectively implement for problems.
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Course Outcomes	After completing the course, Student will be able to:
	1) Make use of the basic commands of scilab.
	2) Construct a formula for recurrence relation, counting and probability using scilab.
	3) Analyse the concept of properties of integers and operations using scilab.
	4) Examine the properties of graphs, applications of graphs and trees.

Module/Unit	Course Description	Hrs.
1	Set Theory a. Inclusion Exclusion principle. b. Power sets c. Mathematical Induction	3hrs
2	Functions and Algorithms a. Recursively defined functions b. Cardinality c. Polynomial evaluations d. Greatest Common Divisor	3hrs
3	Recurrence Relation a. Linear homogeneous recurrence relations with constant coefficients b. Solving linear homogeneous recurrence relations with constant coefficients c. Solving general homogeneous linear recurrence relations.	3hrs

4	<p>Counting :</p> <ul style="list-style-type: none"> a. Sum rule principle b. Product rule principle c. Factorial d. Binomial coefficients e. Permutations f. Permutations with repetitions g. Combinations h. Combinations with repetitions i. Ordered partitions j. Unordered partitions 	3hrs
5	<p>Probability Theory:</p> <ul style="list-style-type: none"> a. Sample space and events b. Finite probability spaces c. Equiprobable spaces d. Addition Principle e. Conditional Probability f. Multiplication theorem for conditional probability. g. Independent events h. Repeated trials with two outcomes. 	3hrs
6	<p>Graph Theory</p> <ul style="list-style-type: none"> a. Paths and connectivity b. Minimum spanning tree c. Isomorphism 	3hrs
7	<p>Direct Graphs</p> <ul style="list-style-type: none"> a. Adjacency matrix b. Path matrix 	3hrs
8	<p>Properties of integers</p> <ul style="list-style-type: none"> a. Division algorithm b. Primes c. Euclidean algorithm d. Fundamental theorem of arithmetic e. Congruence relation f. Linear congruence equation 	3hrs
9	<p>Algebraic Systems</p> <ul style="list-style-type: none"> a. Properties of operations 	3hrs
10	<p>Boolean Algebra</p> <ul style="list-style-type: none"> a. Basic definitions in Boolean Algebra b. Boolean algebra as lattices 	3hrs

References

1. Scilab textbook companion for discrete mathematics by S. Lipschutz, M. Lipson and V. H. Patil

Course Description B.Sc. (Information Technology)	
Semester	I
Course Name	Communication Skills Practical
Course Code	UIT1CSP
Credit	2
Hours	3Hrs per week

Course Objectives	To understand the basics of Professional as well as Business Communication Skills.
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Course Outcomes	After completing the course, Student will be able to:
	1) Develop pronunciation skills, listening skills, writing skills
	2) Construct storytelling, advertising, role plays and situational conversations
	3) Take part in interviews and group discussions
	4) Build presentations

Module/Unit	Course Description	Hrs.
I	<p>1. Mock Interviews</p> <p>a. You are in the HR department of an organization and you are supposed to hire a Candidate. Write a telephonic interview between you and the client.</p> <p>b. Write an interview (a face-to-face interview) between Mr Smith and Mr John regarding a Job position in a company. Mr John is the manager whereas Mr Smith is the candidate.</p> <p>c. You are asked to conduct a video interview for hiring a candidate in your company. Write the questions than you can ask and possible answers that can be given by the Candidate.</p>	3hrs
II	<p>Presentations</p> <p>a. 3D Glasses</p> <p>b. Apple Talk</p> <p>c. Mobile IP</p> <p>d. Big Data</p>	3hrs

III	Group Discussions a. Impact of covid 19 on education b. Gender Equality c. India: The super Powering country d. Social Media: Impact on human behaviour and society	3hrs
IV	Role Play a. Assume that you are a Sales person. Write a conversation between the sales person and the customer for selling a laptop. b. Introduce yourself as an electronic gadget c. Assume that you are a king of a kingdom. Write a conversation between you and your ministers regarding the development of your kingdom.	3hrs
v	Situational Conversion a. Tell me about a time you proved you're the perfect person for this job. b. What would you do if you made a mistake that no one else noticed? Would you address the error and risk slowing things down or ignore it to keep the project or task moving forward? c. What would you do if you were asked to perform a task you've never done before? d. What would you do if an angry and 12hrs dissatisfied customer confronted you? How would you resolve their concern?	3hrs
VI	Advertising a. There is a campaign in you college regarding women's safety in college. Write an advertisement for the same. b. A new product named 'Techno' is introduced by an IT company which helps you locate your personal things like mobile phone, wallet, keys, etc. Write an advertisement to sell this product. Also state its features. c. There is a new TV reality show and you are asked to promote it. How will you write an advertisement for the same?	3hrs
VII	Story-Telling a. A middle-aged woman discovers a ghost. b. A group of children discover a dead body c. A long journey is interrupted by a disaster.	3hrs
VIII	Pronunciation Skills	3hrs
IX	Listening Skills	3hrs
X	Writing Skills	3hrs

References:

1. Business Communication, Edited by Meenakshi Raman and Prakash Singh, Second Edition, Oxford University Press,
2. Professional Communication, ArunaKoneru, Tata McGraw Hill
3. Business Communication, Dr.Rishipal and Dr.JyotiSheoran, SPD
4. Strategies for improving your business communication, Prof. M. S. Rao, Shroff publishers and distributors
5. Graphics for Learning: Proven Guidelines for Planning, Designing, and Evaluating Visuals in Training Materials, Ruth C. Clark, Chopeta Lyons, Pfeiffer

Semester II

Course Description: BSc(Information Technology)	
Semester	II
Course Name	Object Oriented Programming
Course Code	UIT2OPT
Credit	2
Hours	5 Hrs per week

Course Objectives	To learn advanced features of the C++ programming language as a continuation of the previous course, to learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain characteristics of object oriented programming approach with C++.
	2) Make use of operators in C++.
	3) Evaluate the concept of Template, Strings, Streams
	4) Utilize different file handling features

Module/ Unit	Course Description	Hrs.
I	<p>Introduction to OOPs: Need object oriented programming, comparison of procedural and object oriented approach, characteristics of OOPs – object, classes, polymorphism, inheritance, reusability, data hiding and abstraction, applications of OOPs.</p> <p>Classes and Objects: Class declaration, constructors, constructor initialization lists, access functions, private member functions, the copy constructor, the class destructor, constant objects, structures, pointers to objects, static data members, static function members</p>	12hrs
II	<p>Operator Overloading:, overloading the assignment operator, the this pointer, overloading arithmetic operators, overloading the arithmetic assignment, operators, overloading the relational operators, overloading the stream operators, conversion operators, overloading the increment and decrement operators, overloading the subscript operator</p>	12hrs

III	<p>Composition and Inheritance: Type of inheritance, protected class members, overriding and dominating inherited members, Function Overloading, private access verses protected access, virtual functions and polymorphism, pure virtual function, virtual destructors, abstract base classes</p> <p>File Handling: Classes for file stream operations, opening and closing a file, detecting end of file, file modes, file pointers and their manipulations, sequential input and output operations, random access, file operations error handling, command line argument</p>	12hrs
III	<p>Strings and Streams: the string class interface, the constructors and destructor , the copy constructor, the assignment operator, the addition operator , an append operator, access functions , the comparison operators, stream operators,</p> <p>Stream classes, the ios class, ios format flags, ios state, variables, the istream and ostream classes, unformatted input functions, unformatted output functions, stream manipulators.</p> <p>Exception Handling: Introduction, Basics of Exception Handling, Exception Handling mechanism, Throwing Mechanism, Catching Mechanism, Specifying Exception</p>	12hrs
V	<p>Templates and Iterators: function templates, class templates, container classes, subclass templates, passing template classes to template parameters, iterator classes</p> <p>Libraries: the standard C++ library, proprietary libraries, contents of the standard c headers, string streams, file processing, the standard template library</p>	12hrs

References

- 1) Object Oriented Design by Rumbaugh (Pearson publication)
- 2) Object-oriented programming in Turbo C++ By Robert Lafore, Galgotia Publication.
- 3) Object-oriented programming with C++ by E.Balagurusamy, 2nd Edition, TMH.

Course Description :BSc(Information Technology)	
Semester	II
Course Name	Microprocessor Architecture
Course Code	UIT2MAT
Credit	2
Hours	5Hrs per week

Course Objectives	The objective of this course is to introduce the basic structure of 8085 Microprocessor, Assembly Language Programming techniques and its instruction set.
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain Microprocessor, Microcomputer and Assembly Language.
	2) Elaborate the concepts of Microprocessor Architecture, Interface Devices and Assembly Language.
	3) Make use of counter and time delay, Stack and Subroutines.
	4) Explain 8086 microprocessor, Software Development Systems and Interrupt.

Module/ Unit	Course Description	Hrs.
I	<p>Microprocessor, Microcomputers, and Assembly Language: Microprocessor, Microprocessor Instruction Set and Computer Languages, From Large Computers to Single-Chip Microcontrollers, Applications.</p> <p>Microprocessor Architecture and Microcomputer System: Microprocessor Architecture and its operations, Memory, I/O Devices, Microcomputer System, Logic Devices and Interfacing, Microprocessor-Based System Application.</p> <p>Introduction to 8085 Assembly Language Programming: The 8085 Programming Model, Instruction Classification, Instruction, Data and Storage, Writing assembling and Execution of a simple program, Writing and Assembling Program.</p>	12 hrs

<p style="text-align: center;">II</p>	<p>Introduction to 8085 Instructions: Overview of 8085 Instruction Set, Data Transfer Operations, Arithmetic Operations, Logic Operation, Branch Operation, Writing Assembly Languages Programs, Debugging a Program</p> <p>8085 Microprocessor Architecture and Memory Interface: Introduction, 8085 Microprocessor unit, 8085-Based Microcomputer, Memory Interfacing, Interfacing the 8155 Memory Segment, Illustrative Example: Designing Memory for the MCTS Project, Testing and Troubleshooting Memory Interfacing Circuit, 8085-Based Single-Board microcomputer.</p> <p>Interfacing of I/O Devices: Basic Interfacing concepts, Interfacing Output Displays, Interfacing Input Devices, Memory Mapped I/O, Testing and Troubleshooting I/O Interfacing Circuits.</p>	<p style="text-align: center;">12 hrs</p>
<p style="text-align: center;">III</p>	<p>Programming Techniques With Additional Instructions: Programming Techniques: Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Instruction Related to Memory, Logic Operations: Rotate, Logics Operations: Compare, Dynamic Debugging.</p> <p>Counters and Time Delays: Counters and Time Delays, Illustrative Program: Hexadecimal Counter, Illustrative Program: zero-to-nine (Modulo Ten) Counter, Generating Pulse Waveforms, Debugging Counter and Time-Delay Programs.</p>	<p style="text-align: center;">12 hrs</p>
<p style="text-align: center;">IV</p>	<p>Stacks and Sub-Routines: Stack Subroutine, Restart, Conditional Call, Return Instructions, Advanced Subroutine concepts.</p> <p>8086 Microprocessor: Introduction to 8086 Microprocessor, Intel Microprocessor families, 8086 Microprocessor Architecture, Register Organization, Pin Description, Modes of Operation, Difference between 8085 instructions and 8086 instructions.</p>	<p style="text-align: center;">12 hrs</p>
<p style="text-align: center;">V</p>	<p>Software Development System and Assemblers: Microprocessors-Based Software Development system, Operating System and Programming Tools, Assemblers and Cross-Assemblers, Writing Program Using Cross Assemblers.</p> <p>Interrupts: The 8085 Interrupt, 8085 Vectored Interrupts, Restart as S/W Instructions, Additional I/O Concepts and processes.</p>	<p style="text-align: center;">12 hrs</p>

References

- 1) Microprocessors Architecture, Programming and Applications with the 8085, Ramesh Gaonkar, Fifth Edition, PENRAM
- 2) Computer System Architecture, M. Morris Mano, PHI
- 3) Structured Computer Organization, Andrew C. Tanenbaum, PHI

Course Description: BSc(Information Technology)	
Semester	II
Course Name	Database Management System
Course Code	UIT2DMT
Credit	2
Hours	5Hrs per week

Course Objectives	The objective of this course is to introduce the concept of the DBMS with respect to the relational model, to specify the functional and data requirements for a typical database application and to understand creation, manipulation and querying of data in databases and the basic of PL/SQL
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Course Outcomes	After completing the course, Student will be able to:
	1) Design E-R model to represent database
	2) Design the database with normalization
	3) Explain the fundamental of RDBMS
	4) Explain the transactions of database and basic of PL/SQL

Module/Unit	Course Description	Hrs.
I	<p>Introduction: What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management,</p> <p>Data Models :The importance of data models, Basic building blocks ,Business rules, The evolution of data models, Degrees of data abstraction</p>	12hrs
II	<p>Database Design, ER-Diagram Database design and ER Model: overview, ER-Model, Constraints, ER Diagrams,ERD Issues, weak entity sets, Codd's rules, Relational Schemas, Logical view of data, keys, integrity rules.</p> <p>Relational Algebra and Calculus: Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison.</p>	12hrs

III	<p>Constraints, Views and SQL :What is constraints, types of constrains,Integrity constraints, Views: Introduction to views, data independence,security, updates on views, comparison between tables and views</p> <p>SQL:data definition, aggregate function,single row function Null Values, nested sub queries,Joined relations,.</p>	12hrs
IV	<p>Transaction management and Concurrency control: Transaction management: ACID properties, serializability and concurrency control,Lock based concurrency control (2PL, Deadlocks),Time stamping methods, optimistic methods, database recovery management.</p>	12hrs
V	<p>PL-SQL: Beginning with PL / SQL, Identifiers and Keywords, Operators, Expressions, Sequences, Overview and benefits of PL/SQL, Subprograms, types of PL/SQL blocks, Simple Anonymous Block, Identifiers, types of Identifiers, Declarative Section, variables, Scalar Data Types, The %TYPE Attribute, Executable Statements, PL/SQL Block Syntax, Comment the Code, Convert Data Types, Nested Blocks, Operators. Invoke SELECT Statements in PL/SQL, Save and Discard Transactions.</p>	12hrs

References

- 1) "Database System and Concepts",A Silberschatz, H Korth, S Sudarshan, , fifth Edition McGraw-Hill .
- 2) "Database Systems", Rob, Coronel, Seventh Edition, Cengage Learning

Course Description : B.Sc. (Information Technology)	
Semester	II
Course Name	Numerical Methods
Course Code	UIT2NMS
Credit	2
Hours	5Hrs per week

Course Objectives	The course is designed to have a grasp of important concepts of Numerical Methods in a scientific way. The learner is expected to solve as many examples as possible to get complete clarity and understanding of the topics covered.
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Course Outcomes	After completing the course, Student will be able to:
	1) Solve algebraic, transcendental and simultaneous systems of equations using numerical methods.
	2) Evaluate the functions and their derivatives using interpolation.
	3) Solve differential equations and integration by using numerical methods.
	4) Apply triangularization method, LU decomposition, cholesky method, power and inverse power method.

Module/Unit	Course Description	Hrs
I	Solutions of Algebraic and Transcendental Equations: The Bisection Method, The Newton-Raphson Method, The Regula-falsi method, The Secant Method. Solution of simultaneous algebraic equation (linear) using iterative methods: Gauss Elimination Method, Gauss Jordan Method, Gauss Jacobi Method, Gauss Seidel Method	12hrs
II	Interpolation: Forward Difference, Backward Difference, Central Differences, Different Types of Operators, Relation between Operators, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Divided Differences, Newton's Divided Difference Interpolation , Lagrange's Interpolation, Spline Interpolation.	12hrs

III	<p>Numerical differentiation: Numerical differentiation, Methods based on finite Differences: Derivatives using Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Newton's Divided Difference Interpolation & Lagrange's Interpolation.</p> <p>Numerical solution of 1st and 2nd order differential equations: Taylor series, Picard's Method, Euler's Method, Modified Euler's Method, Runge-Kutta Method for 1st and 2nd Order Differential Equations.</p>	12hrs
IV	<p>Numerical integration: Trapezoidal Rule, Simpson's 1/3rd and 3/8th rules, Romberg Method, Gauss Legendre Integration Method, Gauss Chebyshev Integration Method.</p> <p>Double Integration: Trapezoidal Method, Simpson's Method</p>	12hrs
V	<p>Linear System of equations Direct Method: Triangularization Method, LU Decomposition, Cholesky Method, Partition Method.</p> <p>Eigen value Problem : Power Method</p>	12hrs

References:

- 1) Numerical Methods for Scientific and Engineering Computation, M. K. Jain, S. R. K. Iyengar and R. K. Jain, New age International Publishers, Fourth Edition, 2003
- 2) Introductory Methods of Numerical Methods , S. S. Shastri , PHI , Vol – 2
- 3) Numerical Methods for Engineers , Steven C. Chapra, Raymond P. Canale , Tata Mc Graw Hill , 6th Edition , 2010
- 4) Numerical Analysis , Richard L. Burden, J. Douglas Faires , Cengage Learning , 9th Edition, 2011
- 5) Numerical and Statistical Technique, QaziShoeb Ahmad, Zubair Khan, Shadad Ahmad Khan, Ane's Student Edition

Course Description: BSc (Information Technology)	
Semester	II
Course Name	Web Programming
Course Code	UIT2WPT
Credit	2
Hours	5Hrs per week

Course Objectives	On completion of this course, a learner will be able to develop a web application using web technologies. Learners will gain the skills and project-based experience needed for entry into web application and development careers. Learners will be able to develop a dynamic webpage by the use of java script , jquery, xml, basic php along with interaction with mysql database.
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Course Outcomes	After completing the course, Student will be able to:
	1) Illustrate the HTML5 tags used to develop static web pages.
	2) Make use of CSS to improve the look and feel of web pages.
	3) Elaborate the creation of dynamic web pages using server side PHP programming and Database connectivity.
	4) Explain javascript event handling and functions.

Module/Unit	Course Description	Hrs.
I	<p>Internet and the World Wide Web: What is Internet? Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address, World Wide Web (WWW): World Wide Web and its evolution, uniform resource locator (URL)</p> <p>HTML5: Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets, Creating image map, redirecting to another URL</p>	12hrs

<p style="text-align: center;">II</p>	<p>HTML5 Tables, Forms and Media: Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells,</p> <p>Creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5</p> <p>Bootstrap:</p> <p>Introduction, Why Use Bootstrap?, Create First Web Page With Bootstrap, Bootstrap Grids, Bootstrap Typography Classes, Bootstrap Tables, Bootstrap Images, Bootstrap Alerts, Bootstrap Buttons, Bootstrap Progress Bars, Bootstrap basic Forms</p>	<p style="text-align: center;">12hrs</p>
<p style="text-align: center;">III</p>	<p>Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security.</p> <p>Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), -- (Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void</p> <p>Statements: Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with.</p> <p>Core JavaScript (Properties and Methods of Each): Array, Boolean, Date, Function, Math, Number, Object, String, regExp</p> <p>Document and its associated objects: Document, Link, Area, Anchor, Image, Applet, Layer</p> <p>Events and Event Handlers: General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDbClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload</p>	<p style="text-align: center;">12hrs</p>

IV	<p>PHP: Why PHP and MySQL? Server-side scripting, PHP syntax and variables, comments, types, control structures, branching, looping, termination, functions, passing information with PHP, GET, POST, formatting form variables, superglobal arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems.</p> <p>XML: Comparing XML with HTML, Advantages and Disadvantages of XML, Structure of an XML Document, XML entity references, DTD, XSLT.</p>	12hrs
V	<p>Advanced PHP and MySQL: PHP/MySQL Functions, Integrating web forms and databases, Displaying queries in tables, Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, E-Mail</p> <p>Introduction to JQuery: Fundamentals, Selectors, Methods to access HTML attributes.</p>	12hrs

References

- 1) "HTML5 Step by Step", Faithe Wempen, Microsoft Press
- 2) "JavaScript 2.0: The Complete Reference", Thomas Powell and Fritz Schneider, Second Edition, Tata McGraw Hill Publication
- 3) "PHP 5.1 for Beginners", Ivan Bayross, Sharanam Shah, SPD Publication
- 4) "PHP 6 and MySQL Bible", Steve Suehring, Tim Converse, Joyce Park, Wiley Publication
- 5) "PHP Project for Beginners", Sharanam Shah, Vaishali Shah, SPD Publication
- 6) "Web Design The Complete Reference", Thomas Powell, Tata McGraw Hill Publication
- 7) "Head First HTML 5 programming", Eric Freeman, O'Reilly Publication

Course Description: BSc(Information Technology)	
Semester	II
Course Name	Effective Communication Skill
Course Code	USC2CSK
Credit	2
Hours	30Hrs.

Course Objectives	To enhance communication skills of the students
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Course Outcomes	After completing the course, Student will be able to:
	1) Develop an understanding of communication skills to face challenges of real and corporate life
	2) Show enhancement in the communication skill
	3) Demonstrate Leadership qualities, team-work, decision making

Module/ Unit	Course Description	Hrs.
I	<p>Academic Skills :</p> <p>1.1 Essentials of Grammar: Parts of speech, Articles, Modals, Sentences and their types., Punctuation marks</p> <p>1.2 Employment Communication: Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter. Email Writing</p> <p>1.3 Professional Presentation: Nature of Oral Presentation, planning a Presentation, Preparing the Presentation, Delivering the Presentation</p> <p>1.4 Job Interviews: Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Changes in the Interview Process, FAQ During Interviews</p> <p>1.5 Group Discussion: Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Difference between Group Discussion, Panel Discussion and Debate, Traits, Types of Group Discussions, topic based and Case based Group Discussion, Individual Traits</p>	15hrs

II	<p>Soft and Professional Skills:</p> <p>2.1 Introduction to Soft Skills and Hard Skills</p> <p>2.2 Personality Development: Knowing Yourself, Positive Thinking, Johari's Window, Communication Skills, Non-verbal Communication, Physical Fitness Definition</p> <p>2.3 Etiquette and Mannerism: Introduction, Professional Etiquette, Technology Etiquette</p> <p>2.4 Communication Techniques:</p> <p>2.5 Ethical Values: Ethics and Society, Theories of Ethics, Correlation, between Values and behaviour, Nurturing Ethics, Importance of Work Ethics, Problems in the Absence of Work Ethics</p> <p>2.6 Leadership and Team Building: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams</p>	15hrs
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Course Description: BSc(Information Technology)	
Semester	II
Course Name	Object Oriented Programming Practical
Course Code	UIT2OPP
Credit	2
Hours	3Hrs per week
Course Description: BSc(Information Technology)	

Course Objectives	Main objective to teach learners the basic concepts and technique which form the object oriented programming paradigm
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Course Outcomes	After completing the course, Student will be able to:
	1) Construct program using classes, constructors, inheritance
	2) Design programs using virtual functions and abstract classes
	3) Build program using operator overloading, template, exceptional handling and string handling
	4) Utilize private function, friend function.

Module/Unit	Course Description	Hrs.
1	<p>Classes and methods:</p> <p>a. Design an employee class for reading and displaying the employee information, the <code>getInfo()</code> and <code>displayInfo()</code> methods will be used respectively. Where <code>getInfo()</code> will be private method</p> <p>b. Design the class student containing <code>getData()</code> and <code>displayData()</code> as two of its methods which will be used for reading and displaying the student information respectively. Where <code>getData()</code> will be private method.</p> <p>Design the class Demo which will contain the following methods: <code>readNo()</code>, <code>factorial()</code> for calculating the factorial of a number, <code>reverseNo()</code></p> <p>will reverse the given number, <code>isPalindrome()</code> will check the given number is palindrome, <code>isArmstrong()</code> which will calculate the given number is armStrong or not. Where <code>readNo()</code> will be private method.</p> <p>d. Write a program to demonstrate function definition outside class and accessing class members in function definition.</p>	3hrs

2	<p>Using friend functions:</p> <p>a. Write a friend function for adding the two complex numbers, using a single class.</p> <p>b. Write a friend function for adding the two different distances and display its sum, using two classes.</p> <p>c. Write a friend function for adding the two matrix from two different classes and display its sum.</p>	3hrs
3	<p>Constructors and method overloading:</p> <p>a. Design a class Complex for adding the two complex numbers and also show the use of constructor.</p> <p>b. Design a class Geometry containing the methods area() and volume() and also overload the area() function .</p> <p>c. Design a class StaticDemo to show the implementation of static variable and static function.</p>	3hrs
4	<p>Operator Overloading:</p> <p>a.Overload the operator unary(-) for demonstrating operator overloading.</p> <p>b. Overload the operator + for adding the timings of two clocks,And also pass objects as an argument.</p> <p>c.Overload the + for concatenating the two strings. For e.g “Py” + “thon” = Python.</p>	3hrs
5	<p>Inheritance:</p> <p>a.Design a class for single level inheritance using public and private type derivation.</p> <p>b.Design a class for multiple inheritances.</p> <p>c.Implement the hierarchical inheritance</p> <p>d.Design a class for multilevel inheritances.</p>	3hrs

6	<p>Virtual functions and abstract classes</p> <p>a.Implement the concept of method overriding.</p> <p>b.Show the use of virtual function</p> <p>c.Show the implementation of abstract class.</p>	3hrs
7	<p>String handling</p> <p>a..String operations for string length , string concatenation</p> <p>b.String operations for string reverse, string comparison,</p> <p>c. Console formatting functions</p>	3hrs
8	<p>Exception handling</p>	
	<p>a.Show the implementation of exception handling</p> <p>b.Show the implementation for exception handling for strings</p> <p>c.Write a program to demonstrate how we can restrict a function to throw only certain types of exceptions and not all.</p>	3hrs
9	<p>File handling</p> <p>a. Design a class FileDemo open a file in read mode and display the total number of words and lines in the file.</p> <p>b. Design a class to handle multiple files and file operations.</p> <p>c. Design an editor for appending and editing the file.</p>	3hrs
10	<p>Templates</p> <p>Design the template class library for concatenating two strings</p> <p>b.Design the implementation of template class library for swap function.</p> <p>c.Design the template class library for sorting ascending to descending and vice-versa</p>	3hrs

References

1. Object-oriented programming in Turbo C++ By Robert Lafore, Galgotia Publication.
2. Object-oriented programming with C++ by E.Balagurusamy, 2nd Edition, TMH.

Course Description: BSc(Information Technology)	
Semester	II
Course Name	Microprocessor Architecture Practical
Course Code	UIT2MAP
Credit	2
Hours	3Hrs. per week

Course Objectives	The objective of this course is to create simple assembly language programming and Operations on Memory Locations.
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Course Outcomes	After completing the course, Student will be able to:
	1) Create simple Assembly Language Programs.
	2) Evaluate operations on memory locations.
	3) Develop packing and unpacking operations.
	4) Make use of register operations.

Module/Unit	Course Description	Hrs.
1	<p>Perform the following Operations related to memory locations.</p> <p>a. Store the data byte 32H into memory location 4000H.</p> <p>b. Exchange the contents of memory locations 2000H and 4000H</p>	3hrs
2	<p>Assembly language programs.</p> <p>a. Subtract the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.</p> <p>b. Subtract two 8-bit numbers.</p> <p>c. Add the 16-bit number in memory locations 4000H and 4001H to the 16-bit number in memory locations 4002H and 4003H. The most significant eight bits of the two numbers to be added are in</p>	3hrs

	<p>memory locations 4001H and 4003H. Store the result in memory locations 4004H and 4005H with the most significant byte in memory location 4005H.</p> <p>d. Add the contents of memory locations 40001H and 4001H and place the result in the memory locations 4002H and 4003H.</p> <p>e. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.</p> <p>f. Find the 1's complement of the number stored at memory location 4400H and store the complemented number at memory location 4300H.</p> <p>g. Write a program to convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.</p>	
3	<p>Packing and unpacking operations.</p> <p>a. Pack the two unpacked BCD numbers stored in memory locations 4200H and 4201H and store result in memory location 4300H. Assume the least significant digit is stored at 4200H.</p> <p>b. Two digit BCD number is stored in memory location 4200H. Unpack the BCD number and store the two digits in memory locations 4300H and 4301H such that memory location 4300H will have lower BCD digits.</p>	3hrs
4	<p>Register Operations.</p> <p>a. Write a program to shift an eight bit data four bits right. Assume that data is in register C</p> <p>b. Program to shift a 16-bit data 1 bit left. Assume data is in the HL register pair</p> <p>c. Write a set of instructions to alter the contents of flag register in 8085.</p> <p>d. Write a program to count number of 1's in the contents of D register and store the count in the B register.</p>	3hrs

<p style="text-align: center;">5</p>	<p>Multiple memory locations.</p> <p>a. Calculate the sum of series of numbers. The length of the series is in memory location 4200H and the series begins from memory location 4201H. a. Consider the sum to be 8 bit number. So, ignore carries. Store the sum at memory location 4300H. Consider the sum to be 16 bit number. Store the sum at memory locations 4300H and 4301H</p> <p>b. Multiply two 8-bit numbers stored in memory locations 2200H and 2201H by repetitive addition and store the result in memory locations 2300H and 2301H.</p> <p>c. Find the largest number in a block of data. The length of the block is in memory location 2200H and the block itself starts from memory location 2201H. Store the maximum number in memory location 2300H. Assume that the numbers in the block are all 8 bit unsigned binary numbers.</p>	<p style="text-align: center;">3hrs</p>
<p style="text-align: center;">6</p>	<p>Calculations with respect to memory locations.</p> <p>a. Write a program to sort given 10 numbers from memory location 2200H in the ascending order.</p> <p>b. Calculate the sum of series of even numbers from the list of numbers. The length of the list is in memory location 2200H and the series itself begins from memory location 2201H. Assume the sum to be 8 bit number so you can ignore carries and store the sum at memory location 2300H. Sample problem:</p> <p>c. Calculate the sum of series of odd numbers from the list of numbers. The length of the list is in memory location 2200H and the series itself begins from memory location 2201H. Assume the sum to be 16-bit. Store the sum at memory locations 2300H and 2301H.</p> <p>d. Find the square of the given numbers from memory location 6100H and store the result from memory location 7000H</p> <p>e. Search the given byte in the list of 50 numbers stored in the consecutive memory locations and store the address of memory</p>	<p style="text-align: center;">3hrs</p>

	<p>location in the memory locations 2200H and 2201H. Assume byte is in the C register and starting address of the list is 2000H. If byte is not found store 00 at 2200H and 2201H</p> <p>f. Add 2 arrays having ten 8-bit numbers each and generate a third array of result. It is necessary to add the first element of array 1 with the first element of array-2 and so on. The starting addresses of array 1, array2 and array3 are 2200H, 2300H and 2400H, respectively</p>	
7	<p>Assembly programs on memory locations.</p> <p>a. Write an assembly language program to separate even numbers from the given list of 50 numbers and store them in the another list starting from 2300H. Assume starting address of 50 number list is 2200H</p> <p>b. Add even parity to a string of 7-bit ASCII characters. The length of the string is in memory location 2040H and the string itself begins in memory location 2041H. Place even parity in the most significant bit of each character.</p> <p>c .A list of 50 numbers is stored in memory, starting at 6000H. Find number of negative, zero and positive numbers from this list and store these results in memory locations 7000H, 7001H, and 7002H respectively</p> <p>d. Write an assembly language program to generate fibonacci number.</p> <p>e. Program to calculate the factorial of a number between 0 to 8.</p>	3hrs

<p style="text-align: center;">8</p>	<p>String operations in assembly programs.</p> <p>a. Write an 8085 assembly language program to insert a string of four characters from the tenth location in the given array of 50 characters</p> <p>b. Write an 8085 assembly language program to delete a string of 4 characters from the tenth location in the given array of 50 characters.</p> <p>c. Multiply the 8-bit unsigned number in memory location 2200H by the 8-bit unsigned number in memory location 2201H. Store the 8 least significant bits of the result in memory location 2300H and the 8 most significant bits in memory location 2301H.</p> <p>d. Divide the 16-bit unsigned number in memory locations 2200H and 2201H (most significant bits in 2201H) by the 8-bit unsigned number in memory location 2300H store the quotient in memory location 2400H and remainder in 2401H</p> <p>e. DAA instruction is not present. Write a subroutine which will perform the same task as DAA</p>	<p style="text-align: center;">3hrs</p>
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<p style="text-align: center;">9</p>	<p>Calculations on memory locations.</p> <p>a. To test RAM by writing '1' and reading it back and later writing '0' (zero) and reading it back. RAM addresses to be checked are 40FFH to 40FFH. In case of any error, it is indicated by writing 01H at port 10</p> <p>b. Arrange an array of 8 bit unsigned no in descending order</p> <p>c. Transfer ten bytes of data from one memory to another memory block. Source memory block starts from memory location 2200H whereas destination memory block starts from memory location 2300H</p> <p>d. Write a program to find the Square Root of an 8 bit binary number. The binary number is stored in memory location 4200H and store the square root in 4201H.</p> <p>e. Write a simple program to Split a HEX data into two nibbles and store it in memory</p>	<p style="text-align: center;">3hrs</p>
<p style="text-align: center;">10</p>	<p>Operations on BCD numbers.</p> <p>a. Add two 4 digit BCD numbers in HL and DE register pairs and store result in memory locations, 2300H and 2301H. Ignore carry after 16 bit.</p> <p>b. Subtract the BCD number stored in E register from the number stored in the D register</p> <p>c. Write an assembly language program to multiply 2 BCD numbers .</p>	<p style="text-align: center;">3hrs</p>

References

- 1) Microprocessors Architecture, Programming and Applications with the 8085, Ramesh Gaonkar, Fifth Edition, PENRAM
- 2) Computer System Architecture, M. Morris Mano, PHI
- 3) Structured Computer Organization, Andrew C. Tanenbaum, PHI

Course Description: BSc(Information Technology)	
Semester	II
Course Name	Database Management System Practical
Course Code	UIT2DSP
Credit	2
Hours	3Hrs per week

Course Objectives	To give a good formal foundation on the relational model of data, give an introduction to systematic database design approaches
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Course Outcomes	After completing the course, Student will be able to:
	1) Build Basic Database
	2) Build SQL statement
	3) Modify E-R model to relational table
	4) Construct integrity constraints

Module/Unit	Course Description	Hrs
1.	Draw E-R diagram and convert into relation tables a. Design E-R diagram b. Convert E-R diagram into relational database	3hrs
2.	Design a Database and create required tables. a. Creating College database b. Creating Bank database	3hrs
3.	Writing Basic SQL SELECT Statements a. Restricting data b. Sorting Data	3hrs
4.	Applying the constraints a. Table Level b. Column Level	3hrs

5.	Manipulating Data a. Using INSERT b. Using UPDATE c. Using DELETE	3hrs
6.	Write a SQL statement for Creating and Managing Tables a. Alter b. Drop	3hrs
7.	Write a queries using Group Functions and Single-Row Functions a. SUM () , AVG () , MIN () , MAX () , COUNT () b. UPPER , LOWER and INITCAP .	3hrs
8.	Write the queries to implement the joins a. Simple Join b. Outer Join	3hrs
9.	Write the queries to implement the set operators a. UNION , UNION ALL b. INTERSECT c. MINUS	3hrs
10.	Write the query to create the database objects a. Views b. Sequences	3hrs
11.	PL/SQL Basics a. Declaring Variables b. Writing Executable Statements c. Interacting with the oracle server	3hrs

References

- 1) Database Systems A Practical Approach To Design Implementation And Management 4th Edition Thomas Connolly Carolyn Begg, Person

Course Description: BSc(Information Technology)	
Semester	II
Course Name	Numerical Methods Practical
Course Code	UIT2NMP
Credit	2
Hours	3Hrs. per week

Course Objectives	To familiarize the students with the fundamental concepts of scilab and develop programming skill to effectively implement for problems.
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Course Outcomes	After completing the course, Student will be able to:
	1) Make use of the basic commands of scilab.
	2) Construct a formula for interpolation using scilab.
	3) Determine the differential equation and numerical integration using scilab.
	4) Design the program in scilab for Eigenvalue problems and linear systems of equations.

Module/Unit	Course Description	Hrs.
1	Solution of algebraic and transcendental equations <ol style="list-style-type: none"> a. Program to solve algebraic and transcendental equations by bisection method. b. Program to solve algebraic and transcendental equation by false position method. c. Program to solve algebraic and transcendental equation by Secant method. d. Program to solve algebraic and transcendental equation by Newton Raphson method 	3hrs
2.	Solving linear system of equations by iterative methods <ol style="list-style-type: none"> a. Program for solving linear systems of equations using Gauss Jordan method. b. Program for solving linear system of equations using Gauss Seidel method. 	3hrs
3.	Interpolation I <ol style="list-style-type: none"> a. Program for Newton's forward interpolation. b. Program for Newton's backward interpolation. c. Program for Newton's Divided Interpolation. 	3hrs

4.	Interpolation II: a. Program for Lagrange's interpolation. b. Program for Spline interpolation.	3hrs
5.	Numerical Differentiation a. Programming to obtain derivatives numerically.	3hrs
6.	Solution of differential equations a. Program to solve differential equation using Euler's method b. Program to solve differential equations using modified Euler's method. c. Program to solve differential equation using Runge-kutta 2nd order and 4th order methods	3hrs
7.	Numerical Integration a. Program for numerical integration using Trapezoidal rule. b. Program for numerical integration using Simpson's 1/3rd rule. c. Program for numerical integration using Simpson's 3/8th rule.	3hrs
8.	Double Integration: a. Program for numerical integration using Trapezoidal rule. b. Program for numerical integration using Simpson's rule.	3hrs
9.	Linear System of Equation: a. Program for LU Decomposition b. Program for Partition Method	3hrs
10.	EigenValue Problem: a. Program for Power Method	3hrs

References:

1. Scilab textbook companion for numerical methods: principles, analysis and algorithms by S.Pal

Course Description: BSc(Information Technology)	
Semester	II
Course Name	Web Programming Practical
Course Code	UIT2WPP
Credit	2
Hours	3Hrs per week

Course Objectives	To familiarize the students with basic web development concepts required to develop static web pages as well as advanced web concepts required for development of dynamic web pages.
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Course Outcomes	After completing the course, Student will be able to:
	1) Create static web pages using HTML5 and CSS.
	2) Design a responsive website using HTML5 and CSS.
	3) Construct interactive web pages using javascript as client side scripting language.
	4) Develop dynamic web pages using PHP as server side scripting language.

Module/Unit	Course Description	Hrs.
1.	Use of Basic Tags a. Design a web page using different text formatting tags. b. Design a web page with links to different pages and allow navigation between web pages. c. Design a web page demonstrating all Style sheet types	3hrs
2	Image maps, Tables, Forms and Media a. Design a web page with Image maps.	3hrs

	<p>b. Design a web page with different tables.</p> <p>c. Design a webpages using table so that the content appears well placed.</p> <p>d. Design a web page with a form that uses all types of controls.</p> <p>e. Design a web page using bootstrapping</p>	
3	<p>Java Script</p> <ol style="list-style-type: none"> 1. Using JavaScript design, a web page that prints factorial of a number. (Use prompts.) 2. Using JavaScript design, a web page that prints factorial of a number. (Use HTML form) 3. Using JavaScript design, a web page that accepts number of terms from the user and displays Fibonacci series. (Use HTML form) <p>b. Design a form and validate all the controls placed on the form using JavaScript.</p> <p>c. Write a JavaScript program to accept a number from the user and display the sum of its digits.</p> <p>d. Write a JavaScript program to accept a number from the user and display whether it is prime or not.</p> <p>e. Write a program in JavaScript to accept a sentence from the user and display the number of words in it. (Do not use split () function).</p> <p>f. Write a java script program to design simple calculator.</p>	3hrs

4	<p>. Control and looping statements and Java Script references</p> <p>a. Design a web page</p> <ol style="list-style-type: none"> 1. To accept a number from the user and display whether it is odd or even. (If...else). 2. To accept two numbers and operator from the user and perform the operation entered by user. (Use switch case) <p>b.</p> <ol style="list-style-type: none"> 1. Design a web page to display all the odd numbers from 1 to 50. (use while) 2. Design a web page to display all the numbers from 20 to 1. (use for) 3. Design a web page to demonstrate the use of for in loop on an array. <p>c. Design a web page demonstrating different Core JavaScript references (Array, Date, Math, and String).</p>	3hrs
5	<p>Basic PHP I</p> <p>a. Write a PHP Program to accept a number from the user and print it factorial.</p> <p>b. Write a PHP program to accept a number from the user and print whether it is prime or not.</p>	3hrs

6	<p>Basic PHP II</p> <p>a. Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.</p> <p>b. Write a PHP program to display the following Binary Pyramid:</p> <table border="1"> <tr> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>0</td> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td></td> <td></td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td></td> </tr> </table>	1					0	1				1	0	1			0	1	0	1		3hrs
1																						
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0	1	0	1																			
7	<p>String Functions and arrays</p> <p>a. Write a PHP program to demonstrate different string functions.</p> <p>b. Write a PHP program to create one dimensional array.</p>	3hrs																				
8	<p>PHP and Database</p> <p>a. Write a PHP code to create:</p> <ul style="list-style-type: none"> ● Create a database College ● Create a table Department (Dname, Dno, Number_Of_faculty) <p>b. Write a PHP program to create a database named “College”. Create a table named “Student” with following fields (sno, sname, percentage).</p> <p>Insert 3 records of your choice. Display the names of the students whose percentage is between 35 to 75 in a tabular format.</p> <p>c. Design a PHP page for authenticating a user.</p>	3hrs																				

9	Create a XML file with Internal/External DTD and display it using XSL	3hrs
10	Sessions and Cookies a. Write a program to demonstrate use of sessions and cookies.	3hrs

References:

- 1) “HTML5 Step by Step”, FaitheWempen , Microsoft Press
- 2) “JavaScript 2.0: The Complete Reference “, Thomas Powell and Fritz Schneider , Second Edition, Tata McGraw Hill Publication
- 3) “PHP 5.1 for Beginners”, Ivan Bayross, Sharanam Shah, SPD Publication



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: B.Sc

Revised Syllabus of S.Y.B.Sc. Information Technology
Choice Based Credit System (60:40)
w.e.f. Academic Year 2020-2021

BACHELOR'S IN SCIENCE (B. Sc.)

Programme Outcomes

S. N.	After completion of B.Sc. program students will acquire	Graduate Attribute
PO1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO2	An ability to develop and conduct experiments, analyze, and interpret data and use scientific judgment to draw conclusions	Scientific reasoning
PO3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyze and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understanding values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Program Specific outcomes

Name of the Programme: B.Sc.I.T.	
	After completing the programme in Information Technology, Student will be able to:
PSO1	Gain proficiency in the field of Networking and Security.
PSO2	Develop Programming skills that help to meet the needs of the IT industry.
PSO3	Build soft skills for employability and personality development in the Industrial environment.

Preamble:

The B.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

Semester - III
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs. / week	Internal assessment	Semester -end examination	Total	Credits
Python Programming	Skill Enhancement Course	UIT3PYP	5	40	60	100	2
Data Structures	Core Subject	UIT3DST	5	40	60	100	2
Computer Networks	Core Subject	UIT3CNT	5	40	60	100	2
Advanced SQL	Core Subject	UIT3DMS	5	40	60	100	2
Applied Mathematics	Core Subject	UIT3MAT	5	40	60	100	2
Python Programming Practical	Skill Enhancement Course Practical	UIT3PPP	5	--	50	50	2
Data Structures Practical	Core Subject Practical	UIT3DSP	5	--	50	50	2
Computer Networks Practical	Core Subject Practical	UIT3CNP	5	--	50	50	2
Advanced SQL Practical	Core Subject Practical	UIT3 ASP	5	--	50	50	2
Mobile Programming Practical	Core Subject Practical	UIT3MPP	5	--	50	50	2

Semester - IV
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Core Java	Skill Enhancement Course	UIT4CJ V	5	40	60	100	2
Introduction to Embedded systems	Core Subject	UIT4EMB	5	40	60	100	2
Computer Oriented Statistical Techniques	Core Subject	UIT4COS	5	40	60	100	2
Software Engineering	Core Subject	UIT4SWE	5	40	60	100	2
Computer Graphics and Animation	Core Subject	UIT4CGA	5	40	60	100	2
Core Java Practical	Skill Enhancement Course Practical	UIT4CJ P	5	--	50	50	2
Introduction to Embedded Systems Practical	Core Subject Practical	UIT4ESP	5	--	50	50	2
Computer Oriented Statistical Techniques Practical	Core Subject Practical	UIT4COP	5	--	50	50	2
Software Engineering Practical	Core Subject Practical	UIT4SEP	5	--	50	50	2
Computer Graphics and Animation Practical	Core Subject Practical	UIT4CGP	5	--	50	50	2

Examination Scheme

Choice Based Credit System (CBCS)

➤ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Presentation and write up on the selected topics of the subjects / Case studies. 2. Quiz	20 Marks

❖ Maximum Marks: 20

❖ Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

Question Paper Pattern for Semester End Examination (Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

➤ **Undergraduate Programmes for B.Sc. in Information Technology**

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be five questions each of 12 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Question Paper Pattern for Continuous Assessment

Presentation and write-up	Quiz
Presentation skill	Quiz on application of subject in real life
Knowledge	
Quality of ppt.	
Writing skill	

Question Paper Pattern for Practical Examination

Sr. No.	Particular		Marks
01	Practical		50 Marks
	Practical Question	40 Marks	
	Journal	5 Marks	
	Viva	5 Marks	

Semester III

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Python Programming
Course Code	UIT3PYP
Credit	2
Hours	5 lectures per week

Course Objectives	The objective of this course is to introduce the concept of the basic programming language with C++
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain the basic principles of the python programming language.
	2) Create the python programs in functions, string, file handling & exception handling.
	3) Explain facts of object-oriented concepts & modules.
	4) Design GUI & Database applications.

Module/Unit	Description	Hrs.
I	Introduction: The Python Programming Language, History, features, Installing Python, Running Python program, Debugging : Syntax Errors, Runtime Errors, Semantic Errors, Experimental Debugging, Formal and Natural Languages, The Difference Between Brackets, Braces, and Parentheses, Variables and Expressions Values and Types, Variables, Variable Names and	12

	<p>Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations.</p> <p>Conditional Statements: if, if-else, nested if –else</p> <p>Looping: for, while, nested loops</p> <p>Control statements: Terminating loops, skipping specific conditions</p>	
II	<p>Functions: Function Calls, Type Conversion Functions, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters Are Local, Stack Diagrams, Fruitful Functions and Void Functions, Why Functions? Importing with from, Return Values, Incremental Development, Composition, Boolean Functions, More Recursion, Leap of Faith, Checking Types</p> <p>Strings: A String Is a Sequence, Traversal with a for Loop, String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparison, String Operations.</p>	12
III	<p>Lists: Values and Accessing Elements, Lists are mutable, traversing a List, Deleting elements from List, Built-in List Operators, Concatenation, Repetition, In Operator, Built-in List functions and methods</p> <p>Tuples and Dictionaries: Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation, Repetition, in Operator, Iteration, Built-in Tuple Functions</p> <p>Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods</p> <p>Files: Text Files, The File Object Attributes, Directories</p> <p>Exceptions: Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions</p>	12
IV	<p>Regular Expressions – Concept of regular expression, various types of regular expressions, using match function.</p> <p>Classes and Objects: Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding</p> <p>Multithreaded Programming: Thread Module, creating a thread, synchronizing threads, multithreaded priority queue</p> <p>Modules: Importing module, Creating and exploring modules, Math module, Random module, Time module</p>	12
V	<p>Creating the GUI Form and Adding Widgets:</p> <p>Widgets: Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessageBox.</p> <p>Handling Standard attributes and Properties of Widgets.</p> <p>Layout Management: Designing GUI applications with proper Layout Management features.</p> <p>Look and Feel Customization: Enhancing Look and Feel of GUI using different appearances of widgets.</p> <p>Storing Data in Our MySQL Database via Our GUI: Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.</p>	12

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Python Programming Practical
Course Code	UIT3PPP
Credit	2
Hours	5 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Create programs of objects, strings, arrays, functions, etc.
	2) Solve programming errors using exception handling
	3) Construct the concepts of OOP like class, inheritance, polymorphism, encapsulation etc.
	4) Design the GUI using database applications.

Course Code	Practical List
UIT3PPP	<p>1. Write the program for the following:</p> <ol style="list-style-type: none"> Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old. Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user. Write a program to generate the Fibonacci series. Write a function that reverses the user defined value. Write a function to check the input value is Armstrong and also write the function for Palindrome. Write a recursive function to print the factorial for a given number. <p>2. Write the program for the following:</p> <ol style="list-style-type: none"> Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise. Define a function that computes the <i>length</i> of a given list or string. Define a procedure <code>histogram()</code> that takes a list of integers and prints a histogram to the screen. For example, <code>histogram([4, 9, 7])</code> should print the following: ****

3. Write the program for the following:

- a. A pangram is a sentence that contains all the letters of the English alphabet at least once, for example: The quick brown fox jumps over the lazy dog. Your task here is to write a function to check a sentence to see if it is a pangram or not.
- b. Take a list, say for example this one:
a=[1,1,2,3,5,8,13,21,34,55,89]
and write a program that prints out all the elements of the list that are less than 5.

4. Write the program for the following:

- a. Write a program that takes two lists and returns True if they have at least one common member.
- b. Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.
- c. Write a Python program to clone or copy a list

5. Write the program for the following:

- a. Write a Python script to sort (ascending and descending) a dictionary by value.
- b. Write a Python script to concatenate following dictionaries to create a new one.
Sample Dictionary : dic1={1:10, 2:20} dic2={3:30, 4:40} dic3={5:50,6:60}
Expected Result : {1: 10, 2: 20, 3: 30, 4: 40, 5: 50, 6: 60}
- c. Write a Python program to sum all the items in a dictionary.

6. Write the program for the following:

- a. Write a Python program to read an entire text file.
- b. Write a Python program to append text to a file and display the text.
- c. Write a Python program to read last n lines of a file.

7. Write the program for the following:

- a. Design a class that store the information of student and display the same
- b. Implement the concept of inheritance using python

8. Write the program for the following:

- a. Open a new file in IDLE (“New Window” in the “File” menu) and save it as geometry.py in the directory where you keep the files you create for this course. Then copy the functions you wrote for calculating volumes and areas in the “Control Flow and Functions” exercise into this file and save it.
Now open a new file and save it in the same directory. You should now be able to import your own module like this: import geometry
- b. Write a program to implement exception handling.

9. Write the program for the following:

- a. Try to configure the widget with various options like: `bg="red"`, `family="times"`, `size=18`
- b. Try to change the widget type and configuration options to experiment with other widget types like Message, Button, Entry, Checkbutton, Radiobutton, Scale etc.

10. Design the database applications for the following:

- a. Design a simple database application that stores the records and retrieve the same.
- b. Design a database application to search the specified record from the database.
- c. Design a database application to that allows the user to add, delete and modify the records.

Reference Books:

- 1) "Think Python" , Allen Downey, First edition, O'Reilly publication
- 2) "An Introduction to Computer Science using Python 3" , Jason Montojo, First Edition, SPD publication.
- 3) "Python GUI Programming Cookbook", Burkhard A. Meier, Packt Edition
- 4) "Introduction to Problem Solving with Python", E Balagurusamy , First Edition ,Tata McGraw Hill.
- 5) "Murach's Python Programming" , Joel Murach & Michael Urban, First Edition, SPD Publication
- 6) "Object Oriented Programming in Python",Michael H. Glodwasser,First Edition, Pearson Prentice Hall Publication
- 7) "Exploring Python", Budd, First Edition, TMH Publication

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Data Structures
Course Code	UIT3DST
Credit	2
Hours	5 lectures per week

Course Objectives	The objective of this course is to introduce the basic knowledge of algorithms and analysis procedure and determine the complexity of given algorithms and techniques.
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Course Outcomes	After completing the course, Student will be able to:
	1) Define the basics of algorithm analysis and array operations.
	2) Elaborate Operations on Linked lists, Stack and Queue.
	3) Explain Different searching and sorting techniques, tree and AVL tree structures.
	4) Solve Problems based on graph and hashing techniques.

Module/Unit	Description	Hrs.
I	Introduction: Data and Information, Data Structure , Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations , Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation. Array: Introduction, One Dimensional Array, Memory Representation of One	12

	Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Multidimensional Arrays , Memory Representation of Two Dimensional Arrays, General Multi-Dimensional Arrays, Sparse Arrays, Sparse Matrix, Memory Representation of Special kind of Matrices , Advantages and Limitations of Arrays.	
II	Linked List: Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and De-allocation , Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List, Applications of Circular Linked List , Two way Linked List, Traversing a Two way Linked List, Searching in a Two way linked List, Insertion of an element in Two way Linked List, Deleting a node from Two way Linked List, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures .	12
III	Stack: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression , Matching Parenthesis, infix and postfix operations, Recursion. Queue: Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue, Some special kinds of queues, Deque, Priority Queue , Application of Priority Queue, Applications of Queues.	12
IV	Sorting and Searching Techniques Bubble, Selection, Insertion, Merge Sort. Searching: Sequential, Binary , Indexed Sequential Searches, Binary Search. Tree: Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree , Operations Performed on Binary Tree, Reconstruction of Binary Tree from its Traversals, Huffman Algorithm, Binary Search Tree, Operations on Binary Search Tree, Heap, Memory Representation of Heap , Operation on Heap, Heap Sort. Advanced Tree Structures: Red Black Tree, Operations Performed on Red Black Tree, AVL Tree, Operations performed on AVL Tree, 2-3 Tree , B-Tree.	12
V	Hashing Techniques Hash function, Address calculation techniques, Common hashing functions Collision resolution , Linear probing, Quadratic, Double hashing, Bucket hashing, Deletion and rehashing Graph: Introduction, Graph, Graph Terminology, Memory Representation of Graph , Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees .	12

Reference Books:

1. A Simplified Approach to Data Structures - Lalit Goyal, Vishal Goyal, Pawan Kumar
2. An Introduction to Data Structure with Applications - Jean – Paul Tremblay and Paul Sorenson.
4. Data Structure and Algorithm -Maria Rukadikar Tata McGraw Hill

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Data Structure Practical
Course Code	UIT3DSP
Credit	2
Hours	5 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Develop different data structure techniques.
	2) Create Linked list, Stack and Queue Operations.
	3) Make use of searching and sorting techniques
	4) Build a tree and display its elements

Course Code	Practical List
UIT3DSP	<p>1. Implement the following:</p> <p>a. Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements. [Menu Driven]</p> <p>b. Read the two arrays from the user and merge them and display the elements in sorted order.[Menu Driven]</p> <p>c. Write a program to perform the Matrix addition, Multiplication and Transpose Operation. [Menu Driven]</p> <p>2. Implement the following for Linked List:</p> <p>a. Write a program to create a single linked list and display the node elements in reverse order.</p> <p>b. Write a program to search the elements in the linked list and display the same</p> <p>c. Write a program to create double linked list and sort the elements in the linked list.</p> <p>3. Implement the following for Stack:</p> <p>a. Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations.</p> <p>b. Write a program to convert an infix expression to postfix and prefix conversion.</p>

- c. Write a program to implement Tower of Hanoi problem.
- 4. Implement the following for Queue:
 - a. Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.
 - b. Write a program to implement the concept of Circular Queue
 - c. Write a program to implement the concept of Deque.
- 5. Implement the following sorting techniques:
 - a. Write a program to implement bubble sort.
 - b. Write a program to implement selection sort.
 - c. Write a program to implement insertion sort.
- 6. Implement the following data structure techniques:
 - a. Write a program to implement merge sort.
 - b. Write a program to search the element using sequential search.
 - c. Write a program to search the element using binary search.
- 7. Implement the following data structure techniques:
 - a. Write a program to create the tree and display the elements.
 - b. Write a program to construct the binary tree.
 - c. Write a program for inorder, postorder and preorder traversal of tree.
- 8. Implement the following data structure techniques:
 - a. Write a program to insert the element into maximum heap.
 - b. Write a program to insert the element into minimum heap.
- 9. Implement the following data structure techniques:
 - a. Write a program to implement the collision technique.
 - b. Write a program to implement the concept of linear probing.
- 10. Implement the following data structure techniques:
 - a. Write a program to generate the adjacency matrix.
 - b. Write a program for shortest path diagram.

Reference Books:

1. A Simplified Approach to Data Structures - Lalit Goyal, Vishal Goyal, Pawan Kumar
2. An Introduction to Data Structure with Applications - Jean – Paul Tremblay and Paul Sorenson.
3. Data Structure and Algorithm -Maria Rukadikar Tata McGraw Hill

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Computer Network
Course Code	UIT3CNT
Credit	2
Hours	5 lectures per week

Course Objectives	On completion of this course, a learner will be able to understand about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain the functions of each layer in OSI & TCP/IP model.
	2) Elaborate functions of data link layer & its protocols.
	3) Define the concepts of Network layer routing protocols and IP addressing
	4) Explain the working of different transport layer protocols.

Module/Unit	Description	Hrs.
I	<p>Introduction: Data communications, networks, network types, Internet history, standards and administration.</p> <p>Network Models: Protocol layering, TCP/IP protocol suite, The OSI model.</p> <p>Introduction to Physical layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance.</p> <p>Digital and Analog transmission: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-</p>	12

	to-analog conversion.	
III	Data Link Control: DLC services, data link layer protocols, HDLC, Point-to-point protocol. Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet Protocol, standard ethernet, fast ethernet, gigabit ethernet, 10 gigabit ethernet, Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. Connecting devices and Virtual LANs.	12
IV	Introduction to the Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Internet Protocol, ICMPv4, Mobile IP Unicast Routing: Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6.	12
V	Introduction to the Transport Layer: Introduction, Transport layer protocols (Simple protocol, Stop-and-wait protocol, Go-Back-n protocol, Selective repeat protocol, Bidirectional protocols), Transport layer services, User datagram protocol, Transmission control protocol, Standard Client0Server Protocols: World wide-web and HTTP, FTP, Electronic mail, Telnet, Secured Shell, Domain name system.	12

Reference Books:

- a. “Data Communication and Networking”, Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
- b. “TCP/IP protocol suite”, Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
- c. “Computer Networks”, Andrew Tanenbaum , Pearson , Fifth Edition,2013

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Computer Network Practical
Course Code	UIT3CNP
Credit	2
Hours	5Hrs per week

Course Outcomes	After completing the course, Student will be able to:
	1) Determine information about IP address.
	2) Apply network commands for network configuration.
	3) Utilize IP routing using routing techniques.
	4) Make use of wireshark tool for IP packet scanning.

Course Code	Practical List
UIT3CNP	<p>1. IPv4 Addressing and Subnetting</p> <p>A .Given an IP address and network mask, determine other information about the IP address such as:</p> <ul style="list-style-type: none"> • Network address <ul style="list-style-type: none"> • Network broadcast address • Total number of host bits • Number of hosts <p>B .Given an IP address and network mask, determine other information about the IP address such as:</p> <ul style="list-style-type: none"> • The subnet address of this subnet • The broadcast address of this subnet • The range of host addresses for this subnet • The maximum number of subnets for this subnet mask • The number of hosts for each subnet • The number of subnet bits • The number of this subnet <p>2. Use of ping and tracert / traceroute, ipconfig / ifconfig, route and arp utilities.</p> <p>3. Configure IP static routing..</p> <p>4. Configure IP routing using RIP.</p> <p>5. Configuring Simple OSPF.</p> <p>6. Configuring DHCP server and client.</p> <p>7. Create virtual PC based network using virtualization software and virtual NIC.</p>

- | | |
|--|--|
| | <p>8. Configuring DNS Server and client.</p> <p>9. Configuring OSPF with multiple areas.</p> <p>10. Use of Wireshark to scan and check the packet information of following protocols</p> <ul style="list-style-type: none">• HTTP• ICMP• TCP• SMTP• POP3 |
|--|--|

Reference Books:

- d. “Data Communication and Networking”, Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
- e. “TCP/IP protocol suite”, Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
- f. “Computer Networks”, Andrew Tanenbaum , Pearson , Fifth Edition,2013

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Advanced SQL
Course Code	UIT3DMS
Credit	2
Hours	5 lectures per week

Course Objectives	The objective of this course is to introduce the concept of the Advanced SQL with respect to the relational model, to specify the functional and data requirements for a typical database application and to understand creation, manipulation and querying of data in databases
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Course Outcomes	After completing the course, Student will be able to:
	1) Define different database objects to access oracle database
	2) Elaborate the DDL and DML database statements and associated naming rules.
	3) Explain database objects, users and grant privileges
	4) Explain advanced database objects required for PL/SQL programs

S.Y.B.Sc, Information Technology Syllabus

Module/Unit	Description	Hrs.
I	Structured Query Language: Writing Basic SQL Select Statements, Restricting and Sorting Data, Single-Row Functions, Aggregating Data using Group Functions, Manipulating Data, Creating and Managing Tables	12
II	Advanced SQL: Subqueries, Creating Views, Creating Other Database Objects(Sequences, Indexes and Synonyms) Controlling User Access, Using SET operators, Date Time Functions, Joins (Displaying Data from Multiple Tables) Constraints : Constraints, types of constrains, Integrity constraints WITH Clause, Hierarchical retrieval	12
III	PL-SQL: Beginning with PL / SQL, Identifiers and Keywords, Operators, Expressions, Sequences, Overview and benefits of PL/SQL, Subprograms, types of PL/SQL blocks, Simple Anonymous Block, Identifiers, types of Identifiers, Declarative Section, variables, Scalar Data Types, The %TYPE Attribute, Executable Statements, PL/SQL Block Syntax, Comment the Code, Convert Data Types, Nested Blocks, Operators. Invoke SELECT Statements in PL/SQL, Save and Discard Transactions	12
IV	Control Structures: Conditional processing using IF Statements and CASE Statements, Loop Statement, While Loop Statement, For Loop Statement, the Continue Statement Explicit Cursors: Declare the Cursor, Open the Cursor, Fetch data from the Cursor, Close the Cursor, Cursor FOR loop, The %NOTFOUND and %ROWCOUNT Attributes Exception Handling: Handle Exceptions with PL/SQL, Propagate Exceptions Composite Type: PL/SQL Records, The %ROWTYPE Attribute, INDEX BY Tables, INDEX BY Table Methods	12
V	Stored Procedures: Create, Call, and Remove Stored Procedures, Implement Procedures Parameters and Parameters Modes Stored Functions Create, Call, and Remove a Stored Function, advantages of using Stored Functions, the steps to create a stored function, Invoke User-Defined Functions in SQL Statements Packages: advantages of Packages, components of a Package, Develop a Package, enable visibility of a Package's Components, Create the Package Specification and Body using the SQL CREATE Statement and SQL Developer, Triggers: the Trigger Event Types and Body, Create DML Triggers using the CREATE TRIGGER Statement, Identify the Trigger Event Types, Body, and Firing (Timing), Statement Level Triggers and Row Level Triggers, Manage, Test and Remove Triggers.	12

Reference Books:

- 1) Murach's Oracle SQL and PLSQL by Joel Murach, Murach and Associates.
- 2) Oracle database 11g : hands on SQL/PL SQL by Satish Asnani (PHI) EEE edition
- 3) Programming with PL/SQL for Beginners, H. Dand, R. Patil and T. Sambare, First Edition X- Team,2011
- 5) PL/SQL Programming, Ivan Bayross , First Edition, BPB 2011

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Advanced SQL Practical
Course Code	UIT3DMP
Credit	2
Hours	5Hrs per week

Course Outcomes	After completing the course, Student will be able to:
	Apply DDL and DML statements to access database
	Create database objects using SET operators
	Build basic PL/SQL programs
	Develop PL/SQL program using advanced database objects

Course Code	Practical List
UIT3DMP	<ol style="list-style-type: none"> 1. Practical 1: Select queries <ol style="list-style-type: none"> a. Select queries on single table using alias, where and order by clause. b. Select queries on single table using aggregate 2. Practical 2: Select queries using joins and unions <ol style="list-style-type: none"> a. Querying data from multiple tables using all types of joins. b. Querying data from multiple tables using all types of joins. 3. Practical 3: Subqueries, DML and DDL <ol style="list-style-type: none"> a. Querying single and multiple tables using subqueries. b. Manipulating data (Insert, update and delete) c. Creating simple tables and tables with constraints. 4. Practical 4: Creating database objects, using set operators <ol style="list-style-type: none"> a. Creating Views, Sequences, Indexes and synonyms. b. Using set operators, date-time functions,

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| <p>5. Practical 5: Working with advanced subqueries and WITH clause</p> <ul style="list-style-type: none">a. Multiple column subqueries, subqueries in from clause,b. WITH Clause and hierarchical retrieval. <p>6. Practical 6: Basic PL/SQL, INDEX BY tables, PL/SQL Record and FOR loop.</p> <ul style="list-style-type: none">a. Creating anonymous PL/SQL blocks.b. Define, create, and use INDEX BY tables and a PL/SQL record. <p>7. Practical 7: Cursors, Exceptions and procedures issuing DML and query commands.</p> <ul style="list-style-type: none">a. Cursors with parameters to process a number of rows from multiple tables.b. Create exception handlers for specific situations. <p>8. Practical 8: Functions and Stored Procedures</p> <ul style="list-style-type: none">a. Creating and invoking functions from SQL statements.b. Creating and invoking stored procedures. <p>9. Practical 9: Working with packages</p> <ul style="list-style-type: none">a. Create package specifications and package bodies. Invoke the constructs in the packages.b. Create a package containing an overloaded function. <p>10. Practical 9: Working with Large Objects and triggers</p> <ul style="list-style-type: none">a. Create statement triggers.b. Create row triggers. |
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Reference Books:

- 1) Murach's Oracle SQL and PLSQL by Joel Murach, Murach and Associates.
- 2) Oracle database 11g : hands on SQL/PL SQL by Satish Asnani (PHI) EEE edition
- 3) Programming with PL/SQL for Beginners, H. Dand, R. Patil and T. Sambare, First Edition X- Team,2011
- 6) PL/SQL Programming, Ivan Bayross , First Edition, BPB 2010

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Applied Mathematics
Course Code	UIT3MAT
Credit	2
Hours	5 lectures per week

Course Objectives	The learners will understand the concepts of applications of the methods for solving different mathematical structures. This course introduces the advance learning of matrices and complex numbers, differential equations, Laplace transforms and the error functions.
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Course Outcomes	After completing the course, Student will be able to:
	1) Evaluate matrices using different methods and polar, exponential forms of complex as well as hyperbolic functions.
	2) Analyze different solutions of the differential equation using various methods and differential equations with constant coefficients.
	3) Explain the properties and theorems of laplace and integrate the laplace transform and evaluate differential equations using laplace transform.
	4) Analyze double and triple integrals in polar coordinates and area, volume using double and triple integrals

Module/Unit	Description	Hrs.
I	<p>Matrices: Inverse of a matrix, Properties of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Inverse of matrix, Linear equations, Linear dependence and linear independence of vectors, Linear transformation, Characteristics roots and characteristics vectors, Properties of characteristic vectors, Cayley-Hamilton Theorem</p> <p>Complex Numbers: Complex number, Equality of complex numbers, Graphical representation of complex number(Argand's Diagram), Polar form of complex numbers, Polar form of $x+iy$ for different signs of x,y, Exponential form of complex numbers, Mathematical operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles</p>	12
II	<p>Equation of the first order and of the first degree: Separation of variables, Equations homogeneous in x and y, Non-homogeneous linear equations, Exact differential Equation, Integrating Factor, Linear Equation and equation reducible to this form, Method of substitution.</p> <p>Linear Differential Equations with Constant Coefficients: Introduction, The Differential Operator, Linear Differential Equation $f(D) y = 0$, Different cases depending on the nature of the root of the equation $f(D) = 0$, Linear differential equation $f(D) y = X$, The complimentary Function, The inverse operator $1/f(D)$ and the symbolic expiration for the particular integral $1/f(D) X$; the general methods</p>	12
III	<p>The Laplace Transform: Introduction, Definition of the Laplace Transform, Table of Elementary Laplace Transforms, Theorems on Important Properties of Laplace Transformation, First Shifting Theorem, Second Shifting Theorem, The Convolution Theorem, Laplace Transform of an Integral, Laplace Transform of Derivatives</p> <p>Inverse Laplace Transform: Shifting Theorem, Partial fraction Methods, Use of Convolution Theorem, Solution of Ordinary Linear Differential Equations with Constant Coefficients, Solution of Simultaneous Ordinary Differential Equations, Laplace Transformation of Special Function</p>	12
IV	<p>Multiple Integrals: Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals.</p> <p>Applications of integration: Areas, Volumes of solids.</p>	12
V	<p>Beta and Gamma Functions – Definitions, Properties and Problems. Duplication formula.</p> <p>Differentiation Under the Integral Sign</p> <p>Error Functions</p>	12

Books and References:

- 1) A text book of Applied Mathematics Vol I, P. N. Wartikar and J. N. Wartikar ,PuneVidyathi Graha
- 2) Applied Mathematics II , P. N. Wartikar and J. N. Wartikar ,Pune Vidyathi Graha
- 3) Higher Engineering Mathematics, Dr. B.S.Grewal, Khanna publications.

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Mobile Programming Practical
Course Code	UIT3MPP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Build a simple basic program using cordova commands.
	2) Create an application using battery plugin and camera plugin.
	3) Develop an application using contacts plugin , device plugin and accelerometer plugin.
	4) Make use of Network Information plugin, splash screen plugin and vibration plugin.

Course Code	Practical List
UIT3MPP	<p>List of Practical Setting up CORDOVA, PhoneGAP Project and environment.</p> <ol style="list-style-type: none"> • Creating and building simple “Hello World” App using Cordova • Adding and Using Buttons • Adding and Using Event Listeners • Creating and Using Functions • Using Events • Handling and Using Back Button • Installing and Using Plugins • Installing and Using Battery Plugin • Installing and Using Camera Plugin

- | | |
|--|--|
| | <ol style="list-style-type: none">4. <ul style="list-style-type: none">• Installing and Using Contacts Plugin• Installing and Using Device Plugin• Installing and Using Accelerometer Plugin
5. <ul style="list-style-type: none">• Install and Using Device Orientation plugin• Install and Using Device Orientation plugin• Create and Using Prompt Function
6. <ul style="list-style-type: none">• Installing and Using File Plugin• Installing and Using File Transfer Plugin• Using Download and Upload functions
7. <ul style="list-style-type: none">• Installing and Using Globalization Plugin• Installing and Using Media Plugin• Installing and Using Media Capture Plugin
8. <ul style="list-style-type: none">• Installing and Using Network Information Plugin• Installing and Using Splash Screen Plugin• Installing and Using Vibration Plugin |
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Reference Books:

1. Apache Cordova 4 Programming John M. Wargo 1st Addison-Wesley Professional
2. Apache Cordova in Action Raymond Camden 1st Manning Publications

Semester IV

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Core Java
Course Code	UIT4CJT
Credit	2
Hours	5 lectures per week

Course Objectives	The objective of this course is to introduce the concept of the java programming language and understand its fundamentals.
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain the basic concepts and terminologies of java programming.
	2) Build java code using control structure iteration
	3) Explain advanced class features.
	4) Elaborate multithreading, IO file handling, exception handling and AWT application

Modul e/Unit	Description	Hrs.
I	<p>Introduction: History, architecture and its components, Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, java platform, java development kit, Lambda Expressions, Methods References, Type Annotations, Method Parameter Reflection, setting the path environment variable, Java Compiler And Interpreter, java programs, java applications, main(), public, static, void, string[] args, statements, white space, case sensitivity, identifiers, keywords, comments, braces and code blocks, variables, variable name</p> <p>Data types: primitive data types, Object Reference Types, Strings, Auto boxing, operators and properties of operators, Arithmetic operators, assignment operators, increment and decrement operator, relational operator, logical operator, bitwise operator, conditional operator.</p>	12
II	<p>Control Flow Statements: The If...Else If...Else Statement, The Switch...Case Statement</p> <p>Iterations: The While Loop, The Do ... While Loop, The For Loop, The Foreach Loop, Labelled Statements, The Break And Continue Statements, The Return Statement</p> <p>Classes: Types of Classes, Scope Rules, Access Modifier, Instantiating Objects From A Class, Initializing The Class Object And Its Attributes, Class Methods, Accessing A Method, Method Returning A Value, Method's Arguments, Method Overloading, Variable Arguments [Varargs], Constructors, this Instance, super Instance, Characteristics Of Members Of A Class, constants, this instance, static fields of a class, static methods of a class, garbage collection</p>	12
III	<p>Inheritance: Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords.</p> <p>Abstract Classes And Interfaces, Abstract Classes, Abstract Methods, Interfaces, What Is An Interface? How Is An Interface Different From An Abstract Class?, Multiple Inheritance, Default Implementation, Adding New Functionality, Method Implementation, Classes V/s Interfaces, Defining An Interface, Implementing Interfaces.</p> <p>Packages: Creating Packages, Default Package, Importing Packages, Using A Package.</p>	12
IV	<p>Enumerations, Arrays: Two Dimensional Arrays, Multi-Dimensional Arrays, Vectors, Adding Elements To A Vector, Accessing Vector Elements, Searching For Elements In A Vector, Working With The Size of The Vector.</p> <p>Multithreading: the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class.</p> <p>Exceptions: Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause</p> <p>Byte streams: reading console input, writing console output, reading file, writing file, writing binary data, reading binary data, getting started with character streams, writing file, reading file</p>	12
V	<p>Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes.</p> <p>Abstract Window Toolkit: Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames</p> <p>Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout.</p>	12

Reference Books:

- 1) “Core Java 8 for Beginners” , Vaishali Shah, Sharnam Shah, First edition, SPD publication
- 2) “Java: The Complete Reference” , Herbert Schildt, Ninth Edition, McGraw Hill.

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Core Java Practical
Course Code	UIT4CJP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Build basic programs by using operators
	2) Make use of the data types, methods and constructors to write java program
	3) Create a program on inheritance, vectors, multithreading and file handling concepts
	4) Design GUI by using Exception handling

Course Code	Practical List
UIT4CJP	<p>1.Java Basics</p> <p>a. Write a Java program that takes a number as input and prints its multiplication table upto 10.</p> <p>b. Write a Java program to display the patterns.</p> <p>c. Write a Java program to print the area and perimeter of a circle.</p> <p>2.Use of Operators</p> <p>a. Write a Java program to add two binary numbers.</p> <p>b. Write a Java program to convert a decimal number to binary number and vice versa.</p> <p>c. Write a Java program to reverse a string.</p> <p>3.Java Data Types</p> <p>a. Write a Java program to count the letters, spaces, numbers and other characters of an input string.</p> <p>b. Implement a Java function that calculates the sum of digits for a given char array consisting of the digits '0' to '9'. The function should return the digit sum as a long value.</p>

c. Find the smallest and largest element from the array

4.Methods and Constructors

- a. Designed a class SortData that contains the method asc() and desc().
- b. Designed a class that demonstrates the use of **constructor and destructor**.
- c. Write a java program to demonstrate the implementation of abstract class.

5.Inheritance

- a. Write a java program to implement **single level inheritance**.
- b. Write a java program to implement **method overriding**
- c. Write a java program to implement multiple inheritance.

6.Packages and Arrays

- a. Create a package, Add the necessary classes and import the **package** in java class.
- b. Write a java program to add two matrices and print the resultant matrix.
- c. Write a java program for multiplying two matrices and print the product for the same.

7.Vectors and Multithreading

- a. Write a java program to implement the **vectors**.
- b. Write a java program to implement **thread life cycle**.
- c. Write a java program to implement **multithreading**.

8.File Handling

- a. Write a java program to open a file and display the contents in the console window.
- b. Write a java program to copy the contents from one file to other file.
- c. Write a java program to read the student data from user and store it in the file.

9.GUI and Exception Handling

- a. Design a AWT program to print the factorial for an input value.
- b. Design an AWT program to perform various string operations like reverse string, string concatenation etc.
- c. Write a java program to implement **exception handling**.

10.GUI Programming.

- a. Design an **AWT application** that contains the interface to add student information and display the same.
- b. Design a calculator based on AWT application.
- c. Design an AWT application to generate result marks sheet.

Reference Books:

- 3) “Core Java 8 for Beginners” , Vaishali Shah, Sharnam Shah, First edition, SPD publication
- 4) “Java: The Complete Reference” , Herbert Schildt, Ninth Edition, McGraw Hill.

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Introduction to Embedded System
Course Code	UIT4EMB
Credit	2
Hours	5 lectures per week

Course Objectives	To introduce learner with the core components of embedded system and 8051 programming in C. They will also be able to differentiate types of operating system.
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Course Outcomes	After completing the course, Student will be able to:
	Define the core components of embedded systems.
	Explain the types of memory and embedded peripherals.
	Make use of 8051 instruction sets.
	Classify different types of operating systems and their characteristics.

Module/ Unit	Description	Hrs.
I	Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems Core of embedded systems: microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface,	12

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	<p>embedded firmware, other system components. Characteristics and quality attributes of embedded systems: Characteristics, operational and non-operational quality attributes.</p>	
II	<p>Embedded Systems – Application and Domain Specific: Application specific – washing machine, domain specific - automotive. Embedded Hardware: Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory. Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timer</p>	12
III	<p>The 8051 Microcontrollers: Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory. 8051 Programming in C: Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs.</p>	12
IV	<p>Designing Embedded System with 8051 Microcontroller: Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051. Programming embedded systems: structure of embedded program, infinite loop, compiling, linking and debugging</p>	12
V	<p>Real Time Operating System (RTOS): Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS. Design and Development: Embedded system development Environment – IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.</p>	12

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Embedded System Practical
Course Code	UIT4ESP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	Design a reprogrammable embedded computer using 8051 microcontroller.
	Develop a program to generate given time delay by using timer control registers.
	Make use of components like seven-segment display, Oscilloscope and Stepper motor.
	Create a program to generate traffic signals

Course Code	Practical List
UIT4ESP	<p>1)Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects.</p> <ul style="list-style-type: none"> a. Programming b. Execution c. Debugging <p>2A) Configure timer control registers of 8051 and develop a program to generate given time delay.</p> <p>2B) To demonstrate use of general purpose port i.e. Input/ output port of two controllers for data transfer between them.</p> <p>3A) Port I / O: Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's</p> <p>3B) To interface 8 LEDs at Input-output port and create different patterns.</p> <p>3C) To demonstrate timer working in timer mode and blink LED without using any loop delay routine.</p>

- 4A) Serial I / O: Configure 8051 serial port for asynchronous serial communication with serial port of PC exchange text messages to PC and display on PC screen. Signify end of message by carriage return.
- 4B) To demonstrate interfacing of seven-segment LED display and generate counting from 0 to 99 with fixed time delay.
- 4C) Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.
- 5A) Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.
- 5B) Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.
- 6) Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clock wise direction.
- 7) Generate traffic signal.
- 8) Implement Temperature controller.
- 9) Implement Elevator control.
- 10) Using Flash Magic
- To demonstrate the procedure for flash programming for reprogrammable embedded system board using Flash Magic
 - To demonstrate the procedure and connections for multiple controllers programming of same type of controller with same source code in one go, using flash magic.

Reference Books:

- 1) Introduction to embedded systems ,Shibu K V, First, Tata Mcgraw-Hill
- 2) Embedded Systems Rajkamal Tata Mcgraw-Hill

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Computer Oriented Statistical Techniques
Course Code	UIT4COS
Credit	2
Hours	5 lectures per week

Course Objectives	The objective of this course is to provide an understanding for the learners on statistical concepts to include measures of dispersion probability distribution, sampling estimation, hypothesis testing, regression and correlation analysis.
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Course Outcomes	After completing the course, Student will be able to:
	Apply discrete and continuous probability distribution to various problems.
	Analyze the hypothesis as well as calculate confidence interval and the p-concept.
	Apply Chi-square test for independence as well as goodness of fit.
	Estimate bivariate and multivariate regression and correlation analysis and to construct ANOVA.

Course Code UIT4COS	Computer Oriented Statistical Techniques	
I	<p>The Mean, Median, Mode, and Other Measures of Central Tendency: Index, or Subscript, Notation, Summation Notation, Averages, or Measures of Central Tendency ,The Arithmetic Mean , The Weighted Arithmetic Mean ,Properties of the Arithmetic Mean ,The Arithmetic Mean Computed from Grouped Data ,The Median ,The Mode, The Empirical Relation Between the Mean, Median, and Mode, The Geometric Mean G, The Harmonic Mean H ,The Relation Between the Arithmetic, Geometric, and Harmonic Means, The Root Mean Square, Quartiles, Deciles, and Percentiles, Software and Measures of Central Tendency.</p> <p>The Standard Deviation and Other Measures of Dispersion: Dispersion, or Variation, The Range, The Mean Deviation, The Semi-Interquartile Range, The 10–90 Percentile Range, The Standard Deviation, The Variance, Short Methods for Computing the Standard Deviation, Properties of the Standard Deviation, Charlie’s Check, Sheppard’s Correction for Variance, Empirical Relations Between Measures of Dispersion, Absolute and Relative Dispersion; Coefficient of Variation, Standardized Variable; Standard Scores, Software and Measures of Dispersion.</p> <p>Introduction to R: Basic syntax, data types, variables, operators, control statements, R-functions, R –Vectors, R – lists, R Arrays .</p>	12

II	<p>Moments, Skewness, and Kurtosis : Moments , Moments for Grouped Data ,Relations Between Moments , Computation of Moments for Grouped Data, Charlie’s Check and Sheppard’s Corrections, Moments in Dimensionless Form, Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis, Software Computation of Skewness and Kurtosis.</p> <p>Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation, Relation Between Population, Sample Mean, and Variance, Combinatorial Analysis, Combinations, Stirling’s Approximation to $n!$, Relation of Probability to Point Set Theory, Euler or Venn Diagrams and Probability.</p> <p>Elementary Sampling Theory : Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Sampling Distributions, Sampling Distribution of Means, Sampling Distribution of Proportions, Sampling Distributions of Differences and Sums, Standard Errors, Software Demonstration of Elementary Sampling Theory .</p>	12
III	<p>Statistical Estimation Theory: Estimation of Parameters, Unbiased Estimates, Efficient Estimates, Point Estimates and Interval Estimates; Their Reliability, Confidence-Interval Estimates of Population Parameters, Probable Error.</p> <p>Statistical Decision Theory: Statistical Decisions, Statistical Hypotheses, Tests of Hypotheses and Significance, or Decision Rules, Type I and Type II Errors, Level of Significance, Tests Involving Normal Distributions, Two-Tailed and One-Tailed Tests, Special Tests, Operating-Characteristic Curves; the Power of a Test, p-Values for Hypotheses Tests, Control Charts, Tests Involving Sample Differences, Tests Involving Binomial Distributions.</p> <p>Statistics in R: Mean, Median, Mode, Normal Distribution , Binomial Distribution, Frequency Distribution in R</p>	12
IV	<p>Small Sampling Theory: Small Samples, Student’s t Distribution, Confidence Intervals, Tests of Hypotheses and Significance, The Chi-Square Distribution, Confidence Intervals for Sigma , Degrees of Freedom, The F Distribution.</p> <p>The Chi-Square Test: Observed and Theoretical Frequencies, Definition of chi-square, Significance Tests, The Chi-Square Test for Goodness of Fit, Contingency Tables, Yates’ Correction for Continuity, Simple Formulas for Computing chi-square, Coefficient of Contingency, Correlation of Attributes, Additive Property of chi-square</p>	12
V	<p>Curve Fitting and the Method of Least Squares: Relationship Between Variables, Curve Fitting, Equations of Approximating Curves, Freehand Method of Curve Fitting, The Straight Line, The Method of Least Squares, The Least-Squares Line, Nonlinear Relationships, The Least-Squares Parabola, Regression, Applications to Time Series, Problems Involving More Than Two Variables.</p> <p>Correlation Theory: Correlation and Regression, Linear Correlation, Measures of Correlation, The Least-Squares Regression Lines, Standard Error of Estimate, Explained and Unexplained Variation, Coefficient of Correlation, Remarks Concerning the Correlation Coefficient, Product-Moment Formula for the Linear Correlation Coefficient, Short Computational Formulas, Regression Lines and the Linear Correlation Coefficient, Correlation of Time Series, Correlation of Attributes, Sampling Theory of Correlation, Sampling Theory of Regression</p>	12

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Computer Oriented Statistical Techniques (Practical)
Course Code	UIT4COP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	Illustrate basic commands and basic operations of the R tool.
	Make use of R tool commands to calculate summary statistics
	Evaluate testing of hypothesis estimate probability distribution using R tool
	Develop the R programme to infer statistical analysis

Course Code	Practical List
UIT4COP	<ol style="list-style-type: none"> 1.Using R execute the basic commands, array, list and frames. 2.Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations. 3.Using R Execute the statistical functions: mean, median, mode, quartiles, range, inter quartile range histogram 4.Using R import the data from Excel / .CSV file and Perform the above functions. 5.Using R import the data from Excel / .CSV file and Calculate the standard deviation, variance, co-variance. 6. Using R import the data from Excel / .CSV file and draw the skewness. 7. Import the data from Excel / .CSV and perform the hypothetical testing. 8. Import the data from Excel / .CSV and perform the Chi-squared Test. 9.Using R perform the binomial and normal distribution on the data. 10.Perform the Linear Regression using R. 11.Compute the Least squares means using R. 12.Compute the Linear Least Square Regression

Reference Books:

1. STATISTICS, Murray R Spiegel, Larry J. Stephens, McGRAW –HILL INTERNATIONAL, Fourth edition.
2. FUNDAMENTAL OF MATHEMATICAL STATISTICS S.C. GUPTA and V.K. KAPOOR, SULTAN CHAND and SONS, ELEVENTH EDITION.
3. A Practical Approach using R , R.B. Patil, H.J. Dand and R. Bhavsar , SPD publication, First edition.

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Software Engineering
Course Code	UIT4SE
Credit	2
Hours	5 Hrs per week

Course Objectives	<ol style="list-style-type: none"> 1. Basic knowledge and understanding of the analysis and design of complex systems. 2. Ability to apply software engineering principles and techniques. 3. Ability to develop, maintain and evaluate large-scale software systems. 4. To produce efficient, reliable, robust and cost-effective software solutions.
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Course Outcomes	After completing the course, Student will be able to:
	Explain software life cycle model and knowledge about different phases of software life cycle.
	Make use of different methodologies in software engineering.
	Explain current theories, models and techniques that provide a basis for the software life cycle.
	Elaborate techniques and tools necessary for engineering practice.

Module/ Unit	Description	hrs
I	<p>Introduction: What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc.</p> <p>Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements.</p> <p>Software Processes: Process and Project, Component Software Processes.</p> <p>Software Development Process Models.</p> <ul style="list-style-type: none"> • Waterfall Model. • Prototyping. • Iterative Development. 	12

	<ul style="list-style-type: none"> • Rational Unified Process. • The RAD Model • Time boxing Model. <p>Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.</p>	
II	<p>Socio-technical system: Essential characteristics of socio technical systems, Emergent System Properties, Systems Engineering, Components of system such as organization, people and computers, Dealing Legacy Systems.</p> <p>Critical system: Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems.</p> <p>Requirements Engineering Processes: Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management.</p> <p>System Models: Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.</p>	12
III	<p>Architectural Design: Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures.</p> <p>User Interface Design: Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.</p> <p>Project Management: Software Project Management, Management activities, Project Planning, Project Scheduling, and Risk Management.</p> <p>Quality Management: Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics.</p>	12
IV	<p>Verification and Validation: Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods.</p> <p>Software Testing: System Testing, Component Testing, Test Case Design, Test Automation.</p> <p>Software Measurement: Size-Oriented Metrics, Function-Oriented Metrics, Extended Function Point Metrics</p> <p>Software Cost Estimation: Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing</p>	12
V	<p>Process Improvement: Process and product quality, Process Classification, Process Measurement, Process Analysis and Modelling, Process Change, The CMMI Process Improvement Framework.</p> <p>Service Oriented Software Engineering: Services as reusable components, Service Engineering, Software Development with Services.</p> <p>Software reuse: The reuse landscape, Application frameworks, Software product lines, COTS product reuse.</p> <p>Distributed software engineering: Distributed systems issues, Client-server computing, Architectural patterns for distributed systems, Software as a service.</p>	12

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Software Engineering Practical
Course Code	UIT4SEP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	Evaluate products-start-ups implementing software process models in software engineering methods.
	Design the diagram in an open-source tool: Star UML.
	Construct systems using design principles.
	Design the existing software using UML diagrams.

Course Code	Practical List
UIT4SEP	<ol style="list-style-type: none"> 1. Study and implementation of class diagrams. 2. Study and implementation of Use Case Diagrams. 3. Study and implementation of Entity Relationship Diagrams. 4. Study and implementation of Sequence Diagrams. 5. Study and implementation of State Transition Diagrams. 6. Study and implementation of Data Flow Diagrams. 7. Study and implementation of Collaboration Diagrams. 8. Study and implementation of Activity Diagrams. 9. Study and implementation of Component Diagrams. 10. Study and implementation of Deployment Diagrams.

Reference Books:

1. Software Engineering, edition, Ian Somerville Pearson Education. Edition Ninth
2. Software Engineering Pankaj Jalote Narosa Publication
3. Software engineering, a practitioner's approach Roger Pressman Tata Mcgraw-hill Seventh edition
4. Software Engineering principles and practice WS Jawadekar Tata Mcgraw-hill

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Computer Graphics and Animation
Course Code	UIT4CGA
Credit	2
Hours	3 lectures per week

Course Objectives	To make the learners aware of the different algorithms that are actually used for developing different types of animations. This subject aims in making the learners capable of designing different animations programmatically.
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Course Outcomes	After completing the course, Student will be able to:
	Classify various 2D & 3D transformations.
	Define the basic computer graphics applications.
	Explain algorithms of visible surface detection.
	Explain principles of animation.

Module/ Unit	Description	Hrs.
I	<p>Introduction to Computer Graphics: Overview of Computer Graphics, Computer Graphics Application and Software, Description of some graphics devices, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics, Color CRT Raster Scan Basics, Video Basics, The Video Controller, Random-Scan Display Processor, LCD displays.</p> <p>Scan conversion – Digital Differential Analyzer (DDA) algorithm, Bresenham's Line drawing algorithm. Bresenham's method of Circle drawing, Midpoint Circle Algorithm, Midpoint Ellipse Algorithm, Mid-point criteria, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Clipping Lines algorithms–Cyrus-Beck, Cohen-Sutherland and Liang-Barsky, Clipping Polygons, problem with multiple components. • Time boxing Model.</p> <p>Agile software development: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.</p>	12
II	<p>Two-Dimensional Transformations: Transformations and Matrices, Transformation Conventions, 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Translations and Homogeneous Coordinates, Rotation, Reflection, Scaling, Combined</p>	12

	<p>Transformation, Transformation of Points, Transformation of The Unit Square, Solid Body Transformations, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line, A Geometric Interpretation of Homogeneous Coordinates, The Window-to-Viewport Transformations.</p> <p>Three-Dimensional Transformations: Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimensional Rotation, Three-Dimensional Reflection, Three-Dimensional Translation, Multiple Transformation, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections, View volumes for projections.</p>	
III	<p>Viewing in 3D Stages in 3D viewing, Canonical View Volume (CVV), Specifying an Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of Planar Geometric Projections, Combined transformation matrices for projections and viewing, Coordinate Systems and matrices, camera model and viewing pyramid. Light: Radiometry, Transport, Equation, Photometry Color: Colorimetry, Color Spaces, Chromatic Adaptation, Color Appearance</p>	12
IV	<p>Visible-Surface Determination: Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area sub-division method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.</p> <p>Plane Curves and Surfaces: Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Parametric Representation of an Ellipse, Parametric Representation of a Parabola, Parametric Representation of a Hyperbola, Representation of Space Curves, Cubic Splines, , Bezier Curves, B-spline Curves, B-spline Curve Fit, B-spline Curve Subdivision, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces.</p>	12
V	<p>Computer Animation: Principles of Animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects.</p> <p>Image Manipulation and Storage: What is an Image? Digital image file formats, Image compression standard – JPEG, Image Processing - Digital image enhancement, contrast stretching, Histogram Equalization, smoothing and median Filtering.</p>	12

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Computer Graphics and Animation Practical
Course Code	UIT4CGP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	Make use of the graphic functions
	Create 2D, 3D animation.
	Apply line drawing, circle generation algorithm.
	Design program for circle using flood fill, boundary fill algorithm.

Course Code	Practical List
UIT4CGP	<p>1. Solve the following: a. Study and enlist the basic functions used for graphics in C / C++ / Python language. Give an example for each of them. Draw a co-ordinate axis at the center of the screen.</p> <p>2. Solve the following: a. Divide your screen into four region, draw circle, rectangle, ellipse and half ellipse in each region with appropriate message. b. Draw a simple hut on the screen.</p> <p>3. Draw the following basic shapes in the center of the screen : i. Circle ii. Rectangle iii. Square iv. Concentric Circles v. Ellipse vi. Line</p> <p>4. Solve the following: a. Develop the program for DDA Line drawing algorithm. b. Develop the program for Bresenham's Line drawing algorithm.</p> <p>5. Solve the following: a. Develop the program for the mid-point circle drawing algorithm. b. Develop the program for the mid-point ellipse drawing algorithm.</p> <p>6. Solve the following: a. Write a program to implement 2D scaling. b. Write a program to perform 2D translation</p> <p>7. Solve the following: a. Perform 2D Rotation on a given object. b. Program to create a house like figure and perform the following operations. i. Scaling about the origin followed by translation. ii. Scaling with reference to an arbitrary point. iii. Reflect about the line $y = mx + c$.</p> <p>8. Solve the following: a. Write a program to implement Cohen-Sutherland clipping.</p>

	<p>b. Write a program to implement Liang - Barsky Line Clipping Algorithm</p> <p>9. Solve the following:</p> <p>a. Write a program to fill a circle using Flood Fill Algorithm.</p> <p>b. Write a program to fill a circle using Boundary Fill Algorithm.</p> <p>10. Solve the following:</p> <p>a. Develop a simple text screen saver using graphics functions.</p> <p>b. Perform smiling face animation using graphic functions.</p> <p>c. Draw the moving car on the screen.</p>
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Reference Books:

1. Computer Graphics - Principles and Practice J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes Pearson 2nd edition.
2. Computer Graphics Hearn, Baker Pearson 2nd edition.
3. Fundamentals of Computer Graphics Steve Marschner, Peter Shirley 4th edition.



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by
UGC
'Best College Award' by University of Mumbai

Program: B.Sc

Revised Syllabus of T.Y.B.Sc. Information Technology
Choice Based Credit System (60:40)
w.e.f. Academic Year 2021-22

T.Y.B.Sc, Information Technology Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	Information Technology
2	Eligibility for Admission	<p>(a) A candidate for being eligible for admission to the degree course of Bachelor of Science-Information Technology, shall have passed XII standard examination of the Maharashtra Board of Higher Secondary Education or it's equivalent with Mathematic and Statistics as one of the subject and should have secured not less than 45% marks in aggregate for open category and 40% marks in aggregate in case of Reserved category candidates.</p> <p>(b) Candidate who have passed Diploma (Three years after S.S.C. – Xth Std.) in Information Technology/ Computer Technology/ Computer Engineering/Computer Science/ Electrical, Electronics and Video Engineering and Allied Branches/Mechanical and Allied Branches/ Civil and Allied branches are eligible for direct admission to the Second Year of the B.Sc. (I.T.) degree course.</p> <p>(c) However, the Diploma should be recognized by the Board of Technical Education or any other recognized Government Body. Minimum marks required 45% aggregate for open category candidates and 40% aggregate for reserved category candidates.</p> <p>OR</p> <p>Candidates with post HSC-Diploma in Information Technology/Computer Technology/ Computer Engineering/ Computer Science/ and Allied branches will be eligible for direct admission to the Second Year of B.Sc. (I.T.). However, the Diploma should be recognized by the Board of Technical Education or any other recognized Government Body Minimum Marks required 45% aggregate for open category candidates and 40% aggregate for reserved category candidates.</p>
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.

T.Y.B.Sc, Information Technology Syllabus

7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2021-22

BACHELOR'S IN SCIENCE (B. Sc.)

Programme Outcomes

S. N.	After completion of B.Sc. program students will acquire	Graduate Attribute
PO1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO2	An ability to develop and conduct experiments, analyze, and interpret data and use scientific judgment to draw conclusions	Scientific reasoning
PO3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyze and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understanding values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Program Specific outcomes

Name of the Programme: B.Sc.I.T.	
	After completing the programme in Information Technology, Student will be able to:
PSO1	Gain proficiency in the field of Networking and Security.
PSO2	Develop Programming skills that help to meet the needs of the IT industry.
PSO3	Build soft skills for employability and personality development in the Industrial environment.

Preamble:

The B.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

Semester - V
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs. / week	Internal assessment	Semester-end examination	Total	Credits
Software Project Management	Skill Enhancement Course	UIT5SPM	5	40	60	100	2
Internet of Things	Skill Enhancement Course	UIT5IOT	5	40	60	100	2
Advanced Web Programming	Skill Enhancement Course	UIT5AWP	5	40	60	100	2
Linux System Administration	Discipline Specific	UIT5LSA	5	40	60	100	2
Enterprise Java	Ability Enhancement Skill Course	UIT5EJP	5	40	60	100	2
Project Dissertation	Skill Enhancement Course Practical	UIT5PDP	-	-	-	-	2
Internet of Things Practical	Skill Enhancement Course Practical	UIT5ITP	5	--	50	50	2
Advanced Web Programming Practical	Skill Enhancement Course Practical	UIT5WPP	5	--	50	50	2
Linux Administration Practical	Discipline Specific Practical	UIT5LAP	5	--	50	50	2
Enterprise Java Practical	Discipline Specific Practical	UIT5EJP	5	--	50	50	2

Semester - VI
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Software Quality Assurance	Skill Enhancement Course	UIT6SQA	5	40	60	100	2
Security in Computing	Skill Enhancement Course	UIT6SIC	5	40	60	100	2
Business Intelligence	Skill Enhancement Course	UIT6BUI	5	40	60	100	2
Principles of Geographic Information Systems	Discipline Specific	UIT6GIS	5	40	60	100	2
IT Service Management	Discipline Specific	UIT6ISM	5	40	60	100	2
Project Implementation	Skill Enhancement Course Practical	UIT6PIP	5	40	60	100	2
Security in Computing Practical	Skill Enhancement Course Practical	UIT6SCP	5	--	50	50	2
Business Intelligence Practical	Skill Enhancement Course Practical	UIT6BIP	5	--	50	50	2
Principles of Geographic Information Systems Practical	Discipline Specific Practical	UIT6GIP	5	--	50	50	2
Advanced Mobile Programming	Skill Enhancement Course Practical	UIT6ISP	5	--	50	50	2

Examination Scheme

Choice Based Credit System (CBCS)

➤ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Presentation and write up on the selected topics of the subjects / Case studies. 2. Quiz	20 Marks

- ❖ Maximum Marks: 20
- ❖ Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

Question Paper Pattern for Semester End Examination *(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)*

- **Undergraduate Programmes for B.Sc. in Information Technology**
 - Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be five questions each of 12 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Question Paper Pattern for Continuous Assessment

Presentation and write-up	Quiz
Presentation skill	Quiz on application of subject in real life
Knowledge	
Quality of ppt.	
Writing skill	

Question Paper Pattern for Practical Examination

Sr. No.	Particular		Marks
01	Practical		50 Marks
	Practical Question	40 Marks	
	Journal	5 Marks	
	Viva	5 Marks	

Semester V

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Software Project Management
Course Code	UIT5SPM
Credit	2
Hours	5 lectures per week

Course Objectives	The objective of this course is to understand some problem and concern of software project manager, learners will able to cost estimation of project.
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Course Outcomes	After completing the course, Student will be able to:
	1) Define software project management and project planning
	2) Explain risk management and resource allocation
	3) Determine the cost of project based on project duration
	4) Elaborate the quality of leadership skills

Course Code UIT5SPM	Software Project Management	
I	<p>Introduction to Software Project Management: Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices.</p> <p>Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost-benefit</p>	12

	<p>Evaluation Techniques, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme, Aids to Programme Management, Some Reservations about Programme Management, Benefits Management.</p> <p>An Overview of Project Planning : Introduction to Step Wise Project Planning, Step 0: Select Project, Step 1: Identify Project Scope and Objectives, Step 2: Identify Project Infrastructure, Step 3: Analyse Project Characteristics, Step 4: Identify Project Products and Activities, Step 5: Estimate Effort for Each Activity, Step 6: Identify Activity Risks, Step 7: Allocate Resources, Step 8: Review/Publicize Plan, Steps 9 and 10: Execute Plan/Lower Levels of Planning</p>	
II	<p>Selection of an Appropriate Project Approach: Introduction, Build or Buy? Choosing Methodologies and Technologies, Software Processes and Process Models, Choice of Process Models, Structure versus Speed of Delivery, The Waterfall Model, The Spiral Model, Software Prototyping, Other Ways of Categorizing Prototypes, Incremental Delivery, Atern/Dynamic Systems Development Method, Rapid Application Development, Agile Methods, Extreme Programming (XP), Scrum, Lean Software Development, Managing Iterative Processes, Selecting the Most Appropriate Process Model.</p> <p>Software Effort Estimation: Introduction, Where are the Estimates Done? Problems with Over- and Under-Estimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom-up Estimating, The Top-down Approach and Parametric Models, Expert Judgement, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.</p>	12
III	<p>Activity Planning: Introduction, Objectives of Activity Planning, When to Plan, Project Schedules, Projects and Activities, Sequencing and Scheduling Activities, Network Planning Models, Formulating a Network Model, Adding the Time Dimension, The Forward Pass, Backward Pass, Identifying the Critical Path, Activity Float, Shortening the Project Duration, Identifying Critical Activities, Activity-on-Arrow Networks.</p> <p>Risk Management: Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning, Risk Management, Evaluating Risks to the Schedule, Boehm's Top 10 Risks and Counter Measures, Applying the PERT Technique, Monte Carlo Simulation, Critical Chain Concepts.</p> <p>Resource Allocation: Introduction, Nature of Resources, Identifying Resource Requirements, Scheduling Resources, Creating Critical Paths, Counting the Cost, Being Specific, Publishing the Resource Schedule, Cost Schedules, Scheduling Sequence.</p>	12
IV	<p>Monitoring and Control: Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned Value Analysis, Prioritizing Monitoring, Getting the Project Back to Target, Change Control, Software Configuration Management (SCM).</p> <p>Managing Contracts: Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance.</p> <p>Managing People in Software Environments: Introduction, Understanding Behaviour, Organizational Behaviour: A Background, Selecting the Right Person for the Job, Instruction in the Best Methods, Motivation, The Oldham-Hackman Job</p>	12

	Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.	
V	Working in Teams: Introduction, Becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. Software Quality : Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans.	12

ReferenceBooks:

- 1) Software Project Management, Bob Hughes, Mike Cotterell, Rajib Mall sixth edition.
- 2) Project Management and Tools & Technologies – An overview,Shailesh Mehta 1st edition

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Internet of Things
Course Code	UIT5IOT
Credit	2
Hours	5 lectures per week

Course Objectives	<ol style="list-style-type: none">1) To assess the vision and introduction of IoT. To Understand IoT Market perspective.2) To provide an understanding of the technologies and the standards relating to the Internet of Things.
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain Design Principles for Connected Devices
	2) Elaborate the concepts of Prototyping Embedded Devices , its Physical Design and Online Components
	3) Classify types of designing 3D modules.
	4) Explain the Market perspective and Ethical concept of IOT.

Course Code UIT5IOT	Internet of Things	
I	<p>The Internet of Things: An Overview : The Flavour of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?</p> <p>Design Principles for Connected Devices: Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely Joined, First-Class Citizens On The Internet, Graceful Degradation, Affordances.</p> <p>Internet Principles: Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment, Dynamic IP Address Assignment, IPv6, MAC Addresses, TCP and UDP Ports, An Example: HTTP Ports, Other Common Ports, Application Layer Protocols, HTTP, HTTPS: Encrypted HTTP, Other Application Layer Protocols.</p>	12
II	<p>Thinking About Prototyping: Sketching, Familiarity, Costs versus Ease of Prototyping, Prototypes and Production, Changing Embedded Platform, Physical Prototypes and Mass Personalisation, Climbing into the Cloud, Open Source versus Closed Source, Why Closed? Why Open? Mixing Open and Closed Source, Closed Source for Mass Market Projects, Tapping into the Community.</p> <p>Prototyping Embedded Devices: Electronics, Sensors, Actuators, Scaling Up the Electronics, Embedded Computing Basics, Microcontrollers, System-on-Chips, Choosing Your Platform, Arduino, Developing on the Arduino ,Some Notes on the Hardware, Openness, Raspberry Pi, Cases and Extension Boards, Developing on the Raspberry Pi, Some Notes on the Hardware, Openness.</p>	12
III	<p>Prototyping the Physical Design: Preparation, Sketch, Iterate, and Explore, Nondigital Methods, Laser Cutting, Choosing a Laser Cutter, Software, Hinges and Joints, 3D Printing, Types of 3D Printing, Software, CNC Milling, Repurposing/Recycling.</p> <p>Prototyping Online Components: Getting Started with an API, Mashing Up APIs, Scraping, Legalities, Writing a New API, Clockodillo, Security, Implementing the API, Using Curl to Test, Going Further, Real-Time Reactions, Polling, Comet, Other Protocols, MQ Telemetry Transport,</p>	12
IV	<p>Techniques for Writing Embedded Code: Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging,</p> <p>Business Models: A Short History of Business Models, Space and Time, From Craft to Mass Production, The Long Tail of the Internet, Learning from History, The Business Model Canvas, Who Is the Business Model For? Models, Make Thing, Sell Thing, Subscriptions, Customisation, Be a Key Resource, Provide Infrastructure: Sensor Networks, Take a Percentage, Funding an Internet of Things Startup, Hobby Projects and Open Source, Venture Capital, Government Funding, Crowdfunding, Lean Startups.</p>	12
V	<p>Moving to Manufacture: What Are You Producing? Designing Kits, Designing Printed circuit boards, Software Choices, The Design Process, Manufacturing Printed Circuit Boards, Etching Boards, Milling Boards. Assembly, Testing, Mass-Producing the Case and Other Fixtures, Certification, Costs, Scaling Up Software, Deployment, Correctness and Maintainability, Security, Performance, User Community.</p> <p>Ethics: Characterizing the Internet of Things, Privacy, Control, Disrupting Control, Crowdsourcing, Environment, Physical Thing, Electronics, Internet Service, Solutions, The Internet of Things as Part of the Solution, Cautious Optimism, The Open Internet of Things</p>	12

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Internet of Things Practical
Course Code	UIT5ITP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Make use of Raspberry pi to display LED pattern, Time over 4-digit 7-segment and control whatsapp.
	2) Build the interfacing of Raspberry pi with Oscilloscope, Fingerprint sensor, GPS Module
	3) Create basic Home Automation using Raspberry Pi
	4) Construct an application to monitor visitor using Raspberry Pi and Pi Camera.

Course Code	Internet of Things Practical List
UIT5ITP	1 Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface, Connecting to Ethernet, Monitor and USB
	2 Displaying different LED patterns with Raspberry Pi.
	3 Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi
	4 Raspberry Pi Based Oscilloscope
	5 Controlling Raspberry Pi with WhatsApp.
	6 Setting up Wireless Access Point using Raspberry Pi
	7 Fingerprint Sensor interfacing with Raspberry Pi
	8 Raspberry Pi GPS Module Interfacing
	9 IoT based Web Controlled Home Automation using Raspberry Pi
	10 Visitor Monitoring with Raspberry Pi and Pi Camera
	11 Interfacing Raspberry Pi with RFID.
	12 Building Google Assistant with Raspberry Pi.
	13 Installing Windows 10 IoT Core on Raspberry Pi

Reference Books:

- 1) Designing the Internet of Things, "Adrian McEwen" First Edition, WILEY
- 2) Internet of Things – Architecture and Design, "Raj Kamal", First Edition, McGraw Hill

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Advanced Web Programming
Course Code	UIT5AWP
Credit	2
Hours	5 lectures per week

Course Objectives	To learn to develop web applications that use object-oriented techniques and advanced database interactions. Concepts such as advanced CSS concepts web environment, authentication and security will also be explored.
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain the basic components concept of C# .NET framework language along with .NET framework.
	2) Elaborate advanced web concept in ASP.NET .
	3) Explain dynamic web page using ADO.NET fundamentals.
	4) Make use of AJAX and XML programming skills in ASP.NET

Course Code UIT5AWP	Advanced Web Programming	
I	<p>Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library. .NET programming tools: Visual Studio Gallery ,LINQPad , SQL Complete.</p> <p>The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods.</p> <p>Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and</p>	12

	Assemblies, Advanced Class Programming.	
II	<p>Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application.</p> <p>Form Controls: Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation. Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation: Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.</p>	12
III	<p>Error Handling, Logging, and Tracing : Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing</p> <p>State Management : Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options</p> <p>Styles, Themes, and Master Pages : Styles, Themes, Master Page Basics, Advanced Master Pages</p>	12
IV	<p>ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.</p> <p>Data Binding: Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls,</p> <p>The Data Controls: The GridView, Formatting the GridView, Selecting a GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView</p>	12
V	<p>XML: XML Explained, The XML Classes, XML Validation, XML Display and Transforms.</p> <p>Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.</p> <p>ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.</p>	12

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Advanced Web Programming Practical
Course Code	UIT5WPP
Credit	2
Hours	3 Hrs per week

Course Outcomes	After completing the course, Student will be able to:
	1) Build console application in C#.
	2) Develop web applications with strong object-oriented principles.
	3) Develop connection between web pages using ASP.NET AJAX.
	4) Develop dynamic web pages in ASP.NET and XML

Course Code	Advanced Web Programming Practical List
UIT5WPP	<p>1. Working with basic C# and ASP .NET</p> <p>a. Create an application that obtains four int values from the user and displays the product.</p> <p>b. Create an application to demonstrate string operations.</p> <p>c. Create an application that receives the (Student Id, Student Name, Course Name, Date of Birth) information from a set of students. The application should also display the information of all the students once the data is entered.</p> <p>Create an application to demonstrate following operations</p> <p>i. Generate Fibonacci series. ii. Test for prime numbers. iii. Test for vowels. iv. Use of foreach loop with arrays v. Reverse a number and find sum of digits of a number.</p> <p>2. Working with Object Oriented C# and ASP .NET</p> <p>a. Create simple application to perform following operations</p> <p>i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion</p> <p>b. Create simple application to demonstrate use of following concepts</p> <p>i. Function Overloading ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces</p> <p>c. Create simple application to demonstrate use of following concepts</p> <p>i. Using Delegates and events ii. Exception handling</p> <p>3. Working with Web Forms and Controls</p> <p>a. Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example :AutoPostBack)</p> <p>b. Demonstrate the use of Calendar control to perform following operations.</p> <p>a) Display messages in a calendar control b) Display vacation in a calendar control c) Selected day in a calendar control using style d) Difference</p>

	<p>between two calendar dates</p> <p>c. Demonstrate the use of Treeviewcontrol perform following operations.</p> <p>a) Treeview control and datalist b) Treeview operations</p> <p>4. Working with Form Controls</p> <p>a. Create a Registration form to demonstrate use of various Validation controls.</p> <p>b. Create Web Form to demonstrate use of Adrotator Control.</p> <p>c. Create Web Form to demonstrate use User Controls.</p> <p>5. Working with Navigation, Beautification and Master page.</p> <p>a. Create Web Form to demonstrate use of Website Navigation controls and Site Map.</p> <p>b. Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification.</p> <p>c. Create a web application to demonstrate various states of ASP.NET Pages.</p> <p>6. Working with Database</p> <p>a. Create a web application bind data in a multiline textbox by querying in another textbox.</p> <p>b. Create a web application to display records by using database.</p> <p>c. Demonstrate the use of Datalist link control.</p> <p>7. Working with Database</p> <p>a. Create a web application to display Databinding using dropdownlist control.</p> <p>b. Create a web application for to display the phone no of an author using d database.</p> <p>c. Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).</p> <p>8. Working with data controls</p> <p>a. Create a web application to demonstrate various uses and properties of SqlDataSource.</p> <p>b. Create a web application to demonstrate data binding using DetailsView and FormView Control.</p> <p>c. Create a web application to display Using Disconnected Data Access and Databinding using GridView.</p> <p>9. Working with GridView control</p> <p>a. Create a web application to demonstrate use of GridView control template andGridView hyperlink.</p> <p>b. Create a web application to demonstrate use of GridView button column and GridView events.</p> <p>c. Create a web application to demonstrate GridView paging and Creating own table format using GridView.</p> <p>10. Working with AJAX and XML</p> <p>a. Create a web application to demonstrate reading and writing operation with XML.</p> <p>b. Create a web application to demonstrate Form Security and Windows Security with proper Authentication and Authorization properties.</p> <p>c. Create a web application to demonstrate use of various Ajax controls.</p> <p>11. Programs to create and use DLL</p>
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Reference Books:

- 1) Beginning ASP.NET 4.5 in C# ,mathevmacDonald,Apress
- 2) Murach's ASP.NET 4.6 Web Programming in C#2015, SPD,SixthEdition,Mary Delamater and Anne Bohe

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Linux System Administration
Course Code	UIT5LSA
Credit	2
Hours	5 lectures per week

Course Objectives	To make the learners familiar with linux operating system administration. Learners will be able to install and configure different types of servers such as mail server, Web server etc. They will also be able to create and handle user accounts and maintain its security..
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain various commands to manage system level processes and handle software management on linux platforms.
	2) Elaborate storage and user management on linux platforms.
	3) Explain the detailed steps and files for configuration of different types of servers.
	4) Make use of shell level programming in Linux.

Course Code UIT5LSA	Linux System Administration	
I	<p>Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator.</p> <p>Command Line: Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files</p> <p>System Administration Tasks: Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, Using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting</p>	12

	<p>Up Rsyslog, Common Log Files, Setting Up Logrotate</p> <p>Managing Software: Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages</p>	
II	<p>Configuring and Managing Storage: Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes</p> <p>Connecting to the Network: Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key-Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access</p> <p>Working with Users, Groups, and Permissions: Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes</p>	12
III	<p>Securing Server with iptables: Understanding Firewalls, Setting Up a Firewall with system-config-firewall, Allowing Services, Trusted Interfaces, Masquerading, Configuration Files, Setting Up a Firewall with iptables, Tables, Chains, and Rules, Composition of Rule, Configuration Example, Advanced iptables Configuration, Configuring Logging, The Limit Module, Configuring NAT</p> <p>Setting Up Cryptographic Services: Introducing SSL, Proof of Authenticity: the Certificate Authority, Managing Certificates with openssl, Creating a Signing Request, Working with GNU Privacy Guard, Creating GPG Keys, Key Transfer, Managing GPG Keys, Encrypting Files with GPG, GPG Signing, Signing RPM Files</p> <p>Configuring Server for File Sharing: What is NFS? Advantages and Disadvantages of NFS, Configuring NFS4, Setting Up NFSv4, Mounting an NFS Share, Making NFS Mounts Persistent, Configuring Automount, Configuring Samba, Setting Up a Samba File Server, Samba Advanced Authentication Options, Accessing Samba Shares, Offering FTP Services.</p>	12
IV	<p>Configuring DNS and DHCP: Introduction to DNS, The DNS Hierarchy, DNS Server Types, The DNS Lookup Process, DNS Zone Types, Setting Up a DNS Server, Setting Up a Cache-Only Name Server, Setting Up a Primary Name Server, Setting Up a Secondary Name Server, Understanding DHCP, Setting Up a DHCP Server</p> <p>Setting Up a Mail Server: Using the Message Transfer Agent, the Mail Delivery Agent, the Mail User Agent, Setting Up Postfix as an SMTP Server, Working with Mutt, Basic Configuration, Internet Configuration, Configuring Dovecot for POP</p>	12

	<p>and IMAP Configuring Apache on Red Hat Enterprise Linux: Configuring the Apache Web Server, Creating a Basic Website, Understanding the Apache Configuration Files, Apache Log Files, Working with Virtual Hosts, Securing the Web Server with TLS Certificates, Configuring Authentication, Setting Up Authentication with .htpasswd, Configuring LDAP Authentication, Setting Up MySQL</p>	
<p>V</p>	<p>Introducing Bash Shell Scripting: Introduction, Elements of a Good Shell Script, Executing the Script, Working with Variables and Input, Understanding Variables, Variables, Subshells, and Sourcing, Working with Script Arguments, Asking for Input, Using Command Substitution, Substitution Operators, Changing Variable Content with Pattern Matching, Performing Calculations, Using Control Structures, Using if...then...else, Using case, Using while, Using until, Using for, Configuring booting with GRUB.</p> <p>High-Availability Clustering: High-Availability Clustering, The Workings of High Availability, High-Availability Requirements, Red Hat High-Availability Add-on Software, Components, Configuring Cluster-Based Services, Setting Up Bonding, Setting Up Shared Storage, Installing the Red Hat High Availability Add-On, Building the Initial State of the Cluster, Configuring Additional Cluster Properties, Configuring a Quorum Disk, Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems</p> <p>Setting Up an Installation Server: Configuring a Network Server as an Installation Server, Setting Up a TFTP and DHCP Server for PXE Boot, Installing the TFTP Server, Configuring DHCP for PXE Boot, Creating the TFTP PXE Server Content, Creating a Kickstart File, Using a Kickstart File to Perform an Automated, Installation, Modifying the Kickstart File with, system-config-kickstart, Making Manual Modifications to the Kickstart File</p>	<p>12</p>

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Linux System Administration Practical
Course Code	UIT5LAP
Credit	2
Hours	3 Hrs per week

Course Outcomes	After completing the course, Student will be able to:
	1) Make use of administrative level commands for user and storage management and Networking.
	2) Construct the firewall rules for securing server with iptables and setup cryptographic services on linux machine.
	3) Create the configuration for different types of servers.
	4) Develop shell scripting programs on linux platform.

Course Code	Linux System Administration Practical List
UIT5LAP	<p>1 Installation of RHEL 6.X</p> <p>2 Graphical User Interface and Command Line Interface and Processes</p> <p>a Exploring the Graphical Desktop</p> <p>b The Command Line Interface</p> <p>c Managing Processes</p> <p>3 Storage Devices and Links, Backup and Repository</p> <p>a Working with Storage Devices and Links</p> <p>b Making a Backup</p> <p>c Creating a Repository</p> <p>4 Working with RPMs Storage and Networking</p> <p>a Using Query Options</p> <p>b Extracting Files From RPMs</p> <p>c Configuring and Managing Storage</p> <p>d Connecting to the Network</p> <p>5 Working with Users, Groups, and Permissions</p> <p>6 Firewall and Cryptographic services</p> <p>a Securing Server with iptables</p> <p>b Setting Up Cryptographic Services</p> <p>7 Configuring Server for File Sharing</p> <p>a Configuring NFS Server and Client</p> <p>b Configuring Samba</p> <p>c Configuring FTP</p> <p>8 DNS, DHCP and Mail Server</p> <p>a Configuring DNS</p> <p>b Configuring DHCP</p> <p>c Setting Up a Mail Server</p>

9 Web Server

- a Configuring Apache on Red Hat Enterprise Linux
- b Writing a Script to Monitor Activity on the Apache Web Server
- c Using the select Command

10 Shell Scripts and High-Availability Clustering

- a Writing Shell Scripts
- b Configuring Booting with GRUB
- c Configuring High Availability Clustering

11 Setting Up an Installation Server

- a Configuring Network Server as an Installation Server
- b Setting Up a TFTP and DHCP Server for PXE Boot

Reference Books:

1. Red Hat Enterprise Linux 6 Administration, Sander van Vugt, John Wiley and Sons
2. Red hat Linux Networking and System Administration,” Terry Collings and Kurt Wall” ,3rdEdition, Wiley

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Enterprise Java
Course Code	UIT5ENJ
Credit	2
Hours	5 lectures per week

Course Objectives	The objective of this course is to acquire the knowledge of advanced java technologies used in developing and deploying enterprise commercial website.
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain servlet with java applications and database connectivity.
	2) Elaborate the fundamentals and core concepts of cookies, session, file uploading, file downloading and request dispatcher, EJB applications and JNDI.
	3) Explain JSP applications using JSTL.
	4) Make use of knowledge of applications using concepts of persistence, object/relational mapping, JPA and Hibernate.

Course Code UIT5ENJ	Enterprise Java	
I	<p>Understanding Java EE: What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server</p> <p>Java EE Architecture, Server and Containers: Types of System Architecture, Java EE Server, Java EE Containers.</p> <p>Introduction to Java Servlets: The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do?</p> <p>Servlet API and Lifecycle: Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet</p> <p>Working With Servlets: Getting Started, Using Annotations Instead of Deployment Descriptor.</p> <p>Working with Databases: What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.</p>	12

<p>II</p>	<p>Request Dispatcher: RequestDispatcher Interface, Methods of RequestDispatcher, RequestDispatcher Application. COOKIES: Kinds Of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing TheColors Of A Page SESSION: What Are Sessions? Lifecycle Of Http Session, Session Tracking With Servlet API, A Servlet Session Example Working With Files: Uploading Files, Creating an Upload File Application, Downloading Files, Creating a Download File Application. Working With Non-Blocking I/O: Creating a Non-Blocking Read Application, Creating The Web Application, Creating Java Class, Creating Servlets, Retrieving The File, Creating index.jsp</p>	<p>12</p>
<p>III</p>	<p>Introduction To Java Server Pages: Why use Java Server Pages? Disadvantages Of JSP, JSP v/s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? About Java Server Pages Getting Started With Java Server Pages: Comments, JSP Document, JSP Elements, JSP GUI Example. Action Elements: Including other Files, Forwarding JSP Page to Another Page, Passing Parameters for other Actions, Loading a Javabean. Implicit Objects, Scope And El Expressions: Implicit Objects, Character Quoting Conventions, Unified Expression Language [Unified EL], Expression Language. Java Server Pages Standard Tag Libraries: What is wrong in using JSP ScriptletTags? How JSTL Fixes JSP Scriptlet's Shortcomings? Disadvantages Of JSTL, Tag Libraries.</p>	<p>12</p>
<p>IV</p>	<p>Introduction To Enterprise Javabeans: Enterprise Bean Architecture, Benefits of Enterprise Bean, Types of Enterprise Bean, Accessing Enterprise Beans, Enterprise Bean Application, Packaging Enterprise Beans Working With Session Beans: When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Lifecycle of Enterprise Beans, Packaging Enterprise Beans, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Beans. Working with Message Driven Beans: Lifecycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example. Interceptors: Request And Interceptor, Defining An Interceptor, AroundInvoke Method, Applying Interceptor, Adding An Interceptor To An Enterprise Bean, Build and Run the Web Application. Java Naming and Directory Interface: What is Naming Service? What is Directory Service? What is Java Naming and Directory interface? Basic Lookup, JNDI Namespace in Java EE, Resources and JNDI, Datasource Resource Definition in Java EE.</p>	<p>12</p>
<p>V</p>	<p>Persistence, Object/Relational Mapping And JPA: What is Persistence? Persistence in Java, Current Persistence Standards in Java, Why another Persistence Standards? Object/Relational Mapping, Introduction to Java Persistence API: The Java Persistence API, JPA, ORM, Database and the Application, Architecture of JPA, How JPA Works? JPA Specifications. Writing JPA Application: Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database And Tables in Mysql, Creating a Web Application, Adding the Required Library Files, Creating a Javabean Class, Creating Persistence Unit [Persistence.Xml], Creating JSPS, The JPA Application Structure, Running The JPA Application.</p>	<p>12</p>

	<p>Introduction to Hibernate: What is Hibernate? Why Hibernate? Hibernate, Database and The Application, Components of Hibernate, Architecture of Hibernate, How Hibernate Works?</p> <p>Writing Hibernate Application: Application Requirement Specifications, Software Requirements, The Application Development Approach, Creating Database and Tables in Mysql, Creating a Web Application, Adding The Required Library Files, Creating a Javabeen Class, Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPS, Running The Hibernate Application.</p>	
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Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Enterprise Java Practical
Course Code	UIT5EJP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Create applications using servlet with cookies and session.
	2) Develop the servlet IO, file applications and JSP applications.
	3) Construct JSP, JSTL, EL and EJB applications
	4) Build the EJB applications with different types of beans and JPA applications.

Course Code	Enterprise Java Practical List
UIT5EJP	<ol style="list-style-type: none"> 1. Implement the following Simple Servlet applications. <ol style="list-style-type: none"> a. Create a simple calculator application using servlet. b. Create a servlet for a login page. If the username and password are correct then it says message "Hello <username>" else a message "login failed" c. Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database. 2. Implement the following Servlet applications with Cookies and Sessions. <ol style="list-style-type: none"> a. Using Request Dispatcher Interface create a Servlet which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed. b. Create a servlet that uses Cookies to store the number of times a user has visited servlet. c. Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using

sessions.

3. Implement the Servlet IO and File applications.

- a. Create a Servlet application to upload and download a file.
- b. **Develop Simple Servlet Question Answer Application using Database.**
- c. Create simple Servlet application to demonstrate Non-Blocking Read Operation.

4. Implement the following JSP applications.

- a. Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.
- b. **Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).**
- c. **Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.**

5. Implement the following JSP JSTL and EL Applications.

- a. Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.
- b. Create a JSP page to demonstrate the use of Expression language.
- c. Create a JSP application to demonstrate the use of JSTL.

6. Implement the following EJB Applications.

- a. **Create a Currency Converter application using EJB.**
- b. **Develop a Simple Room Reservation System Application Using EJB.**
- c. **Develop simple shopping cart application using EJB [Stateful Session Bean].**

7. Implement the following EJB applications with different types of Beans.

- a. Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.
- b. Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].
- c. Develop simple Marks Entry Application to demonstrate accessing Database using EJB.

8 Implement the following JPA applications.

- A **Develop a simple Inventory Application Using JPA.**
- B **Develop a Guestbook Application Using JPA.**
- C Create simple JPA application to store and retrieve Book details.

9 Implement the following JPA applications with ORM and Hibernate.

- A **Develop a JPA Application to demonstrate use of ORM associations.**
- B **Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.**
- C **Develop a Hibernate application to store and retrieve employee details in MySQL Database.**

10 Implement the following Hibernate applications.

- A **Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.**
- B **Develop Hibernate application to enter and retrieve course details with ORM Mapping.**
- C **Develop a five page web application site using any two or three Java EE Technologies.**

Reference Books:

- 1) “Java EE 7 For Beginners”, Sharanam Shah, Vaishali Shah, FirstEdition,SPD
- 2) “Advanced Java Programming”,Uttam Kumar Roy, Oxford Press

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Project Dissertation
Course Code	UIT5PDP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Identify a problem definition
	2) Estimate system requirement
	3) Design data flow diagram
	4) Plan the system design phase in SDLC

Course Code	Project Dissertation and Viva
UIT5PDP	The learners are expected to develop a project of undergraduate level. Normal websites, web applications, mobile apps are expected. The details are given in Appendix-I

Semester- VI

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Software Quality Assurance
Course Code	UIT6SQA
Credit	2
Hours	5 lectures per week

Course Objectives	The course is designed to introduce concepts about quality as the driving force behind success of software product, also focuses on life cycle of testing and different testing methodologies used for various test processes.
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Course Outcomes	After completing the course, Student will be able to:
	1) Define quality of software project
	2) Explain testing and different testing method
	3) Elaborate software verification, validation and v test model
	4) Classify level of testing

Course Code USIT6SQA	Software Quality Assurance
I	<p>Introduction to Quality: Historical Perspective of Quality, What is Quality? (Is it a fact or perception?), Definitions of Quality, Core Components of Quality, Quality View, Financial Aspect of Quality, Customers, Suppliers and Processes, Total Quality Management (TQM), Quality Principles of Total Quality Management, Quality Management Through Statistical Process Control, Quality Management Through Cultural Changes, Continual (Continuous) Improvement Cycle, Quality in Different Areas, Benchmarking and Metrics, Problem Solving Techniques, Problem Solving Software Tools.</p> <p>Software Quality: Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and Productivity Relationship, Requirements of a Product, Organisation Culture, Characteristics of Software, Software Development Process, Types of Products, Schemes of Criticality Definitions, Problematic Areas of Software Development Life Cycle, Software Quality Management, Why Software Has Defects? Processes Related to Software Quality, Quality Management System Structure, Pillars of Quality Management System, Important Aspects of Quality Management.</p>
	12

<p>II</p>	<p>Fundamentals of testing: Introduction, Necessity of testing, What is testing? Fundamental test process, The psychology of testing, Historical Perspective of Testing, Definitions of Testing, Approaches to Testing, Testing During Development Life Cycle, Requirement Traceability Matrix, Essentials of Software Testing, Workbench, Important Features of Testing Process, Misconceptions About Testing, Principles of Software Testing, Salient Features of Good Testing, Test Policy, Test Strategy or Test Approach, Test Planning, Testing Process and Number of Defects Found in Testing, Test Team Efficiency, Mutation Testing, Challenges in Testing, Test Team Approach, Process Problems Faced by Testing, Cost Aspect of Testing, Establishing Testing Policy, Methods, Structured Approach to Testing, Categories of Defect, Defect, Error, or Mistake in Software, Developing Test Strategy, Developing Testing Methodologies (Test Plan), Testing Process, Attitude Towards Testing (Common People Issues), Test Methodologies/Approaches, People Challenges in Software Testing, Raising Management Awareness for Testing, Skills Required by Tester, Testing throughout the software life cycle, Software development models, Test levels, Test types, the targets of testing, Maintenance testing</p>	<p>12</p>
<p>III</p>	<p>Unit Testing: Boundary Value Testing: Normal Boundary Value Testing, Robust Boundary Value Testing, Worst-Case Boundary Value Testing, Special Value Testing, Examples, Random Testing, Guidelines for Boundary Value Testing, Equivalence Class Testing: Equivalence Classes, Traditional Equivalence Class Testing, Improved Equivalence Class Testing, Edge Testing, Guidelines and Observations. Decision Table–Based Testing: Decision Tables, Decision Table Techniques, Cause-and-Effect Graphing, Guidelines and Observations, Path Testing: Program Graphs, DD-Paths, Test Coverage Metrics, Basis Path Testing, Guidelines and Observations, Data Flow Testing: Define/Use Testing, Slice-Based Testing, Program Slicing Tools.</p>	<p>12</p>
<p>IV</p>	<p>Software Verification and Validation: Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis of Stage Phase, Entities involved in verification, Reviews in testing lifecycle, Coverage in Verification, Concerns of Verification, Validation, Validation Workbench, Levels of Validation, Coverage in Validation, Acceptance Testing, Management of Verification and Validation, Software development verification and validation activities. V-test Model: Introduction, V-model for software, Testing during Proposal stage, Testing during requirement stage, Testing during test planning phase, Testing during design phase, Testing during coding, VV Model, Critical Roles and Responsibilities.</p>	<p>12</p>
<p>V</p>	<p>Levels of Testing: Introduction, Proposal Testing, Requirement Testing, Design Testing, Code Review, Unit Testing, Module Testing, Integration Testing, Big-Bang Testing, Sandwich Testing, Critical Path First, Sub System Testing, System Testing, Testing Stages. Special Tests: Introduction, GUI testing, Compatibility Testing, Security Testing, Performance Testing, Volume Testing, Stress Testing, Recovery Testing, Installation Testing, Requirement Testing, Regression Testing, Error Handling Testing, Manual Support Testing, Intersystem Testing, Control Testing, Smoke Testing, Adhoc Testing, Parallel Testing, Execution Testing, Operations Testing, Compliance Testing, Usability Testing, Decision Table Testing, Documentation Testing, Training testing, Rapid Testing, Control flow graph, Generating tests on the basis of Combinatorial Designs, State Graph, Risk Associated with New Technologies, Process maturity level of Technology, Testing Adequacy of Control in New technology usage, Object Oriented Application Testing, Testing of Internal Controls, COTS Testing, Client Server Testing, Web Application Testing, Mobile Application Testing, eBusinessCommerce Testing, Agile Development Testing, Data Warehousing Testing.</p>	<p>12</p>

Reference Books:

- 1)Software Testing: Principles, Techniques and Tools M. G. Limaye TMH 2017
- 2) Software Testing and Continuous Quality Improvement William E. Lewis Third Edition 2016
- 3)Software Testing: A Craftsman's Approach Paul C. Jorgenson 4th Edition 2017

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Security in Computing
Course Code	UIT6SIC
Credit	2
Hours	5 lectures per week

Course Objectives	The course is designed to introduce the fundamentals about the security in computing for the network, hardware, applications, devices & data with the help of different types of security.
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Course Outcomes	After completing the course, Student will be able to:
	1) Evaluate and contrast computing security issues.
	2) Explain computing security vulnerabilities and threats
	3) Determine alternative countermeasures and controls
	4) Classify virtual machines & cloud computing.

Course Code USIT6SIC	Security in Computing	
I	<p>Information Security Overview : The Importance of Information Protection, The Evolution of Information Security, Justifying Security Investment, Security Methodology, How to Build a Security Program, The Impossible Job, The Weakest Link, Strategy and Tactics, Business Processes vs. Technical Controls.</p> <p>Risk Analysis: Threat Definition, Types of Attacks, Risk Analysis.</p> <p>Secure Design Principles: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.</p>	12
II	<p>Authentication and Authorization: Authentication, Authorization</p> <p>Encryption: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure.</p> <p>Storage Security: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices.</p> <p>Database Security: General Database Security Concepts, Understanding Database Security Layers, Understanding Database-Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring.</p>	12

III	<p>Secure Network Design: Introduction to Secure Network Design, Performance, Availability, Security.</p> <p>Network Device Security: Switch and Router Basics, Network Hardening.</p> <p>Firewalls: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design.</p> <p>Wireless Network Security: Radio Frequency Security Basics, Data-Link Layer Wireless Security Features, Flaws, and Threats, Wireless Vulnerabilities and Mitigations, Wireless Network Hardening Practices and Recommendations, Wireless Intrusion Detection and Prevention, Wireless Network Positioning and Secure Gateways.</p>	12
IV	<p>Intrusion Detection and Prevention Systems: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM).</p> <p>Voice over IP (VoIP) and PBX Security: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management.</p> <p>Operating System Security Models: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.</p>	12
V	<p>Virtual Machines and Cloud Computing: Virtual Machines, Cloud Computing.</p> <p>Secure Application Design: Secure Development Lifecycle, Application Security Practices, Web Application Security, Client Application Security, Remote Administration Security.</p> <p>Physical Security: Classification of Assets, Physical Vulnerability Assessment, Choosing Site Location for Security, Securing Assets: Locks and Entry Controls, Physical Intrusion Detection.</p>	12

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Security in Computing Practical
Course Code	UIT6SCP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Design Routers by OSPF, NTP, SSH
	2) Create AAA Authentication
	3) Apply and Verify Extended Numbered ACL
	4) Test IPV6 by using firewalls & ACL

Course Code	Security in Computing Practical List
	<p>1 Configure Routers</p> <p>a OSPF MD5 authentication.</p> <p>b NTP.</p> <p>c To log messages to the syslog server.</p>

UIT6SCP	<p>d To support SSH connections.</p> <p>2 Configure AAA Authentication</p> <p>a Configure a local user account on Router and configure authenticate on the console and vty lines using local AAA</p> <p>b Verify local AAA authentication from the Router console and the PC-A client</p> <p>3 Configuring Extended ACLs</p> <p>a Configure, Apply and Verify an Extended Numbered ACL</p> <p>4 Configure IP ACLs to Mitigate Attacks and IPV6 ACLs</p> <p>a Verify connectivity among devices before firewall configuration.</p> <p>b Use ACLs to ensure remote access to the routers is available only from management station PC-C.</p> <p>c Configure ACLs on to mitigate attacks.</p> <p>d Configuring IPv6 ACLs</p> <p>5 Configuring a Zone-Based Policy Firewall</p> <p>6 Configure IOS Intrusion Prevention System (IPS) Using the CLI</p> <p>a Enable IOS IPS.</p> <p>b Modify an IPS signature.</p> <p>7 Layer 2 Security</p> <p>a Assign the Central switch as the root bridge.</p> <p>b Secure spanning-tree parameters to prevent STP manipulation attacks.</p> <p>c Enable port security to prevent CAM table overflow attacks.</p> <p>8 Layer 2 VLAN Security</p> <p>9 Configure and Verify a Site-to-Site IPsec VPN Using CLI</p> <p>10 Configuring ASA Basic Settings and Firewall Using CLI</p> <p>a Configure basic ASA settings and interface security levels using CLI</p> <p>b Configure routing, address translation, and inspection policy using CLI</p> <p>c Configure DHCP, AAA, and SSH</p> <p>d Configure a DMZ, Static NAT, and ACLs</p>
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Reference Books:

1. The Complete Reference: Information Security ,Mark Rhodes-Ousley, 2nd,McGraw-Hill
2. Essential Cybersecurity Science, Josiah Dykstra , Fifth, O'Reilly
3. Principles of Computer Security: CompTIA Security+ and Beyond ,Wm.ArthurConklin

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Business Intelligence
Course Code	UIT6BUI
Credit	2
Hours	5 lectures per week

Course Objectives	To provide graduate students of M.Sc. Information Systems with comprehensive and in-depth knowledge of Business Intelligence (BI) principles and techniques by introducing the relationship between managerial and technological perspectives. This course is also designed to expose students to the frontiers of BI-intensive BIG data computing and information systems, while providing a sufficiently strong foundation to encourage further research.
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Course Outcomes	After completing the course, Student will be able to:
	1) Explain the framework of the computerized Business Intelligence System and decision support system.
	2) Analyze data by choosing relevant models and algorithms for respective applications.
	3) Explain Classification and clustering algorithms
	4) Elaborate the applications of Business Intelligence.

Course Code UIT6BUI	Business Intelligence	
I	Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system	12
II	Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models Data mining: Definition of data mining, Representation of input data , Data mining process, Analysis methodologies Data preparation: Data validation, Data transformation, Data reduction	12
III	Classification: Classification problems, Evaluation of classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models	12

IV	Business intelligence applications: Marketing models: Relational marketing, Sales force management, Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems. Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices	12
V	Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Artificial Intelligence Versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems	12

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Business Intelligence Practical
Course Code	UIT6BIP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Import legacy data from different sources and apply ETL process on it
	2) Apply classification and clustering algorithms
	3) Apply linear and logistic regression algorithms
	4) Examine what-if-analysis for data visualization

Course Code	Business Intelligence Practical List
UIT6BIP	<p>1) Import the legacy data from different sources such as (Excel , SqlServer, Oracle etc.) and load in the target system. (You can download sample database such as Adventureworks, Northwind, foodmart etc.)</p> <p>2) Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.</p> <p>3) a. Create the Data staging area for the selected database. b. Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and HOLAP model.</p> <p>4) a.Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the datawarehouse.</p> <p>5)a. Import the datawarehouse data in Microsoft Excel and create the Pivot table and Pivot Chart. b. Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.</p> <p>6) Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.</p> <p>7) Perform the data classification using classification algorithm.</p> <p>8) Perform the data clustering using clustering algorithm.</p> <p>9) Perform the Linear regression on the given data warehouse data.</p> <p>10) Perform the logistic regression on the given data warehouse data.</p>

Reference Books:

- 1)Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Verzellis, First Edition , Wiley
- 2) Decision support and Business Intelligence Systems, Efraim Turban, Ramesh Sharda, DursunDelen , Ninth, Pearson

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Principles of Geographic Information Systems
Course Code	USIT6GIS
Credit	2
Hours	5 lectures per week

Course Objectives	The course is designed to introduce concepts about geographic information system to explore mapping data, analyze different mapping information and to create meaningful maps using different data.
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Course Outcomes	After completing the course, Student will be able to:
	1) Define Importance of GIS and its use in representation of the real world.
	2) Explain data capture, storage, analysis, and output in a GIS.
	3) Elaborate Map scale, projection and coordinate systems in GIS.
	4) Explain Spatial data analysis and Data visualization.

Course Code USIT6GIS	Principles of Geographic Information Systems	
I	<p>A Gentle Introduction to GIS The nature of GIS: Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation. The real world and representations of it: Models and modelling, Maps, Databases, Spatial databases and spatial analysis Geographic Information and Spatial Database Models and Representations of the real world Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries Computer Representations of Geographic Information: Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects Organizing and Managing Spatial Data</p>	12

	The Temporal Dimension	
II	<p>Data Management and Processing Systems Hardware and Software Trends Geographic Information Systems: GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI) Stages of Spatial Data handling: Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation. Database management Systems: Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database. GIS and Spatial Databases: Linking GIS and DBMS, Spatial database functionality.</p>	12
III	<p>Spatial Referencing and Positioning Spatial Referencing: Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations Satellite-based Positioning: Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology Data Entry and Preparation Spatial Data Input: Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere Data Quality: Accuracy and Positioning, Positional accuracy, Attribute accuracy, Temporal accuracy, Lineage, Completeness, Logical consistency Data Preparation: Data checks and repairs, Combining data from multiple sources Point Data Transformation: Interpolating discrete data, Interpolating continuous data</p>	12
IV	<p>Spatial Data Analysis Classification of analytical GIS Capabilities Retrieval, classification and measurement: Measurement, Spatial selection queries, Classification Overlay functions: Vector overlay operators, Raster overlay operators Neighbourhood functions: Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis Analysis: Network analysis, interpolation, terrain modeling GIS and Application models: GPS, Open GIS Standards, GIS Applications and Advances Error Propagation in spatial data processing: How Errors propagate, Quantifying error propagation</p>	12
V	<p>Data Visualization GIS and Maps, The Visualization Process Visualization Strategies: Present or explore? The cartographic toolbox: What kind of data do I have?, How can I map my data? How to map?: How to map qualitative data, How to map quantitative data, How to map the terrain elevation, How to map time series Map Cosmetics, Map Dissemination</p>	12

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Principles of Geographic Information Systems Practical
Course Code	USIT6GIP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Utilize QGIS software for managing vector and raster data.
	2) Build maps with attributes and different data sets.
	3) Design georeferencing for maps.
	4) Make Use of advanced GIS operations like Nearest Neighborhood analysis, automating map creation etc.

Course Code	Principles Geographic Information Systems Practical List
USIT6GIP	<p>1. Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics</p> <p>2. Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping method.</p> <p>3. Making a Map, Working with Attributes, Importing Spreadsheets or CSV files Using Plugins, Searching and Downloading OpenStreetMap Data</p> <p>4. Working with attributes, terrain Data</p> <p>5. Working with Projections and WMS Data</p> <p>6. Georeferencing Topo Sheets and Scanned Maps, Georeferencing Aerial Imagery, Digitizing Map Data .</p> <p>7. Managing Data Tables and Spatial data Sets: Table joins, spatial joins, points in Polygon analysis, performing spatial queries.</p> <p>8. Advanced GIS Operations 1: Nearest Neighbour Analysis, Sampling Raster Data using Points or Polygons, Interpolating Point Data.</p> <p>9. Advance GIS Operations 2: Batch Processing using Processing Framework Automating, Complex Workflows using Processing Modeler, Automating Map Creation with Print Composer Atlas.</p> <p>10. Validating Map data</p>

Reference Books:

- 1) Principles of Geographic Information Systems, Otto Huisman and Rolf A. , The International Institute of Geoinformation Science and Earth Observation, Fourth edition, 2009.
- 2) Principles of Geographic Information Systems , P.A Burrough and R.A.McDonnell , Oxford University Press , Third edition, 1999.

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- 3) Fundamentals of Spatial Information Systems, R.Laurini and D. Thompson, Academic Press,1994.
- 4) Fundamentals of Geographic Information Systems, Michael N.Demers , Wiley Publications , Fourth edition , 2009 .
- 5) Introduction to Geographic Information Systems , Chang Kang-tsung (Karl), McGrawHill edition, Any above 3rd Edition.
- 6) GIS Fundamentals: A First Text on Geographic Information Systems , Paul Bolsatd , XanEdu Publishing Inc , 5th Edition .

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	IT Service Management
Course Code	UIT6ISM
Credit	2
Hours	5 lectures per week

Course Objectives	The objective of this course is to introduce the concept of the IT Service Management with respect to the services, to improve the end user experience and connecting IT to wider business objectives.
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Course Outcomes	After completing the course, Student will be able to:
	1) Define basic concepts of IT Service management and service life cycle.
	2) Explain Service Strategy, Service Design and its Principles.
	3) Elaborate Service Transition and Service Operation in detail.
	4) Explain CSI Model and Responsibility Model for Continual Service Improvement.

Course Code UIT6ISM	IT Service Management	
I	<p>IT Service Management: Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialisation and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle.</p> <p>Service Strategy Principles: Value creation, Service Assets, Service Provider Service Structures, Service Strategy Principles.</p> <p>Service Strategy: Define the market, Develop the offerings, Develop Strategic Assets, Prepare for execution.</p> <p>Challenges, Critical Success factors and risks: Complexity, Coordination and Control, Preserving value, Effectiveness in measurement, Risks.</p>	12
II	<p>Service Design: Fundamentals, Service Design Principles: Goals, Balanced Design, Identifying Service requirements, identifying and documenting business requirements and drivers, Design activities, Design aspects, Subsequent design activities, Design constraints, Service oriented architecture, Business Service Management, Service Design Models</p>	12

	<p>Service Design Processes: Service Catalogue Management, Service Level Management, Capacity Management, Availability Management, IT Service Continuity Management, Information Security Management, Supplier Management</p> <p>Challenges, Critical Success factors and risks: Challenges, Risks</p>	
II	<p>Service Transition: Fundamentals, Service Transition Principles: Principles Supporting Service Transition, Policies for Service Transition</p> <p>Service Transition Processes: Transition planning and support, Change Management, Service Asses Configuration Management, Service and Deployment Management, Service Validation and Testing, Evaluation, Knowledge Management.</p> <p>Challenges, Critical Success factors and risks: Challenges, Critical Success factors, Risks, Service Transition under difficult Conditions.</p>	12
IV	<p>Service Operation: Fundamentals, Service Operation Principles: Functions, groups, teams, departments and divisions, Achieving balance in service operations, Providing service, Operation staff involvement in service design and service transition, Operational Health, Communication, Documentation</p> <p>Service Operation Processes: Event Management, Incident Management, Request fulfilment, Problem Management, Access Management, Operational activities of processes covered in other lifecycle phases.</p> <p>Challenges, Critical Success factors and risks: Challenges, Critical Success factors, Risks</p>	12
V	<p>Continual Service Improvement(CSI) Principles: CSI Approach, CSI and organizational change, Ownership, CSI register, External and Internal drivers, Service level management, Knowledge management, The Deming cycle, Service Measurement, IT governance, Frameworks, models, standards and quality Systems, CSI inputs and outputs.</p> <p>CSI Process: The seven step improvement process. CSI Methods nad Techniques: Methods and techniques, Assessments, benchmarking, Service Measurement, Metrics, Return on Investment, Service reporting, CSI and other service management processes, Organising for CSI: Organisational development, Functions, roles, Customer Engagement, Responsibility model - RACI, Competence and training.</p> <p>Technology considerations: Tools to support CSI activities. Implementing CSI: Critical Considerations for implementing CSI, The start, Governance, CSI and organisational change, Communication Strategy and Plan</p>	12

Reference Books:

1. "ITIL v3 Foundation Complete Certification Kit", 2009
2. "ITIL v3 Service Strategy", OGC/TSO
3. "ITIL v3 Service Transition", OGC/TSO
4. "ITIL v3 Service Operation", OGC/TSO
5. "ITIL Continual Service Improvement", TSO, 2011

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Advanced Mobile Programming Practical
Course Code	UIT6AMP
Credit	2
Hours	3 lectures per week

Course Outcomes	After completing the course, Student will be able to:
	1) Build simple Android Applications.
	2) Apply different resources and layouts in Android Programming.
	3) Design Android applications using UI elements.
	4) Develop applications based on Media, Telephone, Security and Permissions.

Course Code	Advanced Mobile Programming Practical List
UIT6ISP	<ol style="list-style-type: none"> 1. Introduction to Android, Introduction to Android Studio IDE, Application Fundamentals: Creating a Project, Android Components, Activities, Services, Content Providers, Broadcast Receivers, Interface overview, Creating Android Virtual device, USB debugging mode, Android Application Overview. Simple “Hello World” program. 2. Programming Resources Android Resources: (Color, Theme, String, Drawable, Dimension, Image) 3. Programming Activities and fragments Activity Life Cycle, Activity methods, Multiple Activities, Life Cycle of fragments and multiple fragments. 4. Programs related to different Layouts Coordinate, Linear, Relative, Table, Absolute, Frame, List View, Grid View. 5. Programming UI elements AppBar, Fragments, UI Components 6. Programming menus, dialog, dialog fragments 7. Programs on Intents, Events, Listeners and Adapters The Android Intent Class, Using Events and Event Listeners 8. Programs on Services, notification and broadcast receivers 9. Database Programming with SQLite 10. Programming threads, handles and asynchronous programs 11. Programming Media API and Telephone API 12. Programming Security and permissions 13. Programming Network Communications and Services (JSON)

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Project Implementation
Course Code	UIT6PIP
Credit	2
Hours	3 Hrs per week

Course Outcomes	After completing the course, Student will be able to:
	1) Design user interface for input
	2) Develop coding for the system
	3) Examine various system testing.
	4) Predict the future scope of project

Course Code	Project Implementation
UIT6PIP	The details are given in Appendix-I

APPENDIX –1

Project Dissertation Semester V and Project Implementation Semester VI

Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapters have also to be included in Semester VI report. Semester VI report has to be hard bound with golden embossing. Students will be evaluated based on the dissertation in semester V and dissertation and viva voce in Semester VI.

I. OBJECTIVES

- Describe the Systems Development Life Cycle (SDLC).
- Evaluate systems requirements.
- Complete a problem definition.
- Evaluate a problem definition.
- Determine how to collect information to determine requirements.
- Perform and evaluate feasibility studies like cost-benefit analysis, technical feasibility, time feasibility and Operational feasibility for the project.
- Work on data collection methods for fact finding.
- Construct and evaluate data flow diagrams.
- Construct and evaluate data dictionaries.
- Evaluate methods of process description to include structured English, decision tables and decision trees.
- Evaluate alternative tools for the analysis process.
- Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.
- Decide the S/W requirement specifications and H/W requirement specifications.
- Plan the systems design phase of the SDLC.
- Distinguish between logical and physical design requirements.
- Design and evaluate system outputs.
- Design and evaluate systems inputs.
- Design and evaluate validity checks for input data.

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- Design and evaluate user interfaces for input.
- Design and evaluate file structures to include the use of indexes.
- Estimate storage requirements.
- Explain the various file update processes based on the standard file organizations.
- Decide various data structures.
- Construct and evaluate entity-relationship (ER) diagrams for RDBMS related projects.
- Perform normalization for the unnormalized tables for RDBMS related projects
- Decide the various processing systems to include distributed, client/server, online and others.
- Perform project cost estimates using various techniques.
- Schedule projects using both GANTT and PERT charts.
- Perform coding for the project.
- Documentation requirements and prepare and evaluate systems documentation.
- Perform various systems testing techniques/strategies to include the phases of testing.
- Systems implementation and its key problems.
- Generate various reports.
- Be able to prepare and evaluate a final report.
- Brief the maintenance procedures and the role of configuration management in operations.
- To decide the future scope and further enhancement of the system.
- Plan for several appendices to be placed in support with the project report documentation.
- Decide the various processing systems to include distributed, client/server, online and others.
- Perform project cost estimates using various techniques.
- Schedule projects using both GANTT and PERT charts.
- Perform coding for the project.
- Documentation requirements and prepare and evaluate systems documentation.
- Perform various systems testing techniques/strategies to include the phases of testing.
- Systems implementation and its key problems.

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- Generate various reports.
- Be able to prepare and evaluate a final report.
- Brief the maintenance procedures and the role of configuration management in operations.
- To decide the future scope and further enhancement of the system.
- Plan for several appendices to be placed in support with the project report documentation.

- Work effectively as an individual or as a team member to produce correct, efficient, well-organized and documented programs in a reasonable time.
- Recognize problems that are amenable to computer solutions, and knowledge of the tool necessary for solving such problems.
- Develop of the ability to assess the implications of work performed.
- Get good exposure and command in one or more application areas and on the software
- Develop quality software using the software engineering principles
- Develop of the ability to communicate effectively.

II. Type of the Project

The majority of the students are expected to work on a real-life project preferably in some industry/ Research and Development Laboratories/Educational Institution/Software Company. Students are encouraged to work in the areas listed below. However, it is ***not mandatory*** for a student to work on a real-life project. The student can formulate a project problem with the help of her/his Guide and submit the project proposal of the same. **Approval of the project proposal is mandatory.** If approved, the student can commence working on it, and complete it. Use the latest versions of the software packages for the development of the project.

III. SOFTWARE AND BROAD AREAS OF APPLICATION

FRONT END / GUI Tools	.Net Technologies,Java
DBMS/BACK END	Oracle, SQL Plus, MY SQL, SQL Server,
LANGUAGES	C, C++, Java, VC++, C#, R,Python
SCRIPTING LANGUAGES	PHP,JSP, SHELL Scripts (Unix), Tcl/TK,
.NET Platform	F#,C#. Net, Visual C#. Net, ASP.Net
MIDDLE WARE (COMPONENT) TECHNOLOGIES	COM/DCOM, Active-X, EJB
UNIX INTERNALS	Device Drivers, RPC, Threads, Socket

IV. Introduction

The project report should be documented with scientific approach to the solution of the problem that the students have sought to address. The project report should be prepared in order to solve the problem in a methodical and professional manner, making due references to appropriate techniques, technologies and professional standards. The student should start the documentation process from the first phase of software development so that one can easily identify the issues to be focused upon in the ultimate project report. The student should also include the details from the project diary, in which they will record the progress of their project throughout the course. The project report should contain enough details to enable examiners to evaluate the work. The important points should be highlighted in the body of the report, with details often referred to appendices.

1.1 PROJECT REPORT:

Title Page

Original Copy of the Approved Proforma of the Project Proposal

Certificate of Authenticated work

Role and Responsibility Form

Abstract

Acknowledgement

Table of Contents

Table of Figures

CHAPTER 1: INTRODUCTION

1.1 Background

1.2 Objectives

1.3 Purpose, Scope, and Applicability

1.3.1 Purpose

1.3.2 Scope

1.3.3 Applicability

1.4 Achievements

1.5 Organisation of Report

CHAPTER 2: SURVEY OF TECHNOLOGIES

CHAPTER 3: REQUIREMENTS AND ANALYSIS

3.1 Problem Definition

3.2 Requirements Specification

3.3 Planning and Scheduling

3.4 Software and Hardware Requirements

3.5 Preliminary Product Description

3.6 Conceptual Models

CHAPTER 4: SYSTEM DESIGN

4.1 Basic Modules

4.2 Data Design

4.2.1 Schema Design

4.2.2 Data Integrity and Constraints

4.3 Procedural Design

4.3.1 Logic Diagrams

4.3.2 Data Structures

4.3.3 Algorithms Design

4.4 User interface design

4.5 Security Issues

4.6 Test Cases Design

The documentation should use tools like star UML, Visuo for windows, Rational Rose for design as part of Software Project Management Practical Course. The documentation should be spiral bound for semester V and the entire documentation should be hard bound during semester VI.

CHAPTER 5: IMPLEMENTATION AND TESTING

5.1 Implementation Approaches

5.2 Coding Details and Code Efficiency 68

5.2.1 Code Efficiency

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5.3 Testing Approach

5.3.1 Unit Testing

5.3.2 Integrated Testing

5.3.3 Beta Testing

5.4 Modifications and Improvements

5.5 Test Cases

CHAPTER 6: RESULTS AND DISCUSSION

6.1 Test Reports

6.2 User Documentation

CHAPTER 7: CONCLUSIONS

7.1 Conclusion

7.1.1 Significance of the System

7.2 Limitations of the System

7.3 Future Scope of the Project

REFERENCES

GLOSSARY

APPENDIX A

APPENDIX B

V. EXPLANATION OF CONTENTS

Title Page

Sample format of Title page is given in Appendix 1 of this block. Students should follow the given format.

Original Copy of the Approved Proforma of the Project Proposal

T.Y.B.Sc, Information Technology Syllabus

Sample Proforma of Project Proposal is given in Appendix 2 of this block. Students should follow the given format.

Certificate of Authenticated work

Sample format of Certificate of Authenticated work is given in Appendix 3 of this block. Students should follow the given format.

Role and Responsibility Form

Sample format for Role and Responsibility Form is given in Appendix 4 of this block. Students should follow the given format.

Abstract

This should be one/two short paragraphs (100-150 words total), summarising the project work. It is important that this is not just a re-statement of the original project outline. A suggested flow is background, project aims and main achievements. From the abstract, a reader should be able to ascertain if the project is of interest to them and, it should present results of which they may wish to know more details.

Acknowledgements

This should express student's gratitude to those who have helped in the preparation of project. Table of Contents: The table of contents gives the readers a view of the detailed structure of the report. The students would need to provide section and subsection headings with associated pages. The formatting details of these sections and subsections are given below. Table of Figures: List of all Figures, Tables, Graphs, Charts etc. along with their page numbers in a table of figures.

Chapter 1: Introduction

The introduction has several parts as given below:

Background: A description of the background and context of the project and its relation to work already done in the area. Summarise existing work in the area concerned with the project work.

Objectives: Concise statement of the aims and objectives of the project. Define exactly what is going to be done in the project; the objectives should be about 30 /40 words. **Purpose, Scope and Applicability:** The description of Purpose, Scope, and Applicability are given below:

- **Purpose:** Description of the topic of the project that answers questions on why this project is being done. How the project could improve the system its significance and theoretical framework.

- **Scope:** A brief overview of the methodology, assumptions and limitations. The students should answer the question: What are the main issues being covered in the project? What are the main functions of the project?
- **Applicability:** The student should explain the direct and indirect applications of their work. Briefly discuss how this project will serve the computer world and people. **Achievements:** Explain what knowledge the student achieved after the completion of the work. What contributions has the project made to the chosen area? **Goals achieved** -describes the degree to which the findings support the original objectives laid out by the project. The goals may be partially or fully achieved, or exceeded. **Organisation of Report:** Summarising the remaining chapters of the project report, in effect, giving the reader an overview of what is to come in the project report.

Chapter 2: Survey of Technologies

In this chapter Survey of Technologies should demonstrate the students awareness and understanding of Available Technologies related to the topic of the project. The student should give the detail of all the related technologies that are necessary to complete the project. The should describe the technologies available in the chosen area and present a comparative study of all those Available Technologies. Explain why the student selected the one technology for the completion of the objectives of the project.

Chapter 3: Requirements and Analysis

Problem Definition: Define the problem on which the students are working in the project. Provide details of the overall problem and then divide the problem in to sub-problems. Define each sub-problem clearly

Requirements Specification: In this phase the student should define the requirements of the system, independent of how these requirements will be accomplished. The Requirements Specification describes the things in the system and the actions that can be done on these things. Identify the operation and problems of the existing system.

Planning and Scheduling: Planning and scheduling is a complicated part of software development. Planning, for our purposes, can be thought of as determining all the small tasks that must be carried out in order to accomplish the goal. Planning also takes into account, rules, known as constraints, which, control when certain tasks can or cannot happen. Scheduling can be thought of as determining whether adequate resources are available to carry out the plan. The student should show the Gantt chart and Program Evaluation Review Technique (PERT).

Software and Hardware Requirements: Define the details of all the software and hardware needed for the development and implementation of the project.

- **Hardware Requirement:** In this section, the equipment, graphics card, numeric co-processor, mouse, disk capacity, RAM capacity etc. necessary to run the software must be noted.

- **Software Requirements:** In this section, the operating system, the compiler, testing tools, linker, and the libraries etc. necessary to compile, link and install the software must be listed.

Preliminary Product Description: Identify the requirements and objectives of the new system. Define the functions and operation of the application/system the students are developing as project.

Conceptual Models: The student should understand the problem domain and produce a model of the system, which describes operations that can be performed on the system, and the allowable sequences of those operations. Conceptual Models could consist of complete Data Flow Diagrams, ER diagrams, Object-oriented diagrams, System Flowcharts etc.

Chapter 4: System Design

Describes desired features and operations in detail, including screen layouts, business rules, process diagrams, pseudo code and other documentation.

Basic Modules: The students should follow the divide and conquer theory, so divide the overall problem into more manageable parts and develop each part or module separately. When all modules are ready, the student should integrate all the modules into one system. In this phase, the student should briefly describe all the modules and the functionality of these modules. **Data Design:** Data design will consist of how data is organised, managed and manipulated.

- **Schema Design:** Define the structure and explanation of schemas used in the project.
- **Data Integrity and Constraints:** Define and explain all the validity checks and constraints provided to maintain data integrity.

Procedural Design: Procedural design is a systematic way for developing algorithms or procedurals.

- **Logic Diagrams:** Define the systematically flow of procedure that improves its comprehension and helps the programmer during implementation. e.g., Control Flow Chart, Process Diagrams etc.
- **Data Structures:** Create and define the data structure used in procedures.
- **Algorithms Design:** With proper explanations of input data, output data, logic of processes, design and explain the working of algorithms.

User Interface Design: Define user, task, environment analysis and how to map those requirements in order to develop a “User Interface”. Describe the external and internal components and the architecture of user interface. Show some rough pictorial views of the user interface and its components.

Security Issues: Discuss Real-time considerations and Security issues related to the project and explain how the student intends avoiding those security problems. What are the security policy plans and architecture?

Test Cases Design: Define test cases, which will provide easy detection of errors and mistakes with in a minimum period of time and with the least effort. Explain the different conditions in which the students wish to ensure the correct working of the project.

Chapter 5: Implementation and Testing

Implementation Approaches: Define the plan of implementation, and the standards the students have used in the implementation.

Coding Details and Code Efficiency: Students not need include full source code, instead, include only the important codes (algorithms, applets code, forms code etc). The program code should contain comments needed for explaining the work a piece of code does. Comments may be needed to explain why it does it, or, why it does a particular way.

The student can explain the function of the code with a shot of the output screen of that program code.

- Code Efficiency: The student should explain how the code is efficient and how the students have handled code optimisation.

Testing Approach: Testing should be according to the scheme presented in the system design chapter and should follow some suitable model – e.g., category partition, state machine-based. Both functional testing and user-acceptance testing are appropriate. Explain the approach of testing.

- Unit Testing: Unit testing deals with testing a unit or module as a whole. This would test the interaction of many functions but, do confine the test within one module.

- Integrated Testing: Brings all the modules together into a special testing environment, then checks for errors, bugs and interoperability. It deals with tests for the entire application. Application limits and features are tested here.

Modifications and Improvements: Once the students finish the testing they are bound to be faced with bugs, errors and they will need to modify your source code to improve the system. Define what modification are implemented in the system and how it improved the system.

Chapter 6: Results and Discussion

Test Reports: Explain the test results and reports based on the test cases, which should show that the project is capable of facing any problematic situation and that it works fine in different conditions. Take the different sample inputs and show the outputs.

User Documentation: Define the working of the software; explain its different functions, components with screen shots. The user document should provide all the details of the

product in such a way that any user reading the manual, is able to understand the working and functionality of the document.

Chapter 7: Conclusions

Conclusion: The conclusions can be summarised in a fairly short chapter (2 or 3 pages). This chapter brings together many of the points that would have made in the other chapters.

Limitations of the System: Explain the limitations encountered during the testing of the project that the students were not able to modify. List the criticisms accepted during the demonstrations of the project.

Future Scope of the Project describes two things: firstly, new areas of investigation prompted by developments in this project, and secondly, parts of the current work that was not completed due to time constraints and/or problems encountered.

REFERENCES

It is very important that the students acknowledge the work of others that they have used or adapted in their own work, or that provides the essential background or context to the project. The use of references is the standard way to do this. Please follow the given standard for the references for books, journals, and online material. The citation is mandatory in both the reports.

E.g:

Linhares, A., & Brum, P. (2007). Understanding our understanding of strategic scenarios: What role do chunks play? *Cognitive Science*, 31(6), 989-1007.

<https://doi.org/doi:10.1080/03640210701703725>

Lipson, Charles (2011). *Cite right : A quick guide to citation styles; MLA, APA, Chicago, the sciences, professions, and more* (2nd ed.). Chicago [u.a.]: University of Chicago Press. p. 187.

ISBN 9780226484648.

Elaine Ritchie, J Knite. (2001). *Artificial Intelligence*, Chapter 2 ,p.p 23 - 44. Tata McGrawHill.

GLOSSARY

If you the students any acronyms, abbreviations, symbols, or uncommon terms in the project report then their meaning should be explained where they first occur. If they go on to use any of them extensively then it is helpful to list them in this section and define the meaning.

APPENDICES

These may be provided to include further details of results, mathematical derivations, certain illustrative parts of the program code (e.g., class interfaces), user documentation etc.

In particular, if there are technical details of the work done that might be useful to others who

wish to build on this work, but that are not sufficiently important to the project as a whole to justify being discussed in the main body of the project, then they should be included as appendices.

VI. SUMMARY

Project development usually involves an engineering approach to the design and development of a software system that fulfils a practical need. Projects also often form an important focus for discussion at interviews with future employers as they provide a detailed example of what the students are capable of achieving. In this course the students can choose your project topic from the lists given in Unit 4: Category-wise Problem Definition.

VII. FURTHER READINGS

1. Modern Systems Analysis and Design; Jeffrey A. Hoffer, Joey F. George, Joseph,S. Valacich;
Pearson Education; Third Edition; 2002.
2. ISO/IEC 12207: Software Life Cycle Process
(<http://www.software.org/quagmire/descriptions/iso-iec12207.asp>).
3. IEEE 1063: Software User Documentation (<http://ieeexplore.ieee.org>).
4. ISO/IEC: 18019: Guidelines for the Design and Preparation of User Documentation for Application Software.
5. <http://www.sce.carleton.ca/squall>.
6. <http://en.tldp.org/HOWTO/Software-Release-Practice-HOWTO/documentation.html>.
7. <http://www.sei.cmu.edu/cmm/>

PROFORMA FOR THE APPROVAL PROJECT PROPOSAL

(Note: All entries of the proforma of approval should be filled up with appropriate and complete information. Incomplete proforma of approval in any respect will be summarily rejected.)

PNR No.: **Roll no:** _____

1. Name of the Student

2. Title of the Project

3. Name of the Guide

4. Teaching experience of the Guide _____

5. Is this your first submission? Yes No

Signature of the Student

Signature of the Guide

Date:

Date:

Signature of the Coordinator

Date:

(All the text in the report should be in times new roman)

TITLE OF THE PROJECT
(NOT EXCEEDING 2 LINES, 24
BOLD,ALL CAPS)

A Project Report (12 Bold)
Submitted in partial fulfillment of the
Requirements for the award of Degree of (size-12)

BACHELOR OF SCIENCE (INFORMATION
TECHNOLOGY)(14 BOLD,CAPS)

By(12 Bold)

Name of The Student (size-15, title case)
Seat Number (size-15)

Under the esteemed guidance of (13 bold)
Mr./Mrs. Name of The Guide (15 bold, title case)
Designation (14 Bold, title case)

COLLEGE LOGO

DEPARTMENT OF INFORMATION TECHNOLOGY(12 BOLD, CAPS)

COLLEGE NAME (14 BOLD, CAPS)

***(Affiliated to University of Mumbai) (12, Title case, bold, italic)*CITY, PIN CODE(12 bold, CAPS)**
MAHARASHTRA (12 bold, CAPS)

YEAR (12 bold)

COLLEGE NAME (14 BOLD, CAPS)
(Affiliated to University of Mumbai) (13, bold, italic)
CITY-MAHARASHTRA-PINCODE(13 bold, CAPS)

**DEPARTMENT OF INFORMATION TECHNOLOGY (14 BOLD,
CAPS)**

College Logo

CERTIFICATE (14 BOLD, CAPS, underlined, centered)

This is to certify that the project entitled, "**Title of The Project**", is bonafied work of **NAME OF THE STUDENT** bearing Seat.No: **(NUMBER)** submitted in partial fulfillment of therequirements for the award of degree of BACHELOR OF SCIENCE in INFORMATION TECHNOLOGY from University of Mumbai. (12, times new roman, justified)

Internal Guide (12 bold)

Coordinator

(Don't write names of lecturers or HOD)

External Examiner

Date:

College Seal

COMPANY CERTIFICATE (if applicable)

(Project Abstract page format)

Abstract (20bold, caps, centered)

Content (12, justified)

Note: Entire document should be with 1.5 line spacing and all paragraphs should start with 1 tab space.

ACKNOWLEDGEMENT (20, BOLD, ALL CAPS, CENTERED)

The acknowledgement should be in times new roman, 12 font with 1.5 line spacing, justified.

(Declaration page format)

DECLARATION (20 bold, centered, allcaps)

Content (12, justified)

I here by declare that the project entitled, “**Title of the Project**” done at **place where the project is done**, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university.

The project is done in partial fulfillment of the requirements for the award of degree of

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY) to be submitted

as final semester project as part of our curriculum.

Name and Signature of the Student

TABLE OF CONTENTS (20bold, caps, centered)

Should be generated automatically using word processing software.

Chapter 1: Introduction	01(no bold)
1.1 Background	02(no bold)
1.2 Objectives
1.3 Purpose and Scope
1.2.1 Purpose
1.2.2 Scope

.....
.....

Chapter 2: System Analysis

2.1 Existing System

2.2 Proposed System

2.3 Requirement Analysis

2.4 Hardware Requirements

2.5 Software Requirements

2.6 Justification of selection of Technology

Chapter 3: System Design

3.1 Module Division

3.2 Data Dictionary

3.3 ER Diagrams

3.4 DFD/UML Diagrams

Chapter 4: Implementation and Testing

4.1 Code (Place Core segments)

4.2 Testing Approach

4.2.1 Unit Testing (Test cases and Test Results)

4.2.2 Integration System (Test cases and Test Results)

Chapter 5: Results and Discussions (Output

Screens)Chapter 6: Conclusion and Future

Work

Chapter 7: References

List of Tables (20 bold, centered, Title Case)

Should be generated automatically using word processing software

List of Figures (20 bold, centered, Title Case)

Should be generated automatically using word processing software.

(Project Introduction page format)

Chapter 1

Introduction (20 Bold, centered)

Content or text (12, justified)

Note: Introduction has to cover brief description of the project with minimum 4 pages.

Chapter 2

System Analysis (20 bold, Centered)

Subheadings are as shown below with following format (16 bold, CAPS)

2.1 Existing System (16 Bold)

2.1.1 ----- (14 bold, title case)

2.1.1.1 ----- (12 bold, title case)

2.2 Proposed System

2.3 Requirement Analysis

2.4 Hardware Requirements

2.5 Software Requirements

2.6 Justification of Platform – (how h/w & s/w satisfying the project)

Table 2.1: Caption

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--	--	--

Chapter 3

System Design (20 bold, centered)

Subheadings are as shown below with following format (16 bold, CAPS) Specify figures as Fig 11.1 – caption

3.1 Module Division

3.2 Data Dictionary

3.3 E-R Diagrams

3.4 Data Flow Diagrams / UML

Note: write brief description at the bottom of all diagrams

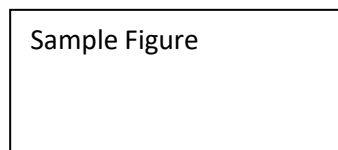


Fig. 3.1: Caption

Chapter 4

Implementation and Testing (20 bold, centered)

4.1 Code (Place Core segments)

Content includes description about coding phase in your project (Font-12)

(* don't include complete code---- just description)

4.2 Testing Approach

Subheadings are as shown below with following format (16 bold, CAPS)

4.2.1 Unit Testing

4.2.2 Integration Testing

Note:

- Explain about above testing methods
- Explain how the above techniques are applied in your project
Provide Test plans, test cases, etc relevant to your project

Chapter 5

Results and Discussions(20 bold, centered)

Note: Place Screen Shots and write the functionality of each screen at the bottom

Chapter 6

Conclusion and Future Work (20 bold, centered)

The conclusions can be summarized in a fairly short chapter around 300 words.
Also include limitations of your system and future scope (12, justified)

Chapter 7

References (20 bold, centered)

Content (12, LEFT)

[1] Title of the book, Author

[2] Full URL of online references

[3]

*** NOTE ABOUT PROJECT VIVA VOCE:**

Student may be asked to write code for problem during VIVA to demonstrate

his coding capabilities and he/she may be asked to write any segment of coding used in the in the project. The project can be done in group of at most four students. However, the length and depth of the project should be justified for the projects done in group. A big project can be modularised and different modules can be assigned as separate project to different students.

Marks Distribution:

Semester V:

50 Marks

Documentation

: 50 marks

Semester VI:

150 Marks

Documentation

: 50 Marks:

Implementation and Viva Voce: 100 Marks

The plagiarism should be maintained as per the UGC guidelines.



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

**Program: M.Sc.
Revised Syllabus of M.Sc. Information Technology (Part-I)
Choice Based Credit System (60:40)
w.e.f. Academic Year 2022-2023**

M.Sc. Part I, Information Technology Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	Information Technology
2	Eligibility for Admission	<p>a) Student securing minimum 45% marks at the three years B.Sc. (IT) degree in Information Technology of University of Mumbai or any recognized university are eligible.</p> <p>OR</p> <ol style="list-style-type: none">1. B.E. in IT with minimum 45% marks2. B.E. in Electronics with minimum 45% marks3. B.E. in Electronics and Telecomm minimum 45% marks.4. B.E. in Computer with minimum 45% marks5. B.Sc. in Computer Science with minimum 45% marks6. B.Sc. Maths with minimum 45% marks7. B.Sc. Physics with minimum 45% marks8. B.Sc. Statistics with minimum 45% marks9. B.C.A. with minimum 45% marks
3	Passing marks	40%
4	Ordinances/Regulations (if any)	-
5	No. of Semesters	Two
6	Level	P.G.
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic year	2020-2021

MASTER'S IN SCIENCE (M. Sc.)

Programme Outcomes

S. N.	After completion of M.Sc. program students will acquire	Graduate Attribute
PO1	An ability to identify and describe broadly accepted methodologies of science, and different modes of reasoning.	Disciplinary knowledge
PO2	An ability to demonstrate proficiency in various instrumentation, modern tools, advanced techniques and ICT to meet industrial expectations and research outputs.	Disciplinary knowledge/Digital literacy
PO3	Ability to identify problems, formulates, and proves hypotheses by applying theoretical knowledge and skills relevant to the discipline.	Problem-solving
PO4	The ability to articulate thoughts, research ideas, information, scientific outcomes in oral and in written presentation to a range of audience.	Communication skills
PO5	A capacity for independent, conceptual and creative thinking, analysis and problem solving through the existing methods of enquiry.	Problem solving
PO6	Acquisitions of Skills required for cutting edge research, investigations, field study, documentation, networking, and ability to build logical arguments using scholarly evidence.	Research skills
PO7	An ability to portray good interpersonal skills with ability to work collaboratively as part of a team undertaking a range of different team roles	Teamwork
PO8	The ability to understand ethical responsibilities and impact of scientific solutions in global, societal and environmental context and contribute to the sustainable development	Moral and ethical awareness/multicultural competence
PO9	An openness to and interest in, life-long learning through directed and self-directed study	Self-directed learning
PO10	The ability to translate the knowledge and demonstrate the skills required to be employed and successful professional development.	Life-long learning
PO11	The ability to identify and describe broadly accepted methodologies of science and different modes of reasoning.	Disciplinary knowledge

Program Specific outcomes

Name of the Programme: B.Sc.I.T.	Programme Coordinator: Dr. J. S. Thakur	Head of the Department: Mrs. I. S. Thakare
	After completing the programme in Information Technology, Student will be able to:	
PSO1	Gain proficiency in the field of Networking and Security.	
PSO2	Develop Programming skills that help to meet the needs of the IT industry.	
PSO3	Build soft skills for employability and personality development in the Industrial environment.	

Preamble:

The B.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

Semester - I
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs./ week	Internal assessment	Semester-end examination	Total	Credits
Research in Computing		PIT1RIC	5	40	60	100	4
Data Science		PIT1DSC	5	40	60	100	4
Cloud Computing		PIT1CLC	5	40	60	100	4
Soft Computing Techniques		PIT1SCT	5	40	60	100	4
Research in Computing Practical		PIT1RCP	5	40	60	100	2
Data Science Practical		PIT1DSP	-	-	-	-	2
Cloud Computing Practical		PIT1CCP	5	--	50	50	2
Soft Computing Techniques Practical		PIT1SCP	5	--	50	50	2

Semester - II
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs./ week	Internal assessment	Semester-end examination	Total	Credits
Big Data Analytics		PIT2BDA	5	40	60	100	4
Modern Networking		PIT2MNW	5	40	60	100	4
Micro services Architecture		PIT2MSA	5	40	60	100	4
Image Processing		PIT2IGP	5	40	60	100	4
Big Data Analytics Practical		PIT2BDP	5	40	60	100	2
Modern Networking Practical		PIT2MNP	-	-	-	-	2
Microservices Architecture Practical		PIT2MAP	5	--	50	50	2
Image Processing Practical		PIT2IPP	5	--	50	50	2

Examination Scheme

Choice Based Credit System (CBCS)

➤ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Presentation and write up on the selected topics of the subjects / Case studies. 2. Quiz	20 Marks

- ❖ Maximum Marks: 20
- ❖ Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

Question Paper Pattern for Semester End Examination

(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

➤ Undergraduate Programmes for B.Sc. in Information Technology

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be five questions each of 12 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Question Paper Pattern for Continuous Assessment

Presentation and write-up	Quiz
Presentation skill	Quiz on application of subject in real life
Knowledge	
Quality of ppt.	
Writing skill	

Question Paper Pattern for Practical Examination

Sr. No.	Particular		Marks
01	Practical		50 Marks
	Practical Question	40 Marks	
	Journal	5 Marks	
	Viva	5 Marks	

Choice Based Credit System (CBCS)

M. Sc. Information Technology Syllabus

To be implemented from the Academic year 2020-2021

SEMESTER I

Course Code	Course Nomenclature	Credits
PIT1RIC	Research in Computing	4
PIT1DSC	Data Science	4
PIT1CLC	Cloud Computing	4
PIT1SCT	Soft Computing Techniques	4
PIT1RCP	Research in Computing Practical	2
PIT1DSP	Data Science Practical	2
PIT1CCP	Cloud Computing Practical	2
PIT1SCP	Soft Computing Techniques Practical	2
Total		24

Choice Based Credit System (CBCS)
M. Sc. Information Technology Syllabus
To be implemented from the Academic year 2020-2021

SEMESTER II

Course Code	Course Nomenclature	Credits
PIT2BDA	Big Data Analytics	4
PIT2MNW	Modern Networking	4
PIT2MSA	Microservices Architecture	4
PIT2IGP	Image Processing	4
PIT2BDP	Big Data Analytics Practical	2
PIT2MNP	Modern Networking Practical	2
PIT2MAP	Microservices Architecture Practical	2
PIT2IPP	Image Processing Practical	2
Total		24

Semester I

Course Code PIT1RIC		Research in Computing
Objectives Understand some basic concepts of research and its methodologies. Select and define appropriate research problem and parameters. Organize and conduct research in a more appropriate manner. Write a research report and thesis		
<ul style="list-style-type: none"> Expected Learning Outcomes: <p>The learner will be able to:</p> <ol style="list-style-type: none"> 1) Define the role business research 2) Classify stages of the research Classify stages of the research and Measurement Sampling and Field work 3) Distinguish different research methods and measurement concepts 4) Explain Different concepts of data analysis 		
I	Introduction: Role of Business Research, Information Systems and Knowledge Management, Theory Building, Organization ethics and Issues	12
II	Beginning Stages of Research Process: Problem definition, Qualitative research tools, Secondary data research	12
III	Research Methods and Data Collection: Survey research, communicating with respondents, Observation methods, Experimental research	12
IV	Measurement Concepts, Sampling and Field work: Levels of Scale measurement, attitude measurement, questionnaire design, sampling designs and procedures, determination of sample size	12
V	Data Analysis and Presentation: Editing and Coding, Basic Data Analysis, Univariate Statistical Analysis and Bivariate Statistical analysis and differences between two variables. Multivariate Statistical Analysis.	12
Course Code PIT1RCP		
Practical List		
Objectives Understand some basic concepts of research and its methodologies. Select and define appropriate research problem and parameters. Organize and conduct research in a more appropriate manner. Write a research report and thesis		
Expected Learning Outcomes: <p>The learner will be able to:</p> <ol style="list-style-type: none"> 1) Build a program for obtain descriptive statistics of data using python and Ms-Excel 2) Analyze primary data and secondary data of given case study 3) Test hypothesis using statistical tool. 4) Examine given data using different sampling technique. 		
1	1A) Write a program for obtaining descriptive statistics of data. 1B) Import data from different data sources (from Excel, csv, mysql, sql server, oracle to R/Python/Excel)	
2	2A) Design a survey form for a given case study, collect the primary data and analyze it 2B) Perform suitable analysis of given secondary data	
3	3A) Perform testing of hypothesis using one sample t-test. 3B) Perform testing of hypothesis using two sample t-test.	

	3C) Perform testing of hypothesis using paired t-test
4	4A) Perform testing of hypothesis using chi-squared goodness-of-fit test. 4B) Perform testing of hypothesis using chi-squared Test of Independence
5	5A) Perform testing of hypothesis using Z-test
6	6A) Perform testing of hypothesis using one-way ANOVA. 6B) Perform testing of hypothesis using two-way ANOVA. 6C) Perform testing of hypothesis using multivariate ANOVA (MANOVA).
7	7A) Perform the Random sampling for the given data and analyze it. 7B) Perform the Stratified sampling for the given data and analyze it.
8	8A) Compute different types of correlation.
9	9A) Perform linear regression for prediction. 9B) Perform polynomial regression for prediction.
10	10A) Perform multiple linear regression. 10B) Perform Logistic regression.

Reference Books:

1. Business Research Methods William G.Zikmund, B.J Babin, J.C. Carr, Cengage 8e 2016 6 Atanu Adhikari, M.Griffin
2. Business Analytics Albright Winston Cengage 5e 2015
3. Research Methods for Business Students Fifth Edition Mark Saunders 2011
4. Multivariate Data Analysis Hair Pearson 7e 2014

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Course Code PIT1DSC	Data Science	
Objectives: Develop in depth understanding of the key technologies in data science and business analytics: data mining, machine learning, visualization techniques, predictive modeling, and statistics Expected Learning Outcomes The learners will be able to <ol style="list-style-type: none"> 1) Explain layered framework and technology stack in data science. 2) Elaborate management layers in data science. 3) Explain assess supersteps in data science. 4) Utilize transform and report supersteps. 		
I	Data Science Technology Stack: Rapid Information Factory Ecosystem, Data Science Storage Tools, Data Lake, Data Vault, Data Warehouse Bus Matrix, Data Science Processing Tools ,Spark, Mesos, Akka , Cassandra, Kafka, Elastic Search, R ,Scala, Python, MQTT, The Future Layered Framework: Definition of Data Science Framework, CrossIndustry Standard Process for Data Mining (CRISP-DM), Homogeneous Ontology for Recursive Uniform Schema, The Top Layers of a Layered Framework, Layered Framework for High-Level Data Science and Engineering Business Layer: Business Layer, Engineering a Practical Business Layer Utility Layer: Basic Utility Design, Engineering a Practical Utility Layer	12
II	Three Management Layers: Operational Management Layer, Processing-Stream Definition and Management, Audit, Balance, and Control Layer, Balance, Control, Yoke Solution, Cause-and-Effect, Analysis System, Functional Layer, Data Science Process Retrieve Superstep : Data Lakes, Data Swamps, Training the Trainer Model, Understanding the Business Dynamics of the Data Lake, Actionable Business Knowledge from Data Lakes, Engineering a Practical Retrieve Superstep, Connecting to Other Data Sources.	12
III	Assess Superstep: Assess Superstep, Errors, Analysis of Data, Practical Actions, Engineering a Practical Assess Superstep, 1	12
IV	Process Superstep : Data Vault, Time-Person-Object-Location-Event Data Vault, Data Science Process, Data Science, Transform Superstep : Transform Superstep, Building a Data Warehouse, Transforming with Data Science, Hypothesis Testing, Overfitting and Underfitting, Precision-Recall, Cross-Validation Test	12

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V	<p>Transform Superstep: Univariate Analysis, Bivariate Analysis, Multivariate Analysis, Linear Regression, Logistic Regression, Clustering Techniques, ANOVA, Principal Component Analysis (PCA), Decision Trees, Support Vector Machines, Networks, Clusters, and Grids, Data Mining, Pattern Recognition, Machine Learning, Bagging</p> <p>Data, Random Forests, Computer Vision (CV), Natural Language Processing (NLP), Neural Networks, TensorFlow. 12</p> <p>Organize and Report Supersteps : Organize Superstep, Report Superstep, Graphics, Pictures, Showing the Difference</p>
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Course Code PIT1DSP	Practical List
<p>Objectives: Practice problem analysis and decision-making. Gain practical, hands-on experience with statistics programming languages and big data tools through coursework and applied research experiences.</p> <p>Expected Learning Outcomes: The learners will be able to</p> <ol style="list-style-type: none"> 1) Modify different format to HOURS format. 2) Construct program using utilities and auditing in data science. 3) Build a program to retrieve and assess the data in data science. 4) Create data visualization with power BI. 	
1	Creating Data Model using Cassandra.
2	Conversion from different formats to HOURS format
3	Utilities and Auditing
4	Retrieving Data
5	Assessing Data
6	Processing Data
7	Transforming Data
8	Organising Data
9	Generating Reports
10	Data Visualisation with Power BI

Reference Books:

1. Practical Data Science Andreas François Vermeulen APress 2018
2. Principles of Data Science Sinan Ozdemir PACKT 2016
3. Data Science from Scratch Joel Grus O'Reilly 2015
4. Data Science from Scratch first Principle in python Joel Grus Shroff Publishers 2017
5. Experimental Design in Data science with Least Resources N C Das Shroff Publishers 2018

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Course Code PIT1CLC	Cloud Computing
Objectives: To learn how to use Cloud Services, implement Virtualization, implement Task Scheduling algorithms. To Apply Map-Reduce concept to applications, build Private Cloud & Broadly educate to know the impact of engineering on legal and societal issues involved.	
Expected Learning Outcomes: The learners will be able to <ol style="list-style-type: none"> 1) Define cloud computing and various virtualization technique. 2) Classify the types of cloud and cloud computing architecture. 3) Explain cloud security mechanism. 4) Elaborate advanced architecture and cloud delivery model. 	

I	Introduction to Cloud Computing: Introduction, Historical developments, Building Cloud Computing Environments, Principles of Parallel and Distributed Computing: Eras of Computing, Parallel v/s distributed computing, Elements of Parallel Computing, Elements of distributed computing, Technologies for distributed computing. Virtualization: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples. Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud usage monitor, Resource replication, Ready-made environment.	12
II	Cloud Computing Architecture: Introduction, Fundamental concepts and models, Roles and boundaries, Cloud Characteristics, Cloud Delivery models, Cloud Deployment models, Economics of the cloud, Open challenges. Fundamental Cloud Security: Basics, Threat agents, Cloud security threats, additional considerations. Industrial Platforms and New Developments: Amazon Web Services, Google App Engine, Microsoft Azure.	12
III	Specialized Cloud Mechanisms: Automated Scaling listener, Load Balancer, SLA monitor, Pay-per-use monitor, Audit monitor, fail over system, Hypervisor, Resource Centre, Multidevice broker, State Management Database. Cloud Management Mechanisms: Remote administration system, Resource Management System, SLA Management System, Billing Management System, Cloud Security Mechanisms: Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single Sign-On (SSO), Cloud-Based Security Groups, Hardened Virtual Server Images	12
IV	Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture. Advanced Cloud Architectures: Hypervisor Clustering Architecture, Load Balanced Virtual Server Instances Architecture, Non-Disruptive Service Relocation Architecture, Zero Downtime Architecture, Cloud Balancing Architecture, Resource Reservation Architecture, Dynamic Failure Detection and Recovery Architecture, Bare-Metal Provisioning Architecture, Rapid Provisioning Architecture, Storage Workload Management Architecture	12

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V	Cloud Delivery Model Considerations: Cloud Delivery Models: The Cloud Provider Perspective, Cloud Delivery Models: The Cloud Consumer Perspective, Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations, Service Quality Metrics and SLAs: Service Quality Metrics, SLA Guidelines	12
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Course Code PIT1CCP	Practical List
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Objectives:

To provide easy, scalable access to computing resources and IT services.

Expected Learning Outcomes:

The learners will be able to

- 1) Create web services using java application (Netbeans).
- 2) Develop Xen Virtualization and manage with Xen Center.
- 3) Create windows hyper v virtualization.
- 4) Make use of virtualization using VMWare ESXi server and managing with vCenter.

1	Write a program for implementing Client Server communication model using TCP. A) A client server based program using TCP to find if the number entered is prime. B) A client server TCP based chatting application
2	Write a program for implementing Client Server communication model using UDP. A) A client server based program using UDP to find if the number entered is even or odd. B) A client server based program using UDP to find the factorial of the entered number C) A program to implement simple calculator operations like addition, subtraction, multiplication and division. D) A program that finds the square, square root, cube and cube root of the entered number.
3	A multicast Socket example.
4	Write a program to show the object communication using RMI. A) A RMI based application program to display current date and time. B) A RMI based application program that converts digits to words, e.g. 123 will be converted to one two three.
5	Show the implementation of web services.
6	Implement Xen virtualization and manage with Xen Center
7	Implement virtualization using VMWare ESXi Server and managing with vCenter
8	Implement Windows Hyper V virtualization
9	Develop application for Microsoft Azure.
10	Develop application for Google App Engine

Reference Books:

- 1) Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi Elsevier - 2013
- 2) Cloud Computing Concepts, Technology & Architecture Thomas Erl, Zaigham Mahmood, and Ricardo Puttini Prentice Hall - 2013
- 3) Distributed and Cloud Computing, From Parallel Processing to the Internet of Things Kai Hwang, Jack Dongarra, Geoffrey Fox MK Publishers -- 2012 VMware and Microsoft Platform in the Virtual Data center, 2006, Auerbach.

Course Code PIT1SCT		Soft Computing Techniques	
Objectives Soft computing concepts like fuzzy logic, neural networks and genetic algorithm, where Artificial Intelligence is the mother branch of all. All these techniques will be more effective to solve the problem efficiently.			
Expected Learning Outcomes:			
The learners will be able to			
<ol style="list-style-type: none"> 1) Explain soft computing techniques and their roles in building intelligent machines. 2) Determine the use of Artificial Intelligence, Fuzzy Logic & Genetic Algorithm 3) Make use of Fuzzy Logic Network for classification and regression problems. 4) Evaluate soft computing approaches and solutions for a genetic algorithm & given problem 			
I	Introduction of soft computing , soft computing vs. hard computing, various types of soft computing techniques, Fuzzy Computing , Neural Computing , Genetic Algorithms , Associative Memory, Adaptive Resonance Theory, Classification, Clustering, Bayesian Networks, Probabilistic reasoning, applications of soft computing.		12
II	Artificial Neural Network : Fundamental concept, Evolution of Neural Networks, Basic Models, McCulloch-Pitts Neuron, Linear Separability, Hebb Network. Supervised Learning Network: Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neurons, Backpropagation Network, Radial Basis Function, Time Delay Network, Functional Link Networks, Tree Neural Network. Associative Memory Networks : Training algorithm for pattern Association, Autoassociative memory network, heteroassociative memory network, bi-directional associative memory, Hopfield networks, iterative autoassociative memory networks , temporal associative memory networks.		12
III	UnSupervised Learning Networks : Fixed weight competitive nets, Kohonen self-organizing feature maps, learning vectors quantization, counter propagation networks, adaptive resonance theory networks. Special Networks: Simulated annealing, Boltzman machine, Gaussian Machine, Cauchy Machine, Probabilistic neural net, cascade correlation network, cognition network, neo-cognition network, cellular neural network, optical neural network Third Generation Neural Networks : Spiking Neural networks, convolutional neural networks, deep learning neural networks, extreme learning machine model.		12

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IV	<p>Introduction to Fuzzy Logic, Classical Sets and Fuzzy sets: Classical sets, Fuzzy sets. Classical Relations and Fuzzy Relations: Cartesian Product of relation, classical relation, fuzzy relations, tolerance and equivalence relations, non-iterative fuzzy sets. Membership Function: features of the membership functions, fuzzification, methods of membership value assignments. Defuzzification: Lambda-cuts for fuzzy sets, Lambda-cuts for fuzzy relations, Defuzzification methods. Fuzzy Arithmetic and Fuzzy measures: fuzzy arithmetic, fuzzy measures, measures of fuzziness, fuzzy integrals.</p>	12
V	<p>Fuzzy Rule base and Approximate reasoning: Fuzzy proportion, formation of rules, decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, Fuzzy logic control systems, control system design, architecture and operation of FLC system, FLC system models and applications of FLC System. Genetic Algorithm: Biological Background, Traditional optimization and search techniques, genetic algorithm and search space, genetic algorithm vs. traditional algorithms, basic terminologies, simple genetic algorithm, general genetic algorithm, operators in genetic algorithm, stopping condition for genetic algorithm flow, constraints in genetic algorithm, problem solving using genetic algorithm, the schema theorem, classification of genetic algorithm, Holland classifier systems, genetic programming, advantages and limitations and applications of genetic algorithm. Differential Evolution Algorithm, Hybrid soft computing techniques – neuro – fuzzy hybrid, genetic neuro-hybrid systems, genetic fuzzy hybrid and fuzzy genetic hybrid systems.</p>	12

Course Code PIT1SCP	Practical List
<p>Objectives To understand soft computing concepts by doing programs of fuzzy logic, neural networks and genetic algorithms. To understand how to solve the problems Mathematically by using Python Programming language efficiently.</p> <p>Expected Learning Outcomes:</p> <p>The learners will be able to</p> <ol style="list-style-type: none"> 1) Design a simple linear neural network model 2) Make use of a program for Back Propagation Algorithm 3) Solve the Tipping Problem using fuzzy logic 4) Create two classes, city and fitness using genetic algorithm 	
1	<p>1A) Design a simple linear neural network model. 1B) Calculate the output of neural net using both binary and bipolar sigmoidal function.</p>
2	<p>2A) Generate AND/NOT function using McCulloch-Pitts neural net. 2B) Generate XOR function using McCulloch-Pitts neural net.</p>
3	<p>3A) Write a program to implement Hebb's rule. 3B) Write a program to implement of delta rule.</p>
4	<p>4A) Write a program for Back Propagation Algorithm. 4B) Write a program for error Backpropagation algorithm.</p>
5	<p>5A) Write a program for Hopfield Network. 5B) Write a program for Radial Basis function.</p>
6	<p>6A) Kohonen Self organizing map. 6B) Adaptive resonance theory</p>
7	<p>7A) Write a program for Linear separation. 7B) Write a program for Hopfield network model for associative memory.</p>
8	<p>8A) Membership and Identity Operators in, not in. 8B) Membership and Identity Operators is, is not.</p>
9	<p>9A) Find ratios using fuzzy logic. 9B) Solve Tipping problem using fuzzy logic</p>
10	<p>10A) Implementation of Simple genetic algorithm. 10B) Create two classes: City and Fitness using Genetic algorithm.</p>

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Reference Books:

1. Artificial Intelligence and Soft Computing Anandita Battacharya Das SPD 3rd 2018
2. Principles of Soft computing S.N.Sivanandam S.N.Deepa Wiley 3 rd 2019
3. Neuro-Fuzzy Computing and Soft J.S.R.Jang, C.T.Sun and E.Mizutani Prentice Hall of India 2004
4. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications
S.Rajasekaran, G. A. Vijayalakshami Prentice Hall of India 2004
5. Fuzzy Logic with Engineering Applications Timothy J.Ross McGrawHill 1997 15
6. Genetic Algorithms: Search, Optimization and Machine Learning Davis E.Goldberg Addison
Wesley 1989
7. Introduction to AI and Expert System Dan W. Patterson Prentice Hall of India 2009

Semester II

Course Code PIT2BDA	Big Data Analytics	
Objectives: To enable students to have skills that will help them to solve complex real world problems for decision support. To provide an overview of an exciting growing field of big data analytics.		
Expected Learning Outcomes: The learners will be able to		
<ol style="list-style-type: none"> 1) Explain concept of Data and Big Data 2) Explain clustering and association algorithm 3) Solve problem based on classification methods 4) Elaborate Data Products and Patterns with Hadoop in Data science 		
I	Introduction to Big Data Characteristics of Data, and Big Data Evolution of Big Data, Definition of Big Data, Challenges with big data, Why Big data? Data Warehouse environment, Traditional Business Intelligence versus Big Data. State of Practice in Analytics, Key roles for New Big Data Ecosystems, Examples of big Data Analytics. Big Data Analytics: Introduction to big data analytics, Classification of Analytics, Challenges of Big Data, Importance of Big Data, Big Data Technologies, Data Science, Responsibilities, Soft state eventual consistency. Data Analytics Life Cycle	12
II	Analytical Theory and Methods Clustering and Associated Algorithms, Association Rules, Apriori Algorithm, Candidate Rules, Applications of Association Rules, Validation and Testing, Diagnostics, Regression, Linear Regression, Logistic Regression, Additional Regression Models.	12
III	Analytical Theory and Methods Classification, Decision Trees, Naïve Bayes, Diagnostics of Classifiers, Additional Classification Methods, Time Series Analysis, Box Jenkins methodology, ARIMA Model, Additional methods. Text Analysis, Steps, Text Analysis Example, Collecting Raw Text, Representing Text, Term Frequency-Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments	12
IV	Data Product, Building Data Products at Scale with Hadoop Data Science Pipeline and Hadoop Ecosystem, Operating System for Big Data, Concepts, Hadoop Architecture, Working with Distributed file system, Working with Distributed Computation, Framework for Python and Hadoop Streaming, Hadoop Streaming, MapReduce with Python, Advanced MapReduce. In-Memory Computing with Spark, Spark Basics, Interactive Spark with PySpark, Writing Spark Applications,	12
V	Distributed Analysis and Patterns, Computing with Keys, Design Patterns, Last-Mile Analytics, Data Mining and Warehousing, Structured Data Queries with Hive, HBase, Data Ingestion, Importing Relational data with Sqoop, Injesting stream data with flume. Analytics with higher level APIs, Pig, Spark's higher level APIs..	12

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Course Code PIT2BDP	Practical List
<p>Objectives: To understand implementation of clustering, regression ,classification model .To install , configure Hadoop and explore HDFS for handling huge volume of data</p> <p>Expected Learning Outcomes: The learners will be able to</p> <ol style="list-style-type: none"> 1) Build Hadoop and HDFS 2) Construct a program using MapReduce 3) Develop application in MongoDB 4) Design an application in Hive 	
1	Install, configure and run Hadoop and HDFS ad explore HDFS
2	Implement word count / frequency programs using MapReduce
3	Implement an MapReduce program that processes a weather dataset
4	Implement an application that stores big data in Hbase / MongoDB and manipulate it using R / Python
5	Implement the program in practical 4 using Pig
6	Configure the Hive and implement the application in Hive.
7	Write a program to illustrate the working of Jaql.
8	Implement the following:
a	Implement Decision tree classification techniques
b	Implement SVM classification techniques
9	Solve the following:
a	REGRESSION MODEL Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in an institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. require (foreign), require(MASS).
b	MULTIPLE REGRESSION MODEL Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.
10	Solve the Following:
a	CLASSIFICATION MODEL a. Install relevant package for classification. b. Choose classifier for classification problem. c. Evaluate the performance of classifier.
b	CLUSTERING MODEL a. Clustering algorithms for unsupervised classification. b. Plot the cluster data using R visualizations.

Reference Books:

1. Big Data and Analytics: Subhashini Chellappan Seema Acharya, Wiley, First
2. Data Analytics with Hadoop An Introduction for Data Scientists: Benjamin Bengfort and Jenny Kim, O'Reilly, 2016
3. Big Data and Hadoop: V.K Jain, Khanna Publishing, First, 2018

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Course Code PIT2MNW	Modern Networking	
<p>Objectives To understand the state-of-the-art in network protocols, architectures and applications. Analyse existing network protocols and networks. Develop new protocols in networking</p> <p>Expected Learning Outcomes: The learners will be able to</p> <ol style="list-style-type: none"> 1) List the elements of Modern Networking 2) Classify different levels of Software Define Network 3) Explain Network Virtualization Function and VLAN 4) Summarizing Quality of Service, Quality of Experience & Modern Network Architecture. 		
I	<p>Modern Networking Elements of Modern Networking The Networking Ecosystem ,Example Network Architectures,Global Network Architecture,A Typical Network Hierarchy Ethernet Applications of Ethernet Standards Ethernet Data Rates Wi-Fi Applications of Wi-Fi,Standards Wi-Fi Data Rates 4G/5G Cellular First Generation Second Generation, Third Generation Fourth Generation Fifth Generation, Cloud Computing Cloud Computing Concepts The Benefits of Cloud Computing Cloud Networking Cloud Storage, Internet of Things Things on the Internet of Things, Evolution Layers of the Internet of Things, Network Convergence Unified Communications, Requirements and Technology Types of Network and Internet Traffic,Elastic Traffic,Inelastic Traffic, Real-Time Traffic Characteristics Demand: Big Data, Cloud Computing, and Mobile TrafficBig Data Cloud Computing,,Mobile Traffic, Requirements: QoS and QoE,,Quality of Service,Quality of Experience, Routing Characteristics, Packet Forwarding, Congestion Control ,Effects of Congestion,Congestion Control Techniques, SDN and NFV SoftwareDefined Networking,Network Functions Virtualization Modern Networking Elements</p>	12
II	<p>Software-Defined Networks SDN: Background and Motivation, Evolving Network Requirements Demand Is Increasing,Supply Is IncreasingTraffic Patterns Are More ComplexTraditional Network Architectures are Inadequate, The SDN Approach Requirements SDN Architecture Characteristics of Software12 20 Defined Networking,</p>	12

	<p>SDN- and NFV-Related Standards StandardsDeveloping Organizations Industry Consortia Open Development Initiatives, SDN Data Plane and OpenFlow SDN Data Plane, Data Plane Functions Data Plane Protocols OpenFlow Logical Network Device Flow Table Structure Flow Table Pipeline, The Use of Multiple Tables Group Table OpenFlow Protocol, SDN Control Plane SDN Control Plane Architecture Control Plane Functions, Southbound Interface Northbound InterfaceRouting, ITU-T Model, OpenDaylight OpenDaylight Architecture OpenDaylight Helium, REST REST Constraints Example REST API, Cooperation and Coordination Among Controllers, Centralized Versus Distributed Controllers, HighAvailability Clusters Federated SDN Networks, Border Gateway Protocol Routing and QoS Between Domains, Using BGP for QoS Management IETF SDNi OpenDaylight SNDi SDN Application Plane SDN Application Plane Architecture Northbound Interface Network Services Abstraction Layer Network Applications, User Interface, Network Services Abstraction Layer Abstractions in SDN, Frenetic Traffic Engineering PolicyCop Measurement and Monitoring Security OpenDaylight DDoS Application Data Center Networking, Big Data over SDN Cloud Networking over SDN Mobility and Wireless Information-Centric Networking CCNx, Use of an Abstraction Layer</p>	
<p>III</p>	<p>Virtualization, Network Functions Virtualization: Concepts and Architecture, Background and Motivation for NFV, Virtual Machines The Virtual Machine Monitor, Architectural Approaches Container Virtualization, NFV Concepts Simple Example of the Use of NFV, NFV Principles High-Level NFV Framework, NFV Benefits and Requirements NFV Benefits, NFV Requirements, NFV Reference Architecture NFV Management and Orchestration, Reference Points Implementation, NFV Functionality, NFV Infrastructure,Container Interface,Deployment of NFVI Containers,Logical Structure of NFVI Domains,ComputeDomain, Hypervisor Domain,Infrastructure Network Domain, Virtualized Network Functions, VNF Interfaces,VNFC to VNFC Communication,VNF Scaling, NFV Management and Orchestration, Virtualized Infrastructure Manager,Virtual Network Function Manager,NFV Orchestrator, Repositories, Element Management, OSS/BSS, NFV Use Cases Architectural Use Cases, Service-Oriented Use Cases, SDN and NFV Network Virtualization, Virtual LANs ,The Use of Virtual LANs,Defining VLANs, Communicating VLAN Membership,IEEE 802.1Q VLAN Standard, Nested VLANs, OpenFlow VLAN Support, Virtual Private Networks, IPsec VPNs,MPLS VPNs, Network Virtualization, Simplified Example, Network Virtualization Architecture, Benefits of Network Virtualization, OpenDaylight’s Virtual Tenant Network, Software-Defined Infrastructure,SoftwareDefined Storage, SDI Architecture</p>	<p>12</p>
<p>IV</p>	<p>Defining and Supporting User Needs, Quality of Service, Background, QoS Architectural Framework, Data Plane, Control Plane, Management Plane, Integrated Services Architecture, ISA Approach ISA Components, ISA Services, Queuing Discipline, Differentiated Services, Services, DiffServ Field, DiffServ Configuration and Operation, Per-Hop Behavior, Default Forwarding PHB, ServiceLevel Agreements, IP Performance Metrics, OpenFlow QoS Support, Queue Structures, Meters, QoE: User Quality of Experience, Why QoE?,Online Video Content Delivery, Service Failures Due to Inadequate QoE Considerations QoE-Related Standardization Projects, Definition of Quality of Experience, Definition of Quality, Definition of Experience Quality Formation Process, Definition of Quality of Experience, QoE Strategies in Practice, The QoE/QoS Layered Model Summarizing and Merging the ,QoE/QoS Layers, Factors Influencing QoE, Measurements of QoE, Subjective Assessment, Objective Assessment, End-User Device Analytics, Summarizing the QoE Measurement Methods, Applications of QoE Network Design Implications of QoS and QoE Classification of QoE/ QoS Mapping Models, Black-Box Media-Based QoS/QoE Mapping Models, GlassBox Parameter-Based</p>	<p>12</p>

	QoS/QoE Mapping Models, Gray-Box QoS/QoE Mapping Models, Tips for QoS/QoE Mapping Model Selection, IP Oriented Parameter-Based QoS/QoE Mapping Models, Network Layer QoE/QoS Mapping Models for Video Services, Application Layer QoE/QoS Mapping Models for Video Services Actionable QoE over IP-Based Networks, The System-Oriented Actionable QoE Solution, The Service-Oriented Actionable QoE Solution, QoE Versus QoS Service Monitoring, QoS Monitoring Solutions, QoE Monitoring Solutions, QoE-Based Network and Service Management, QoE-Based Management of VoIP Calls, QoE-Based Host-Centric Vertical Handover, QoE-Based Network-Centric Vertical Handover	
V	Modern Network Architecture: Clouds and Fog, Cloud Computing, Basic Concepts, Cloud Services, Software as a Service, Platform as a Service, Infrastructure as a Service, Other Cloud Services, XaaS, Cloud Deployment Models, Public Cloud Private Cloud Community Cloud, Hybrid Cloud, Cloud Architecture, NIST Cloud Computing Reference Architecture, ITU-T Cloud Computing Reference Architecture, SDN and NFV, Service Provider Perspective Private Cloud Perspective, ITU-T Cloud Computing Functional Reference Architecture, The Internet of Things: Components The IoT Era Begins, The Scope of the Internet of Things Components of IoT-Enabled Things, Sensors, Actuators, Microcontrollers, Transceivers, RFID, The Internet of Things: Architecture and Implementation, IoT Architecture, ITU-T IoT Reference Model, IoT World Forum Reference Model, IoT Implementation, IoTivity, Cisco IoT System, ioBridge, Security Security Requirements, SDN Security Threats to SDN, Software Defined Security, NFV Security, Attack Surfaces, ETSI Security Perspective, Security Techniques, Cloud Security, Security Issues and Concerns, Cloud Security Risks and Countermeasures, Data Protection in the Cloud, Cloud Security as a Service, Addressing Cloud Computer Security Concerns, IoT Security, The Patching Vulnerability, IoT Security and Privacy Requirements Defined by ITU-T An IoT Security Framework, Conclusion	12

Course Code PIT2MNP	Practical List
Objectives To understand how networking research is done to investigate novel ideas in the area of Networking via term-long research projects	
Expected Learning Outcomes: The learners will be able to	
<ol style="list-style-type: none"> 1) Build IP SLA Tracking & Path Control 2) Create AS-PATH attribute 3) Construct IBGP & EBGP Session & Secure Management Plan 4) Develop Inter VLAN Routing , MPLS Environment , VRF and SDN Controller 	
1	Configure IP SLA Tracking and Path Control Topology
2	Using the AS_PATH Attribute
3	Configuring IBGP and EBGP Sessions, Local Preference, and MED
4	Secure the Management Plane
5	Configure and Verify Path Control Using PBR
6	IP Service Level Agreements and Remote SPAN in a Campus Environment
7	Inter-VLAN Routing
8	Simulating MPLS environment
9	Simulating VRF
10	Simulating SDN with • OpenDaylight SDN Controller with the Mininet Network Emulator • OFNet SDN network emulator
11	Simulating OpenFlow Using MININET

Reference Books:

1. Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud William Stallings AddisonWesley
2. Network Functions Virtualization (NFV) with a Touch of SDN Rajendra Chayapathi Syed Farrukh Hassan AddisonWesley

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Course Code PIT2MSA	Microservice Architecture	
<p>Objectives Gain a thorough understanding of the philosophy and architecture of Web applications using ASP.NET Core MVC; Acquire a working knowledge of Web application development using ASP.NET Core MVC 6 and Visual Studio Persist data with XML Serialization and ADO.NET with SQL Server Create HTTP services using ASP.NET Core Web API;</p> <p>Expected Learning Outcomes: The learners will be able to</p> <ol style="list-style-type: none"> 1) Define Micro services Architecture & Micro services Boundaries. Elaborate Service Design and Micro Services in Practice 2) Explain ASP.Net Core, Docker and Continuous Integration 3) Explain Data Services & Micro Services Ecosystems 4) Create Data Services 		
I	<p>Microservices: Understanding Microservices, Adopting Microservices, The Microservices Way. Microservices Value Proposition: Deriving Business Value, defining a Goal-Oriented, Layered Approach, Applying the Goal-Oriented, Layered Approach. Designing Microservice Systems: The Systems Approach to Microservices, A Microservices Design Process, Establishing a Foundation: Goals and Principles, Platforms, Culture.</p>	12
II	<p>Service Design: Microservice Boundaries, API design for Microservices, Data and Microservices, Distributed Transactions and Sagas, Asynchronous Message-Passing and Microservices, dealing with Dependencies, System Design and Operations: Independent Deployability, More Servers, Docker and Microservices, Role of Service Discovery, Need for an API Gateway, Monitoring and Alerting. Adopting Microservices in Practice: Solution Architecture Guidance, Organizational Guidance, Culture Guidance, Tools and Process Guidance, Services Guidance.</p>	12
III	<p>Building Microservices with ASP.NET Core: Introduction, Installing .NET Core, Building a Console App, Building ASP.NET Core App. Delivering Continuously: Introduction to Docker, Continuous integration with Wercker, Continuous Integration with Circle CI, Deploying to Dicker Hub. Building Microservice with ASP.NET Core: Microservice, Team Service, API First Development, Test First Controller, Creating a CI pipeline, Integration Testing, Running the team service Docker Image. Backing Services: Microservices Ecosystems, Building the location Service, Enhancing Team Service.</p>	12
IV	<p>Creating Data Service: Choosing a Data Store, Building a Postgres Repository, Databases are Backing Services, Integration Testing Real Repositories, Exercise the Data Service.Event Sourcing and CQRS: Event Sourcing, CQRS pattern, Event Sourcing and CQRS, Running the samples. Building an ASP.NET Core Web Application: ASP.NET Core Basics, Building Cloud-Native Web Applications. Service Discovery: Cloud Native Factors, Netflix Eureka, Discovering and Advertising ASP.NET Core Services. DNS and Platform Supported Discovery.</p>	12
V	<p>Configuring Microservice Ecosystems: Using Environment Variables with Docker, Using Spring Cloud Config Server, Configuring Microservices with etcd, Securing Applications and Microservices: Security in the Cloud, Securing ASP.NET Core Web Apps, Securing ASP.NET Core Microservices. Building Real-Time Apps and Services: Real-Time Applications Defined, Websockets in the Cloud, Using a Cloud Messaging Provider,</p>	12

M.Sc. Part II, Information Technology Syllabus

Building the Proximity Monitor. Putting It All Together: Identifying and Fixing Anti-Patterns, Continuing the Debate over Composite Microservices, The Future.

Course Code	Practical List
PIT2MAP	
Objectives Gain a practical understanding of .NET Core; Deploy ASP.NET Core MVC applications to the Windows Azure cloud.	
Expected Learning Outcomes: The learners will be able to	
<ol style="list-style-type: none">1) Define Micro services Architecture & Micro services Boundaries , Elaborate Service Design and Micro Services in Practice2) Explain ASP.Net Core, Docker and Continuous Integration3) Explain Data Services & Micro Services Ecosystems4) Build Real Time Micro Services	
1	Building ASP.NET Core MVC Application
2	Building ASP.NET Core REST API.
3	Working with Docker, Docker Commands, Docker Images and Containers.
4	Installing software packages on Docker, Working with Docker Volumes and Networks.
5	Working with Docker Swarm.
6	Working with Circle CI for continuous integration.
7	Creating Microservice with ASP.NET Core.
8	Working with Kubernetes.
9	Creating Backing Service with ASP.NET Core.
10	Building real-time Microservice with ASP.NET Core.

Reference Books:

- 1) Building Microservices with ASP.NET Core ,Kevin Hoffman ,O'Reilly
- 2) Building Microservices: Designing Fine-Grained Systems, Sam Newman ,O'Reilly
- 3) Production-ready Microservices, Susan J. Fowler, O'Reilly

Course Code PIT2IGP	Image Processing	
<p>Objectives: To Understand the fundamental concepts of a digital image processing system by analysing images in the frequency domain using various transforms.</p> <p>Expected Learning Outcomes: The learners will be able to</p> <ol style="list-style-type: none"> 1) Explain basic fundamental concepts of digital image processing. 2) Examine the images in the frequency domain using various transforms. 3) Evaluate the techniques for image enhancement, restoration & Categorise of various compression techniques. 4) Interpret Image compression, image segmentation, and representation techniques. 		
I	<p>Introduction: Digital Image Processing, Origins of Digital Image Processing, Applications and Examples of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships Between Pixels, Basic Mathematical Tools Used in Digital Image Processing, Intensity Transformations and Spatial Filtering: Basics, Basic Intensity Transformation Functions, Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters, Highpass, Bandreject, and Bandpass Filters from Lowpass Filters, Combining Spatial Enhancement Methods, Using Fuzzy Techniques for Intensity Transformations and Spatial Filtering</p>	12
II	<p>Filtering in the Frequency Domain: Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform of One Variable, Extensions to Functions of Two Variables, Properties of the 2-D DFT and IDFT, Basics of Filtering in the Frequency Domain, Image Smoothing Using Lowpass</p>	12
	<p>Frequency Domain Filters, Image Sharpening Using Highpass Filters, Selective Filtering, Fast Fourier Transform Image Restoration and Reconstruction: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only ---- Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Image Reconstruction from Projections</p>	
III	<p>Wavelet and Other Image Transforms: Preliminaries, Matrix-based Transforms, Correlation, Basis Functions in the Time-Frequency Plane, Basis Images, Fourier-Related Transforms, Walsh-Hadamard Transforms, Slant Transform, Haar Transform, Wavelet Transforms Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Full-Color Image Processing, Color Transformations, Color Image Smoothing and Sharpening, Using Color in Image Segmentation, Noise in Color Images, Color Image Compression. Image Compression and Watermarking: Fundamentals, Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run-length Coding, Symbol-based Coding, 8 Bit-plane Coding, Block Transform Coding, Predictive Coding, Wavelet Coding, Digital Image Watermarking,</p>	12

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IV	<p>Morphological Image Processing: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit-or-Miss Transform, Morphological Algorithms, Morphological Reconstruction, Morphological Operations on Binary Images, Grayscale Morphology</p> <p>Image Segmentation I: Edge Detection, Thresholding, and Region Detection: Fundamentals, Thresholding, Segmentation by Region Growing and by Region Splitting and Merging, Region Segmentation Using Clustering and Superpixels, Region Segmentation Using Graph Cuts, Segmentation Using Morphological Watersheds, Use of Motion in Segmentation</p>	12
V	<p>Image Segmentation II: Active Contours: Snakes and Level Sets: Background, Image Segmentation Using Snakes, Segmentation Using Level Sets. Feature Extraction: Background, Boundary Preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principal Components as Feature Descriptors, Whole-Image Features, Scale-Invariant Feature Transform (SIFT)</p>	12

Course Code PIT2IPP	Practical List
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Objectives:

To understand how to analyse images in the frequency domain using various transforms for image enhancement and image restoration, image compression, segmentation and representation techniques in a mathematical way using Matlab/Scilab/Python.

Expected Learning Outcomes:

The learners will be able to

- 1) Design a program for image transformation.
- 2) Develop a program for Filtering in Frequency Domain.
- 3) Design a program for Color Image Processing.
- 4) Apply image compression & segmentation.

1	a	Program to calculate number of samples required for an image.
	b	Program to study the effects of reducing the spatial resolution of a digital image.
	c	Program to study the effects of varying the number of intensity levels in a digital image
	d	Program to perform image averaging (image addition) for noise reduction.
	e	Program to compare images using subtraction for enhancing the difference between images.
	f	Image Registration
2		Intensity transformation and Spatial Filtering
		IMAGE ENHANCEMENT
	a	<p>Basic Intensity Transformation functions</p> <ol style="list-style-type: none"> i. Program to perform Image negation ii. Program to perform threshold on an image. iii. Program to perform Log transformation iv. Power-law transformations v. Piecewise linear transformations <ol style="list-style-type: none"> a. Contrast Stretching b. Gray-level slicing with and without background. c. Bit-plane slicing
	b	Program to plot the histogram of an image and categorise 2. Program to apply histogram equalization.
	c	Write a program to perform convolution and correlation.
	d	Write a program to apply smoothing and sharpening filters on grayscale and color images <ol style="list-style-type: none"> a) Low Pass b) High Pass

M.Sc. Part II, Information Technology Syllabus

	Note: Use all kernels mentioned in the reference book
3	Filtering in Frequency Domain a) Program to apply Discrete Fourier Transform on an image b) Program to apply Low pass and High pass filters in frequency domain c) Program to apply Laplacian filter in frequency domain d) Note: All other filters can be applied, studied and compared with filters in spatial domain. e) Program for high frequency emphasis filtering, high boost and homomorphic filtering.
4	Image Denoising i. Program to denoise using spatial mean, median and adaptive mean filtering ii. Program for Image deblurring using inverse, Weiner filters
5	Color Image Processing i. Program to read a color image and segment into RGB planes , histogram of color image ii. Program for converting from one color model to another model iii. Program to apply false colouring(pseudo) on a gray scale image
6	Fourier Related Transforms Program to compute Discrete Cosine Transforms, Walsh -Hadamard Transforms, Haar Transform , Wavelet
7	Image compression Program to apply compression and decompression algorithm on an image (Arithmetic, Huffman and LZW coding techniques.
8	Morphological Image Processing i. Program to apply erosion, dilation, opening, closing ii. Program for detecting boundary of an image iii. Program to apply Hit-or-Miss transform iv. Program to apply morphological gradient on an image v. Program to apply Top-Hat/Bottom-hat Transformations
9	Image Segmentation i. Program for Edge detection using a. Sobel, Prewitt, Marr-Hildreth and Canny ii. Illustrate Watershed segmentation algorithm iii. Any more to be included(to be consulted)
10	Feature Extraction i. Apply Principal components for image description ii. Apply Harris-Stephens corner detector algorithm

Reference Books:

- 1) Digital Image Processing, Gonzalez and Woods, Pearson/Prentice Hall
- 2) Fundamentals of Digital Image Processing, A K. Jain, PHI
- 3) The Image Processing Handbook, J. C. Russ, CRC



**Janardan Bhagat Shikshan Prasarak Sanstha's
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Program: M.Sc.

**Revised Syllabus of M.Sc. Information Technology (Part –II)
Choice Based Credit System (60:40)
w.e.f. Academic Year 2021-2022**

M.Sc. Part II, Information Technology Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	M.Sc. (Information Technology) Part II
2	Eligibility for Admission	A candidate for being eligible for admission to the M.Sc. I.T. Part-II, shall have passed M.Sc. I.T. Part-I and should have secured not less than 40%.
3	Passing marks	40%
4	Ordinances/Regulations (if any)	-
5	No. of Semesters	Two years – Four Semesters
6	Level	P.G.
7	Pattern	Semester, Choice Based
8	Status	Revised
9	To be implemented from Academic year	From the Academic Year 2021 – 2022

Preamble:

The M.Sc. Information Technology programme is started with an aim to make the learners employable and impart industry oriented training.

The main objectives of the course are:

- To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related post graduate programmes.
- To be capable of managing complex IT projects with consideration of the human, financial and environmental factors.
- To work effectively as a part of a team to achieve a common stated goal.
- To adhere to the highest standards of ethics, including relevant industry and organizational codes of conduct.
- To communicate effectively with a range of audiences both technical and non-technical.
- To develop an aptitude to engage in continuing professional development.

S. N.	OUTCOMES FOR M. SC. PROGRAM After completion of M.Sc. program students will acquire	Graduate Attribute
PO1	The ability to identify and describe broadly accepted methodologies of science, and different modes of reasoning. Disciplinary knowledge	Disciplinary knowledge
PO2	An ability to demonstrate proficiency in various instrumentation, modern tools, and advanced techniques to meet industrial expectations and research outputs	Disciplinary knowledge
PO3	Ability to identify problems, formulates, and prove hypotheses by applying theoretical knowledge and skills relevant to the discipline.	Problem-solving
PO4	The ability to articulate thoughts, research ideas, information, scientific outcomes in oral and in written presentation to range of audience.	Communication skills
PO5	A capacity for independent, conceptual, and creative thinking, and critical analysis through the existing methods of enquiry.	Critical thinking
PO6	Acquisition of skills required for cutting edge research, investigations, field study, documentation, networking, and ability to build logical arguments using scholarly evidence.	Research skills
PO7	An ability to portray good interpersonal skills with the ability to work collaboratively as part of a team undertaking a range of different team roles.	Teamwork

PO8	The ability to understand ethical responsibilities and impact of scientific solutions in global, societal, and environmental context and contribute to sustainable development.	Moral and ethical awareness/ multicultural competence
PO9	An openness to and interest in, life-long learning through directed and self-directed study.	self-directed learning
PO10	The ability to translate the knowledge and demonstrate the skills required to be employed and successful professional development.	Life-long learning

Program Specific outcomes

Name of the Programme: M.Sc.I.T.	
	After completing the programme in Information Technology, Student will be able to:
PSO1	Apply IT in the field of Data Science, AI, Networking, Security and Cloud Computing.
PSO2	Design solutions for complex IT problems.
PSO3	Develop research, investigation skills and achieve professional competency in the field of I.T.

Semester - III
[Under CBCS Scheme]

Course	Course code	Hrs. / wee k	Internal assessment	Semester -end examinat ion	Total	Cred its
Technical Writing and Entrepreneurship Development	PIT3TED	4	40	60	100	4
Security Breaches and Countermeasures	PIT3SBC	4	40	60	100	4
Malware Analysis	PIT3MWA	4	40	60	100	4
Robotic Process Automation	PIT3RPA	4	40	60	100	4
Project Documentation and Viva	PIT3PDP	4	40	60	100	2
Security Breaches and Countermeasures Practical	PIT3SBP	4	-	50	50	2
Malware Analysis Practical	PIT3MAP	4	--	50	50	2
Robotic Process Automation Practical	PIT3TED	4	--	50	50	2

Semester - IV
[Under CBCS Scheme]

Course	Course code	Hrs/ week	Internal assessment	Semester -end examination	Total	Credits
Blockchain	PIT4BLC	4	40	60	100	4
Digital Image Forensics	PIT4DIF	4	40	60	100	4
Security Operations Center	PIT4SOC	4	40	60	100	4
Human Computer Interaction	PIT4HCI	4	40	60	100	4
Blockchain Practical	PIT4BCP	4	40	60	100	2
Digital Image Forensics Practical	PIT4DFP	4	40	60	100	2
Security Operations Center Practical	PIT4SOP	4	--	50	50	2
Project Implementation and Viva	PIT4PIP	4	--	50	50	2

Examination Scheme

Choice Based Credit System (CBCS)

➤ Revised Scheme of Examination

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Presentation and write up on the selected topics of the subjects / Case studies. 2. Quiz	20 Marks

- ❖ Maximum Marks: 20
- ❖ Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

Question Paper Pattern for Semester End Examination (Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

- Undergraduate Programmes for B.Sc. in Information Technology
 - Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be five questions each of 12 marks.
2. All questions shall be compulsory with internal options.
3. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Question Paper Pattern for Continuous Assessment

Presentation and write-up	Quiz
Presentation skill	Quiz on application of subject in real life
Knowledge	
Quality of ppt.	
Writing skill	

Question Paper Pattern for Practical Examination

Sr. No.	Particular	Marks	
01	Practical	50 Marks	
	Practical Question		40 Marks
	Journal		5 Marks
	Viva		5 Marks

Semester III

Course Code PIT3TED	Technical Writing and Entrepreneurship Development	
<p>Objectives</p> <ul style="list-style-type: none"> • This course aims to provide conceptual understanding of developing strong foundation in general writing, including research proposal and reports. • It covers the technological developing skills for writing Article, Blog, E-Book, Commercial web Page design, Business Listing Press Release, E-Listing and Product Description. • This course aims to provide conceptual understanding of innovation and entrepreneurship development. <p>Expected Learning Outcomes:</p> <ol style="list-style-type: none"> 1) Develop technical documents that meet requirement with standard guidelines. 2) Build effective blogs and social media pages. 3) Explain effectiveness of innovation and entrepreneurship. 4) Make use of graphic functions for writing different types of research proposals. 		
I	<p>Introduction to Technical Communication: What Is Technical Communication? The Challenges of Producing Technical Communication, Characteristics of a Technical Document, Measures of Excellence in Technical Documents, Skills and Qualities Shared by Successful Workplace Communicators, How Communication Skills and Qualities Affect Your Career?</p> <p>Understanding Ethical and Legal Considerations: A Brief Introduction to Ethics, Your Ethical Obligations, Your Legal Obligations, The Role of Corporate Culture in Ethical and Legal Conduct, Understanding Ethical and Legal Issues Related to Social Media, Communicating Ethically Across Cultures, Principles for Ethical Communication</p> <p>Writing Technical Documents: Planning, Drafting, Revising, Editing, Proofreading</p> <p>Writing Collaboratively: Advantages and Disadvantages of Collaboration, Managing Projects, Conducting Meetings, Using Social Media and Other Electronic Tools in Collaboration, Importance of Word Press Website, Gender and Collaboration, Culture and Collaboration.</p>	12
II	<p>Introduction to Content Writing: Types of Content (Article, Blog, E-Books, Press Release, Newsletters Etc), Exploring Content Publication Channels. Distribution of your content across various channels.</p> <p>Blog Creation: Understand the psychology behind your web traffic, Creating killing landing pages which attract users, Using Landing Page Creators, Setting up Accelerated Mobile Pages, Identifying UI UX Experience of your website or blog.</p> <p>Organizing Your Information: Understanding Three Principles for Organizing Technical Information, Understanding Conventional Organizational Patterns,</p> <p>Emphasizing Important Information: Writing Clear, Informative Titles, Writing Clear, Informative Headings, Writing Clear Informative Lists, Writing Clear Informative Paragraphs.</p>	12
III	<p>Creating Graphics: The Functions of Graphics, The Characteristics of an Effective Graphic, Understanding the Process of Creating Graphics, Using Color Effectively, Choosing the Appropriate Kind of Graphic, Creating Effective Graphics for Multicultural Readers.</p> <p>Researching Your Subject: Understanding the Differences Between Academic and Workplace Research, Understanding the Research Process, Conducting Secondary</p>	12

	<p>Research, Conducting Primary Research, Research and Documentation: Literature Reviews, Interviewing for Information, Documenting Sources, Copyright, Paraphrasing, Questionnaires. Report Components: Abstracts, Introductions, Tables of Contents, Executive Summaries, Feasibility Reports, Investigative Reports, Laboratory Reports, Test Reports, Trip Reports, Trouble Reports</p>	
IV	<p>Writing Proposals: Understanding the Process of Writing Proposals, The Logistics of Proposals, The —Deliverables of Proposals, Persuasion and Proposals, Writing a Proposal, The Structure of the Proposal. Writing Informational Reports: Understanding the Process of Writing Informational Reports, Writing Directives, Writing Field Reports, Writing Progress and Status Reports, Writing Incident Reports, Writing Meeting Minutes. Writing Recommendation Reports: Understanding the Role of Recommendation Reports, Using a Problem-Solving Model for Preparing Recommendation Reports, Writing Recommendation Reports. Reviewing, Evaluating, and Testing Documents and Websites: Understanding Reviewing, Evaluating, and Testing, Reviewing Documents and Websites, Conducting Usability Evaluations, Conducting Usability Tests, Using Internet tools to check writing Quality, Duplicate Content Detector, What is Plagiarism?, How to avoid writing Plagiarism content? Innovation management: an introduction: The importance of innovation, Models of innovation, Innovation as a management process. Market adoption and technology diffusion: Time lag between innovation and useable product, Innovation and the market Innovation and market vision ,Analysing internet search data to help adoption and forecasting sales ,Innovative new products and consumption patterns, Crowd sourcing for new product ideas, Frugal innovation and ideas from everywhere, Innovation diffusion theories.</p>	12
V	<p>Managing innovation within firms: Organisations and innovation, The dilemma of innovation management, Innovation dilemma in low technology sectors, Dynamic capabilities, Managing uncertainty, Managing innovation projects Operations and process innovation: Operations management, The nature of design and innovation in the context of operations, Process design, Process design and innovation Managing intellectual property: Intellectual property, Trade secrets, An introduction to patents, Trademarks, Brand names, Copyright Management of research and development: What is research and development?, R&D management and the industrial context, R&D investment and company success, Classifying R&D, R&D management and its link with business strategy, Strategic pressures on R&D, Which business to support and how?, Allocation of funds to R&D, Level of R&D expenditure Managing R&D projects: Successful technology management, The changing nature of R&D management, The acquisition of external technology, Effective R&D management, The link with the product innovation process, Evaluating R&D projects.</p>	12

Reference Books:

1. Technical Communication Mike Markel Bedford/St. Martin's 11 2014.
2. Innovation Management and New Product Development Paul Trott Pearson 06 2017.
3. Handbook of Technical Writing Gerald J. Alred , Charles T. Brusaw , Walter E. OliuBedford/St. Martin's 09 2008.
4. Technical Writing 101: A Real-World Guide to Planning and Writing Technical ContentAlan S. Pringle and Sarah S. O'Keefe scriptorium 03 2009.
5. Innovation and Entrepreneurship Peter Drucker Harper Business 03 2009

Course Code	Project Documentation and viva
PIT3PDP	The learners are expected to develop a project beyond the undergraduate level. Normal web sites, web applications, mobile apps are not expected. Preferably, the project should be from the elective chosen by the learner at the post graduate level. In semester three. The learner is supposed to prepare the synopsis and documentation. The same project has to be implemented in Semester IV. More details about the project is given is Appendix 1.

Course Code PIT3SBC	Security Breaches and Countermeasures	
Objectives: <ul style="list-style-type: none"> • To get the insight of the security loopholes in every aspect of computing. • To understand the threats and different types of attacks that can be launched on computing systems. • To know the countermeasures that can be taken to prevent attacks on computing systems. • To test the software against the attacks Expected Learning Outcomes <ol style="list-style-type: none"> 1) Classify different security breaches that can occur. 2) Identify vulnerabilities in the systems, breach the security of the system, and threats due to malware. 3) Develop social engineering and educate people to be Careful from attacks due to it. 4) Evaluate vulnerabilities in the Web Servers, Applications and newer technologies like mobiles, IoT and computing. 		
I	Introduction to Security Breaching: Overview of Information Security, Threats and Attack vectors, Concepts of Hacking – Ethical and Unethical, Information Security Controls, Concepts of penetration Testing, Information Security Laws and Standards. Evaluation Security of IT Organisation: Concepts, Methodology, Tools, Countermeasures, Penetration Testing. Network Scanning: Concepts, Scanning beyond IDS and firewalls, Tools, Banner Grabbing, Scanning Techniques, Network Diagrams, penetration testing. Enumeration: Concepts, Different types of enumeration: Netbios, SNMP, LDAP, NTP, SMTP, DNS, other enumeration techniques, Countermeasures, Penetration Testing	12
II	Analysis of Vulnerability: Concepts, Assessment Solutions, Scoring Systems, Assessment Tools, Assessment Reports. Breaching System Security: Concepts, Cracking passwords, Escalating privileges, Executing Applications, Hiding files, covering tracks, penetration testing. Threats due to malware: Concepts, Malware Analysis, Trojan concepts, countermeasures, Virus and worm concepts, anti-malware software, penetration testing. Network Sniffing: Concepts, countermeasures, sniffing techniques, detection techniques, tools, penetration testing.	12
III	Social Engineering: Concepts, Impersonation on networking sites, Techniques, Identity theft, Insider threats, countermeasures, Pen testing. Denial of Service and Distributed Denial of service: Concepts, techniques, botnets, attack tools, countermeasures, protection tools, penetration testing. Hijacking an active session: Concepts, tools, application level session hijacking, countermeasures, network level session hijacking, penetration testing. Evasion of IDS, Firewalls and Honeypots: Introduction and concepts, detecting honeypots, evading IDS, IDS and Firewall evasion countermeasures, evading firewalls, penetration testing.	12
IV	Compromising Web Servers: Concepts, attacks, attack methodology, attack tools, countermeasures, patch management, web server security tools, penetration testing. Compromising Web Applications: Concepts, threats, methods, tools, countermeasures, testing tools, penetration testing. Performing SQL Injection: Concepts, types, methodology, tools, techniques, countermeasures. Compromising Wireless Networks: Concepts, wireless encryption, threats, methodology, tools, compromising Bluetooth, countermeasures, wireless security tools,	12

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	penetration testing.	
V	<p>Compromising Mobile Platforms: Attack vectors, Compromising Android OS, Compromising iOS, Mobile spyware, Mobile Device Management, Mobilesecurity, penetration testing.</p> <p>Compromising IoT: Concepts, attacks, compromising methodology, tools, countermeasures, penetration testing.</p> <p>Cloud Security: Concepts, Security, threats, attacks, tools, penetration testing.</p> <p>Cryptography: Concepts, email encryption, algorithms, disk encryption, tools, cryptanalysis, Public key infrastructure, countermeasures.</p>	12

Course Code PIT3SBP	Security Breaches and Countermeasures Practical List
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Objectives:

To make the learners capable using of various network information gathering tools.

To make the learners capable of using various network security tools

Expected Learning Outcomes

- 1) Make use of tools to perform footprinting and reconnaissance
- 2) Determine use of Enumeration and network scanning tools.
- 3) Test social engineering toolkits and web application scanning.
- 4) Apply different tools for cryptography.

1	<p>a. Use the following tools to perform footprinting and reconnaissance</p> <ol style="list-style-type: none"> i. Recon-ng (Using Kali Linux) ii. FOCA Tool iii. Windows Command Line Utilities <ul style="list-style-type: none"> • Ping • Tracert using Ping • Tracert • NSLookup iv. Website Copier Tool – HTTrack v. Metasploit (for information gathering) vi. Whois Lookup Tools for Mobile – DNS Tools, Whois, Ultra Tools Mobile vii. Smart Whois viii. eMailTracker Pro ix. Tools for Mobile – Network Scanner, Fing – Network Tool, Network Discovery Tool, Port Droid Tool <p>b. Scan the network using the following tools:</p> <ol style="list-style-type: none"> i. Hping2 / Hping3 ii. Advanced IP Scanner iii. Angry IP Scanner iv. Masscan v. NEET vi. CurrPorts vii. Colasoft Packet Builder viii. The Dude
2	c. Use Proxy Workbench to see the data passing through it and save the data to file.

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	<p>d. Perform Network Discovery using the following tools:</p> <ul style="list-style-type: none"> i. Solar Wind Network Topology Mapper ii. OpManager iii. Network View iv. LANState Pro <p>e. Use the following censorship circumvention tools:</p> <ul style="list-style-type: none"> i. Alkasir ii. Tails OS <p>f. Use Scanning Tools for Mobile – Network Scanner, Fing – Network Tool, Network Discovery Tool, Port Droid Tool</p>
3	<p>a. Perform Enumeration using the following tools:</p> <ul style="list-style-type: none"> i. Nmap ii. NetBIOS Enumeration Tool iii. SuperScan Software iv. Hyena v. SoftPerfect Network Scanner Tool vi. OpUtils vii. SolarWinds Engineer’s Toolset viii. Wireshark <p>b. Perform the vulnerability analysis using the following tools:</p> <ul style="list-style-type: none"> i. Nessus ii. OpenVas
4	<p>a. Perform mobile network scanning using NESSUS.</p> <p>b. Perform the System Hacking using the following tools:</p> <ul style="list-style-type: none"> i. Winrtgen ii. PWDump iii. Ophcrack iv. Flexispy v. NTFS Stream Manipulation vi. ADS Spy vii. Snow viii. Quickstego ix. Clearing Audit Policies x. Clearing Logs
5	<p>a. Use wireshark to sniff the network.</p> <p>b. Use SMAC for MAC Spoofing.</p> <p>c. Use Caspa Network Analyser.</p> <p>d. Use Omnippeek Network Analyzer</p>
6	<p>a. Use Social Engineering Toolkit on Kali Linux to perform Social Engineering using Kali Linux.</p> <p>b. Perform the DDOS attack using the following tools:</p> <ul style="list-style-type: none"> i. HOIC ii. LOIC iii. HULK iv. Metasploit <p>c. Using Burp Suite to inspect and modify traffic between the browser and target application.</p>
7	<p>a. Perform Web App Scanning using OWASP Zed Proxy.</p> <p>b. Use droidsheep on mobile for session hijacking</p> <p>c. Demonstrate the use of the following firewalls:</p> <ul style="list-style-type: none"> i. Zonealarm and analyse using Firewall Analyzer. ii. Comodo Firewall <p>d. Use HoneyBOT to capture malicious network traffic.</p> <p>e. Use the following tools to protect attacks on the web servers:</p> <ul style="list-style-type: none"> i. ID Server ii. Microsoft Baseline Security Analyzer

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	iii. Syhunt Hybrid
8	a. Protect the Web Application using dotDefender. b. Demonstrate the following tools to perform SQL Injection: i. Tyrant SQL ii. Havij iii. BBQSQL
9	Use Aircrack-ng suite for wireless hacking and countermeasures.
10	Use the following tools for cryptography i. HashCalc ii. Advanced Encryption Package iii. MD5 Calculator iv. TrueCrypt v. CrypTool

Reference Books:

1. CEHv10, Certified Ethical Hacker Study Guide Ric Messier Sybex - Wiley - 2019
2. All in One, Certified Ethical Hacker Matt Walker Tata McGraw Hill - 2012
3. CEH V10: EC-Council Certified Ethical Hacker Complete Training Guide I.P. Specialist IPSPECIALIST – 2018

Course Code PIT3MWA	Malware Analysis	
Objectives: <ul style="list-style-type: none"> • Possess the skills necessary to carry out independent analysis of modern malware samples using both static and dynamic analysis techniques. • Have an intimate understanding of executable formats, Windows internals and API, and analysis techniques. • Extract investigative leads from host and network-based indicators associated with a malicious program. • Apply techniques and concepts to unpack, extract, decrypt, or bypass new anti-analysis techniques in future malware samples. • Achieve proficiency with industry standard tools including IDA Pro, OllyDbg, WinDBG, PE Explorer, ProcMon etc. Expected Learning Outcomes: <ol style="list-style-type: none"> 1) Define Malware Analysis , Basic Static & Dynamic Analysis Techniques 2) Explain IDA Pro, C code construct in assemble & Advance Dynamic Analysis 3) Classify OLLYDBG , WINDBG & Malware Functionality 4) Elaborate Data encoding , Anti disassembly, debugging , Virtual Machine techniques, Shellcode Analysis 		
I	<p>Malware Analysis: Introduction, Techniques, Types of malware, General rules for Malware Analysis.</p> <p>Basic Static Techniques: Antivirus Scanning, Hashing, Finding Strings, Packed and Obfuscated Malware, Portable Executable Malware, Portable executable File Format, Linked Libraries and Functions, Static Analysis, The PE file headers and sections.</p> <p>Malware Analysis in Virtual Machines: Structure of VM, Creating and using Malware Analysis machine, Risks of using VMware for malware analysis, Record/Replay.</p> <p>Basic Dynamic Analysis: Sandboxes, Running Malware, Monitoring with process monitor, Viewing processes with process explorer, Comparing registry snapshots with regshot, Faking a network, Packet sniffing with Wireshark, Using INetSim, Basic Dynamic Tools. x86 Disassembly</p>	12
II	<p>IDA PRO: Loading an executable, IDA Pro Interface, Using cross references, Analysing functions, Using graphing options, Enhancing disassembly, Extending IDA with plug-ins.</p> <p>Recognising C Code constructs in assembly: Global v/s local variables, Disassembling arithmetic operations, recognizing if statements, recognizing loops, function call conventions, Analysing switch statements, Disassembling arrays, Identifying structs, Analysing linked list traversal.</p> <p>Analysing Malicious Windows Programs: The windows API, The Windows Registry, Networking APIs, and Understanding running malware. Kernel v/s user mode, Native API.</p> <p>Advanced Dynamic Analysis – Debugging: Sourcelevel v/s Assembly-level debugging, kernel v/s user mode debugging, Using a debugger, Exceptions,</p>	12

	Modifying execution with a debugger, modifying program execution.	
III	<p>Advanced Dynamic Analysis – OLLYDBG: Loading Malware, The Ollydbg Interface, Memory Map, Viewing threads and Stacks, Executing code, Breakpoints, Loading DLLs, Tracing, Exception handling, Patching, Analysing shell code, Assistance features, Plug-ins, Scriptable debugging.</p> <p>Kernel Debugging with WINDBG: Drivers and kernel code, Using WinDbg, Microsoft Symbols, kernel debugging and using it, Rootkits, Loading drivers, kernel issues with windows.</p> <p>Malware Functionality – Malware Behavior: Downloaders and launchers, Backdoors, Credential stealers, Persistence mechanisms, Privilege escalation, covering the tracks.</p> <p>Covert Malware Launching: Launchers, Process injection, Process replacement, Hook injection, detours, APC injection.</p>	12
IV	<p>Data Encoding: Goal of Analysing algorithms, Simple ciphers, Common cryptographic algorithms, Custom encoding, decoding.</p> <p>Malware – focused network signatures: Network countermeasures, Safely investigating attacker online, Content-Based Network Countermeasures, Combining Dynamic and Static Analysis Techniques, Understanding the Attacker’s Perspective.</p> <p>Anti-disassembly: Concepts, Defeating disassembly algorithms, anti-disassembly techniques, Obscuring flow control, Thwarting stack-frame analysis.</p> <p>Anti-debugging: Windows debugger detection, debugger behavior, Interfering with debugger functionality, Debugger vulnerabilities.</p>	12
V	<p>Anti-virtual machine techniques: VMWare artifacts, Vulnerable functions, Tweaking settings, Escaping the virtual machine.</p> <p>Packers and unpacking: Packer anatomy, Identifying Packed Programs, Unpacking options, Automated Unpacking, Manual Unpacking, Common packers, Analysing without unpacking, Packed DLLs,</p> <p>Shellcode Analysis: Loading shellcode for analysis, Position-independent Code, Identifying Execution Location, Manual Symbol Resolution, Shellcode encoding, NOP Sleds, Finding Shellcode.</p> <p>C++ Analysis: OOP, Virtual and Non-virtual functions, Creating and destroying objects.</p> <p>64-bit Malware: Why 64-bit malware? Differences in x64 architecture, Windows 32-bit on Windows 64-bit, 64-bit hints at malware functionality.</p>	12

Course Code PIT3MAP	Malware Analysis Practical List
Objectives: <ul style="list-style-type: none"> To enable the learners to create basic software automation using UIPath Studio. To make the learners capable of building applications for automating the operations on excel file Expected Learning Outcomes: <ol style="list-style-type: none"> Identify the Malware Using Basic & Static Techniques Examine the Malware using IDA Pro Find Malware effect on .exe & .dll file using OLLYDBG Test the Malware Using Advanced Dynamic Technique 	
1	<ol style="list-style-type: none"> Files: Lab01-01.exe and Lab01-01.dll. Analyze the file Lab01-02.exe. Analyze the file Lab01-03.exe. Analyze the file Lab01-04.exe. Analyze the malware found in the file Lab03-01.exe using basic dynamic analysis tools. Analyze the malware found in the file Lab03-02.dll using basic dynamic analysis tools. Execute the malware found in the file Lab03-03.exe while monitoring it using basic dynamic analysis tools in a safe environment Analyze the malware found in the file Lab03-04.exe using basic dynamic analysis tools.
2	<ol style="list-style-type: none"> Analyze the malware found in the file Lab05-01.dll using only IDA Pro. The goal of this lab is to give you hands-on experience with IDA Pro. If you've already worked with IDA Pro, you may choose to ignore these questions and focus on reverseengineering the malware analyze the malware found in the file Lab06-01.exe. Analyze the malware found in the file Lab06-02.exe. analyze the malware found in the file Lab06-03.exe. analyze the malware found in the file Lab06-04.exe
3	<ol style="list-style-type: none"> Analyze the malware found in the file Lab07-01.exe Analyze the malware found in the file Lab07-02.exe. For this lab, we obtained the malicious executable, Lab07-03.exe, and DLL, Lab07- 03.dll, prior to executing. This is important to note because the malware might change once it runs. Both files were found in the same directory on the victim machine. If you run the program, you should ensure that both files are in the same directory on the analysis machine. A visible IP string beginning with 127 (a loopback address) connects to the local machine. (In the real version of this malware, this address connects to a remote machine, but we've set it to connect to localhost to protect you.) Analyze the malware found in the file Lab09-01.exe using OllyDbg and IDA Pro to answer the following questions. This malware was initially analyzed in the Chapter 3 labs using basic static and dynamic analysis techniques. Analyze the malware found in the file Lab09-02.exe using OllyDbg Analyze the malware found in the file Lab09-03.exe using OllyDbg and IDA Pro. This malware loads three included DLLs (DLL1.dll, DLL2.dll, and DLL3.dll) that are all built to request the same memory load location. Therefore, when viewing these DLLs in OllyDbg versus IDA Pro, code may appear at different memory locations. The purpose of this lab is to make you comfortable with finding the correct location of code within IDA Pro when you are looking at code in OllyDbg
4	<ol style="list-style-type: none"> This lab includes both a driver and an executable. You can run the executable from anywhere, but in order for the program to work properly, the driver must be placed in the C:\Windows\System32 directory where it was originally found on the victim computer. The executable is Lab10-01.exe, and the driver is Lab10-01.sys. The file for this lab is Lab10-02.exe This lab includes a driver and an executable. You can run the executable from anywhere, but in order for the program to work properly, the driver must be placed in the C:\Windows\System32

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	directory where it was originally found on the victim computer. The executable is Lab10-03.exe, and the driver is Lab10-03.sys
5	<p>a. Analyze the malware found in Lab11-01.exe</p> <p>b. Analyze the malware found in Lab11-02.dll. Assume that a suspicious file named Lab11-02.ini was also found with this malware</p> <p>c. Analyze the malware found in Lab11-03.exe and Lab11-03.dll. Make sure that both files are in the same directory during analysis</p>
6	<p>a. Analyze the malware found in the file Lab12-01.exe and Lab12-01.dll. Make sure that these files are in the same directory when performing the analysis.</p> <p>b. Analyze the malware found in the file Lab12-02.exe.</p> <p>c. Analyze the malware extracted during the analysis of Lab 12-2, or use the file Lab12-03.exe</p> <p>d. Analyze the malware found in the file Lab12-04.exe.</p>
7	<p>a. Analyze the malware found in the file Lab13-01.exe.</p> <p>b. Analyze the malware found in the file Lab13-02.exe.</p> <p>c. Analyze the malware found in the file Lab13-03.exe</p>
8	<p>a. Analyze the malware found in file Lab14-01.exe. This program is not harmful to your system.</p> <p>b. Analyze the malware found in file Lab14-02.exe. This malware has been configured to beacon to a hard-coded loopback address in order to prevent it from harming your system, but imagine that it is a hard-coded external address.</p> <p>c. This lab builds on Practical 8 a. Imagine that this malware is an attempt by the attacker to improve his techniques. Analyze the malware found in file Lab14-03.exe.</p> <p>d. Analyze the sample found in the file Lab15-01.exe. This is a command-line program that takes an argument and prints “Good Job!” if the argument matches a secret code.</p> <p>e. Analyze the malware found in the file Lab15-02.exe. Correct all anti-disassembly countermeasures before analyzing the binary in order to answer the questions.</p> <p>f. Analyze the malware found in the file Lab15-03.exe. At first glance, this binary appears to be a legitimate tool, but it actually contains more functionality than advertised</p>
9	<p>a. Analyze the malware found in Lab16-01.exe using a debugger. This is the same malware as Lab09-01.exe, with added anti-debugging techniques</p> <p>b. Analyze the malware found in Lab16-02.exe using a debugger. The goal of this lab is to figure out the correct password. The malware does not drop a malicious payload.</p> <p>c. Analyze the malware in Lab16-03.exe using a debugger. This malware is similar to Lab09-02.exe, with certain modifications, including the introduction of anti-debugging techniques.</p> <p>d. Analyze the malware found in Lab17-01.exe inside VMware. This is the same malware as Lab07-01.exe, with added anti-VMware techniques.</p> <p>e. Analyze the malware found in the file Lab17-02.dll inside VMware. After answering the first question in this lab, try to run the installation exports using rundll32.exe and monitor them with a tool like procmon. The following is an example command line for executing the DLL: rundll32.exe Lab17-02.dll,InstallRT (or InstallSA/InstallSB)</p> <p>f. Analyze the malware Lab17-03.exe inside VMware</p>
10	<p>a. Analyze the file Lab19-01.bin using shellcode_launcher.exe</p> <p>b. The file Lab19-02.exe contains a piece of shellcode that will be injected into another process and run. Analyze this file</p> <p>c. Analyze the file Lab19-03.pdf. If you get stuck and can't find the shellcode, just skip that part of the lab and analyze file Lab19-03_sc.bin using shellcode_launcher.exe.</p> <p>d. The purpose of this first lab is to demonstrate the usage of the this pointer. Analyze the malware in Lab20-01.exe.</p> <p>e. Analyze the malware in Lab20-02.exe.</p> <p>f. Analyze the malware in Lab20-03.exe.</p> <p>g. Analyze the code in Lab21-01.exe.</p> <p>h. Analyze the malware found in Lab21-02.exe on both x86 and x64 virtual machines.</p>

Reference Books:

1. Practical Malware Analysis – The Hands-On Guide to Dissecting Malicious Software
Michael Sikorski, Andrew Honig No Scratch Press - 2013
2. Mastering Malware Analysis Alexey Kleymenov, Amr ThabetPackt Publishing - 2019
3. Windows Malware Analysis Essentials Victor MarakPackt Publishing 2015

Course Code PIT3RPA	Robotic Process Automation	
Objectives: <ul style="list-style-type: none"> • To make the students aware about the automation today in the industry. • To make the students aware about the tools used for automation. • To help the students automate a complete process Expected Learning Outcomes: <ol style="list-style-type: none"> 1) Define the scope and techniques of robotic process automation using UiPath Studio. 2) Explain the concept of sequence, flowchart and control flow used to manipulate data. 3) Make use of Exception Handling, Debugging and logging to handle user events and Assistant bots. 4) Elaborate the deployment and maintenance of bot along with maintaining the code. 		
I	Robotic Process Automation: Scope and techniques of automation, About UiPath Record and Play: UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder, Step-by-step examples using the recorder.	12
II	Sequence, Flowchart, and Control Flow: Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Step-by-step example using Sequence and Flowchart, Step-by-step example using Sequence and Control flow Data Manipulation: Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example, CSV/Excel to data table and vice versa (with a step-by-step example)	12
III	Taking Control of the Controls : Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR, Avoiding typical failure points Tame that Application with Plugins and Extensions: Terminal plugin, SAP automation, Java plugin, Citrix automation, Mail plugin, PDF plugin, Web integration, Excel and Word plugins, Credential management, Extensions – Java, Chrome, Firefox, and Silverlight	12
IV	Handling User Events and Assistant Bots: What are assistant bots?, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger, Monitoring image and element triggers, An example of monitoring email, Example of monitoring a copying event and blocking it, Launching an assistant bot on a keyboard event Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging techniques, Collecting crash dumps, Error reporting	12
V	Managing and Maintaining the Code: Project organization, Nesting workflows, Reusability of workflows, Commenting techniques, State Machine, When to use Flowcharts, State Machines, or Sequences, Using config files and examples of a configfile, Integrating a TFS server Deploying and Maintaining the Bot: Publishing using bpublish utility, Overview of Orchestration Server, Using Orchestration Server to control bots, Using Orchestration Server to deploy bots, License management, Publishing and managing updates	12

Course Code PIT3RAP	Robotic Process Automation Practical List
<p>Objectives:</p> <ul style="list-style-type: none"> • To make the students aware about the automation today in the industry. • To make the students aware about the tools used for automation. • To help the students automate a complete process <p>Expected Learning Outcomes:</p> <ol style="list-style-type: none"> 1) Create simple sequence and flowchart based projects in UiPath Studio. 2) Develop Automation of any process using basic and Desktop recording. 3) Build applications for automating the operations on excel file. 4) Demonstrate the UiPath automation of activities such as MouseClick, Hotkey Trigger. 	
1	<ol style="list-style-type: none"> a. Create a simple sequence based project. b. Create a flowchart-based project. c. Create an UiPath Robot which can empty a folder in Gmail solely on basis of recording.
2	<ol style="list-style-type: none"> a. Automate UiPath Number Calculation (Subtraction, Multiplication, Division of numbers). b. Create an automation UiPath project using different types of variables (number, datetime, Boolean, generic, array, data table)
3	<ol style="list-style-type: none"> a. Create an automation UiPath Project using decision statements. b. Create an automation UiPath Project using looping statements.
4	<ol style="list-style-type: none"> a. Automate any process using basic recording. b. Automate any process using desktop recording. c. Automate any process using web recording.
5	<ol style="list-style-type: none"> a. Consider an array of names. We have to find out how many of them start with the letter "a". Create an automation where the number of names starting with "a" is counted and the result is displayed.
6	<ol style="list-style-type: none"> a. Create an application automating the read, write and append operation on excel file. b. Automate the process to extract data from an excel file into a data table and vice versa
7	<ol style="list-style-type: none"> a. Implement the attach window activity. b. Find different controls using UiPath. c. Demonstrate the following activities in UiPath: <ol style="list-style-type: none"> i. Mouse (click, double click and hover) ii. Type into iii. Type Secure text
8	<ol style="list-style-type: none"> a. Demonstrate the following events in UiPath: <ol style="list-style-type: none"> i. Element triggering event ii. Image triggering event iii. System Triggering Event b. Automate the following screen scraping methods using UiPath <ol style="list-style-type: none"> i. Full Test ii. Native iii. OCR c. Install and automate any process using UiPath with the following plug-ins: <ol style="list-style-type: none"> i. Java Plugin ii. Mail Plugin iii. PDF Plugin iv. Web Integration v. Excel Plugin vi. Word Plugin vii. Credential Management

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9	a. Automate the process of send mail event (on any email). b. Automate the process of launching an assistant bot on a keyboard event. c. Demonstrate the Exception handing in UiPath. d. Demonstrate the use of config files in UiPath
10	a. Automate the process of logging and taking screenshots in UiPath. b. Automate any process using State Machine in UiPath. c. Demonstrate the use of publish utility. d. Create and provision Robot using Orchestrator.

Reference Books:

1. Learning Robotic Process Automation Alok Mani TripathiPackt 1st 2018
2. Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation Srikanth Merianda Createspace Independent Publishing 1st 2018
3. The Simple Implementation Guide to Robotic Process Automation (Rpa): How to Best Implement Rpa in an Organization Kelly Wibbenmeyer Universe 1st 2018

Semester IV

Course Code PIT4BLC	Blockchain
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Objectives:

- To provide conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.
- To cover the technological underpinnings of blockchain operations as distributed data structures and decision-making systems, their functionality and different architecture types.
- To provide a critical evaluation of existing —smart contract capabilities and platforms, and examine their future directions, opportunities, risks and challenges.

Expected Learning Outcomes:

- 1) Define the structure of blockchain system such as bitcoin and ethereum.
- 2) Elaborate the use of different components in Solidity Programming.
- 3) Explain concepts of Hyperledger, Smart Contracts & tokens, Mining Ether and cryptoeconomics.
- 4) Elaborate the development of blockchain, EthereumD, Dapp applications.

I	<p>Blockchain: Introduction, History, Centralised versus Decentralised systems, Layers of blockchain, Importance of blockchain, Blockchain uses and use cases.</p> <p>Working of Blockchain: Blockchain foundation, Cryptography, Game Theory, Computer Science Engineering, Properties of blockchain solutions, blockchain transactions, distributed consensus mechanisms, Blockchain mechanisms, Scaling blockchain</p> <p>Working of Bitcoin: Money, Bitcoin, Bitcoin blockchain, bitcoin network, bitcoin scripts, Full Nodes and SVPs, Bitcoin wallets.</p>	12
II	<p>Ethereum: three parts of blockchain, Ether as currency and commodity, Building trustless systems, Smart contracts, Ethereum Virtual Machine, The Mist browser, Wallets as a Computing Metaphor, The Bank Teller Metaphor, Breaking with Banking History, How Encryption Leads to Trust, System Requirements, Using Parity with Geth, Anonymity in Cryptocurrency, Central Bank Network, Virtual Machines, EVM Applications, State Machines, Guts of the EVM, Blocks, Mining’s Place in the State Transition Function, Renting Time on the EVM, Gas, Working with Gas, Accounts, Transactions, and Messages, Transactions and Messages, Estimating Gas Fees for Operations, Opcodes in the EVM.</p> <p>Solidity Programming: Introduction, Global Banking Made Real, Complementary Currency, Programming the EVM, Design Rationale, Importance of Formal Proofs, Automated Proofs, Testing, Formatting Solidity Files, Reading Code, Statements and Expressions in Solidity, Value Types, Global Special Variables, Units, and Functions,</p>	12
III	<p>Hyperledger: Overview, Fabric, composer, installing hyperledger fabric and composer, deploying, running the network, error troubleshooting.</p> <p>Smart Contracts and Tokens: EVM as Back End, Assets Backed by Anything, Cryptocurrency Is a Measure of Time, Function of Collectibles in Human Systems, Platforms for High-Value Digital Collectibles, Tokens as Category of Smart Contract, Creating a Token, Deploying the Contract, Playing with Contracts.</p>	12
IV	<p>Mining Ether: Why? Ether’s Source, Defining Mining, Difficulty, Self-Regulation, and the Race for Profit, How Proof of Work Helps Regulate Block Time, DAG and Nonce, Faster Blocks, Stale Blocks, Difficulties, Ancestry of Blocks and Transactions, Ethereum and Bitcoin, Forking, Mining, Geth on Windows, Executing Commands in the EVM via the Geth Console, Launching Geth with Flags, Mining on the Testnet, GPU Mining Rigs, Mining on a Pool with Multiple GPUs.</p>	12

	Cryptoeconomics: Introduction, Usefulness of cryptoeconomics, Speed of blocks, Ether Issuance scheme, Common Attack Scenarios.	
V	<p>Blockchain Application Development: Decentralized Applications, Blockchain Application Development, Interacting with the Bitcoin Blockchain, Interacting Programmatically with Ethereum—Sending Transactions, Creating a Smart Contract, Executing Smart Contract Functions, Public vs. Private Blockchains, Decentralized Application Architecture,</p> <p>Building an EthereumDApp: The DApp, Setting Up a Private Ethereum Network, Creating the Smart Contract, Deploying the Smart Contract, Client Application,</p> <p>DApp deployment: Seven Ways to Think About Smart Contracts, Dapp Contract Data Models, EVM back-end and front-end communication, JSONRPC, Web 3, JavaScript API, Using Meteor with the EVM, Executing Contracts in the Console, Recommendations for Prototyping, Third-Party Deployment Libraries, Creating Private Chains.</p>	12

Course Code PIT4BCP	Blockchain Practical List
Objectives:	
<ul style="list-style-type: none"> Blockchain is an emerging technology platform for developing decentralized applications and data storage, over and beyond its role as the technology underlying the cryptocurrencies. The basic tenet of this platform is that it allows to create a distributed and replicated ledger of events, transactions, and data generated through various IT processes with strong cryptographic guarantees of tamper resistance, immutability, and verifiability 	
Expected Learning Outcomes:	
<ul style="list-style-type: none"> Design programs for blockchain in Python. Create blockchain and exhibit its use. Build Apps with angular. Develop different functions in Solidity Programming. 	
1	Write the following programs for Blockchain in Python: <ul style="list-style-type: none"> a. A simple client class that generates the private and public keys by using the builtin Python RSA algorithm and test it. b. A transaction class to send and receive money and test it. c. Create multiple transactions and display them. d. Create a blockchain, a genesis block and execute it. e. Create a mining function and test it. f. Add blocks to the miner and dump the blockchain.
2	Install and configure Go Ethereum and the Mist browser. Develop and test a sample application.
3	Implement and demonstrate the use of the following in Solidity: <ul style="list-style-type: none"> a. Variable, Operators, Loops, Decision Making, Strings, Arrays, Enums, Structs, Mappings, Conversions, Ether Units, Special Variables. b. Functions, Function Modifiers, View functions, Pure Functions, Fallback Function, Function Overloading, Mathematical functions, Cryptographic functions.
4	Implement and demonstrate the use of the following in Solidity: <ul style="list-style-type: none"> a. Withdrawal Pattern, Restricted Access.

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	b. Contracts, Inheritance, Constructors, Abstract Contracts, Interfaces. c. Libraries, Assembly, Events, Error handling.
5	Install hyperledger fabric and composer. Deploy and execute the application.
6	Write a program to demonstrate mining of Ether.
7	Demonstrate the running of the blockchain node.
8	Demonstrate the use of Bitcoin Core API.
9	Create your own blockchain and demonstrate its use.
10	Build Dapps with angular.

Reference Books:

1. Beginning Blockchain A Beginner's Guide to Building Blockchain Solutions Bikramaditya Singhal, Gautam Dhameja, Priyansu Sekhar Panda Apress 2018
2. Introducing Ethereum and Solidity Chris Dannen Apress 2017
3. The Blockchain Developer Elad Elrom Apress 2019
4. Mastering Ethereum Andreas M. Antonopoulos Dr. Gavin Wood O'Reilly First 2018
5. Blockchain Enabled Applications Vikram Dhillon David Metcalf Max Hooper Apress 2017

Course Code PIT4DIF	Digital Image Forensics	
Objectives		
<ul style="list-style-type: none"> To understand describe the origin of computer forensics and the relationship between law enforcement and industry. Describe electronic evidence and the computing investigation process. Extracting Digital Evidence from Images and establishing them in court of Law. Enhancing images for investigation and various techniques to enhance images. Interpret and present Evidences in Court of Law. 		
Expected Learning Outcomes:		
<ol style="list-style-type: none"> 1) Define the origin of Computer Forensics & relationship between law enforcement & industry 2) Distinguish Digital Still & Digital Video Camera , Color Mode & Channel Blending 3) Classify Multiple Image Techniques, Contrast adjustment Techniques & Advanced Processing Techniques 4) Elaborate Enhancement Strategies for Image Intended for Analysis. 		
I	History of Forensic Digital Enhancement, Establishing Integrity of Digital Images for Court,	12
II	Digital Still and Video Cameras, Color Modes and Channel Blending to Extract Detail.	12
III	Multiple Image Techniques, Fast Fourier Transform (FFT) – Background Pattern Removal.	12
IV	Contrast Adjustment Techniques, Advanced Processing Techniques, Comparison and Measurement	12
V	The Approach – Developing Enhancement Strategies for Images Intended for Analysis, Digital Imaging in the Courts, Interpreting and Presenting Evidence	12

Reference Books:

1. Forensic Digital Image Brian Dalrymple, Jill CRC 2018 Processing: Optimization of impression Evidence Smith Press
2. Forensic Uses of Digital Imaging John C. Russ, Jens Rindel, P. Lord Taylor & Francis Group 2nd2016

Course Code PIT4DFP	Digital Image Forensics Practical List	
Objectives		
<ul style="list-style-type: none"> To understand the basic digital forensics and techniques for conducting the forensic examination on different digital devices. The main goal of Digital Image forensics is to identify, collect, preserve, and analyse data in a way that preserves the integrity of the evidence collected so it can be used effectively in a legal case. 		
Expected Learning Outcomes:		
1) Apply basic Image Forensics Techniques to establish their integrity		

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- 2) Categorize different technique for extracting details from images
- 3) Measure various parameters associated with digital Images
- 4) Apply various enhancement strategies for digital image

1	Finding image raw data by using Data Acquisition tools.
2	Fake photo Identification using Forensically.
3	Understand the Apply image in Photoshop.
4	Use Image subtraction technique on image.
5	Understand calculation dialogue box using Photoshop Focus Stacking.
6	Do HDR pro procedure on image.
7	Understand the Channel Subtraction in Photoshop.
8	Understand different tools in Photoshop.
9	Making adjustments in curves using Photoshop
10	Understand Shadow/Highlight dialogue box.

Reference Books:

1. Forensic Digital Image Brian Dalrymple, Jill CRC 2018 Processing: Optimization of impression Evidence Smith Press
2. Forensic Uses of Digital Imaging John C. Russ, Jens Rindel, P. Lord Taylor & Francis Group 2nd2016

Course Code PIT4SOC	Security Operations Centre
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Objectives

- To get the insight of the security loopholes in every aspect of computing.
- To understand the threats and different types of attacks that can be launched on computing systems.
- To know the countermeasures that can be taken to prevent attacks on computing systems.
- To test the software against the attacks

Expected Learning Outcomes:

- 1) Classify different security breaches that can occur.
- 2) Identify vulnerabilities in the systems, breach the security of the system, and threats due to malware.
- 3) Develop social engineering and educate people to be Careful from attacks due to it.
- 4) Evaluate vulnerabilities in the Web Servers, Applications and newer technologies like mobiles, IoT and computing.

I	<p>Introduction to Security Operations Management: Foundation Topics Introduction to Identity and Access Management Phases of the Identity and Access Lifecycle Registration and Identity Validation Privileges Provisioning Access Review Access Revocation Password Management Password Creation Password Storage and Transmission Password Reset Password Synchronization Directory Management Single Sign-On Kerberos Federated SSO Security Assertion Markup Language OAuth OpenID Connect Security Events and Logs Management Logs Collection, Analysis, and Disposal Syslog Security Information and Event Manager Assets Management Assets Inventory Assets Ownership Assets Acceptable Use and Return Policies Assets Classification Assets Labeling Assets and Information Handling Media Management Introduction to Enterprise Mobility Management Mobile Device Management Configuration and Change Management Configuration Management Change Management Vulnerability Management Vulnerability Identification Finding Information about a Vulnerability Vulnerability Scan Penetration Assessment Product Vulnerability Management Vulnerability Analysis and Prioritization Vulnerability Remediation Patch Management References and Additional Readings</p> <p>Fundamentals of Cryptography and Public Key Infrastructure (PKI): Cryptography Ciphers and Keys Ciphers Keys Block and Stream Ciphers Symmetric and Asymmetric Algorithms Symmetric Algorithms Asymmetric Algorithms Hashes Hashed Message Authentication Code Digital Signatures Digital Signatures in Action Key Management Next-Generation Encryption Protocols IPsec and SSL IPsec SSL Fundamentals of PKI Public and Private Key Pairs RSA Algorithm, the Keys, and Digital Certificates Certificate Authorities Root and Identity Certificates Root Certificate Identity Certificate X.500 and X.509v3 Certificates Authenticating and Enrolling with the CA Public Key Cryptography Standards Simple Certificate Enrollment Protocol Revoking Digital Certificates Using Digital Certificates PKI Topologies Single Root CA Hierarchical CA with Subordinate CAs Cross-certifying CAs Exam Preparation Tasks Review All Key Topics Complete Tables and Lists from Memory</p> <p>Introduction to Virtual Private Networks (VPNs) What Are VPNs? Site-to-site vs. Remote-Access VPNs An Overview of IPsec IKEv1 Phase 1 IKEv1 Phase 2 IKEv2 SSL VPNs SSL VPN Design Considerations User Connectivity VPN Device Feature Set Infrastructure Planning Implementation Scope</p>	12
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<p>II</p>	<p>Windows-Based Analysis: Process and Threads Memory Allocation Windows Registration Windows Management Instrumentation Handles Services Windows Event Logs Exam Preparation Tasks</p> <p>Linux- and Mac OS X–Based Analysis: Processes Forks Permissions Symlinks Daemons UNIX-Based Syslog Apache Access Logs</p> <p>Endpoint Security Technologies: Antimalware and Antivirus Software Host-Based Firewalls and Host-Based Intrusion Prevention Application-Level Whitelisting and Blacklisting System-Based Sandboxing</p>	<p>12</p>
<p>III</p>	<p>Threat Analysis: What Is the CIA Triad: Confidentiality, Integrity, and Availability? Confidentiality Integrity Availability Threat Modeling Defining and Analyzing the Attack Vector Understanding the Attack Complexity Privileges and User Interaction The Attack Scope Exam Preparation Tasks</p> <p>Forensics: Introduction to Cybersecurity Forensics The Role of Attribution in a Cybersecurity Investigation The Use of Digital Evidence Defining Digital Forensic Evidence Understanding Best, Corroborating, and Indirect or Circumstantial Evidence Collecting Evidence from Endpoints and Servers Collecting Evidence from Mobile Devices Collecting Evidence from Network Infrastructure Devices Chain of Custody Fundamentals of Microsoft Windows Forensics Processes, Threads, and Services Memory Management Windows Registry The Windows File System Master Boot Record (MBR) The Master File Table (MFT) Data Area and Free Space FAT NTFS MFT Timestamps, MACE, and Alternate Data Streams EFI Fundamentals of Linux Forensics Linux Processes Ext4 Journaling Linux MBR and Swap File System Exam Preparation Tasks</p> <p>Fundamentals of Intrusion Analysis: Common Artifact Elements and Sources of Security Events False Positives, False Negatives, True Positives, and True Negatives Understanding Regular Expressions Protocols, Protocol Headers, and Intrusion Analysis Using Packet Captures for Intrusion Analysis Mapping Security Event Types to Source Technologies</p>	<p>12</p>
<p>IV</p>	<p>Introduction to Incident Response and the Incident Handling Process Introduction to Incident Response: What Are Events and Incidents? The Incident Response Plan The Incident Response Process The Preparation Phase The Detection and Analysis Phase Containment, Eradication, and Recovery Post- Incident Activity (Postmortem) Information Sharing and Coordination Incident Response Team Structure The Vocabulary for Event Recording and Incident Sharing (VERIS)</p> <p>Incident Response Teams: Computer Security Incident Response Teams (CSIRTs) Product Security Incident Response Teams (PSIRTs) Security Vulnerabilities and Their Severity Vulnerability Chaining Role in Fixing Prioritization Fixing Theoretical Vulnerabilities Internally Versus Externally Found Vulnerabilities National CSIRTs and Computer Emergency Response Teams (CERTs) Coordination Centers Incident Response Providers and Managed Security Service Providers (MSSPs)</p> <p>Compliance Frameworks:Payment Card Industry Data Security Standard (PCI DSS) PCI DSS Data Health Insurance Portability and Accountability Act (HIPAA) HIPAA Security Rule HIPAA Safeguards Administrative Safeguards Physical Safeguards Technical Safeguards Sarbanes-Oxley (SOX) Section 302 Section 404 Section 409 SOX Auditing Internal Controls</p> <p>Network and Host Profiling: Network Profiling Throughput Measuring Throughput Used Ports Session Duration Critical Asset Address Space Host ProfilingListening Ports Logged-in Users/Service Accounts Running Processes Applications</p>	<p>12</p>

V	<p>The Art of Data and Event Analysis: Normalizing Data Interpreting Common Data Values into a Universal Format Using the 5-Tuple Correlation to Respond to Security Incidents Retrospective Analysis and Identifying Malicious Files Identifying a Malicious File Mapping Threat Intelligence with DNS and Other Artifacts Deterministic Versus Probabilistic Analysis</p> <p>Intrusion Event Categories Diamond Model of Intrusion Cyber Kill Chain Model Reconnaissance Weaponization Delivery Exploitation Installation Command and Control Action and Objectives</p> <p>Types of Attacks and Vulnerabilities: Types of Attacks Reconnaissance Attacks Social Engineering Privilege Escalation Attacks Backdoors Code Execution Man-in-the-Middle Attacks Denial-of-Service Attacks Direct DDoS Botnets Participating in DDoS Attacks Reflected DDoS Attacks Attack Methods for Data Exfiltration ARP Cache Poisoning Spoofing Attacks Route Manipulation Attacks Password Attacks Wireless Attacks Types of Vulnerabilities</p> <p>Security Evasion Techniques: Key Encryption and Tunneling Concepts Resource Exhaustion Traffic Fragmentation Protocol-Level Misinterpretation Traffic Timing, Substitution, and Insertion Pivoting</p>	12
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Course Code PIT4SOP	Security Operations Centre Practical List
Objectives	
<ul style="list-style-type: none"> • To make the learners capable using of various network information gathering tools. • To make the learners capable of using various network security tools. 	
Expected Learning Outcomes:	
<ol style="list-style-type: none"> 1) Make use of tools to perform footprinting and reconnaissance 2) Determine use of Enumeration and network scanning tools. 3) Test social engineering toolkits and web application scanning. 4) Apply different tools for cryptography. 	
1	Encrypting and Decrypting Data Using OpenSSL
2	Demonstrate the use of Snort and Firewall Rules
3	Demonstrate Extract an Executable from a PCAP
4	Demonstrate Analysis of DNS Traffic
5	Create your own syslog Server
6	Configure your Linux system to send syslog messages to a syslog server and Read them
7	Install and Run Splunk on Linux
8	Install and Configure ELK on Linux
9	Install and Configure GrayLog on Linux
10	Demonstrate Conversion of Data into a Universal Format.

Reference Books:

1. CCNA Cyber Ops SECOPS 210-255 Official Cert Guide Omar Santos, Joseph Muniz CISCO 1st 2017
2. CCNA Cyber Ops SECFND 210-250 Official Cert Guide Omar Santos, Joseph Muniz CISCO 1st 2017
3. CCNA Cyber security Operations Companion Guide CISCO 1st 2018

Course Code PIT4HCI	Human Computer Interaction	
Objectives: <ul style="list-style-type: none"> • Understand the important aspects of implementation of human-computer interfaces. • Identify the various tools and techniques for interface analysis, design, and evaluation. • Identify the impact of usable interfaces in the acceptance and performance utilization of information systems Expected Learning Outcomes: <ol style="list-style-type: none"> 1) Define HCI principles that influence a system’s interface design. 2) Explain techniques used for any of the proposed systems. 3) Explain the cognitive models and its design. 4) Elaborate system resource management techniques and implementing systems. 		
I	The Interaction: Models of interaction, Design Focus, Frameworks and HCI, Ergonomics, Interaction styles, Elements of the WIMP interface, Interactivity Paradigms: Introduction, Paradigms for interaction Interaction design basics: What is design?, The process of design, User focus, Cultural probes, Navigation design, the big button trap, Modes, Screen design and layout, Alignment and layout matters, Checking screen colors, Iteration and prototyping HCI in the software process: The software life cycle, Usability engineering , Iterative design and prototyping, Prototyping in practice, Design rationale	12
II	Design: Principles to support usability, Standards, Guidelines, Golden rules and heuristics, HCI patterns Implementation support: Elements of windowing systems, Programming the application, Going with the grain, Using toolkits, User interface management systems Evaluation techniques: What is evaluation?, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method	12
III	Universal design: Universal design principles, Multimodal interaction, Designing websites for screen readers, Choosing the right kind of speech, Designing for diversity User support: Requirements of user support, Approaches to user support, Adaptive help systems, Designing user support systems Cognitive models: Goal and task hierarchies, Linguistic models, The challenge of display-based systems, Physical and device models, Cognitive architectures	12
IV	Socio-organizational issues and stakeholder requirements: Organizational issues, Capturing requirements Communication and collaboration models: Face-to face communication, Conversation, Text-based communication, Group working Task analysis: Differences between task analysis and other techniques, Task decomposition, Knowledge based analysis, Entity–relationship-based techniques, Sources of information and data collection, Uses of task analysis	12
V	Dialog notations and design: What is dialog?, Dialog design notations, Diagrammatic notations, Textual dialog notations, Dialog semantics, Dialog analysis and design Models of the system: Standard formalisms, Interaction models, Continuous behavior Modeling rich interaction: Status–event analysis, Rich contexts, Low intention and sensor-based interaction	12

**Course
Code
PIT4PIP**

Project Implementation and Viva-Voce

Objectives:

The Project Implementation and Viva Voce details are given in Appendix 1.

Expected Learning Outcomes:

- 1) Design User Interface
- 2) Develop Coding for the project
- 3) Examine various system testing
- 4) Predict the future Scope of Project

Appendix – 1

Project Documentation and Viva-voce (Semester III) and Project Implementation and Viva-Voce (Semester IV)

Goals of the course Project Documentation and Viva-Voce

The student should:

- be able to apply relevant knowledge and abilities, within the main field of study, to a given problem within given constraints, even with limited information, independently analyse and discuss complex inquiries/problems and handle larger problems on the advanced level within the main field of study reflect on, evaluate and critically review one's own and others' scientific results
- be able to document and present one's own work with strict requirements on structure, format, and language usage
- be able to identify one's need for further knowledge and continuously develop one's own Knowledge

To start the project:

- Start thinking early in the programme about suitable projects.
- Read the instructions for the project.
- Attend and listen to other student's final oral presentations.
- Look at the finished reports.
- Talk to senior master students.
- Attend possible information events (workshops / seminars / conferences etc.) about the related topics.

Application and approval:

- Read all the detailed information about project.
- Finalise finding a place and supervisor.
- Check with the coordinator about subject/project, place and supervisor.
- Write the project proposal and plan along with the supervisor.
- Fill out the application together with the supervisor.
- Hand over the complete application, proposal and plan to the coordinator.
- Get an acknowledgement and approval from the coordinator to start the project.

During the project:

- Search, gather and read information and literature about the theory.
- Document well the practical work and your results.
- Take part in seminars and the running follow-ups/supervision.
- Think early on about disposition and writing of the final report.
- Discuss your thoughts with the supervisor and others.
- Read the SOP and the rest you need again.
- Plan for and do the mid-term reporting to the coordinator/examiner.
- Do a mid-term report also at the work-place (can be a requirement in some work-places).
- Write the first draft of the final report and rewrite it based on feedback from the supervisor and possibly others.

- Plan for the final presentation of the report.

Finishing the project:

- Finish the report and obtain an OK from the supervisor.
- Ask the supervisor to send the certificate and feedback form to the coordinator.
- Attend the pre-final oral presentation arranged by the Coordinator.
- Rewrite the final report again based on feedback from the opponents and possibly others.
- Prepare a title page and a popular science summary for your report.
- Send the completed final report to the coordinator (via plagiarism software)
- Rewrite the report based on possible feedback from the coordinator.
- Appear for the final exam.

Project Proposal/research plan

- The student should spend the first 1-2 weeks writing a 1-2 pages project plan containing:
 - Short background of the project
 - Aims of the project
 - Short description of methods that will be used
 - Estimated time schedule for the project
- The research plan should be handed in to the supervisor and the coordinator.
- Writing the project plan will help you plan your project work and get you started in finding information and understanding of methods needed to perform the project.

Project Documentation

The documentation should contain:

- Introduction - that should contain a technical and social (when possible) motivation of the project topic.
- Description of the problems/topics.
- Status of the research/knowledge in the field and literature review.
- Description of the methodology/approach. (The actual structure of the chapters here depends on the topic of the documentation.)
- Results - must always contain analyses of results and associated uncertainties.
- Conclusions and proposals for the future work.
- Appendices (when needed).
- Bibliography - references and links.

For the master's documentation, the chapters cannot be dictated, they may vary according to the type of project. However, in Semester III Project Documentation and Viva Voce must contain at least 4 chapters (Introduction, Review of Literature, Methodology / Approach, Proposed Design / UI design, etc. depending on the type of project.) The Semester III report should be spiral bound.

Examination Pattern

Theory: 100 Marks (60 +40=100)

60 Theory			40 Internal
Q.1	Solve any 2 (From 4)	12 M	1) Class Test 20M 2) Attendance 5M 3) Presentation 15M <u>Semester III (For only 1 subject)</u> SWAYAM(Advanced Course) of minimum 20 hours and certification exam should be completed in any one of the course. <u>Semester IV (For only 1 subject)</u> Research paper to be Published for any of the course.
Q.2	Solve any 2 (From 4)	12 M	
Q.3	Solve any 2 (From 4)	12 M	
Q.4	Solve any 2 (From 4)	12 M	
Q.5	Solve any 2 (From 4)	12 M	

Practical: 50 Marks

50 Marks	OR	50 Marks
20 Program1		40 Program1
20 Program 2		5 Viva
5 Viva		5 Journal
5 Journal		

॥ विद्या विनयेन शोभते ॥



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE, NEW PANVEL
(AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: Bachelor's in Science (B. Sc.)

Credits: 132

SYLLABUS

(Approved in the Academic council meeting held on 12th April 2022)

F. Y. B. Sc. ZOOLOGY

Revised as per

Choice Based Credit System (60:40)

w. e. f. Academic Year 2022-23

BACHELOR'S IN SCIENCE (B. Sc.)**Programme Outcomes**

S. N.	After completion of B.Sc. program students will acquire	Graduate Attribute
PO1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO2	An ability to develop and conduct experiments, analyze, and interpret data and use scientific judgment to draw conclusions	Scientific reasoning
PO3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyze and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understanding values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

PREAMBLE OF THE SYLLABUS:

The ongoing B.Sc. (CBCGS) Zoology course was introduced by the Faculty of Sciences from the academic year 2022-2023. The new course of F.Y.B.Sc. Zoology that will be effective from the academic year 2019- 2020, will follow the Semester mode. It has been prepared keeping in view the unique requirements of B.Sc. (CBCGS) Zoology students. The syllabus has been drawn up to introduction of the classical zoology with accommodation of widening horizons of the discipline of Biological Sciences. The Board of Studies examined the existing syllabus and after analysing with respective subjects in term of content relevance, quality and pattern of teaching along with examination in present scenario. With the holistic approach the syllabus including basic as well as advanced concepts in Zoology from first year to third year shall inspire the students for pursuing higher studies in Zoology and for becoming an entrepreneur and also enable students to get employed in the biological research Institutes, Industries, Educational Institutes and in the various concerning departments of State and Central Government based on subject Zoology.

Semester - I
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/week	Internal assessment	Semester-end examination	Total	Credits
Chemistry 1	Core		3	40	60	100	2
Chemistry 2	Core		3	40	60	100	2
Physics1	Core		3	40	60	100	2
Physics 2	Core		3	40	60	100	2
Mathematics1	Core		3	40	60	100	2
Mathematics 2	Core		3	40	60	100	2
Microbiology 1	Core		3	40	60	100	2
Microbiology 2	Core		3	40	60	100	2
Zoology 1	Core		3	40	60	100	2
Zoology 2	Core		3	40	60	100	2
Botany 1	Core		3	40	60	100	2
Botany 2	Core		3	40	60	100	2
Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement		3	40	60	100	2
Environmental Science	Ability enhancement		2	40	60	100	2
Chemistry Practical	Core		6	--	100	100	2
Physics Practical	Core		6	--	100	100	2
Mathematics Practical	Core		3	--	100	100	2
Microbiology Practical	Core		6	--	100	100	2
Zoology Practical	Core		6	--	100	100	2
Botany Practical	Core		6	--	100	100	2

Semester - II
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry 1	Core		3	40	60	100	2
Chemistry 2	Core		3	40	60	100	2
Physics1	Core		3	40	60	100	2
Physics 2	Core		3	40	60	100	2
Mathematics1	Core		3	40	60	100	2
Mathematics 2	Core		3	40	60	100	2
Microbiology 1	Core		3	40	60	100	2
Microbiology 2	Core		3	40	60	100	2
Zoology 1	Core		3	40	60	100	2
Zoology 2	Core		3	40	60	100	2
Botany 1	Core		3	40	60	100	2
Botany 2	Core		3	40	60	100	2
Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement		3	40	60	100	2
Communication Skill	Ability enhancement		2	40	60	100	2
Chemistry Practical	Core		6	--	100	100	2
Physics Practical	Core		6	--	100	100	2
Mathematics Practical	Core		6	--	100	100	2
Microbiology Practical	Core		6	--	100	100	2
Zoology Practical	Core		6	--	100	100	2
Botany Practical	Core		6	--	100	100	2

Course Description	
Semester	I & II
Course Name	Zoology
Course Code	USCZ1P/ USCZ2P
Eligibility for the Course	12th Science passed
Credit	6
Hours	90 Hrs

**Scheme of Examination
Faculty of Science
(Undergraduate Programmes)**

Choice Based Credit System (CBCS)➤ **Revised Scheme of Examination**

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below: -

A) Internal Assessment: 40 %**40 Marks**

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Any two tools out of these (10 Marks each) 1. Group/ Individual Project 2. Presentation and write up on the selected topics of the subjects / Case studies. 3. Test on Practical Skills 4. Quiz	20 Marks

Question Paper Pattern

(Periodical Class Test/ online examination for the Courses at Under Graduate Programmes)

- ❖ Maximum Marks: 20
- ❖ Duration: 30 Minutes

Particular	Marks
Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20 Marks

B) Semester End Examination: 60 %

60 Marks

➤ **Undergraduate Programmes of F. Y. B.Sc. (Sem. I & II) and S. Y. B.Sc. (Sem. III & IV)**

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be four questions of 15 marks each (30 marks with internal options).
2. On each unit there will be one question and fourth question will be based on entire syllabus.
3. All questions shall be compulsory with internal options.
4. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Undergraduate Programmes of T. Y. B.Sc. (Sem. V & VI)**

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be five questions each of 12 marks (24 marks with internal options).
2. On each unit there will be one question and fifth question will be based on entire syllabus.
3. All questions shall be compulsory with internal options.
4. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ **Passing Standard**

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

➤ **Evaluation pattern of the project work (50 Marks)**

Student would undertake a project for 1-2 months during the semester.

Sr. No.	Particular	Marks
01	Project	50 Marks
	Documentation	25 Marks
	Presentation	15 Marks
	Viva	10 Marks

- ***The plagiarism should be maintained as per the UGC guidelines.***

Note: As per previous ordinance there will not be any internal examination for practical.

Note: 1) It is noted that the concerned regulation of the College is amended and implemented to all Semesters i.e. Semester I to Semester VI to all undergraduate programmes, under faculty of Arts, Commerce and Science with effect from the academic year 2022 - 2023.

2) This revised scheme of evaluation is discussed in detail, finalised and accepted

Question Paper Pattern for Semester End Examination

I	Theory: 60 Marks	
	Each theory paper shall be of two-hour duration.	
	All questions are compulsory and will have internal options.	
	Q-1	From Unit – I (having internal options.) 15 M
	Q-2	From Unit – II (having internal options.) 15 M
	Q-3	From Unit – III (having internal options.) 15M
	Q-4	Questions from all the THREE Units with equal weightage of marks Allotted to each Unit. 15 M

Question Paper Pattern for Continuous Assessment (Total Marks 20 to be converted in 10 marks)

Marks	Group Project*/ Individual Project	Presentation and write-up	Practical Skills	Open book test	Quiz
5	Hypothesis/Topic of the project	Presentation skill	Demonstration of skill	High order thinking questions (HOTS)	Quiz on application of subject in real life
5	Actual laboratory work/Field work	Knowledge	Viva		
5	Result/output	Quality of ppt	Report		
5	Dissertation/Report	Writing skill	Problem solving ability		

Note**Group Project***

- 1) Define number of students
- 2) Every student will get equal marks if the same contribution
- 3) if any student without any kind of involvement in the project, guide will take the decision on his share

Question Paper Pattern for Practical Examination

II	Practical	The External examination per practical course will be conducted as per the Following scheme.
Sr. No.	Particulars of External Practical Examination	Marks
1.	Laboratory Work	35+35 = 70
2.	Field visit and report	05+05= 10
3.	Journal	05+05 = 10
4.	Viva	05+05 = 10
	TOTAL	100

Choice Based Credit Grading and Semester System (CBCGS)
F.Y.B. Sc. Course – ZOOLOGY
To be implemented from the Academic year 2022-2023
SEMESTER I

COURSE CODE	UNIT	TOPICS	CREDITS	LECTURES/WEEK
USC1Z01	I	Diversity in Non-chordates	2	1
	II	Animal Diversity- Non chordates		1
	III	Type study- Earthworm		1
USC1Z02	I	Introduction of Cell	2	1
	II	Structure and function of cell		1
	III	Tools and Techniques in cell biology		1
USC1Z0P	Practical based on both courses		2	6

SEMESTER II

COURSE CODE	UNIT	TOPICS	CREDITS	LECTURES/WEEK
USZ0201	I	Animal Diversity in chordates	2	1
	II	Group Eurochordata		1
	III	Type study- Shark		1
USZ0202	I	Mendelian Inheritance	2	1
	II	Sex determination and Sex linkage		1
	III	Basics of linkage and crossing over		1
USZ0P2	Practical based on both courses		2	6

**SYLLABUS F.Y.B.Sc. ZOOLOGY
UNIT WISE DISTRIBUTION**

Semester I		Semester II	
Core Course 1	Core Course 2	Core Course 3	Core Course 4
Unit 1 Diversity of animal Kingdom I	Unit 1 Introduction of Cell	Unit 1 Animal Diversity in chordates	Unit 1 Mendelian Inheritance
Unit 2 Animal Diversity- Non chordates	Unit 2 Structure and function of cell	Unit 2 Group Eurochordata	Unit 2 Sex determination and Sex linkage
Unit 3 Type study- Earthworm	Unit 3 Tools and Techniques in cell biology	Unit 3 Tools and Techniques in cell biology	Unit 3 Basics of linkage and crossing over
Practical (USC1ZOP)	Practical (USC1ZOP)	Practical (USC2ZOP)	Practical (USC2ZOP)

**Syllabus for F.Y.B.Sc.
Program: B.Sc.
Course: ZOOLOGY
Semester I
Paper I and Practical I**

F.Y.B.Sc. ZOOLOGY (THEORY)

SEMESTER I

Course Code: USCZ1P01

Course I: Diversity in Non-chordates

Credit 2

Course Objectives:

- To nurture interest in the students for the subject of Zoology.
- To understand animal diversity.
- To study detailed morphology of invertebrates.

Course Outcomes

- Learners will be able to comprehend the diversity of animals.
- Learners will be able to understand the importance of classification.
- Learners develop insight of particular group and type study.

Unit I: Diversity of animal Kingdom I

(15 Lectures)

1.1: Levels of organization

1.1.1: Unicellularity Vs multicellularity, Colonization and organization of germ layers (diploblastic and triploblastic condition)

1.1.2: Division of labour and organization of tissues (Brief fate of ectoderm, mesoderm and endoderm)

1.1.3: Development of coelom: Acoelomate, pseudocoelomate and coelomate organization

1.1.4: Radial and bilateral symmetry

1.1.5: Metamerism

1.2: Unicellular and multicellular organization

(Salient features with examples of phyla, subphyla and classes mentioned below)

1.2.1: Unicellular organization: Phylum Protozoa

1.2.2: Multicellular organization: Colonization level- Phylum Porifera

1.2.3: Multicellular organization: Division of labour (Cell differentiation)- Phylum Coelenterata

1.3 Triploblastic acoelomate and pseudocoelomate organization

1.3.1: Acoelomate organization - Phylum Platyhelminthes

1.3.2: Pseudocoelomate organization – Phylum Nematelminths

1.4: Triploblastic coelomate organization

1.4.1: Animals with metameric segmentation- Phylum Annelida

1.4.2: Animals with jointed appendages- Phylum Arthropoda

Unit II: Animal Diversity- Non chordates

(15 Lectures)

2.1 Non-Chordates: General characters and classification of the following up to classes with examples showing distinctive / adaptive features of the following phyla:

2.1.1: Kingdom Protista: Protozoa (Amoeba, Paramecium, Euglena, Plasmodium)

2.2: Kingdom Animalia

2.2.1: Porifera (Leucosolenia, Euplactella, Hyalonema, Euspongia)

2.2.2: Coelenterata (Cnidaria) (Physalia, Obelia, Aurelia, sea Anemone)

2.2.3: Ctenophora (Comb jelly)

2.2.4: Platyhelminthes (Fasciola, Planaria, Liverfluke, Tapeworm)

2.2.5: Nematohelminthes (*Ascaris*, *Ancylostoma*, *Enterobius*)

2.2.6: Annelida (Nereis, Earthworm, Leech)

2.2.7: Arthropoda (Crab, Lobster, Beetle, Dragonfly, Butterfly, Moth, Spider, Centipede, Millipede)

2.2.8: Mollusca (Chiton, Dentalium, Pila, Unio, Sepia and Nautilus)

2.2.9: Echinodermata (Starfish, Brittle star, Sea urchin, Sea cucumber, Feather star)

2.2. General topics: Economic importance of Protozoa

Unit III: Type study- Earthworm:

(15 Lectures)

Systematic position, Habits and habitat, External characters, Body wall, Digestive system, Blood Vascular System, Excretory system, Nervous system and sense organs. Reproductive system, Economic importance

SEMESTER I

Practical Code: USCZ1P

PRACTICAL – I

1. Study of levels of organization in Animal kingdom

A) Symmetry:

- i) Asymmetric organization: Amoeba
- ii) Radial symmetry: Sea anemone, Aurelia
- iii) Bilateral symmetry: Planaria / liver fluke

B) Acoelomate: T.S. of Planaria / liver fluke

C) Pseudocoelomate: T.S. of Ascaris

D) Coelomate: T.S. of Earthworm

E) Segmentation

- i) Pseudosegmentation: Tapeworm
- ii) Metamerism: Earthworm

F) Specialization of body parts for division of labour: Head, thorax and abdomen - Insect

G) Cephalization

- i) Cockroach – Head
- ii) Prawn/ crab – Cephalothorax

2. Study of animal diversity with reference to-

- i) Protozoa: Amoeba, Paramecium, Euglena, Plasmodium
- ii) Porifera: Leucosolenia, bath sponge
- iii) Coelenterate: Hydra, obelia colony, Aurelia, sea anemone and any one coral
- iv) Platyhelminthes: Planaria, liver fluke and tapeworm
- v) Nematelminths: Ascaris- male and female
- vi) Annelida: Nereis, earthworm and leech
- vii) Arthropoda: Crab, lobster, Lepisma, beetle, dragonfly, butterfly, moth, spider, centipede, millipede

3. Preparation and observation of Paramecium.

4. Determination of the rate of heart beat in Daphnia and population density (Daphnia or any suitable organism) by sub sampling method.

5. Study of animal interaction:

- Commensalism: Echinus and shark
- Mutualism: Termite and Trichonympha

- Antibiosis: Effect of antibiotic on bacterial growth on a petri plate
 - Parasitism: Ectoparasite – head louse and bed bug
 - Endoparasite: *Trichinella spiralis*
 - Predation: Praying mantis and spider
6. Demonstration of systems/ organs in Earthworm: Digestive system, Excretory system, Reproductive system and Nervous system (Use of permanent slide, model or photographs)
 7. Study of life cycle and pathogenicity of *Entamoeba*, *Leishmania*, liver fluke and Tapeworm
 8. Study of any 5 invertebrates available in nearby area (Submit the project)

REFERENCES AND ADDITIONAL READING

1. Invertebrate Zoology Volume II- Jordan and Verma , S. Chand and Co.
2. Invertebrate Zoology- T. C. Majumuria , S. Nagin and Co.
3. Invertebrate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co.
4. Zoology- S. A. Miller and J. B. Harley, Tata McGraw Hill
5. Modern Textbook of Zoology, Invertebrates, R. L. Kotpal
6. Biodiversity- S.V.S Rana- Prentice Hall Publications
7. Modern Biology- V. B. Rastogi
8. Biology of Mollusca- D. R. Khanna
9. A Textbook of Zoology, Vol. II- T. Jeffery Parker and William. A. Haswell- Low Price Publications.
10. Manuals of Laboratory Specimens Invertebrates Gurudarshan Singh

**Syllabus for F.Y.B.Sc.
Program: B.Sc.
Course: ZOOLOGY
Semester I
Paper II and Practical II**

F.Y.B.Sc. ZOOLOGY (THEORY)
SEMESTER I
Course Code: USC1ZO2
Course -II Fundamentals of Cell biology

Credit 2

Course Objectives:

- To study the cell as a basic unit of life and its different types
- To understand cell structure and function
- To study basic techniques used in cell biology

Course outcome:

- The learners can describe cell as structural and functional unit of life
- Learners will differentiate prokaryotic and eukaryotic cell and role of various cell organelles.
- Students are well known about use of techniques in cell biology.

Unit I: Introduction of Cell

(15 Lectures)

1.1: The Cell

1.1.1. Introduction and History of cell Biology

1.1.2. Study of prokaryotic and eukaryotic cell

1.1.3. Scope of cell biology

1.2 : Organization of cell

1.3: Extranuclear

1.3.1. Structure and composition cell cytoplasm and cytoplasmic organelles.

1.3.2. Structure and functions of mitochondria, Endoplasmic reticulum, lysosomes, Golgi complex and nucleus

Unit II: Structure and function of cell membrane:

(15 Lectures)

2.1. Cell membrane organization

2.2. Cell membrane:

2.2.1. Chemical composition

2.2.2. Fluid mosaic model

2.2.3. Functions of plasma membrane

Unit III: Tools and Techniques in cell biology

(15 Lectures)

3.1. Microscopy

➤ Light microscopy

➤ Electron microscopy

3.2. Cytochemical stains

3.3. Cell fractionation

3.4. Chromatography -paper chromatography

SEMESTER I
Practical code: USC1ZOP
Course I

1. Study of Microscopy: Simple, Compound and Phase contrast
2. Study of prokaryotic and eukaryotic cell types with the help of chart, slide and video.
3. Observation of Prokaryotic and eukaryotic cell by simple staining
4. Study of mitosis from onion root tip/ bone marrow.
5. Study of meiosis from onion flowers/grasshopper testis.
6. Isolation of DNA from the liver tissue.
7. Detection of mitochondria by Janus green B using onion.
8. Study of membrane permeability of RBC using saline solution.
9. Project work.

REFERENCES AND ADDITIONAL READING

1. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology – Verma, Agarwal – S. Chand & Co.
2. Molecular & Cell Biology – Bhamrah – Anmol Publ. Pvt. Ltd., New Delhi.
3. Molecular Biology of the Cell – Alberts, Bray, Lewis, Raff, Roberts, Watson – Garland Publishers, New York.
4. Molecular Biology of the gene – J. D. Watson, NH Hopkins, Roberts, Stertz, Weiner-Freeman.
5. Molecular Biology of the Gene – Watson, Hopkins, Roberts, Steitz, Weiner – Benjamin Cummings Publishing Co.
6. Molecular Cell Biology – Baltimore, Zipursky, Matsudaria, Darnel – W. H. Freeman & Co., New York.
7. Principles of Biochemistry – White, Handler, Smith – McGraw Hill Publ. 18) Cell & Molecular Biology – Phillip Sheller – Wiley Publ.
8. Lehninger Principles of Biochemistry -David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.

**Syllabus for F.Y.B.Sc.
Program: B.Sc.
Course: ZOOLOGY
Semester II
Paper I and Practical I**

F.Y.B.Sc. ZOOLOGY (THEORY)

Course Code: USC2ZO1

SEMESTER II Paper I

Course III: Diversity in Chordates

Credit 2

Course Objectives:

- To nurture interest in the students for the subject of Zoology.
- To understand animal diversity.
- To study detailed morphology of chordates

Course Outcomes:

- Learners will be able to comprehend the diversity of animals.
- Learners will be able to understand the importance of classification.
- Learners develop insight of particular group and type study.

Unit I: Animal Diversity in chordates

(15 Lectures)

1.1: Phylum Chordata:

1.1.1. General characters and classification of Chordata.

1.1.2. Difference between Chordates and non-chordates.

1.1.3. Affinities of Balanoglossus

1.2: Group Protochordata:

1.2.1. Subphylum Hemichordata e.g., Balanoglossus

1.2.2: Subphylum Urochordata e.g., Herdmania

1.2.3: General characters of Ascidian

1.2.4: Retrogressive Metamorphosis in Ascidian

1.2.5: Subphylum Cephalochordata e.g., Amphioxus

Unit II: Group Eurochordata

(15 Lectures)

2.1: Division: Agnatha

2.1.1: Class Ostracodermi

2.1.2: Class Cyclostomata

1.1.3: Division: Gnathostomata

1.1.3.1: Superclass Pisces (Cartilaginous and bony fish)

➤ Class Chondrichthyes

➤ Class Osteichthyes

1.1.3.2: Superclass Tetrapoda

- Class Amphibia
- Class Reptilia
- Class Aves
- Class Mammalia

Unit III: Type study- Shark:

(15 Lectures)

- 3.1.** Systematic position, Habits and habitat
- 3.2.** External characters
- 3.3.** Digestive system
- 3.4.** Circulatory system
- 3.5.** Excretory system
- 3.6.** Reproductive system
- 3.7.** Nervous system and sense organs

SEMESTER II PAPER I
Practical code: USC2ZOP
Practical I

1. Study of museum specimen of Herdmania, *Petromyzon* (Sea lamprey) and *Myxine* (Hagfish)
2. Study of permanent slide of Amphioxus and Balanoglossus.
3. Study of classification and morphological characteristics of vertebrates
 - i. Superclass Pisces: Shark (*Scoliodon*), Skate (*Rhinobatys*), Sting ray (*Dasiatias*), Electric ray, Sciana, Flying fish, Tilapia
 - ii. Class Amphibia: Frog, toad
 - iii. Class Reptilia: Chameleon, Calotes, Turtle, Cobra
 - iv. Class Aves: Duck, Kingfisher, Parakeet
 - v. Class Mammalia: Bat, Shrew
4. Study of External morphology of *Scoliodon* (Demonstration).
5. Study of Digestive system of *Scoliodon* (Demonstration).
6. Study of Circulatory system of *Scoliodon* (Demonstration).
7. Study of Reproductive system of *Scoliodon* (Demonstration).
8. Study of Nervous system (Brain and Cranial Nerves) of *Scoliodon* (Demonstration).
9. Mounting of scales of fish (Placoid, Cycloid, Ctenoid)
10. Visit to forest/ wildlife sanctuary/ biodiversity park/ museum and preparation of field visit report.

REFERENCES AND ADDITIONAL READING

1. Vertebrate Zoology Volume I- Jordan and Verma, S. Chand and Co.
2. Chordate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co.
3. Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition
4. Zoology- S. A. Miller and J. B. Harley, Tata McGraw Hill
5. Modern Textbook of Zoology, Invertebrates, R. L. Kotpal
6. A Textbook of Zoology, Vol. II- T. Jeffery Parker and William. A. Haswell- Low Price Publications
7. Animal Behavior: Mechanisms, Ecology and Evolution Stephen Vessey, Elizabeth Jacob, S. H. Vessey and L. C. Drickamer, McGraw-Hill.
8. An introduction to Animal Behaviour- Manning and Dawkins
9. Animal Behaviour-Agarwal
10. Principles of Animal Communication. Bradbury, J.W. and S.L. Vehrencamp. Sinauer Assoc. Sunderland, Massachsets, USA.
11. The biology of Behaviour. Eibl-Eibesfeldt, I. Ethology. Holt, Rineheart & Winston, New York.

**Syllabus for F.Y.B.Sc.
Program: B.Sc.
Course: ZOOLOGY
Semester II
Paper II and Practical II**

F.Y.B.Sc. ZOOLOGY (THEORY)

SEMESTER II

Course Code: USC2ZO2

Course IV: Fundamentals of Genetics

Credit 2

Course Objectives:

- To introduce the learners about basic concepts of genetics and
- To correlate Application of genetics in day-to-day life.
- To understand the basic concept of DNA, Gene and genome organization

Course Outcomes

- Learners will be able to understand the basic concepts of genetics.
- Learners will be able to understand recombination and interaction of Genes
- Learners will appreciate impact of genetics on diversity of animals.

Unit I: Mendelian Inheritance

(15 Lectures)

1.1. Genetics: scope and importance.

1.2. Elements of heredity and variation:

1.2.1. Classical and Modern concept of Gene (Cistron, muton, recon), Alleles etc.

1.2.2. Mendel's laws of inheritance

1.2.3. Chromosomal basis of inheritance and its applications

1.3. Exceptions to Mendelian Inheritance: Incomplete dominance, Codominance, Multiple allelism, Lethal alleles, Pleiotropy, Epistasis - Recessive, Double recessive and double dominant

1.4. Autosomal dominant and autosomal recessive, X-linked dominant, and X-linked recessive.

Unit II: Sex determination and Sex linkage

(15 Lectures)

2.1. Mechanism of Sex determination: XX/XO, XX/XY, ZZ/ZW

2.2. Multiple alleles

2.3. Genic balance theory, intersex, gynandromorphs.

2.4. Hormonal influence on sex determination-Freemartin and sex reversal.

2.5. Role of environmental factors- Bonellia and Crocodile.

Unit III: Basics of linkage and crossing over

(15 Lecture)

3.1. Basics of linkage and its types

3.2. Basics of crossing over and its type, Factors influencing crossing over

3.3. Chromosomal mapping

**F.Y.B.Sc. ZOOLOGY
SEMESTER II
PRACTICAL CODE: USC2ZOP**

1. Study of Human karyotypes
2. Study of monohybrid ratio/ dihybrid ratio.
3. Study of multiple alleles/ epistasis.
4. Study of inheritance patterns by pedigree analysis in human for autosome and sex chromosome.
5. Mounting of Barr bodies.
6. Identification of the following genetic traits in human: widow's peak, attached ear lobe, dimple in chin, hypertrichosis, colour blindness, Rolling of tongue, Dimple in cheek.
7. Study of ABO blood group system. (Experimental)
8. Survey project based on genetics.

REFERENCE BOOKS AND ADDITIONAL READING

1. Principles of Genetics. Gardner, E.J., Simmons, M.J and Snustad, D.P. John Wiley and Sons
2. Concepts of Genetics. Klug, W.S., Cummings M.R., Spencer, C.A. Benjamin Cummings.
3. Genetics- A Molecular Approach. Russell, P. J Benjamin Cummings.
4. Genetics: Analysis of Genes and Genomes. Daniel L., Hartl, Elizabeth W. Jones Jones & Bartlett Publishers
5. Introduction to Genetic Analysis. Griffiths, A.J.F., Wessler. S.R., Lewontin, R.C. and Carroll, S.B. W. H. Freeman and Co.
6. Cell Biology, Genetics, Molecular Biology Evolution and Ecology. Verma P.S. and Agrawal P.K., 9th edition, S. Chand Publication, New Delhi.
7. Principles of Genetics – Eight edition- Eldon John Gardner, Michael J. Simmons, D. Peter Snustad
8. Genetics- Weaver, Hedrick, third edition, Mc Graw Hill Education
9. Genetics A Mendelian approach Peter Russel, Pearson Benjamin Cummings
10. Genetics A conceptual approach, Benjamin A. Pierce, Southwestern University, W.H. Freeman and company, New York
11. Genetics, Third Edition, M o n r o e W. Strickberger
12. Genetics from gene to genome, third edition, Leeland H. Hartwell, Leeroy Hood, Michael 7. L. Goldberg, Ann E. Reynolds, Lee M. Silver, McGraw Hill Education

N.B.

I) It is pertinent to note that we have to adhere strictly to the directions as given in the UGC Circular F14-4/2006 (CPP-II).

II) Apart from the institutional Animal Ethics Committee (IAEC) and any other Committee appointed by a Competent Authority/Body from time to time, every college should constitute the following Committees:

- 1) A Committee for the Purpose of Care and Supervision of Experimental Animals (CPCSEA) and
- 2) A Dissection Monitoring Committee (DMC)

Composition of DMC shall be as follows:

- i) Head of the Concerned Department (Convener/Chairperson)
- ii) Two Senior Faculty Members of the concerned Department
- iii) One Faculty of related department from the same College
- iv) One or two members of related department from neighbouring colleges.

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Syllabus for S.Y.B.Sc.
Program B.Sc.

Course: ZOOLOGY

Semester III and IV

(Credit Based Semester and Grading System with effect from
the academic year 2020-2021)

Syllabus for
S.Y.B.Sc.

Course – ZOOLOGY

1. Preamble
2. Aims
3. Syllabus Semester III & IV
4. Questions paper pattern (Theory & Practical)
5. References and Additional Reading

PREAMBLE

The ongoing B.Sc. Zoology course was introduced by the Faculty of Sciences from the academic year 2019-2020. The new course of S.Y.B.Sc. Zoology that will be effective from the academic year 2020-2021, will follow the Semester mode. It has been prepared keeping in view the unique requirements of B.Sc. Zoology students. The syllabus has been drawn up to introduction of the classical zoology with accommodation of widening horizons of the discipline of Biological Sciences.

The Board of Studies examined the existing syllabus and after analyzing with respective subjects in term of content relevance, quality and pattern of teaching along with examination in present scenario.

With the holistic approach the syllabus including basic as well as advanced concepts in Zoology from first year to third year shall inspire the students for pursuing higher studies in Zoology and for becoming an entrepreneur and also enable students to get employed in the Biological research Institutes, Industries, Educational Institutes and in the various concerning departments of State and Central Government based on subject Zoology

Aims

- To nurture interest in the students for the subject of Zoology
- To create awareness of the basic and modern concepts of Zoology
- To study of heredity and its variations
- To orient students to study of the origin of animals and their adaptation to their environments
- To motivate the students for self-employment in various applied branches of Zoology.
- To inculcate good laboratory practices in students and to train them about scientific handling of important instruments.

S.Y.B.Sc.					
Semester III			Semester IV		
Course 5	Course 6	Course 7	Course 8	Course 9	Course 10
Unit 1 Fundamentals of Genetics	Unit 1 Study of Nutrition & Excretion	Unit 1 Comparative embryology	Unit 1 Origin and Evolution of life	Unit 1 Cell Biology	Unit 1 Sericulture
Unit 2 Chromosome & Heredity	Unit 2 Respiration & Circulation	Unit 2 Ethology	Unit 2 Population Genetics and Evolution	Unit 2 Endomembran e System	Unit 2 Apiculture, Vermiculture and Dairy Science
Unit 3 Nucleic Acids	Unit 3 Control and Coordination Locomotion & Reproduction	Unit 3 Parasitology	Unit 3 Scientific Attitude, Methodology, Writing & Ethics	Unit 3 Biomolecule s	Unit 3 Aquaculture
Practical I	Practical II	Practical III	Practical I	Practical II	Practical III

Course - ZOOLOGY
To be implemented from Academic year 2020-21
SEMESTER - III

COURSE CODE	UNIT	TOPIC	CREDITS	LECTURES /WEEK
USZ0301	I	Fundamentals of Genetics	2	1
	II	Chromosomes and Heredity		1
	III	Nucleic acids		1
USZ0302	I	Nutrition and Excretion	2	1
	II	Respiration and Circulation		1
	III	Control and coordination, Locomotion and Reproduction		1
USZ0303	I	Comparative embryology	2	1
	II	Ethology		1
	III	Parasitology		1
USZOP3		Practical's based on all three courses	3	9

Course – ZOOLOGY
Semester IV

COURSE CODE	UNIT	TOPIC	CREDITS	LECTURES /WEEK
USZO401	I	Origin and Evolution of Life	2	1
	II	Population genetics and evolution		1
	III	Scientific Attitude, Methodology, Writing & Ethics		1
USZO402	I	Cell Biology	2	1
	II	Endomembrane System		1
	III	Biomolecules		1
USZO403	I	Sericulture	2	1
	II	Apiculture, Vermiculture and Dairy Science		1
	III	Aquaculture		1
USZOP4		Practical's based on all three courses	3	9

**Syllabus
for
S.Y.B.Sc.**

Course - ZOOLOGY

1. Syllabus Semester III & IV (Theory and Practical)
2. References and Additional Reading
3. Scheme of Examination and Paper Pattern (Theory and Practical)

S.Y.B.Sc SYLLABUS DRAFT

SEMESTER III

USZO301 COURSE-5

Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids

Sr. No	USZO301 COURSE-5	No. of lecture allotted	Learning
	Fundamentals of Genetics, Chromosomes and Heredity, Nucleic acids		
	Unit 1: Fundamentals of Genetics	15L	25hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ <i>To introduce basic terms of genetics.</i> ➤ <i>To develop conceptual clarity of Mendelian principles of inheritance and other forms and pattern of inheritance</i> 		
	<p>Desired outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner would comprehend and apply the principles of inheritance to study heredity.</i> ➤ <i>Learner will understand the concept of multiple alleles, linkage and crossing over.</i> 		
1.1	<p>Introduction to Genetics</p> <ul style="list-style-type: none"> ● Definition, Scope and Importance of Genetics. ● Classical and Modern concept of Gene (Cistron, Muton, Recon). ● Brief explanation of the following terms: Allele, Wild type and Mutant alleles, Locus, Dominant and Recessive traits, Homozygous and Heterozygous, Genotype and Phenotype, Genome. 	2L	2hrs

1.2	<p>Mendelian Genetics</p> <ul style="list-style-type: none"> • Mendelian Genetics: Monohybrid & Dihybrid Cross, Test Cross, Back Cross, Mendel's Laws of Inheritance, Mendelian Traits in Man. • Exceptions to Mendelian inheritance: Incomplete dominance, Co- dominance, Lethal Genes, Epistasis - Recessive, Double recessive, Dominant and Double dominant. • Chromosome theory of inheritance. • Pedigree Analysis-Autosomal dominant and recessive, X-linked dominant, and recessive. 	8L	12hrs
1.3	<p>Multiple Alleles and Multiple Genes</p> <ul style="list-style-type: none"> • Concept of Multiple Alleles, Coat colour in rabbit, ABO and Rh blood group system • Polygenic inheritance with reference to skin colour and eye colour in humans. • Concept of Pleiotropy. 	03L	06hrs
1.4	<p>Linkage and Crossing Over</p> <ul style="list-style-type: none"> • Linkage and crossing over, Types of crossing over, Cytological basis of crossing over. 	02L	05hrs
Unit: 2: Chromosomes and Heredity		15L	26hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ To familiarize the learners with the structure, types and classification of chromosomes. ➤ To introduce the concept of sex determination and its types, sex influenced and sex-limited genes. 		

	<p>Desired outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner will comprehend the structure of chromosomes and its types.</i> ➤ <i>Learner will understand the mechanisms of sex determination.</i> ➤ <i>Learner would be able to correlate the disorders linked to a particular sex chromosome.</i> 		
2.1	<p>Chromosomes</p> <ul style="list-style-type: none"> ● Types of Chromosomes–Autosomes and Sex chromosomes ● Chromosome structure - Heterochromatin, Euchromatin ● Classification based on the position of centromere ● Endomitosis, Giant chromosomes- Polytene and Lampbrush chromosomes and Significance of Balbiani rings 	04L	08hrs
2.2	<p>Sex- determination</p> <ul style="list-style-type: none"> ● Chromosomal Mechanisms: XX-XO, XX-XY, ZZ-ZW ● Sex determination in Honey bees: Haplo-diploidy ● Sex determination in <i>Drosophila</i>- Genic balance theory, Intersex, Gynandromorphs ● Parthenogenesis ● Hormonal influence on sex determination- Freemartin and Sex reversal. ● Role of environmental factors- <i>Bonelia</i> and Crocodile ● Barr bodies and Lyon hypothesis 	07L	10hrs
2.3	<p>Sex linked, sex influenced and sex-limited inheritance.</p> <ul style="list-style-type: none"> ● X-linked: Colour-blindness, Haemophilia ● Y-linked: Hypertrichosis ● Sex-influenced genes ● Sex-limited genes 	04L	08hrs

	Unit: 3. Nucleic acids	15L	30hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ <i>To introduce the learner to the classical experiments proving DNA as the genetic material.</i> ➤ <i>To introduce the learner the structure of nucleic acids and the concept of central dogma of molecular biology.</i> ➤ <i>To familiarize the learner with the concept of gene</i> 		
	<p>Desired outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner will understand the importance of nucleic acids as genetic material.</i> ➤ <i>Learner would comprehend and appreciate the regulation of gene expressions.</i> 		
3.1	<p>Genetic material</p> <ul style="list-style-type: none"> ● Griffith's transformation experiment, Avery-Macleod & McCarty experiment and Hershey Chase experiment of Bacteriophage infection ● Chemical composition and structure of nucleic acids ● Double helix nature of DNA, Solenoid model of DNA ● Types of DNA – A, B, Z & H forms ● DNA in Prokaryotes - Chromosomal and Plasmid ● Extra nuclear DNA - Mitochondria and Chloroplast ● RNA as a genetic material in virus ● Types of RNA: Structure and function 	07L	14hrs
3.2	<p>Flow of genetic information in a eukaryotic cell</p> <ul style="list-style-type: none"> ● DNA Replication ● Transcription of mRNA ● Translation ● Genetic code 	05L	08hrs

3.3	Gene expression and regulation <ul style="list-style-type: none">● One gene-one enzyme hypothesis /one polypeptide hypothesis● Concept of Operon● Lac Operon	03L	08hrs
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USZO302 COURSE-6

Study of Nutrition and Excretion, Respiration and circulation, Control and coordination, Locomotion and Reproduction

SEMESTER – III			
Sr. No	USZO302 (COURSE-VI)	No. of lect allotted	Learning pleasure
	Nutrition and Excretion, Respiration and Circulation,		
	Unit: 1 Nutrition and Excretion	15L	23hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ <i>To introduce the concepts of physiology of nutrition, excretion and osmoregulation.</i> ➤ <i>To expose the learner to various nutritional apparatus, excretory and osmoregulatory structures in different classes of organisms.</i> 		
	<p>Desired outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner would understand the increasing complexity of nutritional, excretory and osmoregulatory physiology in evolutionary hierarchy.</i> ➤ <i>Learner would be able to correlate the habit and habitat with nutritional, excretory and osmoregulatory structures.</i> 		
1.1	Comparative study of nutritional apparatus (structure and function): Amoeba, Hydra, Cockroach, Amphioxus, Pigeon, Ruminants.	05L	06hrs
1.2	Physiology of digestion in man.	02L	04hrs
1.3	Comparative study of excretory and osmoregulatory structures and functions. a) Amoeba -Contractile vacuole b) Planaria -Flame cells c) Cockroach- Malpighian tubules	05L	08hrs

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1.4	Categorization of animals based on principle nitrogenous excretory products	01L	01hrs
1.5	Structure of kidney, uriniferous tubule and physiology of urine formation in man	02L	04 hr
Unit: 2 Respiration and Circulation		15L	27hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ <i>To introduce the concepts of physiology of respiration and circulation</i> ➤ <i>To expose the learner to various respiratory and circulatory organs in different classes of organisms.</i> 		
	<p>Desired outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner would understand the increasing complexity of respiratory and circulatory physiology in evolutionary hierarchy.</i> ➤ <i>Learner will be able to correlate the habit and habitat of animals with respiratory and circulatory organs.</i> 		
2.1	Comparative study of respiratory organs (structure and function): Earthworm, Spider, Any bony fish (Rohu / <i>Anabas</i> / <i>Clarius</i>), Frog and Pigeon.	03L	06hrs
2.2	Structure of lungs and physiology of respiration in man	02L	03hrs
2.3	Comparative study of circulation: (a) Open and Closed type, (b) Single and Double type.	02L	04hrs
2.4	Types of circulating fluids- Water, Coelomic fluid, Haemolymph, Lymph and Composition of blood	02L	03hrs
2.5	Comparative study of hearts (structure and function): Earthworm, Cockroach, Shark, Frog, Crocodile and Pigeon.	04L	07hrs
2.6	Structure and mechanism of working of heart in man.	02	04hrs

	Unit: 3 Control and Coordination, Locomotion and Reproduction	15L	25hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ <i>To introduce the concepts of physiology of control and coordination, locomotion and reproduction.</i> ➤ <i>To expose the learner to various locomotory and reproductive structures in different classes of organisms.</i> 		
	<p>Desired outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner would understand the process of control and coordination by nervous and endocrine regulation.</i> ➤ <i>Learner would be amazed by various locomotory structures found in the animal kingdom.</i> ➤ <i>Learner would be acquainted with various reproductive strategies present in animals.</i> 		
3.1	<p>Control and co-ordination</p> <ul style="list-style-type: none"> ● Irritability in <i>Paramecium</i>, nerve net in <i>Hydra</i>, nerve ring and nerve cord in earthworm. ● Types of neurons based on the structure and function. ● Conduction of nerve impulse: Resting potential, Action potential and Refractory period ● Synaptic transmission 	05L	08hrs
3.2	<p>Movement and Locomotion</p> <p>Locomotory organs- structure and functions;</p> <ol style="list-style-type: none"> a. Pseudopodia in <i>Amoeba</i> (Sol- Gel theory), Cilia in <i>Paramecium</i> b. Wings and legs in cockroach c. Tube feet in starfish d. Fins of fish 	04L	08hrs
3.3	Structure of striated muscle fibre in human and sliding filament theory	02L	02hrs

3.4	Reproduction a. Asexual Reproduction- Fission, Fragmentation, Gemmule formation and Budding b. Sexual reproduction i. Gametogenesis ii. Structure of male and female gametes in human iii. Types of fertilization iv. Oviparity, Viviparity, Ovo-viviparity	04L	07hrs
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USZO 303

COURSE-7

Amazing animals, Ethology and Parasitology

SEMESTER III			
USZOE1303 (COURSE-VII			
	Amazing animals ,Ethology and Parasitology,	15L	26hrs
	Unit 1: Comparative Embryology	15L	24hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ <i>To acquaint the learner with key concepts of embryology</i> 		
	<p>Desired Outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner will be able to understand and compare the different types of eggs and sperms</i> ➤ <i>Learner will be able to understand and compare the different pre- embryonic stages</i> 		
1.1	Types of Eggs- Based on amount and distribution of yolk	03L	4hrs
1.2	Structure and Types of Sperm	02L	4hr
1.3	Types of Cleavages	02L	4hrs
1.4	Types of Blastulae	02L	4hrs
1.5	Types of Gastrulae	02L	4hrs
1.6	Coelom -Formation and types	04L	6hrs
Unit: 2 Ethology			
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ <i>To equip learner with a sound knowledge of how animals interact with one another and their environment.</i> ➤ <i>To enable the learner to understand different behavioural patterns.</i> 		
	<p>Desired Outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner would gain insight into different types of animal behaviour and their role in biological</i> 		

	<p><i>adaptations.</i></p> <p>➤ <i>Learner would be sensitized to the feelings which are instrumental in social behaviour.</i></p>		
2.1	<p>Introduction to Ethology:</p> <ul style="list-style-type: none"> ● Definition, History and Scope of Ethology ● Animal behaviour : Innate and Learned behaviour ● Types of learning: Habituation, Imprinting and Types of imprinting - Filial and sexual, Classical conditioning ● Instrumental learning and insight learning. 	04L	06hrs
2.2	<p>Aspects of animal behavior:</p> <ul style="list-style-type: none"> ● Communication in bees and ants ● Mimicry and colorations ● Displacement activities, Ritualization ● Migration in fish, schooling behaviour ● Habitat selection, territorial behaviour. 	07L	12hrs
2.3	<p>Social behaviour:</p> <ul style="list-style-type: none"> ● Social behaviour in primates-Hanuman langur ● Elements of socio-biology: Altruism and Kinship 	04L	08hrs
Unit: 3 Parasitology		15L	27hrs
	<p>Objectives:</p> <p>➤ <i>To acquaint the learner with the concepts of parasitism and its relationship in the environment.</i></p> <p>➤ <i>To introduce the learner to modes of transmission of parasites.</i></p>		
	<p>Desired Outcome:</p> <p>➤ <i>Learner would understand the general epidemiological aspects of parasites that affect humans and take simple preventive measures for the same.</i></p> <p>➤ <i>Learner would comprehend the life cycle of specific parasites, the symptoms of the disease and its</i></p>		

	<i>treatment.</i>		
3.1	<p>Introduction to Parasitology and host specificity</p> <ul style="list-style-type: none"> • Definitions: Parasitism, Host, Parasite, Vector-biological and mechanical • Types of parasite- Ectoparasite , Endoparasite and their subtypes • Parasitic adaptations in Ectoparasites and Endoparasites • Host Specificity- - parasite relationship, structural specificity, physiological specificity and ecological specificity 	06 L	06hrs
3.2	<p>Life cycle, pathogenicity, control measures and treatment</p> <ul style="list-style-type: none"> • <i>Leshmania</i> • Liver fluke • Leech • Flea 	04L	06hrs
3.3	<p>Parasitological significance</p> <ul style="list-style-type: none"> • Zoonosis- Bird flu, Anthrax, Rabies and Toxoplasmosis 	05L	03hrs

SEMESTER III
Practical USZOP1 (Course V)

Practical USZOP1 (Course V)	
1	Extraction and detection of DNA
2	Extraction and detection of RNA.
3	Mounting of Barr bodies.
4	Study of Polytene chromosome.
5	Study of mitosis- temporary squash preparation of Onion root tip
6	Detection of blood groups and Rh factor.
7	Problems in genetics a. Monohybrid/ Dihybrid cross b. X- linked inheritance c. Multiple alleles
8	Chromosome morphology: Metaphase spreadsheet (photograph to be provided)
9	Pedigree analysis
10	Problems on molecular biology

SEMESTER III
Practical USZOP2 (Course VI)

Practical USZOP2 (Course VI)	
1	Urine analysis—Normal and abnormal constituents
2	Detection of ammonia in water excreted by fish
3	Detection of uric acid from excreta of Birds
4	Study of striated and nonstriated muscle fibre
5	Study of nutritional Apparatus (Amoeba, Hydra, Earthworm, Pigeon, Ruminant stomach)
6	Study of respiratory structures: a. Gills of Bony fish and Cartilaginous fish. b. Lungs of Frog c. Lungs of Mammal. d. Accessory respiratory structure in Anabas (Labyrinthine organ) e. Air sacs of Pigeon
7	Study of locomotory organs (Amoeba, Unio, Cockroach, Starfish, Fish, and Birds)
8	Study of hearts (Cockroach, Shark, Frog, Calotes, Crocodile, Mammal)
9	Study of permanent slides on topic of Reproduction a. Sponge gemmules b. Hydra budding c. T.S. of mammalian testis d. T.S. of mammalian ovary

10	Field visit- Visit to vermicomposting unit or Visit to Aquarium or wild life sanctuaries and submission of report. (Report may be submitted in a group not exceeding five students).
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SEMESTER III

Practical USZOP3 (Course VII)

Practical USZOP3 (Course VII)	
1	Study of the following permanent slides- Mammalian sperm and ovum
2	Study of types of Egg– fish, frog and hen
3	Study of the following permanent slides - Cleavage, blastula and gastrula (Amphioxus, Frog and Bird)
4	Study of ethological aspects: a) Warning colouration b) Animal instinct c) Imprinting
5.	Study of ethological aspects: d) Communication in animals: Chemical signals and Sound signals e) Displacement activities in animals: Courtship and mating behaviour in animals and Ritualization
6	Study of Endoparasites: a. <i>Leshmania</i> b. Liver fluke
7	Study of Ectoparasites: a. Leech b. Flea
8	Parasitic adaptations: Scolex and mature proglottid of Tapeworm
9	Preparation and staining of temporary slides

Note -The practical's may be conducted by using specimens authorised by the wildlife and such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practical's mentioned here-in-above.

#There shall be at least one excursion/field trip.

SEMESTER -III

REFERENCE BOOKS AND ADDITIONAL READING

COURSE-V (USZO301)

1. Principles of Genetics. Gardner, E.J., Simmons, M.J and Snustad, D.P. John Wiley and Sons
2. Concepts of Genetics. Klug, W.S., Cummings M.R., Spencer, C.A. Benjamin Cummings.
3. Genetics- A Molecular Approach. Russell, P. J Benjamin Cummings.
4. Genetics: Analysis of Genes and Genomes. Daniel L., Hartl, Elizabeth W. Jones Jones & Bartlett Publishers
5. Introduction to Genetic Analysis. Griffiths, A.J.F., Wessler. S.R., Lewontin, R.C. and Carroll, S.B. W. H. Freeman and Co.
6. Cell Biology, Genetics, Molecular Biology Evolution and Ecology. Verma P.S. and Agrawal P.K., 9th edition, S. Chand Publication, New Delhi.
7. Principles of Genetics – Eight edition- Eldon John Gardner, Michael J. Simmons, D. Peter Snustad
8. Genetics- Weaver, Hedrick, third edition, Mc Graw Hill Education
9. Genetics A Mendelian approach Peter J. Russell, Pearson Benjamin Cummings
10. Genetics A conceptual approach, Benjamin A. Pierce, Southwestern University, W.H. Freeman and company, New York
11. Genetics, Third Edition, Monroe W. Strickberger
12. Genetics from gene to genome, third edition, Leeland H. Hartwell, Leeroy Hood, Michael 7. L. Goldberg, Ann E. Reynolds, Lee M. Silver, McGraw Hill Education

SEMESTER -III

REFERENCE BOOKS AND ADDITIONAL READING

COURSE-VI (USZO302)

1. Vertebrate Zoology Volume I- Jordan and Verma , S. Chand and Co.
2. Invertebrate Zoology Volume II- Jordan and Verma , S. Chand and Co.
3. Invertebrate Zoology- Majupuria T. C., Nagin S. and Co.
4. Chordate Zoology- Dhami P. S. and Dhami J. K. , R. Chand and Co.
5. Invertebrate Zoology- Dhami P. S. and Dhami J. K., R. Chand and Co.
6. Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition.
7. Zoology- Miller S. A. and Harley J. B., Tata McGraw Hill.
8. Modern Textbook of Zoology, Invertebrates, Kotpal R. L.
9. Biological Science, Taylor D.J., Stout G.W., Green N.P.O, Soper R., Cambridge University Press.

SEMESTER -III
REFERENCE BOOKS AND ADDITIONAL READING

COURSE-VII (USZ0303)

1. Biology. E. P. Solomon, L. R. Berg, D. W. Martin, Thompson Brooks/Cole
2. Animal Behavior: Mechanisms, Ecology and Evolution Stephen Vessey, Elizabeth Jacob, S. H. Vessey and L. C. Drickamer, McGraw-Hill.
3. Animal Behaviour- David McFarland
4. Animal Behaviour- Mohan Arora
5. Animal Behaviour- Reena Mathur
6. An introduction to Animal Behaviour- Manning and Dawkins
7. Animal Behaviour-Agarwal
8. Principles of Animal Communication. Bradbury, J.W. and S.L. Vehrencamp. Sinauer Assoc. Sunderland, Massachsets, USA.
9. The biology of Behaviour. Eibl-Eibesfeldt, I. Ethlogy. Holt,Rineheart & Winston, New York.
10. The Book of Indian Dogs- S. Theodore Baskaran (2017) Aleph Book Company
11. Newsletters- Animal Welfare Board of India- awbi.org
12. Candler, W., & Kumar, N. (1998). India: The dairy revolution: The impact of dairy development in India and the World Bank's contribution. World Bank Publications.
13. Park, Y. W., & Haenlein, G. F. (Eds.). (2013). Milk and dairy products in human nutrition: production, composition and health. John Wiley & Sons.
14. Venkatasubramanian, V., Singh, A. K., & Rao, S. V. N. (2003). Dairy development in India: An appraisal of challenges and achievements. Concept Publishing Company
15. Shrivastava, J. S. M. (2008). Dairy Development In The New Millennium (The Second White Revolution). Deep and Deep Publications.
16. Developmental Biology- 5th Edition, Scot F. Gilbert, Sinauer Associates Inc.
17. Developmental Biology- Subramoniam T., Narosa Publishers.
18. Developmental Biology-BerrilN.J., Tata McGraw –Hill Publication.
19. Essential Reproduction-Martin H. Johnson, Wiley-Blackwell Publication.
20. Chick Embryology- Bradley M. Pattern.
21. Embryology-Mohan P. Arora.
22. Chordate Embryology-Dalela, Verma and Tyagi

SCHEME OF EXAMINATION

- (a) One Theory examination of seventy five (75) marks per course per semester should be conducted as per the following skeleton question paper pattern.
- (b) One practical examination of fifty (50) marks per course each should be conducted at the end of every semester.
- (c) Internal assessment and overall performance twenty five (25) marks.

SKELETON PAPER PATTERN FOR THEORY EXAMINATION

NOTE: All Questions are compulsory.

Figures to the right indicate full marks.

Draw neat labelled diagrams wherever necessary.

Question number 1, 2 and 3 will be 20 Marks each and Question 4 for 15 Marks

Time: 2.5 hours

Total marks: 75

- Q.1. Unit I may have questions carrying 12 and 8 marks OR of 10 marks each with 100% internal options
- Q.2. Unit II may have questions carrying 12 and 8 marks OR of 10 marks each with 100% internal options
- Q.3. Unit III may have questions carrying 12 and 8 marks OR of 10 marks each with 100% internal options
- Q.4. Unit I, II and III (Any3 out of 6)
For Q.1, 2, 3 and 4 there shall be 100% internal option.

PRACTICAL
USZOP-I (Course V)
Skeleton-Practical Examination Question Paper Pattern

Time: 3 hrs

Marks: 50

Major Question

15 marks

Q1. Extraction and detection of DNA

OR

Q1. Extraction and detection of RNA

Minor Question

07 marks

Q2. Mounting of Barr bodies

OR

Q2. Study of mitosis-Temporary squash preparation of Onion root
tip OR

Q2. Detection of blood groups and Rh factor

Q3. Problems on Genetics and Molecular biology (Transcription /Genetic code) (01
problem each)

10 marks

Q4. Identification

08 marks

- a. Chromosome morphology
- b. Pedigree analysis

Q5. Viva and Journal

10 marks

**PRACTICAL
USZOP-2 (Course VI)**

Skeleton-Practical Examination Question Paper Pattern

Time: 3 hrs

Marks: 50

Major Question

15 marks

Q1. Urine analysis—Normal and abnormal constituents

Minor Question

10 marks

Q2. Detection of ammonia in water excreted by fish

OR

Q2. Detection of uric acid from excreta of Birds

Q3. Identification

15 marks

- a. Nutritional apparatus
- b. Respiratory structures
- c. Locomotory organs
- d. Study of hearts
- e. Permanent slides on reproduction

Q4. Viva

05 marks

Q5. Journal

05 marks

PRACTICAL
USZOP-3 (Course VII)

Skeleton -Practical Examination Question Paper Pattern

Time: 3 hrs

Marks: 50

Major Question

12 marks

Q1. Preparation and staining of temporary slides

Q2. Identify and describe as per instructions (3 marks each)

18 marks

- a. Any one permanent slide types of Egg– fish, frog and hen
- b. Any one permanent slide Cleavage, blastula and gastrula (Amphioxus, Frog and Bird)
- c. Any one from Animal behavior
- d. Any one from Ectoparasites
- e. Any one from Endoparasites

Q3. Survey project report.

10 marks

Q4. Viva and Journal

10 marks

**SEMESTER IV
USZO401 COURSE-8**

Origin and Evolution of Life, Population Genetics, Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research

SEMESTER IV			
USZO401 COURSE-8			
	Origin and Evolution of Life, Population and Evolutionary Genetics, Scientific Attitude, Methodology, Scientific Writing and Ethics in Scientific Research.		
	Unit 1: Origin and Evolution of Life	15L	30hrs
	Objectives: ➤ <i>To impart scientific knowledge about how life originated and evolved on our planet.</i>		
	Desired outcomes: ➤ <i>Learner will gain insight about origin of life.</i> ➤ <i>Learner will ponder and critically view the different theories of evolution.</i>		
1.1	Introduction ● Origin of Universe ● Chemical evolution - Miller-Urey experiment, Haldane and Oparin theory ● Origin of Life ● Origin of Eukaryotic cell	05L	10hrs
1.2	Evidences in favour of Organic evolution ● Evidences from: Geographical distribution, Palaeontology, Anatomy, Embryology, Physiology and Genetics	04L	08hrs
1.3	Theories of organic evolution ● Theory of Lamarck ● Theory of Darwin and Neo Darwinism ● Mutation Theory ● Modern Synthetic theory ● Weismann's Germplasm theory ● Neutral theory of Molecular evolution	06L	12hrs

	Unit: 2: Population Genetics and Evolution	15L	28hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ To develop knowledge and understanding of genetic variability within a population and how the change in the gene pool leads to evolution of species 		
	<p>Desired outcomes:</p> <ul style="list-style-type: none"> ➤ Learner would understand the forces that cause evolutionary changes in natural populations ➤ Learner would comprehend the mechanisms of speciation ➤ Learner will be able to distinguish between microevolution, macroevolution and megaevolution 		
2.1	<p>Introduction to Population genetics</p> <ul style="list-style-type: none"> ● Definition ● Brief explanation of the following terms: ● Population, Gene pool, Allele frequency, Genotype frequency, Phenotype frequency, Microevolution 	01L	03hrs
2.2	<p>Population genetics</p> <ul style="list-style-type: none"> ● Hardy- Weinberg Law ● Factors that disrupt Hardy Weinberg equilibrium: Mutation, Migration (Gene flow), Non-random mating (Inbreeding, inbreeding depression, Assortative mating-Positive and Negative, Dis- assortativemating),Genetic drift (Sampling error, Fixation, Bottleneck effect and Founder effect) ● Natural Selection ● Patterns of Natural Selection ● Stabilizing selection ● Directional selection (Examples: Peppered moth, Antibiotic resistance in bacteria, Pesticide resistance) ● Disruptive selection 	06L	10hrs
2.3	<p>Evolutionary genetics</p> <ul style="list-style-type: none"> ● Genetic variation: Genetic basis of Variation- Mutations and Recombination (crossing over during meiosis, independent assortment of chromosomes during meiosis and random union of gametes during fertilization) 	08L	15hrs

	<ul style="list-style-type: none"> • Nature of genetic variations: Genetic polymorphism, Balanced polymorphism, Mechanisms that preserve balanced Polymorphism- Heterozygote advantage and frequency dependent selection, • Neutral variations • Geographic variation (Cline) • Species Concept: Biological species concept and evolutionary species concept • Speciation and Isolating mechanisms: Definition and Modes of speciation (Allopatric, Sympatric, Parapatric and Peripatric) • Geographical isolation • Reproductive isolation and its isolating mechanisms (Prezygotic and Postzygotic) 		
	<ul style="list-style-type: none"> • Macroevolution and Megaevolution: Concept and Patterns of macroevolution (Stasis, Preadaptation /Exaptation, Mass extinctions, Adaptive radiation and Coevolution), Megaevolution 		
	<p>Unit 3: Scientific Attitude, Methodology, Writing and Ethics</p>	15L	32hrs
	<p>Objective:</p> <ul style="list-style-type: none"> ➤ To inculcate scientific temperament in the learner. 		
	<p>Desired outcome:</p> <ul style="list-style-type: none"> ➤ The learner will develop qualities such as critical thinking and analysis. ➤ The learner will develop the skills of scientific communication. ➤ Learner will understand the ethical aspects of research 		
3.1	<p>Process of science:</p> <ul style="list-style-type: none"> • A dynamic approach to investigation: The Scientific method, Deductive reasoning and inductive reasoning, Critical thinking, Role of chance in scientific discovery (serendipity) • Scientific research: Definition, difference 	4L	10hrs

	<p>between method and methodology, characteristics, types</p> <p>Steps in the Scientific method: Identification of research problem, formulation of research hypothesis, testing the hypothesis using experiments or surveys, preparing research/study design including methodology and execution (appropriate controls, sample size, technically sound, free from bias, repeat experiments for consistency), documentation of data, data analysis and interpretation, results and conclusions</p> <ul style="list-style-type: none"> ● Dissemination of data: Reporting results to scientific community (publication in peer-reviewed journals, thesis, dissertation, reports, oral presentation, poster presentation) ● Application of knowledge: Basic research, Applied research and Translational research 		
3.2	<p>Scientific writing:</p> <ul style="list-style-type: none"> ● Structure and components of a research paper: preparation of manuscript for publication of research paper- title, authors and their affiliations, abstract, keywords and abbreviations, introduction, material and methods, results, discussion, conclusions, acknowledgement, bibliography; figures, tables and their legends 	7L	15hrs
3.3	<p>Writing a review paper</p> <ul style="list-style-type: none"> ● Structure and components of review ● Report writing and types of report ● Computer application: Plotting of graphs, Statistical analysis of data. Internet and its application in research-Literature survey, 	03L	05hrs

	online submission of manuscript for publication		
3.4	Ethics <ul style="list-style-type: none">● Ethics in animal research: The ethical and sensitive care and use of animals in research, teaching and testing, approval from Dissection Monitoring Committee (DMC)● Ethics in clinical research: Approval from clinical research ethics committee or/and informed consent	03L	05hrs
3.5	Plagiarism	1L	2hrs

SEMESTER IV
USZO402 COURSE-9

Cell Biology, Endo membrane System and Biomolecules

USZO402 COURSE-9			
Cell Biology, Endo membrane System and Biomolecules			
Unit 1: Cell Biology		15L	24hrs
	<p>Objective:</p> <ul style="list-style-type: none"> ➤ <i>To study the structural and functional organization of cell with an emphasis on nucleus, plasma membrane and cytoskeleton.</i> 		
	<p>Desired outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner would acquire insight into the composition of the transport mechanisms adopted by the cell and its organelles for its maintenance and composition of cell</i> 		
1.1	<p>Introduction to cell biology</p> <ul style="list-style-type: none"> ● Definition and scope ● Cell theory ● Generalized prokaryotic, eukaryotic cell: size, shape and structure 	02L	04hrs
1.2	<p>Nucleus</p> <ul style="list-style-type: none"> ● Size, shape, number and position ● Structure and functions of interphase nucleus ● Ultrastructure of nuclear membrane and pore complex ● Nucleolus: general organization, chemical composition & functions ● Nuclear sap/ nuclear matrix ● Nucleocytoplasmic interactions 	05L	06hrs
1.3	<p>Plasma membrane</p> <ul style="list-style-type: none"> ● Fluid Mosaic Model 	04L	08hrs

	<ul style="list-style-type: none"> ● Junctional complexes ● Membrane receptors ● Modifications: Microvilli and Desmosomes 		
1.4	Transport across membrane <ul style="list-style-type: none"> ● Diffusion and Osmosis ● Transport: Passive and Active ● Endocytosis and Exocytosis 	02L	04hrs
1.5	Cytoskeletal structures <ul style="list-style-type: none"> ● Microtubules: Composition and functions ● Microfilaments: Composition and functions 		
	Unit: 2: Endomembrane System	15L	28hrs
	Objective: <ul style="list-style-type: none"> ➤ <i>To acquaint the learner with ultrastructure of cell organelles and their functions</i> 		
	Desired outcome: <ul style="list-style-type: none"> ➤ <i>Learner would appreciate the intricacy of endomembrane system.</i> ➤ <i>Learner would understand the interlinking of endomembrane system for functioning of cell</i> 		
2.1	Endoplasmic reticulum (ER): General morphology of endomembrane system, ultrastructure, types of ER and biogenesis of ER <ul style="list-style-type: none"> ● Functions of Rough Endoplasmic Reticulum (RER) and Smooth Endoplasmic Reticulum (SER) 	01L	03hrs
2.2	Golgi complex: Ultrastructure of Golgi complex, functions of Golgi complex (protein glycosylation, lipid and polysaccharide metabolism, protein sorting and secretion, Golgi Anti-Apoptotic Protein -GAAP)	06L	10hrs

2.3	Lysosomes: Origin, occurrence, polymorphism and functions; Peroxisomes: Origin, morphology & functions	03L	5hrs
2.4	Mitochondria: Ultrastructure, chemical composition, functions of mitochondria and bioenergetics (Chemical energy & ATP, Krebs's cycle, respiratory chain and oxidative phosphorylation)	05L	10hrs
	Unit: 3 Biomolecules	15L	30hrs
	Objective: <ul style="list-style-type: none"> ➤ <i>To give learner insight into the structure of biomolecules and their role in sustenance of life.</i> 		
	Desired outcome: <ul style="list-style-type: none"> ➤ <i>The learner will realize the importance of biomolecules and their clinical significance.</i> 		
3.1	Biomolecules: Concept of micromolecules and macromolecules	02L	05hrs
3.2	Carbohydrates: <ul style="list-style-type: none"> ● Definition classification, properties and isomerism, glycosidic bond ● Structure of Monosaccharides (glucose and fructose); Oligosaccharides (lactose and sucrose); Polysaccharides (cellulose, starch, glycogen and chitin) ● Biological role and clinical significance 	04L	08hrs

3.3	<p>Amino Acids and Proteins:</p> <ul style="list-style-type: none"> ● Basic structure, classification of amino acids, ● Essential and Non-essential amino acids, Peptide bond, ● Protein conformation: Primary, Secondary, Tertiary, Quaternary ● Types of proteins – Structural (collagen) and functional proteins (haemoglobin) ● Biological role and clinical significance 	05L	08hrs
3.4	<p>Lipids:</p> <ul style="list-style-type: none"> ● Definition, classification of lipids with examples, ester linkage ● Physical and chemical properties of lipids ● Saturated and unsaturated fatty acids ● Essential fatty acids; Triacylglycerols; Phospholipids (lecithin and cephalin); Steroids (cholesterol) ● Biological role and clinical significance 	04L	05hrs
3.5	<p>Vitamins:</p> <ul style="list-style-type: none"> ● Water soluble vitamins (e.g. Vit C, Vit B₁₂) ● Lipid soluble vitamins (e.g. Vit A, Vit D) ● Biological role and clinical significance 	02L	04hrs

SEMESTER IV
USZO403 COURSE-10
Economic Zoology

	USZO403 COURSE-10		
	Economic Zoology		
	UNIT 1 : Sericulture	15L	30 hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ <i>To comprehend the functioning of sericulture industry and its scope in India.</i> ➤ <i>To study the varieties of silk-worms and host plants.</i> ➤ <i>To critically study the life history and rearing of Bombyx mori, harvesting, processing of cocoon, production of silk and diseases afflicting silk-worms.</i> 		
	<p>Desired Outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner would understand the basics of the functioning of sericulture industry and its scope in India.</i> ➤ <i>Learner shall gain knowledge on the varieties of silk-worms, host-plants and aspects on silk extraction and the diseases afflicting silk-worms.</i> 		
1.1	Introduction and scope of sericulture	02L	4hrs
1.2	Varieties of silk worm, host plants	02L	4hrs
1.3	Life history and rearing of <i>Bombyx mori</i>	03L	8hrs
1.4	Harvesting and processing of cocoon	02L	4hrs
1.5	Reeling and extraction of silk	03L	4hrs
1.6	Diseases and control measures	03L	4hrs
	UNIT2: APICULTURE, VERMICULTURE AND DAIRY SCIENCE	06L	08hrs

2.1.	<p>2.1.1 Methods of bee keeping and management</p> <ul style="list-style-type: none"> ● Introduction to different species of honey bees used in apiculture. ● Selection of flora and bees for apiculture. ● Advantages and disadvantages of traditional and modern methods of apiculture. ● Pests and Bee enemies- Wax moth, wasp, black ants, bee-eaters, king crow and disease control 		
	<p>2.1.2 Economic importance</p> <ul style="list-style-type: none"> ● Honey- Production, chemical composition and economic importance ● Bee wax- Composition and economic importance. ● Role of honey bee in pollination. 		
2.2	VERMICULTURE	04L	08hrs
	<p>2.2.1 Rearing methods, management and economic importance</p> <ul style="list-style-type: none"> ● Introduction to different species of earthworms used in vermiculture. ● Methods of vermiculture. ● Maintenance and harvesting 		
	<p>2.2.2 Economic importance:</p> <p>Advantages of vermiculture, demand for earthworms; market for vermicompost and scope for entrepreneurship.</p>		
2.3	DAIRY SCIENCE	05L	08hrs
	<p>Objectives:</p> <ul style="list-style-type: none"> ➤ <i>To comprehend various kinds of aquaculture practices and its scope as fishery resource in India.</i> ➤ <i>To study various techniques employed in aquaculture practices</i> 		

	<p>Desired Outcome:</p> <ul style="list-style-type: none"> ➤ <i>Learner shall understand the aquaculture practices and the scope of fishery in India.</i> ➤ <i>Learner would gain knowledge of various techniques employed in aquaculture practices.</i> 		
	<p>2.3.1 Dairy development in India Role of dairy development in rural economy, employment opportunities</p>		
	<p>2.3.2 Dairy Processing</p> <ul style="list-style-type: none"> ● Filtration, cooling, chilling, clarification, pasteurization, freezing 		
	<p>2.3.3 Milk and milk products</p> <ul style="list-style-type: none"> ● Composition of milk ● Types of milk: <ul style="list-style-type: none"> a) Buffalo milk b) Cow milk (A1 &A2) ● Whole milk and toned milk ● Milk products 		
	UNIT 3: AQUACULTURE	15L	24hrs
3.1	<p>Pisciculture:</p> <ul style="list-style-type: none"> ● Definition and scope of fishery resources in India ● Finfish culture – monoculture and polyculture ● Role of exotic fishes in polyculture ● Cage culture ● Fish seed transport ● Fish diseases -- symptoms and control 	05L	8rs
3.2	<p>Prawn/shrimp culture: Sources, seed, culture methods –</p> <ul style="list-style-type: none"> ● Giant fresh water prawn (<i>Macrobrachium rosenbergii</i>) 	05L	8hrs

	<ul style="list-style-type: none">• White shrimp (<i>Penaeus vannamei</i>)		
3.3	Pearl culture: <ul style="list-style-type: none">• Pearl producing species and their distribution• Pearl culture methods• Composition of pearl	05L	8hrs

Note -The practicals may be conducted by using specimens authorised by the wildlife and such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practicals mentioned here-in-above.

There shall be at least one excursion/field trip

SEMESTER IV	
Practical USZOP 1 (Course - VIII)	
1	<p>Study of population density by Line transect method & Quadrant method and calculate different diversity indices.</p> <ul style="list-style-type: none"> ● Index of Dominance ● Index of frequency ● Rarity Index ● Shannon Index ● Index of species diversity
2	Study of prokaryotic cells (bacteria) by Crystal violet staining technique
3	Study of eukaryotic cells (WBCs) from blood smear by Leishman's stain
4	<p>Identification and study of fossils:</p> <ul style="list-style-type: none"> ● Arthropods: Trilobite ● Mollusca: Ammonite ● Aves: Archaeopteryx
5	<p>Identification of :</p> <ul style="list-style-type: none"> ● Allopatric speciation (Cyprinodont species) ● Sympatric speciation (Hawthorn fly and Apple maggot fly) ● Parapatric speciation (Snail)
6	Bibliography/ Abstract writing
7	Preparation of Power Point Presentation based on research paper.
8	Review writing based on programmes telecast by Doordarshan, Gyandarshan, UGC programmes or other media sources

SEMESTER IV	
Practical USZOP 2 (Course - IX)	
1	Study of permeability of cell through plasma membrane (osmosis in blood cells)
2	Measurement of cell diameter by occulometer (by using permanent slide)
3	Qualitative tests for carbohydrates (Molisch's test, Benedicts test, Barfoed's test, Anthrone test)
4	Qualitative tests for protein (Ninhydrin test, Biuret test, Millon's test, Xanthoproteic test)
5	Qualitative test for lipids (Solubility test, Sudan III test)
6	Study of rancidity of lipids by titrimetric method
7	Ultrastructure of cell organelles (Electron micrographs) of: <ul style="list-style-type: none"> ● Nucleus ● Endoplasmic reticulum (Smooth and Rough) ● Mitochondria. ● Golgi apparatus ● Lysosomes
8.	Study of clinical disorders due to carbohydrates, proteins and lipid imbalance (Photograph to be provided / symptoms to be given and disorder to be identified)

SEMESTER IV	
Practical USZO P3 (Course - X)	
1.	Study of life cycle of <i>Bombyx mori</i>
2.	Study of Honey Bee: a) Life Cycle of Honey Bee and Bee Hive b) Mouthparts of Honey Bee c) Legs of Honey Bee d) Sting Apparatus of Honey Bee
3.	Estimation and comparison of protein content in Cow and Buffalo milk sample
4.	Estimation and comparison of fat content in Cow and Buffalo milk sample
5.	Study of commercially important fishery. (Catla, Rohu, Catfish, Mackerel, Pomfret, Bombay duck, Prawn/Shrimp, Crab, Lobster, Edible oyster)
6.	Visit to dairy farm /aquaculture/ fish landing centre/fishery institute and submit report of the same
7.	Estimation of dissolved oxygen from the given water sample.
8.	Estimation of salinity by refractometer from the given water sample.
9.	Estimation of conductivity by conductometer from the given water sample.
10.	A project on aquarium setting in laboratory / vermicomposting.
11.	Visit to Sericulture ,Apiculture and Aquaculture Center

Semester IV
REFERENCES AND ADDITIONAL READING

COURSE-VIII (USZO401)

1. Darwin, C. 1859. *On the Origin of Species*. London: John Murray (always seek out the first edition, facsimile version, and avoid later editions).
2. Dobzhansky, T. 1937. *Genetics and the Origin of Species*. New York: Columbia Univ. Press (there are several later editions, and the title changed in the last).
3. Fisher, R. A. 1930. *The Genetical Theory of Natural Selection*. Oxford: Oxford Univ. Press (there is a later edition).
4. Hennig, W. 1966. *Phylogenetic Systematics*. Urbana: Univ. Illinois Press (an English translation of a book published earlier in German).
5. Mayr, E. 1942. *Systematics and the Origin of Species*. New York: Columbia Univ. Press (there is a later edition, with a different title).
6. Schmalhausen, I. I. 1949. *Factors of Evolution*. Philadelphia: Blakiston (publication of this book, written in the early 1940's, was delayed because of war, and then the translation from Russian to English was also delayed; it has been reprinted by Univ. Chicago Press).
7. Bonner, J. T. 1988. *The Evolution of Complexity*. Princeton: Princeton Univ. Press.
8. Hall, B. J. (ed.). 1994. *Homology, the Hierarchical Basis of Comparative Biology*. San Diego: Academic Press (a collection of essays by many authors).
9. Keller, E. F. and E. A. Lloyd. 1992. *Keywords in Evolutionary Biology*. Cambridge, MA: Harvard Univ. Press.
10. Mayr, E. 1982. *The Growth of Biological Thought: Diversity, Evolution and Inheritance*. Cambridge, MA: Harvard Univ. Press.
11. Rieppel, O. 1988. *Fundamentals of Comparative Biology*. Basel: Birkhäuser
12. Dawkins, R. 1982. *The Extended Phenotype*. New York: W. H. Freeman.
13. Williams, G. C. 1992. *Natural Selection: Domains, Levels and Challenges*. New York: Oxford Univ. Press.
14. Crow, J. F. 1991. *Basic Concepts in Population, Quantitative, and Evolutionary Genetics*. New York: W. H. Freeman.
15. Falconer, D. S. 1981. *Introduction to Quantitative Genetics*, second ed. London: Longman.
16. Hartl, D. L. And A. G. Clark. 1989. *Principles of Population Genetics*, second, ed. Sunderland, MA: Sinauer.
17. Real, L. A. (ed.). 1994. *Ecological Genetics*. Princeton: Princeton Univ. Press (a collection of essays by many authors).
18. *Research Methodology, Methods and Techniques*- by C.R. Kothari, Wiley Eastern

Ltd. Mumbai

19. Practical research planning and design 2nd edition- Paul D Leedy, Macmillan Publication

Semester IV
REFERENCES AND ADDITIONAL READING
COURSE-IX (USZO402)

1. Harpers Illustrated Biochemistry 30th Edition / Edition 30 by Victor Rodwell 2015, Publisher:McGraw-Hill Professional Publishing
2. Biochemistry, 5th edition|Jeremy M Berg, John L Tymoczko, and Lubert Stryer 2002,publisher W. H. Freeman and Company.
3. Text Book of Biochemistry – West, Todd, Mason, Bruggen – Amerind Publishing Co. Pvt., Ltd
4. Harper’s Biochemistry – Murray, Granner, Mayes, and Rodwell – Prentice Hall International Inc.
5. Text Book of Biochemistry – West, Todd, Mason, Bruggen – Amerind Publishing Co. Pvt., Ltd.
6. Principles & Techniques of Practical Biochemistry – Wilson, Walker- Cambridge Univ. Press.
7. Principles of Biochemistry – White, Handler, Smith – McGraw Hill Publ.
8. Cell Biology, Genetics, Molecular Biology, Evolution & Ecology – Verma, Agarwal – S. Chand & Co.
9. Molecular & Cell Biology – Bhamrah – Anmol Publ. Pvt. Ltd., New Delhi.
10. Molecular Biology of the Cell – Alberts, Bray, Lewis, Raff, Roberts, Watson – Garland Publishers, New York.
11. Molecular Biology of the gene – J. D. Watson, NH Hopkins, Roberts, Stertz, Weiner-Freeman.
12. Concepts in Biotechnology – Editors- Balasubramanian, Bryee, Dharmalingam, Green, Jayraman – Sangam Books.
13. Molecular Biology of the Gene – Watson, Hopkins, Roberts, Steitz, Weiner – Benjamin Cummings Publishing Co.
14. Molecular Cell Biology – Baltimore, Zipursky, Matsudaria, Darnel – W. H. Freeman & Co., New York.
15. Principles of Biochemistry – White, Handler, Smith – McGraw Hill Publ. 18) Cell & Molecular Biology – Phillip Sheller – Wiley Publ.
16. Lehninger Principles of Biochemistry -David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.
17. Harper’s Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, LangeMedical Books. 25thedition.

18. Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.
19. Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.
20. Biochemistry-Dr. Ambika Shanmugam, Published by Author. 6) Biomolecules- C.Kannan , MJP Publishers,Chennai.

Semester IV
REFERENCES AND ADDITIONAL READING

COURSE-X (USZO403)

1. **Mulberry pests current status and management practices** : Sakthivel, Narendra Kumar Dhahira Beev . Devamani R.S. Teotia Published by Central Silk Board, Ministry of Textiles, Government of India Srirampura, Mysuru - 570 008. July - 2019
2. **Sericulture technologies developed by csrti mysore** Central Sericultural Research & Training Institute (ISO 9001 : 2008 Certified) Central Silk Board – Ministry of Textiles – Govt. of India, CSRTI Mysore
3. **Text Book of Tropical Sericulture**. Publ., Japan Overseas Corporation volunteers – 1975.
4. **Silkworm Rearing Techniques in the Tropics**, Dr. S. Omura, Japan International Cooperation Agency, 1980.
5. **Muga Silk Industry** by S. N. Choudhary, Directorate of Sericulture and weaving, Govt. of Assam, 1982. The natures and property of soils (9th edition) N. C. Brady (Mac Millan pub. Co. Inc., New York.
6. **Handbook of Practical Sericulture** : S.R. Ullal and M.N. Narasimhanna CSB, Bangalore 1987.
7. **Handbook of Silkworm Rearing: Agriculture and Technical Manual-1**, Fuzi Pub. Co. Ltd., Tokyo, Japan1972.
8. **Manual of Silkworm Egg Production**: M. N. Narasimhanna, CSB, Bangalore 1988.
9. **Economics of Sericulture under Irrigated Conditions**: M.S. Jolly, CSR & TI, Mysore, 1982.
10. **Mulberry cultivation** (Vol. I) written by Zheng Ting-xing, Tan Yun-fang, Huang Guangxian and Ma ben. Published by: Oxford and IBH publishing Co. Pvt.Ltd., New Delhi, Bombay, Calcutta.
11. **Silk egg productions** (Vol. III) written by Wang Sang-ming Published by : Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Bombay, Calcutta.
12. **Principles of Sericulture**: Hisao Aruga, Mohan Primlani for Oxford and IBH Publishing Co. Pvt. Ltd., 66, Janpath, New Delhi-110001.
13. **Silkworm Rearing and Disease of Silkworm**, 1956, Ptd. By Director of Ptg., Stn. & Pub.Govt.Press Bangalore

14. **Guide to Bees and Honey:** Ted Hooper, 2010. The World's Best Selling Guide to Beekeeping. Northern Bee Books. Oxford. 8 David Cramp, 2012.
15. **The Complete Step-by-step Book of Beekeeping:** A Practical Guide to Beekeeping, from Setting Up a Colony to Hive Management and Harvesting the Honey. Oxford. 8 David Cramp, 2012. Lorenz Books. London.
16. **Apiculture:** Prost, P. J. (1962). e. Oxford and IBH, New Delhi.
17. **Beekeeping** in India, Singh, S. (1971) , Indian council of Agricultural Research, NewDelhi
18. Living in the Environment-Concepts, Connections and Solutions. G. Tyler Miller and Scott E. Spoolman, Brooks/Cole, Cengage learning.
19. An introduction to conservation biology. Richard B. Primack and Anna A. Sher, Sinauer Associates
20. FishLore.Com – Fresh water Aquarium Book- Free EBook
21. In Association with practical fish keeping magazine www.practicalfishkeeping.co.uk
22. Handbook on Aquafarming-Ornamental Fishes. Published by MPEDA
23. Diseases of ornamental fishes and their control- By A. P. Lipton (2006) eprints.cmfri.org.in

SCHEME OF EXAMINATION

- (d) One Theory examination of seventy five (75) marks per course per semester should be conducted as per the following skeleton question paper pattern.
- (e) One practical examination of fifty (50) marks per course each should be conducted at the end of every semester.
- (f) Internal assessment and overall performance twenty five (25) marks.

SKELETON PAPER PATTERN FOR THEORY EXAMINATION

NOTE: All Questions are compulsory.

Figures to the right indicate full marks.

Draw neat labeled diagrams wherever necessary.

Question number 1, 2 and 3 will be 20 Marks each and Question 4 for 15 Marks

Time: 2.5 hours

Total marks: 75

- Q.1. Unit I may have questions carrying 12 and 8 marks OR of 10 marks each with 100% internal options
- Q.2. Unit II may have questions carrying 12 and 8 marks OR of 10 marks each with 100% internal options
- Q.3. Unit III may have questions carrying 12 and 8 marks OR of 10 marks each with 100% internal options
- Q.4. Unit I, II and III (Any3 out of 6) 15 marks

For Q.1, 2, 3 and 4 there shall be 100% internal option.

PRACTICAL USZOP1
(Course VIII)
Skeleton -Practical Examination Question Paper
Pattern

Time: 3 hrs

Marks: 50

Major Question

12 Marks

Q1. Study Population density by Line transect or Quadrant method and calculate biodiversity indices (any 2)

Minor Question

08 Marks

Q2. Prepare a smear to show prokaryotic cell

OR

Q2. Prepare a smear to show eukaryotic cell.

Q3. Identify and describe as per instructions

08 Marks

a. Fossils

b. Speciation

Q4. From the given article prepare the bibliography/ abstract

06 Marks

Q5. Power point presentation

06 Marks

Q6. Viva and Journal

10 Marks

PRACTICAL
USZOP2 (Course IX)

Skeleton -Practical Examination Question Paper Pattern

Time: 3 hrs

Marks: 50

Major Question

12 marks

Q1. Study of permeability of cell through plasma membrane (Osmosis in blood cells)

OR

Q2. Study of rancidity of lipids by titrimetric method.

Minor Question

08 marks

Q2. Qualitative tests for carbohydrates (Molisch's test, Benedicts test, Barfoed's test, Anthrone test)

OR

Q2. Qualitative tests for proteins (Ninhydrin test, Biuret test, Millon's test, Xanthoproteic test)

OR

Q2. Qualitative test for lipids (Solubility test, Sudan III test)

OR

Q2. Measurement of cell diameter by occulometer (by using permanent slide)

Q3. Identify and describe as per instructions

15 marks

i. Ultra structure of cell organelles (a, b, c)

ii. Clinical disorders (d, e)

Q4. Field Report and Viva based on it.

10 marks

Q5. Journal

05 marks

**PRACTICAL
USZOP3 (Course X)**

Skeleton -Practical Examination Question Paper Pattern

Time: 3 hrs

Marks: 50

Major Question

12 marks

Q1. Estimation and comparison of protein content in Cow and Buffalo milk sample

OR

Q1. Estimation and comparison of fat content in Cow and Buffalo milk sample

Minor Question

08 marks

Q2. . Estimation of Dissolved oxygen from the given water sample.

OR

Q. 2 Estimation of Salinity by refractometer from the given water sample

OR

Q.2 Estimation of conductivity by conductometer from the given water sample

Q3. Describe any two type of commercially important fishery.

Catla, Rohu, Catfish, Mackerel, Pomfret

06 marks

Q3. Identify and describe as per instructions: (Any 3)

09 marks

i. Life Cycle of Honey Bee and Bee Hive

ii. Mouthparts of Honey Bee

iii. Legs of Honey Bee

iv. Sting Apparatus of Honey Bee

v. Life cycle of silk worm

Q4. Visit to dairy farm /aquaculture/ fish landing center/fishery institute and submit report of the same

10 marks

Q5. Journal and viva

05 marks

T.Y.B.Sc. Zoology



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by
UGC
'Best College Award' by University of Mumbai**

Program: B.Sc Zoology

**Revised Syllabus of T.Y.B.Sc. Zoology
Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2021-2022**

Sr. No.	Heading	Particulars
1	Title of Course	Zoology
2	Eligibility for Admission	S.Y.B.Sc. with subject Zoology
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2021-2022

PREAMBLE OF THE SYLLABUS

The ongoing B.Sc. Zoology course was introduced by the Faculty of Sciences from the academic year 2019-2020. The Revised Syllabus of T.Y.B.Sc. Zoology (CBCGS) that will be effective from the academic year 2021- 2022, will follow the Semester mode. It has been prepared keeping in view the unique requirements of B.Sc. Zoology students. The syllabus has been drawn up to introduction of the classical zoology with accommodation of widening horizons of the discipline of Biological Sciences.

The Board of Studies examined the existing syllabus and after analyzing with respective subjects in term of content relevance, quality and pattern of teaching along with examination in present scenario.

With the holistic approach the syllabus including basic as well as advanced concepts in Zoology from first year to third year shall inspire the students for pursuing higher studies in Zoology and for becoming an entrepreneur and also enable students to get employed in the biological research Institutes, Industries, Educational Institutes and in the various concerning departments of State and Central Government based on subject Zoology.

Program Specific Outcomes

- PS01** Gain the comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Zoology and its different subfields.
- PS02** Learn a wide range of approaches, from genetics to molecular and cellular biology, well as physiological processes and anatomy, and diseases
- PS03** Spread awareness about wildlife and ecology as well as the environment and its conservation in the society
- PS04** Gain knowledge of Agro based Small Scale industries like sericulture, aquaculture and vermicomposting.
- PS05** Develop the interest and employability, program includes learning experiences which offer opportunities for higher studies and research at reputed laboratories
- PS06** Understand the concept of research and its type along with basic knowledge of qualitative research techniques, data collection and process of scientific documentation.
- PS07** Analyze the ethical aspects of research and evaluate the different methods of scientific writing and reporting by appropriate documentations and presentations.

OBJECTIVES OF THE COURSE

Zoology deals with the study of animal kingdom along with the different realm. The main focus of curriculum is to enable the learner to be professionally competent and successful in career.

- The learners to be proficient in identification of animals by studying modern system of classification.
- Learners will learn the skill required to study or perceive laboratory and experimental work such as Molecular Biology, Genetic Engineering, Human Genetics and Bioinformatics.
- Learners will achieve proficiency in the skills necessary for the study of haematology and immunology.
- Introduce the learners to principles of toxicology with particular emphasis on toxic responses and toxicity testing and obtain knowledge and practical skills in the toxicology.
- To make the learners to understand the principal concepts of biostatistics, collect data relating to variable/variables, which can be examined and descriptive statistics can be calculated from these data.
- Aim to introduce various tools and their applications in bioinformatics and statistical studies.
- To make learner understand various concepts of endocrinology, developmental biology, integumentary system and human osteology.
- To introduce the learners to understand the importance of different factors of environment and its management, importance of wildlife conservation, zoopharmacognosy and zoogeography.

EXPECTED OUTCOME OF SYLLABUS

The present course of T.Y.B.Sc. Zoology introduced by the Board of studies and Faculty of Sciences from the academic year 2021-22 has some expected outcomes of entire syllabi as follows:

- The present syllabus helps to understand the basic concepts of animal taxonomy and zoological nomenclature and evaluate the significance of museum specimens.
- Students can learn about the historical development of systematic biology from 18th century to the present.
- The syllabus helps learners to understand the concepts, mechanisms, evolutionary significance and relevance of molecular biology in the current scenario.
- Learners will be familiar with the concepts of molecular biology and genetic engineering which holds application in biomedical & genomic science, agriculture, environment management, etc.
- Syllabus will help learners to identify the major cellular and tissue components which comprise the innate and adaptive immune system.
- The students learn about various aspects of enzymological assays and their applications in industries and study of basics histological techniques
- The students will gain a broad understanding of different areas of toxicology.
- Learners will know the theory behind fundamental bioinformatics analysis methods and acquire knowledge of various databases of proteins, nucleic acids, primary, secondary and composite databases like BLAST, FASTA etc. This will make them familiar with widely used bioinformatics databases.
- Learners will know basic concepts of probability and statistics which help them to describe statistical methods and probability distributions relevant for biological data analysis.
- Learners can understand the basic concepts of endocrinology and learn about the hypothalamus and hypophysial axis, endocrine glands and mechanism of hormone action.
- Learners will understand about environment and wildlife management, and learn the basic concepts of bioprospecting, zoopharmacognosy and zoogeography.

SCHEME OF EXAMINATION FOR EACH SEMESTER:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two- and half-hour duration.	
	All questions are compulsory and will have internal options.	
	Q-1	From Unit - I (having internal options.) 15 M
	Q-2	From Unit - II (having internal options.) 15 M
	Q-3	From Unit - III (having internal options.) 15 M
	Q-4	From Unit - IV (having internal options.) 15 M
	Q-5	Questions from all the FOUR Units with equal weightage of marks. Allotted to each Unit. 15 M
II	Practical	The External examination per practical course will be conducted as per the Following scheme.
Sr. No.	Particulars of External Practical Examination	Marks
1.	Laboratory Work	35
2.	Field visit and report	05
3.	Journal	05
4.	Viva	05
	TOTAL	50

Syllabus for T.Y.B.Sc.
Course - ZOOLOGY
 (Credit Based Semester and Grading System)
 (To be implemented from the Academic Year 2021- 2022)

SEMESTER- V					
THEORY					
COURSE NO.	COURSE CODE	UNIT	TOPICS	CREDITS	LECTURES/ WEEK
DSC 11	USC5Z01	I	Basics of Taxonomy, Trends in biosystematics and Dimensions of speciation	2.5	1
		II	Protista and Metazoa		1
		III	Non- Chordates		1
		IV	Type Study – Earthworm		1
DSC 12	USC5Z02	I	Basic Haematology	2.5	1
		II	Applied Haematology		1
		III	Basic Immunology		1
		IV	Applied Immunology		1
DSC 13	USC5Z03	I	Histology	2.5	1
		II	Toxicology		1
		III	Enzymology		1
		IV	Biostatistics		1
DSE 14	USC5Z04	I	Integumentary system and derivatives	2.5	1
		II	Human Osteology		1
		III	Introduction to Endocrinology		1
		IV	Peripheral Endocrine glands		1
				10	16
PRACTICAL					
USC5ZOP	Practicals based on all four courses			06	16
Total Number of Credits and Workload				16	32

Syllabus for T.Y.B.Sc.

Course-ZOOLOGY

(Credit Based Semester and Grading System)

(To be implemented from the Academic Year 2021-2022)

SEMESTER-VI					
THEORY					
COURSE NO.	COURSE CODE	UNIT	TOPICS	CREDITS	LECTURES/ WEEK
DSC 15	USC6Z01	I	Chordata	2.5	1
		II	Euchordata I		1
		III	Euchordata II		1
		IV	Type study - Shark		1
DSC 16	USC6Z02	I	Molecular Biology	2.5	1
		II	Genetic Engineering		1
		III	Human Genetics		1
		IV	Bioinformatics		1
DSC 17	USC6Z03	I	Basic concept Developmental biology	2.5	1
		II	Gametogenesis, fertilization and early		1
		III	Morphogenesis and organogenesis in animals		1
		IV	Chick Embryology		1
DSE18	USC6Z04	I	Environment management	2.5	1
		II	Wildlife management		1
		III	Bioprospecting and		1
		IV	Zoogeography		1
				10	16
PRACTICAL					
USC6ZOP	Practical's based on all four courses			06	16
Total Number of Credits and Workload				16	32

SYLLABUS
T.Y.B.Sc. ZOOLOGY
UNIT WISE DISTRIBUTION

Semester V			
Core Course 11	Core Course 12	Core Course 13	Discipline Specific Elective 14
Unit 1 Basics of Taxonomy, Trends in biosystematics and Dimensions of speciation	Unit 1 Basic Hematology	Unit 1 Histology	Unit 1 Integumentary system and derivatives
Unit 2 Protista and Metazoa	Unit 2 Applied Hematology	Unit 2 Toxicology	Unit 2 Human Osteology
Unit 3- Non- Chordates	Unit 3 Basic Immunology	Unit 3 Enzymology	Unit 3 Introduction to Endocrinology
Unit 4 Type Study – Earthworm	Unit 4 Applied Immunology	Unit 4 Biostatistics	Unit 4 Peripheral Endocrine glands
Practical (USC5ZOP1)	Practical (USC5ZOP2)	Practical (USC5ZOP3)	Practical (USC5ZOP4)

SYLLABUS
T.Y.B.Sc. ZOOLOGY
UNIT WISE DISTRIBUTION

Semester VI			
Core Course 15	Core Course 16	Core Course 17	Discipline Specific Elective 18
Unit 1 Chordata	Unit 1 Molecular Biology	Unit 1 Basic concept Developmental biology	Unit 1 Environmental Management
Unit 2 Euchordata- I	Unit 2 Genetic Engineering	Unit 2 Gametogenesis, fertilization and early development	Unit 2 Wildlife Management
Unit 3 Euchordata- II	Unit 3 Human Genetics	Unit 3 Morphogenesis and organogenesis in animals	Unit 3 Bioprospecting and Zoo pharmacognosy
Unit 4 Type Study- Shark	Unit 4 Bioinformatics	Unit 4 Chick Embryology	Unit 4 Zoogeography
Practical (USC6ZOP1)	Practical (USC6ZOP2)	Practical (USC6ZOP3)	Practical (USC6ZOP4)

Syllabus for T.Y.B.Sc.
Program B.Sc.
Course: ZOOLOGY
Semester V
Paper I and Practical I

T.Y.B.Sc. Zoology Semester V (Theory)

Course Code: USC5Z01

Core Course 11

Principles of Taxonomy, Modern Trends in Taxonomy and study of invertebrates

Course objectives:

To introduce the basics of taxonomy along with the study of invertebrates.

Course outcome:

- *Learners will understand the basics concept of taxonomy and learn to classify animals on the basis of their relation to other animals by body structure, external characters and development*
- *Apply the International rules of Nomenclature to give a scientific name to animals which are found during research.*
- *Understand the gradual development and evolutionary history of different kinds of living organisms from earlier forms over several generations*
- *Understand and demonstrate the internal anatomy of various animals, biodiversity and related indices.*

**Unit 1: Basics of Taxonomy, Trends in biosystematics and Dimensions of speciation
(15 lectures)**

Learning objectives:

To introducing the students for the basic concepts of Taxonomy and trends in biosystematics.

Desired outcome:

Learners will understand the rules of nomenclature and other theories, concepts and principles of taxonomy.

1.1: Definition and basic concept of biosystematics taxonomy and classification.

- a. Introduction,
- b. Definition of taxonomy,
- c. Definition of Systematics
- d. Basic concepts of taxonomy
- e. History of Classification

1.2: Trends in biosystematics

- a. Chemotaxonomy
- b. Cytotoxonomy
- c. Molecular taxonomy

1.3: Dimensions of speciation.

Species concepts: Typological, Nominalist and Biological Species concepts.

Unit 2 - : Protista and Metazoa

(15 lectures)

Learning objectives:

To comprehend the general characters and classification of Kingdom Animalia from Protista and Metazoa and specific characters of organisms.

Desired outcome:

The learners will be familiarized with classification up to Nematoda and their distinctive features.

2.1 : Protozoa

- General characteristics and Classification up to phylum (according to Levine et. al., 1980)
- Locomotion in Euglena, Paramecium and Amoeba; Conjugation in Paramecium.
- Life cycle and pathogenicity of Plasmodium vivax and Entamoeba histolytica

2.2 : Metazoa

- Evolution of symmetry and segmentation of Metazoa

2.3 : Porifera

- General characteristics and Classification up to orders (after Hyman, 1951); Canal system and spicules in sponges

2.4 : Cnidaria

- General characteristics and Classification up to orders.
- Metagenesis in Obelia, Polymorphism in Cnidaria
- Corals and coral reef diversity, function & conservation

2.5 : Ctenophora

- General characteristics and classification upto classes

2.6 : Platyhelminthes

- General characteristics and Classification up to classes

2.7 : Nematoda

- General characteristics and Classification up to classes

Unit3: Non- Chordates

(15 lectures)

Learning objectives:

To introduce basic concepts of classification up to class in animal kingdom from phylum Annelida to Hemichordata and to familiarize with their characters.

Desired outcome:

Learners will get an idea of higher groups of invertebrate animal life, their classification and their peculiar aspects.

3.1 : Introduction

- Evolution of coelom and metamerism

3.2 : Annelida

- General characteristics and Classification up to order
- Excretion in Annelida through nephridia.

3.3 : Arthropoda

- General characteristics and Classification up to subclass
- Vision in Insecta
- Respiration in Arthropoda (Gills in prawn and trachea in cockroach)
- Metamorphosis in Lepidopteran Insects.
- Social life in termite

3.4 : Onychophora

- General characteristics and Evolutionary significance

3.5 : Mollusca

- General characteristics and Classification up to classes
- Nervous system and torsion in Gastropoda
- Feeding and respiration in Pila sp.

3.6 : Echinodermata

- General characteristics and Classification up to orders
- Larval forms in Echinodermata
- Affinities with Chordates

3.7 : Hemichordata

- General characteristics of phylum Hemichordata.
- Relationship with non-chordates and chordates

Unit 4: Type study- Earthworm

(15 lectures)

Learning objective-

To acquaint learners with the details of earthworm as a representative of invertebrate animals.

Desired outcome-

Learners will get an idea of general characteristics and details of invertebrate animal systems.

4.1: General characters and classification, Habit and habitat, External characters, metamerism, locomotion, economic importance.

4.2: Digestive system, Respiratory system, Circulatory system, excretory system, nervous system, and Reproductive system.

T.Y.B.Sc. Semester V (Practical)

Course Code: USC5Z01

Core Course 11

1. Identification of *Amoeba*, *Euglena*, *Entamoeba*, *Opalina*, *Paramecium*, *Plasmodium vivax* and *Plasmodium falciparum* (from the prepared slides)
2. Identification of *Sycon*, *Obelia*, *Physalia*, *Millepora*, *Aurelia*, *Tubipora*, *Corallium*, *Alcyonium*, *Gorgonia*, *Metridium*, *Pennatula*, *Fungia*, *Meandrina*, *Madrepora*
3. Identification and significance of adult *Fasciola hepatica*, *Taenia solium* and *Ascaris lumbricoides*.
4. Staining/mounting of any protozoa/helminth from gut of cockroach.
5. Identification of following specimens (based on specimen characters):
 - a. Annelids- *Nereis*, *Heteronereis*, *Sabella*, *Chaetopterus*, *Pheretima*, *Hirudinaria*
 - b. Arthropods- *Palamnaeus*, *Palaemon*, *Daphnia*, *Balanus*, *Sacculina*, *Eupagurus*, *Scolopendra*, *Julus*, *Bombyx*, *Periplaneta*, *Odontotermes* and *Apis*
 - c. Onychophora- *Peripatus*
 - d. Molluscs – *Chiton*, *Dentalium*, *Pila*, *Doris*, *Helix*, *Lamellidens*, *Ostrea*, *Pinctada*, *Sepia*, *Octopus*, *Nautilus*
 - e. Echinoderms- *Asterias*, *Ophiura*, *Clypeaster*, *Echinus*, *Cucumaria* and *Antedon*
 - f. Hemichordates – *Balanoglossus*
7. Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm using model and chart.
8. Study of T.S. through pharynx, gizzard, and intestine at typhlosolar region of earthworm
9. Study of mouth parts and study of digestive system and nervous system of *Periplaneta*.
10. To submit a Project Report on any related topic on larval forms (arthropods, mollusca and Echinodermata).

Reference and Additional Reading

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Syllabus for T.Y.B.Sc.
Program B.Sc.
Course: ZOOLOGY
Semester V
Paper II and Practical II

T.Y.B.Sc. Zoology Semester V (Theory)

Course Code: USC5Z02

Core Course 12

Haematology and Immunology

Course objective:

Demonstrate an understanding of the components of human blood with their characteristics, functions, abnormalities and related diseases and also to identify the major cellular and tissue components which comprise the innate and adaptive immune system.

Course Outcome:

Learners can achieve proficiency in the skills necessary for the study of haematology and can identify the major cellular and tissue components which comprise the innate and adaptive immune system.

Unit I: Basic Haematology

(15 Lectures)

Learning objectives:

To introduce to the learner the composition of blood, haemorrhage and haematopoiesis and to acquaint the learner with the physiology of blood clotting and clinical aspects of haematology,

Desired outcome:

- *Learner shall be familiar with the fundamental concepts in haematology.*
- *Learner shall comprehend basic haematology.*
- *Learner will be able to identify various components of haemostatic systems.*

1.1 : Composition of blood plasma

Water, plasma proteins, inorganic constituents, respiratory gases, organic constituents other than protein (include internal secretions, antibodies and enzymes)

1.2 : Erythrocytes

Structure and functions, abnormalities in structure, total count, variation in number; ESR; types of anaemia

1.3 : Hemoglobin

Structure, formation and degradation; variants of hemoglobin (fetal, adult), abnormalities in Hemoglobin (Sickle cell and Thalassemia)

1.4 : Leucocytes

Types of leucocytes and function, total count and variation in number; leukemia and its types

1.5 : Thrombocytes

Structure of thrombocytes, factors and mechanism of clotting, failure of clotting mechanism

1.6 : Haematopoiesis

Erythropoiesis, leucopoiesis and thrombopoiesis

1.7 : Blood volume

Total quantity and regulation; hemorrhage

Unit II: Applied Haematology

(15 Lectures)

Learning Objective

- *To introduce to the learner the basics of applied hematology and to impart knowledge of basic diagnostic techniques used in pathology.*

Desired outcome:

- *Learners shall get familiar with different terminologies and diagnostic tests performed in a pathological laboratory.*
- *Learners will be acquainted with diagnostic approaches in haematological disorders*
- *Learners will be better equipped for taking any further pathological course or working in a diagnostic laboratory.*

2.1 : Introduction to Applied Haematology

Scope and brief introduction of basic branches: clinical, microbiological, oncological and forensic hematology

2.2: Diagnostic techniques used in haematology

2.2.1 : Microscopic examination of blood: For detection of blood cancers (lymphoma, myeloma), infectious diseases (malaria, leishmaniasis), hemoglobinopathies (sickle cell, thalassemia)

2.2.2 : Coagulopathies: Diagnostic methods (hemophilia and purpura)

2.2.3 : Microbiological examination: Blood culture: Method and application in diagnosis of infectious diseases (Typhoid and TB)

2.2.4 : Biochemical examination of blood:

- Liver function tests: AST, ALT, Total bilirubin, Direct bilirubin, LDH and Alkaline phosphatase
- Kidney function tests: Serum creatinine, blood urea nitrogen (BUN) Carbohydrate metabolism tests: Blood sugar, Glucose tolerance test, Glycosylated haemoglobin test
- Other biochemical tests: Blood hormones - TSH, FSH, LH.

2.2.5 : Blood Bank: Collection, storage & preservation of blood components, anticoagulants

Unit III: Basic Immunology

(15 Lectures)

Learning Objective:

- *To introduce the topic of immunology by emphasizing the basic concepts to build a strong foundation and to give an overview of the immune system that plays an important role in disease resistance.*

Desired outcome:

- *Learners would comprehend the types of immunity and the components of immune system.*
- *Learners would realize the significant role of immune system in giving resistance against diseases.*

3.1 : Overview of Immunology

Haematopoiesis, Cells and organs of the Immune system

3.2 : Innate and Adaptive Immunity

Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral), Passive: Artificial and natural Immunity, Active: Artificial and natural Immunity, Immune dysfunctions.

3.3 : Antigens

Antigenicity and immunogenicity, Immunogens, Adjuvants and haptens, Factors influencing immunogenicity, B and T-Cell epitopes Definition, properties of antigens; haptens

3.4 : Immunoglobulins

Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions, Immunoassays, Polyclonal sera, Monoclonal antibodies, Hybridoma technology

3.5: Major Histocompatibility Complex (MHC)

Types and Pathways

Unit IV: Applied Immunology

(15 Lectures)

Learning Objective:

- *To introduce to the learner immune related pathologies*
- *To introduce the concept of vaccines and vaccination.*
- *To familiarise the learner to immunological perspectives of organ transplant and tumour treatment.*

Desired outcome:

- *Learners shall understand immune related pathologies and the principles and applications of vaccines.*
- *Learners will develop basic understanding of immunology of organ transplantation.*

4.1 : Antigen-Antibody interaction

4.1.1 : General features of antigen-antibody interaction

4.1.2 : Precipitation reaction- Definition, characteristics and mechanism, Precipitation in gels (slide test), Radial immunodiffusion (Mancini method), Double immunodiffusion (Ouchterlony method)

4.1.3 : Immunoelectrophoresis - Counter current, Laurel's Rocket and crossed immunoelectrophoresis

4.1.4 : Agglutination reaction- definition, characteristics and mechanism
Haemagglutination (slide and micro-tray agglutination), passive agglutination, Coomb's test

4.1.5 : Immunoassay- ELISA

4.2 : Vaccines and Vaccination

4.2.1 : Brief history of vaccination, principles of vaccines-active and passive immunization, Routes of vaccine administration

4.2.2 : Classification of vaccines: Live attenuated; Whole-Killed or inactivated; Sub- unit vaccines: Toxoids, Protein vaccines, Viral-like particles, DNA vaccines

4.2.3 : Adjuvants used for human vaccines – Virosomes and Liposomes, Saponins, Water-in-oil emulsions.

4.2.4 : Vaccines against human pathogens: Polio; Hepatitis A and B; Tuberculosis (BCG)

4.3 : Transplantation Immunology

Introduction to transplantation; Types of grafts; Immunologic basis of graft rejection;

Precautions against graft rejection

4.4 : Auto immune and immunodeficiency disorder

4.4.1: Anaphylaxis,

4.4.2: Auto immune disorders

System specific (Systemic lupus erythematosus, Rheumatoid arthritis) and Organ specific (Grave's Disorder),

4.4.3: Immunodeficiency disorder -Primary (SCID) Secondary (AIDS).

T.Y.B.Sc. Practical (Semester V)

Course codes: USC5ZOP2

Core Course 12

- 1. ABO blood group determination**
- 2. Preparation of a Peripheral Blood Smear**
- 3. Enumeration of Erythrocytes – Total Count.**
- 4. Enumeration of Leucocytes – Total Count.**
- 5. Differential count of Leucocytes**
- 6. Erythrocyte Sedimentation Rate by suitable method– Westergren or Wintrobe method.**
- 7. Estimation of haemoglobin by Sahli’s acid haematin method.**
- 8. Determination of serum LDH.**
- 9. Estimation of total serum/ plasma proteins by Folin’s method.**
- 10. Estimation of serum/ plasma total triglycerides by Phosphovanillin method.**
- 11. Latex agglutination test – Rheumatoid Arthritis.**

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5. Essential Haematology; Victor Hoffbrand, Paul Moss, John Pettit
6. Rapid Review of Hematology; RamadasNayak; Jaypee Brothers
7. Precise Haematology; UshaRusia, MeeraSikka, RenuSaxena; Wiley India
8. Short Textbook of Haematology; Shah B.S.; C.B.S. Publisher and Distributor
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9. Principles of Anatomy & Physiology; Thirteenth Edition; Gerard J. Tortora& Bryan

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11. Biochemistry; Fourth Edition; U. Satyanarayana & U. Chakrapani; Elsevier; 2013

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1. Immunology - Introductory Textbook; Shetty N.; New Age International; 2005
2. Immunology - Essential and Fundamental; Pathak S., & Palan U.; Science Publishers; 2005
3. Immunology: A textbook; Rao C. V.; Alpha Science Int'l Ltd.; 2005
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Syllabus for T.Y.B.Sc.

Program B.Sc.

Course: ZOOLOGY

Semester V

Paper III and Practical III

T.Y.B.Sc. Zoology Semester V (Theory) Course

Code: USC5Z03

Core Course 13

Histology, Toxicology, Enzymology and Biostatistics

Course objectives:

- *To introduce the learners with the basic concepts of enzymology and enzyme kinetics, principles of toxicology and obtain knowledge and practical skills in the toxicology.*
- *To make the learners to understand the principal concepts of biostatistics, collect data relating to variable/variables, which can be examined and descriptive statistics can be calculated from these data.*

Course outcome:

- *The students can learn about various aspects of enzymological assays and their applications in industries and study of basics histological techniques, a broad understanding of different areas of toxicology.*

Unit I: Histology

(15 Lectures)

Learning Objectives:

- *To familiarize the learners with the cellular architecture of the various organs in the body.*
- *To make the learners understand the need and importance of different types of tissues in the vital organs and their functions.*

Desired outcome:

- *Learners would appreciate the well-planned organization of tissues and cells in the organ systems.*

1.1 : Vertical section (V.S.) of skin

Layers and cells of epidermis; papillary and reticular; layers of dermis; sweat glands, sebaceous glands and skin receptors.

1.2 : Digestive System

1.2.1 : Vertical section (V.S.) of tooth – hard tissue – dentine and enamel, soft tissue – dentinal pulp and periodontal ligaments.

1.2.2 : Transverse section (T.S.) of tongue – mucosal papillae and taste buds

1.2.3 : Alimentary canal – Transverse section (T.S.) of stomach, small intestine, large intestine of mammal.

1.2.4 : Glands associated with digestive system - Transverse section (T.S.) of salivary glands, liver.

Unit II: Toxicology

(15 Lectures)

Learning Objective:

- *To introduce the learners to the principles of toxicology with particular emphasis on toxic responses to chemical exposures, nature and effect of toxicity and toxicity testing.*
- *It also intends to develop amongst students an introductory understanding of regulatory affairs in toxicology.*

Desired outcome:

- *The course will prepare learners to develop broad understanding of the different areas of toxicology.*
- *It will also develop critical thinking and assist students in preparation for employment in pharmaceutical industry and related areas.*

2.1 : Basic toxicology

2.1.1 : Introduction to toxicology – brief history, different areas of toxicology, principles and scope of toxicology

2.1.2 : Toxins and Toxicants – Phytotoxins (caffeine, nicotine), Mycotoxins (aflatoxins), Zootoxins (cnidarian toxin, bee venom, scorpion venom, snake venom).

2.1.3 : Characteristics of Exposure – Duration of exposure, Frequency of exposure, Site of exposure and Routes of exposure.

2.1.4 : Types of toxicity – Acute toxicity, subacute toxicity, sub chronic toxicity and chronic toxicity.

2.1.5 : Concept of LD₅₀, LC₅₀, ED₅₀

2.1.6 : Dose Response relationship – Individual/ Graded dose response, Quantal dose response, shape of dose response curves, Therapeutic index, Margin of safety.

2.1.7 : Dose translation from animals to human – Concept of extrapolation of dose, NOAEL (No Observed Adverse Effect Level), Safety factor, ADI (Acceptable Daily Intake).

2.2 : Regulatory toxicology

2.2.1 : OECD guidelines for testing of chemicals (an overview)

2.2.2 : CPCSEA guidelines for animal testing center, ethical issues in animal studies

2.2.3 : Animal models used in regulatory toxicology studies

2.2.4 : Alternative methods in toxicology (*in vitro* tests)

Unit III: Enzymology

(15 Lectures)

Learning Objective:

- *To introduce to the learner the basic concepts of enzyme biochemistry and to make the learner realize the power and application of enzymes in basic and applied science.*

Desired outcome:

- *Learners shall be able to understand basics of enzyme structure and function.*
- *Learners will be able to comprehend variations in enzyme activity and kinetics.*
- *Learners shall appreciate the enzyme assay procedures and the therapeutic application of enzymes.*

3.1: Introduction and Nomenclature

Definition; Concept of activation energy; Nomenclature and classification (based on enzyme Commission) of enzymes; Co-factors and Co-enzymes.

3.2: Enzyme Action

Mechanism of enzyme action; Factors affecting enzyme activity - pH and temperature; Enzyme structure (lysozyme and serine protease) .

3.3: Enzyme kinetics

Derivation of Michaelis-Menten equation and Lineweaver-Burk plot; Concept and significance of K_m , V_{max} and K_{cat} ; Modulation of enzyme activity with reference to GDH.

3.4: Enzyme inhibition

Enzyme inhibitors, competitive and non-competitive inhibitors and their kinetics; therapeutic applications of enzyme inhibitors.

3.5: Regulation of enzyme activity

Allosteric regulation and regulation by covalent modification of enzymes; Isozymes (LDH)

3.6: Applications

Clinical significance and industrial applications of enzymes.

Unit IV: Biostatistics

Learning Objective:

- *To make learners familiar with biostatistics as an important tool of analysis and its applications.*

Desired outcome:

- *The learners will be able to collect, organize and analyze data using parametric and non- parametric tests.*
- *They will also be able to set up a hypothesis and verify the same using limits of significance.*

4.1 : Probability Distributions

Normal, Binomial, Poisson distribution, Z-transformation, p-value, Probability - Addition and multiplication rules and their applications.

4.2 : Measures of Central Tendency and Dispersion

Variance, standard deviation, standard error.

4.3 : Testing of Hypothesis

Basic concepts, types of hypothesis: Null hypothesis and Alternate hypothesis. Levels of significance and testing of hypothesis.

4.4 : Parametric and non-parametric tests

Parametric tests: two-tailed Z-test and t-test.

Non-parametric test: Chi-square test and its applications.

4.5 : Correlation

Correlation coefficient and its significance

T.Y.B.Sc. Semester V (Practical3)

Course Code: USC5ZOP3

Core Course 13

1. Study of mammalian tissues:
 - i. V.S. of Tooth
 - ii. T.S. of Stomach
 - iii. T.S. of small intestine
 - iv. T.S. of Liver
2. Microtomy: Tissue preservation and fixation, dehydration, infiltration, paraffin embedding and block preparation, sectioning, staining.
3. To study the effect of different pH on activity of salivary content (salivary amylase) on starch.
4. To study the effect of different temperature on activity of salivary content (salivary amylase) on starch.
5. Effect of varying pH on activity of enzyme Acid Phosphatase.
6. Effect of varying enzyme concentration on activity of enzyme Acid Phosphatase
7. Effect of varying substrate concentration on activity of enzyme Acid Phosphatase
8. Effect of inhibitor on the activity of enzyme Acid Phosphatase
9. Separation of LDH isozymes by agarose gel electrophoresis
10. Biostatistics- Any 10-example based on theory
11. **Project** (preparation of slides of any suitable tissue). Slides and Report of the same to be submitted at the time of practical examination.

Reference and Additional Reading

Histology

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3. A Textbook of Histology; Mathur Ramesh; Anmol Pub.
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Syllabus for T.Y.B.Sc.

Program B.Sc.

Course: ZOOLOGY

Semester V

Paper IV and Practical IV

T.Y.B.Sc. Semester V (Theory)

Course Code: USC5Z04

Discipline Specific Elective 14

Integumentary system, Human Osteology and Endocrinology

Course Objectives:

To introduce the learners to different integumentary structures, epidermal derivatives in the vertebrates and also to elaborate on structure, functions and regulation of mammalian endocrine glands.

Course outcome:

Learners can understand the basic concepts of Integumentary system, Human osteology and Endocrinology.

Unit 1: Integumentary system and derivatives

(15 Lectures)

Learning Objective:

- *To introduce the learners to understand different integumentary structures and derivatives in the vertebrates and to acquaint learners with special derivatives of integument.*

Desired outcome:

- *Learners will be able to understand the importance of epidermal and dermal derivatives and their functions.*

1.1 : Basic structure of integument

Epidermis and dermis

1.2: Epidermal derivatives of Vertebrates

Hair, hoof, horn, claw, teeth, beak, epidermal scales (large scales, small scales, modified scales - spine), glands - types and functions (mucous, serous, ceruminous, poison, uropygial, salt), type of feathers.

1.3: Dermal derivatives of Vertebrates

Scales in fish; Scutes in reptiles and birds; Dermal scales in mammals- Armadillo, Antler -Caribou

1.4: Special derivatives of integument

Wart in toad, rattle in snake, whale bone in baleen whale, kneepads in camel.

Unit 2: Human Osteology

(15 Lectures)

Learning Objective:

To introduce the learners to different bones of human skeleton and their importance.

Desired outcome:

Learners will be able to understand the structure, types and functions of human skeleton.

2.1: Introduction

Bone structure, physical properties, chemical composition and functions of bones.

2.2: Axial skeleton

2.2.1 : Skull:

General characteristics of skull bones a) Cranial bones b) Facial bones

2.2.2 : Vertebral column:

General characteristics of a vertebra, structure of different types of vertebrae (cervical, thoracic, lumbar, sacrum & coccyx).

2.2.3 : Ribs and sternum (Thorax): General skeleton of ribs and sternum.

2.2.4 : Hyoid bone: Structure and function.

2.3: Appendicular skeleton

2.3.1 : Pectoral girdle and Pelvic girdle in male and female.

2.3.2 : Bones of forelimbs and hind limbs.

Unit 3: Introduction to Endocrinology

(15 Lectures)

Learning Objective:

- *To introduce to the learner the basics of endocrinology.*

Desired outcome:

- *Learners can understand the basic concepts of endocrinology and learn about the hypothalamus and hypophysial axis.*

3.1 : General idea of Endocrine systems

3.2 : Definition and classification of hormones.

3.3 : Mechanism of Hormone action

3.4 : Epiphysis, Hypothalamo-hypophysial Axis

3.5 : Structure and functions of hypothalamus, Regulation of neuroendocrine glands and Feedback mechanisms

3.6 : Structure of pituitary gland, Hormones and their functions.

Unit 4: Peripheral Endocrine Glands

(15 Lectures)

Learning Objective:

- *To introduce the learners about the endocrine glands.*

Desired outcome:

- *Learners shall be able to understand the types & secretions of endocrine glands and their functions.*

4.1 : Structure, Hormones, Functions, Regulation and Disorders of the following glands:

Thyroid gland, Parathyroid gland, Adrenal gland, Pancreas, Ovaries and testes.

T.Y.B.Sc. Semester V (Practical)

Course code: USC5ZOP4

Discipline Specific Elective 14

1. Study of integumentary systems and its derivatives - V.S. of Skin of Shark, Frog, *Calotes*, Pigeon and Human.
2. Study of Human Axial Skeleton - Skull and Vertebral column.
3. Study of Human Appendicular Skeleton - Girdles and Limb bones.
4. Study of the skeleton of Rana (Frog), Varanus, Pigeon
5. Histological and cytological study of the following endocrine glands with the help of Permanent slides:
 - A. T.S. of pituitary
 - B. Pineal gland
 - C. Thyroid
 - D. Parathyroid
 - E. Pancreas
 - F. Adrenal
 - G. Ovary
 - H. Testis
6. Histological study of testes and ovaries from various vertebrate groups.
7. Demonstration of endocrine glands in rat by using charts and model.
8. Estimation of plasma level in any hormone using ELISA.

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Integumentary system and derivatives

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Human Osteology

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Syllabus for T.Y.B.Sc.
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Paper I and Practical I

T.Y.B.Sc. Semester VI (Theory)

Course Code: USC6Z01

Core Course 15

Phylum Chordata, Group Euchordata- I, Group Euchordata II and

Type study - Shark

Unit 1: Phylum Chordata

(15 lectures)

Learning objectives:

To introduce basic concepts of modern Chordate classification with evolution point of view and to understand the concept of taxonomy in higher animal kingdom.

Desired outcome:

Learners will get an idea of origin of Chordates, its taxonomy up to class with reference to phylogeny and their special features.

1.1: General characteristics and outline classification of Phylum Chordata

1.2: Protochordata

1.2.1 : General characteristics and classification of sub-phylum Urochordata and Cephalochordate up to Classes.

1.2.2 : Retrogressive metamorphosis in Ascidia.

1.2.3 : Chordate Features and Feeding in Branchiostoma

Unit 2: Group Euchordata- I

(15 lectures)

2.1: Division – Gnathostomata

Superclass – Pisces and Tetrapoda

Superclass – Pisces- Distinguishing characters.

Class- Placodermi, Chondrichthyes and Osteichthyes-

Distinguishing characters with examples:

- a. Hammer headed shark
- b. Skates and rays, e.g. Saw fish
- c. Chimeras e.g Spotted rat fish
- d. Flying fish, e.g. Exocoetus

2.2: Dipnoi (Lung fish) -

Distribution, habit and habitat, External and internal characters, affinities with superclass

Pisces, affinities and differences with class Amphibia

2.3 : Migration in fish:

Reasons for migration, types of migration; Examples- Eel and Salmon

2.4 : Superclass Tetrapoda-

Class Amphibia -General characters with Examples:

- a. Limb-less amphibian, e.g. Ichthyophis
- b. Tailed amphibian, e.g. Amphiuma
- c. Tail-less amphibian, e.g. Hyla

2.5.: Neoteny and Paedogenesis in Amphibia

Unit 3: Group Euchordata II - Reptilia, Aves and Mammals

(15 Lectures)

Learning objectives:

To introduce the learners to the distinguishing characters of classes Reptilia, Aves and Mammalia and their adaptive features with reference to their habitat.

Learning outcome:

Learners will understand the characteristic features and examples of class of Reptilia, Aves and Mammalia.

3.1 : Class Reptilia:

General characters with examples:

- a. Extinct reptile, e.g. Ichthyosaurus
- b. Living fossil, e.g. Sphenodon
- c. Aquatic reptile, e.g. Chelone
- d. Arboreal reptile, e.g. Chamaeleon

3.2 : Class Aves-

3.2.1. General Characters and Examples

- a. Arboreal bird e.g Wood pecker
- b. Terrestrial bird e.g. Jungle fowl
- c. Swimming bird e.g. Cormorant
- d. Wading bird, e.gs. Pond heron
- e. Birds of prey, e.g. Owl
- f. Flightless birds e.g. Emu

3.2.2: Flight adaptations in birds

3.3 : Class Mammalia

3.3.1 : General characters and examples -

- a. Aquatic mammals, e.g. Dolphin
- b. Egg-laying mammals, e.g. Duck-billed platypus
- c. Pouched mammals, e.g. Kangaroo
- d. Toothless mammals, e.g. Sloth
- e. Gnawing mammals, e.g. Squirrel
- f. Primates, e.g. Lemur

3.3.2 : Adaptations in aquatic mammals with examples.

Unit 4: Type study - Shark

(15 lectures)

Learning objectives:

To study in depth one vertebrate animal type i. e. general characteristics and salient features of animal type - shark.

Learning outcome:

Learners will get an idea of vertebrate animal life after studying one representative animal Shark.

4.1 : Habit & habitat, distribution, external characters and classification, and economic importance.

4.2 : Skin, exoskeleton, endoskeleton, Digestive system, respiratory system, blood vascular System, nervous system, receptor organs, urogenital system, copulation, fertilization and development.

T. Y. B. Sc. Semester VI (Practical)

Course Code: USC6Z01

Core Course 15

1. Group - Protochordata

Subphylum Urochordata -

- a. Class Larvaceae, e.g. Oikopleura
- b. Class Ascidiacea, e.g. Ciona
- c. Class Thaliacea, e.g. Salpa

Subphylum Cephalochordata:

- a. Class Leptocardii, e.g. Branchiostoma (Amphioxus)

2. Subphylum Vertebrata:

i. Division Agnatha

- a. Class Ostracodermi, e.g. Pharyngolepis,
- b. Class Cyclostomata, e.g. Petromyzon

ii. Division- Gnathostomata

➤ Superclass - Pisces:

- a. Class Placodermi e.g. Bothriolepis
- b. Class Chondrichthyes- e.g. Rhinobates . Chimaera
- c. Class- Osteichthyes -e.g. Protopterus , Catfish

➤ Superclass - Tetrapoda :

- a. Class Amphibia, e.g. Ichthyophis, Alytes, Triton
- b. Class Reptilia: e.g. Geochelone (Indian star tortoise) , Sphenodon , Varanus, Alligator

3. Class Aves:

E.g. Archaeopteryx, Ostrich, Penguin, Flamingo, Vulture, Hornbill

4. Class Mammalia

E.g. Duck-billed platypus, Dasyurus (Tiger cat), Dugong, Flying Squirrel, Gorilla.

5. Shark: Study of endoskeleton of shark:

- a. Axial- skull and vertebral column
- b. Appendicular- pelvic and pectoral fins, pelvic and pectoral girdle.

6. Visit to local fish market/Aquarium/ zoo/ National park/Any other relevant place to observe Chordate animals.

References and Additional Readings

1. Modern text book of Zoology – Vertebrates; Professor R.L. Kotpal;
Rastogi publication;Third Edition 2012
2. Vertebrate Zoology for Degree students; V. K. Agarwal; S.Chand Publication; 2012
3. Fundamentals of Zoology, Dr. K.C. Ghosh and Dr. B. Manna,New Central book
Agency (P) Ltd.
4. Chordate Zoology Volume II, Prof. N. Arumogam. Saras Publication.
5. Chordate Anatomy Mohan P. Arora, Himalaya Publishing House, First edition
6. Chordate Zoology, E.L.Jordan, P.S. Verma, S. Chand & Company Ltd.
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T. Y. B. Sc. Semester VI (Theory)

Course Code: USC6Z02

Core Course 16

Molecular Biology, Genetic Engineering,

Human Genetics and Bioinformatics

Unit I: Molecular Biology

(15 Lectures)

Learning Objectives:

- *To introduce learner to chemical and molecular processes that affect genetic material.*
- *To make learner understand the concept of DNA damage and repair, and how gene control is necessary for cell survival.*

Desired outcome:

- *Learner shall get an insight into the intricacies of chemical and molecular processes that affect genetic material.*
- *The course shall prepare learner to recognize the significance of molecular biology as a basis for the study of other areas of biology and biochemistry.*
- *Learner shall also understand related areas in relatively new fields of genetic engineering and biotechnology.*

1.1: Types of mutation

1.1.1 : Point mutations – substitution, deletion and insertion mutations

- Substitution mutations – silent (same-sense), missense and nonsense mutations, transition and transversion
- Deletion and Insertion mutations – frameshift mutations

1.1.2 : Trinucleotide repeat expansions – fragile X syndrome, Huntington disease

1.1.3 : Spontaneous mutation – tautomeric shifts, spontaneous lesions

1.2: Induced mutations/mutagens/mutagenic agents/Nucleic acid damage

1.2.1: Physical agents:

- Ionizing radiation (X-rays, α , β and γ rays)
- Non-ionizing radiation (UV light)

1.2.2: Chemical agents:

- Base analogs (5-bromouracil)

- Intercalating agents (ethidium bromide)
- Deaminating agents (nitrous acid)
- Hydroxylating agents (hydroxylamine)
- Alkylating agents (mustard gas)
- Aflatoxin (aflatoxin B₁)

1.2: Preventative and repair mechanisms for DNA damage

1.2.1 : Mechanisms that prevent DNA damage – superoxide dismutase and catalase

1.2.2 : Mechanisms that repair damaged DNA – direct DNA repair (alkyl transferases, photoreactivation, excision repair)

1.2.3 : Postreplication repair – recombination repair, mismatch repair, SOS repair

1.3: Eukaryotic gene expression

1.3.1 : Regulatory protein **domains**– zinc fingers, helix-turn-helix domain and leucine zipper

1.3.2 : DNA methylation

Unit II: Genetic Engineering

(15 Lectures)

Learning Objective:

- *To introduce learner to a set of techniques to modify an organism's genome to produce improved or novel genes and organisms.*

Desired outcome:

- *The learners shall get acquainted with the vast array of techniques used to manipulate genes which can be applied in numerous fields like medicine, research, etc. for human benefit.*

2.1: Tools in Genetic Engineering

2.1.1 : Enzymes involved in Genetic Engineering:

Introduction, nomenclature and types of restriction enzymes with examples, Ligases– *E. coli* DNA ligase, T4 DNA ligase, polynucleotide kinase, phosphatases, DNA polymerases, reverse transcriptase, terminal transferase

2.1.2 : Vectors for gene cloning: General properties, advantages and disadvantages of cloning vectors - plasmid vectors(pBR322), phage vectors (λ Phage), cosmid vectors (c2XB),

2.1.3 : Cloning techniques: Cloning after restriction digestion - blunt and cohesive end ligation, creation of restriction sites using linkers and adapters, cloning after homopolymer tailing, cDNA synthesis (Reverse transcription), genomic and cDNA libraries

2.2: Techniques in Genetic Engineering

2.2.1 : PCR techniques: Principle of polymerase chain reaction (PCR), Applications of PCR

2.2.2 : Sequencing techniques: DNA sequencing: Maxam-Gilbert method, Sanger's Dideoxymethod, Recent high throughput method, Protein sequencing: Edman's method Applications of sequencing techniques

2.2.3 : Animal Cell culture

Unit III: Human Genetics

(15 Lectures)

Learning Objectives:

- *To introduce learner with genetic alterations in human genome and their diagnosis.*

Desired outcome:

- *The learners shall become aware of the impact of changes occurring at gene level on human health and its diagnosis.*

3.1 : Non-disjunction during mitosis and meiosis

3.1.1 : Chromosomal Aberrations: Structural: Deletion: types, effects and disorders; Translocation: types: Robertsonian and non-Robertsonian, disorders; Inversion: types, effects and significance; Duplication and their evolutionary significance (multigene families)
Numerical: Aneuploidy and Polyploidy (Autopolyploidy and Allopolyploidy)

3.2 : Genetic Disorders

3.2.1 : Inborn Errors of Metabolism: Phenylketonuria, G-6-PD deficiency, Alkaptonuria, Albinism

3.2.2 : Single gene mutation: Cystic fibrosis

3.2.3 : Multifactorial: Breast Cancer

3.2.4 : Uniparental Disomy: Angelman Syndrome and Prader-Willi Syndrome

3.3: Diagnosis

3.3.1 : Prenatal Diagnosis (Amniocentesis) and chorio-villus sampling, Banding techniques (G, C, Q), FISH, Protein truncation test (PTT),

3.3.2 : Genetic counselling: Psycho-social aspects for the individual and the family in connection with genetic investigations

Unit IV: Bioinformatics

(15 Lectures)

Objectives:

- *To introduce learner to bioinformatics – a computational approach to learning the structure and organization of genomes, phylogeny, metabolism and immunology.*

Desired outcome:

- *Learner shall become aware of the computational point of view of studying the genomes.*

4.1: Introduction

4.1.1 : Introduction to Bioinformatics and Bioinformatics web resource (NCBI, EBI, OMIM, PubMed)

4.1.2 : Applications of Bioinformatics

4.2: Databases – Tools and their uses

4.2.1 : Biological databases (With reference to Zoological Databases):

4.2.2 : Primary sequence databases:

Nucleic acid sequence databases (GenBank, EMBL-EBI, DDBJ)

Protein sequence data bases (UniProtKB, PIR, PDB)

4.2.3 : Secondary sequence databases:

Derived databases - PROSITE, BLOCKS, Structure databases and bibliographic databases

4.3: Sequence alignment methods

4.3.1 : BLAST, FASTA

4.3.2 : Types of sequence alignment (Pairwise & Multiple sequence alignment)

4.3.3 : Significance of sequence alignment

4.3.4 : Predictive applications using DNA and protein sequences: Evolutionary studies: Concept of phylogenetic trees convergent and parallel evolution

4.3.5 : Functional Proteomics: Different types of protein chip (detecting and quantifying), applications of Proteomics

4.3.6 : Metabolomics: Concept and applications

4.4. : Predictive applications using DNA and protein sequences (5 L)

4.4.1: Evolutionary studies: Concept of phylogenetic trees convergent and parallel evolution

4.4.2: Functional Proteomics: Different types of protein chip (detecting and quantifying), applications of Proteomics

4.4.3: Metabolomics: Concept and applications

T. Y. B. Sc. Semester VI (Practical)

Course Code: USC6Z02

Core Course 16

- 1. Isolation & Estimation of RNA by Orcinol method.**
- 2. Isolation & Estimation of DNA by Diphenylamine method.**
- 3. Separation of Genomic DNA by Agarose gel electrophoresis.**
- 4. Colorimetric estimation of proteins from given sample by Bradford's method.**
- 5. Problems related to Restriction endonucleases.**
6. Karyotype (Idiogram) analysis for the following syndromes with comments on numerical & structural variations in chromosomes (no cutting of chromosomes):
 - a. Turner's syndrome
 - b. Klinefelter's syndrome
 - c. Down's syndrome
 - d. Cri-du-chat syndrome
 - e. D-G translocation
 - f. Edward's syndrome
 - g. Patau's syndrome
7. Packaging of glassware for tissue culture.
8. Aseptic transfer techniques.
9. Calculation of mitotic index from the photograph or stained preparation of onion root tip or cancer cells.
- 10. Exploring BLAST tool (nucleotide sequence comparison).**
- 11. Exploring the integrated database system at NCBI server and querying (Querying a nucleotide sequence, querying a protein sequence, use of operators (AND, OR & NOT)).**
- 12. Exploring bibliographic database PubMed (Data Mining-Downloading a research paper on subject of interest, use of operators (AND, OR & NOT)).**

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17. A textbook of Biotechnology; R.C.Dubey; S.Chand and Company Ltd., New Delhi
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14. Proteomics; Timothy Palzkill; Springer; 2002

- 15.** Metabolomics - A Powerful Tool in Systems Biology; Jens Hřiriis Nielsen, Michael
- 16.** C. Jewett; Springer; 2007
- 17.** Systems Metabolic Engineering; Dr. Christoph Wittmann, Sang Yup. Lee; Springer; 2012
- 18.** Bioinformatics (Bios Instant Notes); Second Edition (Special Indian Edition); T. Charlie Hodgman, Andrew French and David R. Westhead; Garland Science (Taylor and Francis Group); 2010
- 19.** Understanding Bioinformatics; Marketa Zvelebil and Jeremy O. Baum; Garland Science (Taylor and Francis Group); 2008
- 20.** Bioinformatics Computing – The complete practical guide to bioinformatics for life scientists; Bryan Bergeron; Eastern Economy Edition; Prentice-Hall of India Pvt. Ltd., New Delhi; 2003
- 21.** Bioinformatics; Prakash S. Lohar; MJP Publishers, Chennai; 2009
- 22.** Introduction to Bioinformatics; First Edition; S. SundaraRajan and R. Balaji; Himalaya Publishing House, Mumbai; 2002
- 23.** Molecular Biology – Bios Instant Notes; Fourth Edition; Alexander McLennan, Andy Bates, Phil Turner & Mike White; Garland Science; 2013

Syllabus for T.Y.B.Sc.

Program B.Sc.

Course: ZOOLOGY

Semester VI

Paper III and Practical III

T.Y.B.Sc. Semester VI (Theory)

Course Code: USC6Z03

Core Course 17

Developmental biology

Course objectives:

- *To learn the basics of developmental biology.*
- *To comprehend fertilization process and study different patterns of cleavage and formation of embryo.*

Course outcomes:

- *Learners can familiarize with early and later stages of development.*

Unit 1: History & Basic concepts of development

(15 Lectures)

Learning Objectives:

To learn the history and understand basic concepts of development in animals

Desired outcome:

Learners can understand embryo development by studying the important process of cell differentiation, stages of development and morphogenesis.

1.1: Overview of how the modern era of developmental biology emerged through multidisciplinary approaches

1.2 : Stages of development- zygote, blastula, gastrula, neurula

1.3 : Cell fate & commitment – potency- concept of embryonic stem cells, differential gene expression, terminal differentiation, lineages of three germ layers, fate map

1.4: Mechanisms of differentiation- cytoplasmic determinants, embryonic induction, concept of morphogen, mosaic and regulative development

1.5 : Pattern formation- axis specification, positional identification (regional specification)

1.6. Morphogenetic movements

Unit 2: Early and Late Embryonic Development

Learning Objectives:

To learn the process of early and late embryonic development in animals.

Desired outcome:

Learners get acquainted with process of early and late embryonic development in animals.

2.1. Early Embryonic Development

- Gametogenesis
- Egg membranes
- Fertilization
- Changes in gametes
- Monospermy and polyspermy
- Planes and patterns of cleavage
- Early development of frog
- Fate maps
- Embryonic induction and organizers

2.2: Late Embryonic Development

Fate of Germ Layers; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta)

Unit 3: Post Embryonic Development and Implications of Developmental Biology

(15 lectures)

Learning Objectives:

To learn post Embryonic Development and Implications of Developmental Biology

Desired outcome:

Learners get acquainted with post Embryonic Development and Implications of Developmental Biology.

3.1 : Post Embryonic Development

- Metamorphosis: Changes, hormonal regulations in amphibians;
- Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each);
- Ageing: Concepts and models

3.2 : Implications of Developmental Biology

- Teratogenesis: Teratogenic agents and their effects on embryonic development;
Stem cell culture, Amniocentesis.

Unit 4: Chick Embryology

Learning Objectives:

To introduce to the learners the basics of developmental biology with reference to chick as a model and also understand experiments related to it.

Desired outcome:

Learners will be able to understand the processes involved in embryonic development and its application.

4.1. Development of Chick-

- a. Structure of Egg and Sperm**
- b. Fertilization, cleavage, blastulation and Gastrulation**
- c. Fate map of blastula**
- d. Structure of 24 hrs. Chick embryo.**
- e. Structure of 33 hrs. Chick embryo.**
- f. Structure of 48 hrs. Chick embryo.**
- g. Structure of 72 hrs. Chick embryo.**

4.2. Chick Foetal membranes or extra embryonic membranes

(Amnion, Chorion, Allantois and Yolk sac) & their significance.

T.Y.B.Sc. Semester VI (Practical)

Course code: USC6ZOP3

Core Course 17

1. Study of types of eggs: Eggs of Insects, Amphioxus, Frog and Chick with the help of Permanent slides/ Model/museum specimens/CD/Chart)
2. Study of Cleavage, Blastula and Gastrula: Amphioxus with the help of CD/Chart/Model/Permanent slides
3. Study of whole mounts and sections of developmental stages of frog through permanent slides:
 - a. Cleavage stages
 - b. Blastula
 - c. Gastrula
 - d. Neurula
 - e. Tail-bud stage
 - f. Tadpole (external and internal gill stages)
4. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 24, 28, 33, 36, 48, 72, and 96 hours of incubation.
5. Study of the developmental stages and life cycle of Drosophila from stock culture.
6. Study of Histological structures of placenta (permanent slide or microphotographs)
 - 1) Epitheliochorial
 - 2) Endotheliochorial
 - 3) Hemochorial
 - 4) Syndesmochorial
 - 5) Hemoendothelial
7. Study of human embryology: Principle and mechanism of ultra sound or ultrasonography with the help of photograph/flow-chart/Chart
8. Visit to IVF center and submission of report.

References and Additional Readings

1. An Introduction to Embryology 1981, Balinsky B.L., Saunders College, Philadelphia.
2. Developmental Biology; Patterns/Principles/Problems, 1982, Saunders J. W. Collier MacMillan, Publishers, London.
3. Developmental Biology, 1997, 3rd Edition, Gilbert S.F. Saunder Associates Inc. U.S.A.
4. Developmental Biology, 1992 3rd edition, Browder L.W. Erickson C.A. & Williams, R.J. Saunders College, Publications, London.
5. A Text Book of Embryology, Dr. Puranik P. G., S. Chand & Co. 6. Developmental Biology, 1984, Browder L.W. , Saunders College Publicaions, U.S.A.
6. Development of Chick embryo, 1972, Lillie. 8. Developmental Biology, 1991, 3rd Edition, Sinaur Associates, Inc. U.S.A. Gilbert, S. F. (2006).
7. Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA. Balinsky, B.I. (2008).
9. An introduction to Embryology, International Thomson Computer Press. Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc

Syllabus for T.Y.B.Sc.

Program B.Sc.

Course: ZOOLOGY

Semester VI

Paper IV and Practical IV

T.Y.B.Sc. Semester VI (Theory)

Course Code: USC6Z04

Discipline Specific Elective 18

Environment and Wildlife management, Bioprospecting,

Zoopharmacognosy and Zoogeography

Course objectives:

To introduce the learners to understand the importance of different factors of environment and its management, importance of wildlife conservation, pharmacognosy and zoogeography.

Course outcome:

Learners will understand about environment and Wildlife management, and learn the basic concepts of bioprospecting, zoopharmacognosy and Zoogeography.

Unit 1: Environment management

(15 lectures)

Learning Objectives:

To introduce the learners to understand the importance of different factors of environment and its management.

Desired outcome:

Learners will understand the different factors affecting environment, its impact and environment management laws.

1.1 : Natural resources and their classification

Forest resources, water resources (surface and ground), mineral resources, energy resources: renewable and non-renewable resources.

1.2 : Exploitation and modification of natural resources

Impact on climate, flora and fauna.

1.3: Waste Management

3R's (Reduce, Reuse & Recycle) of solid waste, e-waste, hazardous waste.

1.4: Water Management

Rain water harvesting, watershed management, effluent treatment, recycling plants, control and treatment of sewage water.

1.5: Rules and Acts of Environment Management

Environment Protection Act, Air (Prevention and Control of Pollution) Rules- 1982, Water (Prevention and Control of Pollution) Rules-1978, Hazardous Wastes (Management and Handling) Rules-1989, EIA(Environmental Impact Assessment), Role of Central and State Government(Pollution Control Board) and NGOs.

Unit 2: Wildlife management

(15 lectures)

Learning Objectives:

To introduce the learners to the importance of wildlife conservation.

Desired outcome:

Learners will be able to understand the wildlife habitat projects for animal protection.

2.1 : Habit, habitat, territory and niche of wild animals

Herbivores, carnivores, solitary, pack and herd.

2.2 : Threats to wildlife

Diseases (zoonosis and reverse zoonosis), competition, hunting and poaching, encroachment, deforestation, tourism, overgrazing, human-animal conflict and climate change.

2.3 : Wildlife conservation: Techniques and methods

2.3.1: Ex-situ conservation (Zoos, cryogenics, seedbank, germplasm and genebank), in-situ conservation (Bio-reserves, Sanctuaries and National Parks),

2.3.2: Application of GIS and Remote sensing

Unit 3: Bioprospecting and Zoopharmacognosy

(15 lectures)

Objective:

To introduce the learners to understand prospecting in biology and importance of pharmacognosy.

Desired outcome:

Learners will understand the paradigms of discovery and commercialization of biological resources and knowledge gained by self-medication by animals.

3.1: Bioprospecting

3.1.1. Traditional and modern bioprospecting

3.1.2. Economic value of bioprospecting

3.1.3. IPR

3.1.4. Bioprospecting and conservation

3.1.5. Advantages and disadvantages

3.2: **Zoopharmacognosy**

3.2.1 Definition and types

3.2.2 Self-medication and its mechanism

3.2.3 Methods of self-medication through- Ingestion- ants and mammals, Geophagy- invertebrates and birds

3.2.4 Absorption and adsorption

3.2.5 Applications – birds, mammals, social and trans-generational aspects

3.2.6 3.2.6:Contribution to human medicines.

Unit 4: Zoogeography

(15 lectures)

Objective:

To introduce learners to a branch of science dealing with the geographic distribution of animals.

Desired outcome:

The learners will become acquainted with how and why different animal species are distributed around the globe.

4.1 : Introduction

Plate tectonics and continental drift theory.

4.2 : Animal distribution and barriers

4.2.1 : Patterns of animal distribution – continuous, discontinuous, isolation and bipolarity.

4.2.2 : Barriers of distribution –Topographic, climatic, vegetative, large water masses, land mass, lack of salinity and special characteristic habit (homing instinct).

4.2.3 : Means of dispersal – land bridges, natural rafts and drift wood, favoring gales, migration by host, accidental transportation and by human agencies.

4.3 : Zoogeographical realms

4.3.1: Palearctic, Ethiopian, Oriental, Australian, Neotropical, Nearctic and Antarctic.

T.Y.B.Sc. Semester VI (Practical)

Course code: USC6ZOP

Discipline Specific Elective 18

1. Estimation of phosphates from sample water.
2. Estimation of BOD and COD from sample water.
3. Estimation of Nitrates from sample water.
4. Estimation of acidity and alkalinity of sample water by methyl orange and phenolphthalein indicator.
5. Determination of soil pH.
6. Comparative study of sound intensity in different places by Decibel meter.
7. Study of threatened animal species inhabiting Indian continent with reasons for decline- Great Indian bustard, One-horned rhinoceros, Royal Bengal tiger, Blackbuck, lion tailed macaque, Nilgiri Thar, Asiatic lion, Snow leopard, Gharial, and Gangetic dolphin.
8. Study of Zoopharmacognosy in ants, cats, elephants and dogs.
9. Indicate the distribution of fauna in the world map w.r.t. to its realm and comment on the pattern of distribution.
10. Study tour/Visit to Zoo/Sanctuary/National Park/Research institute.

References and Additional Readings

Environment management

1. Essentials of Environmental Science; N. Vasudevan; Narosa Publishing House Pvt. Ltd. New Delhi 110002
2. Environmental Biology; P.S Verma, V.K Agarwal; S. Chand & company Ltd. New Delhi 110055
3. A textbook of Environmental Science; Arvind Kumar; APH Publishing Corporation New Delhi 110002
4. Environmental Biotechnology - Basic Concepts and Application; Indu Shekhar Thakur; I. K. International Pvt. Ltd. New Delhi 110016
5. Text book of environmental science; S. C. Santra

Wildlife management

1. Wild life management; Rajesh Gopal
2. Wildlife Management and Conservation - Contemporary Principles and Practices; Paul R. Krausman and James W. Cain III
3. Wildlife Ecology, Conservation, and Management; John M. Fryxell, Anthony R. E. Sinclair, Graeme Caughley

Bioprospecting and Zoopharmacognosy

1. Molecular biotechnology – principles and practices; Channarayappa
2. Biotechnology; P. K. Gupta
3. Biotechnology; B. D. Singh
4. Biotechnology Fundamentals & Applications; S. S. Purohit
5. Pharmacognosy and Pharmaco biotechnology; Ashutosh Kar Trease and Evans
Pharmacognosy; Evans, W.C.
6. Pharmacognosy; Kokate, C. K. A. and Purohit, A.P.
7. Practical Pharmacognosy; Gokhale, S. B. and Kokate, C. K.
8. Text book of Pharmacognosy; T. E. Wallis

Zoogeography

1. Zoogeography – The Geographical Distribution of Animals; Philip J. Darlington JR;
2. Academic Publishers, Kolkata
3. Animal geography; Newbegin

4. Vertebrate paleontology; Romer
5. Ecological animal geography; Allee, Park and Schmidt
6. Zoogeography of India and South East Asia; Dr. S.K.Tiwari; CBS Publishers and Distributors, Delhi; 1985



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
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Program: B.Sc

Syllabus of T.Y.B.Sc. Zoology (Fishery Biology)

Choice Based Credit & Grading System (75:25)

w.e.f. Academic Year 2021-22

Sr. No.	Heading	Particulars
1	Title of Course	Fishery Biology
2	Eligibility for Admission	T.Y.B.Sc. with subject Zoology
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2021-22

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5.	Theory Syllabus for Semester VI (Course code: USCFB601)
6.	Practical Syllabus for Semester VI (Course code: USCFB6P1)
7.	References and Additional Reading (Course code: USCFB501, USCFB601)

Fishery Biology (Applied Component)
(Credit Based Semester and Grading System)
(To be implemented from the Academic Year 2021- 2022)

Semester V

Oceanography, Aquaculture Practices, Marketing and Finance

Theory (Any four units to be opted)				
Course	Unit	TOPIC	Credits	L/Week
USACFBIO501	1	Oceanography	2	4
	2	Crafts and Gear		
	3	Farming of Major Carps		
	4	Introduction to other Commercial Aquaculture Practices in Fresh Water		
	5	Culture of Shell fishes and Fin-Fish		
	6	Quality Control and Packaging		
	7	Marketing and Finance		
	8	Case Study and Simulation		
Practical				
USACFBIO5P1		Practical's based on Course USCFB501	2	4

Semester VI

Marine resources, Post-harvest and Farm Engineering

Theory (Any four units to be opted)				
Course	Unit	TOPIC	Credits	L/Week
USACFBIO601	1	Marine Fin-fish of India	2	4
	2	Marine Shellfish of India		
	3	Nutrition		
	4	Diseases		
	5	Preservation and Processing		
	6	Byproducts and Value-added Products		
	7	Farm Engineering		
	8	Open Unit		
Practical				
USACFBIO6P1		Practicals based on Course USCFB601	2	4

Semester V: Theory

Course code: USCFB501

Skill Enhancing Course 1

**Oceanography, Aquaculture Practices, Marketing
and Finance**

(Any four units to be opted)

Lectures 60

Credits 2

Unit 1: Oceanography

Learning Objective:

- *To study different instruments and equipments in navigation and oceanography*
- *To introduce physical, chemical and biological oceanography*

Desired outcome:

- *Learner shall understand and learn about the use of sea safety, navigational equipments and oceanographic instruments*
- *Learner shall understand basic physical, chemical and biological oceanography*

1.1 : Navigational and sea safety equipments

- i)** Life saving devices
- ii)** Global Positioning System (GPS)
- iii)** Rudder
- iv)** Signaling devices

1.2 : Oceanographic Instruments

- i)** Niskin water sampler
- ii)** Peterson's grab
- iii)** Dredges
- iv)** Fish finding instruments / Methods
- v)** Remote sensing
- vi)** CTD device

1.3 : Introduction to basic physical, chemical and biological oceanography

Unit 2: Crafts and Gear

Learning Objective:

- *To study the process of boat building, materials used and various types of diesel engines*

- *To study various types of nets used in fishery*

Desired outcome:

- *Learner shall comprehend boat building techniques and design of engines used in mechanized boats*
- *Learner shall understand the operations of various types of nets and fishing method*

2.1 : Basic boat building (parts, design, material used), methods of protection from foulers and borers

2.2 : Basic studies of marine engines:

- i) Outboard and Inboard Engines
- ii) Winch and Deck Side Equipment

2.3 : Operations:

- i) Gill, Trawl, Purse seine Nets
- ii) Hooks and Lines
- iii) Non-conventional Fishing Methods such as
 - Light Fishing
 - Hose Pipe Fishing
 - Electric Fishing

Unit 3: Farming of major carps

Learning Objective:

- *To study and develop skills in breeding techniques, hatchery, nursery and management of various carps*
- *To study and explore various techniques used in fishery and poly culture practices*

Desired outcome:

- *Learner will understand breeding techniques and skills for culture of major carps*
- *Learner will comprehend hatchery and nursery management of major carps*

3.1 : Breeding techniques of major carps and common carp

3.2 : Hatchery and nursery management of:

• Major carps:

i) IMCs: *Labeo rohita* (Rohu), *Catla catla* (Catla), *Cirrhinus mrigala* (Mrigal)

ii) Exotic carps: *Hypophthalmichthys molitrix* (Silver carp), *Ctenopharyngodon idella* (Grass carp)

iii) *Cyprinus carpio* (Common carp)

3.3 : Mono-culture and polyculture practices:

i) Extensive

ii) Semi-intensive

iii) Intensive

Unit 4: Introduction to other commercial aquaculture practices in fresh water

Learning Objective:

- To develop skills and understanding of breeding and rearing of sewage-fed fishery, Basa cat fish and Tilapia by novel ways

Desired outcome:

- Learner will be equipped to carry out entrepreneurial operations or gain confidence to work in freshwater prawn unit
- Learner will gain knowledge about how to breed and rear ornamental fishes and commercially viable fish species

4.1 : *Macrobrachium rosenbergii* (Freshwater prawn)

i) Breeding, life cycle, hatchery management

ii) Monoculture of *Macrobrachium rosenbergii*

iii) Composite culture of major carps and *Macrobrachium rosenbergii*

4.2 : Ornamental fishes - breeding and rearing:

i) Egg layers:

• *Danio spp.* (Danio)

• *Pterophyllum spp.* (Angel)

• *Symphysodon spp.* (Discus)

• *Paracheirodon innesi* (Neon tetra)

- Flower horn (Hybrid variety)
- *Betta splendens* (Siamese fighter)

ii) Live bearers:

- *Poecilia reticulata* (Guppy)
- *Xiphophorus hellerii* (Swordtail)
- *Poecilia velifera* (Tangerine)
- *Poecilia sphenops* (Molly)
- *Xiphophorus maculatus* (Platy)

4.3 : Breeding and rearing of:

- Sewage-fed fishery of air breathing fish: *Pangasianodon hypophthalmus* (Striped catfish), *Clarius spp.*, *Heteropneustes spp.* and *Anabas spp.*
- *Pangasius bocourti* (Basa Catfish)
- All meal (Less bones) *Tilapia* – GIFT (Genetically Improved Farmed *Tilapia*)

Unit 5: Culture of shell fishes and fin-fish

Learning Objective:

- To study breeding techniques, hatchery and management of fin-fish and shell fishes
- To study rearing practices of fin-fish and shell fishes
- To study culture of brackish water shrimp

Desired outcome:

- Learner shall understand breeding techniques, hatchery and management of fin- fish and shell fishes
- Learner shall understand the rearing techniques

5.1 : Breeding, hatchery, nursery management and rearing (extensive, semi-intensive, intensive)

i) Fin-fish – *Lates calcarifer* (Sea bass)

ii) *Litopenaeus vannamei* (Brackish water prawn or Pacific white shrimp)

iii) *Scylla serrata* (Giant mud Crab)

iv) *Pinctada vulgaris* (Pearl)

Unit 6: Quality control and packaging

Learning Objective:

- *To comprehend various aspects of quality control and packaging involved in fish processing and marketing*

Desired outcome:

- *Learner will be oriented towards understanding the various stages of quality control*
- *Learner will gain knowledge about the postmortem changes, spoilage mechanisms and methods involved in evaluating the freshness and quality of fishes and prawns / shrimps*
- *Learner shall comprehend the value of maintaining and taking sanitary precautions during the processing and packaging operations*

6.1 : Post mortem changes and mechanism of spoilage

- i) Hyperaemia**
- ii) Rigor mortis**
- iii) Autolysis**
- iv) Rancidity**

6.2 : Brief methods for evaluating freshness and quality of fish and prawns / shrimps

- i) Organoleptic**
- ii) Microbial**
- iii) Chemical**

6.3 : Sanitary operations

- i) Maintenance of hygiene of food contact surfaces, storage and equipment**
- ii) Water quality, ice, sewage and waste water disposal and effluent treatment plant**

6.4 : Various packaging materials used in freezing and canning industry

- i) Polyolefin**
- ii) Wax duplex carton**
- iii) Master carton**
- iv) Can**
- v) Lacquered can**
- vi) Retort**
- vii) Freezing procedures including hygienic washing, dressing**

6.5 : Quality Policy and Quality Analysis: ISO 22000/HACCP/ BRC/IFS

Unit 7: Marketing and finance

Learning Objective:

- *To acquaint and instils knowledge of the fundamentals of marketing and finance required for entrepreneurship in fishery related enterprises and co-operatives*

Desired outcome:

- *Learner shall acquire knowledge about traditional marketing practices and role of co-operatives in selling fish*
- *Learner shall be exposed to the avenues and procedure for raising funds for Fishery related entrepreneurial practices*

7.1 : Traditional marketing vis-a-vis role of fishery co-operatives with reference to operations at Satpati, Sasoon dock and Karanja

7.2 : Global marketing and Export-Import procedures and role of Marine Products Exports Development Authority (MPEDA)

7.3 : i) Fund raising:

- Financial institutions
- Schemes and subsidies
- Basic accounting
- Costing and feasibility report

: ii) Role of NABARD (National Bank for Agriculture and Rural Development) for refinancing and NFDB (National Fishery Development Board, Hyderabad) for funding through the State Government

Unit 8: Case Study and Simulation

Case Study and Simulation is one of the eight units and hence may or may not be opted by the college. If opted, teachers in consultation with the students shall select the case studies for this unit every year, if required, and shall seek endorsement of the Head and the Principal.

Colleges/ Institutes have to select the topics as per their needs and available resources. It is pertinent to note that the case studies and simulations shall be operational and available in the syllabus only till it comes under the scope of internal assessment.

Learning Objective:

- *To inculcate entrepreneurial abilities and skills so as to make the learner confident and prepare them to raise new projects and venture in the realm of fishery biology*
- *To understand the concepts and to develop the acumen of the learner in a better way*
- *To assess varying dimensions while taking decisions in fishery biology*

Desired outcome:

- *Learner will gain technical and financial knowledge in fishery biology business ventures*
- *Learner will develop better acumen so as to take wise and necessary decisions while participating in fishery biology related projects*

(Any eight from suggested below or more, developed by teacher)

- a) Sawantwadi New Fish Market developed through NFDB funding
- b) Trilok foods, an RTE industry established as PPP through DST funding
- c) Sewage-fed fishery; Kolkata model
- d) Pancham Aquaculture
- e) Naik Oceanic
- f) Aquaponics, Hydroponics
- g) Mahseer Ranching at Dehu
- h) Integrated fish farm goatery, piggery, poultry, dairy, etc.
- i) Juchandra Village

Semester V Practical

Course code: USCFB5P1

Skill Enhancement Course 1

1) Identification and functioning of oceanographic instruments:

- Niskin water sampler
- Peterson's Grab
- Dredge

2) Identification of various stages of development of carps and study of sexual dimorphism in adults.

Indian major carps:

- *Labeo rohita* (Rohu)
- *Catla catla* (Catla)
- *Cirrhinus mrigala* (Mrigal)

Exotic carps:

- *Cyprinus carpio* (Common Carp)
- *Hypophthalmichthys molitrix* (Silver Carp)
- *Ctenopharyngodon idella* (Grass Carp)

3) a) Identification of *Litopenaeus vannamei* (Pacific white shrimp) and *Macrobrachium rosenbergii* (Freshwater prawn

b) Study of sexual dimorphism in adults

4) Identification of fishes:

- *Anabas testudineus* (Climbing perch)
- *Clarius batrachus* (Walking catfish)
- *Boleophthalmus spp.* (Mudskipper)
- *Pangasianodon hypophthalmus* (Iridescent shark)
- *Pangasius bocourti* (Basa catfish)
- *Tilapia*(GIFT)

5) Identification of:

A) Ornamental fishes:

- *Pterophyllum spp.* (Angel)

- *Xiphophorus hellerii* (Swordtail)
- *Paracheirodon innesi* (Neon tetra)
- *Betta splendens* (Siamese fighter)
- *Danio spp.* (Danio)
- *Symphysodon spp.* (Discus)
- Flower Horn (Hybrid variety)

B) Aquatic plants:

- Ludwigia
- Cabomba
- Corkscrew *Vallisneria*
- Aquarose
- Amazon Sword plant

C) Aquarium accessories:

- Aerator
- Under Gravel Filter
- Internal Filter
- External / Canister Filter
- Food dispensers

6) Study of models and functioning of D 81 hatchery, Shirgur's hatcheries and Chinese hatchery.

7) Organoleptic tests for fish and prawn / shrimp

8) Total Plate Count (TPC) of bacteria from fish

9) Identification of packaging materials:

- Waxed duplex carton
- Master carton
- Simple cans
- Coated [Lacquered] cans
- Polyolefin

- Retort

10) Estimation of toxins and moulting retardant

- H₂S (qualitative)
- Ammonia (qualitative)
- Ca (quantitative)
- Mg (quantitative)

11) Photographic documentation of fishery biology related topics.

Submission of 5 hard and soft copies of 5 original photographs taken by the learner (exit details required)

12) Assignment (may be submitted in a group not exceeding three students)

Please refer the Annexure I for the suggested topics for assignment for Course code USACFBIO5P1.

***Note – The practicals may be conducted by using specimens authorized by the wild life and such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/simulations/ models etc. as recommended by the UGC and as envisaged in the regulation of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practicals mentioned here-in above.**

N.B:

I) It is pertinent to note that we have to adhere strictly to the directions as given in the UGC Circular F14-4/2006 (CPP-II).

II) Apart from the Institutional Animal Ethics Committee (IAEC) and any other Committee appointed by a Competent Authority / Body from time to time, every college should constitute the following Committees:

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Composition of DMC shall be as follows:

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- iv) One or two members of related department from neighbouring colleges.

USE OF ANIMALS FOR ANY EXPERIMENT /DISSECTION /MOUNTING IS BANNED. SIMULATIONS, AUTHORIZED PERMANENT SPECIMENS/SLIDES, CHARTS, MODELS AND OTHER INNOVATIVE METHODS ARE ENCOURAGED.

Semester VI: Theory
Course code: USCFB601
Skill Enhancing Course 2
Marine resources, Post-harvest and Farm
Engineering

(Any four units to be opted)

Lectures 60

Credits 2

Unit 1: Marine Fin-fish of India

Learning Objective:

- *To study coastal and deep-sea fishes*
- *To study commercial potential and major landing centres*

Desired outcome:

- *Learner shall understand deep sea and coastal fishes.*
- *Learner shall understand commercial potential and know about the major landing centres of the fishes*

1.1 : Coastal fisheries:

- Pampus argenticus* (Silver pomfret)
- Parastromateus niger* (Black pomfret)
- Eleutheronema tetradactylum* (Threadfin)
- Protonibea diacanthus* (Two-spined Jewfish or Ghol)
- Nemipterus japonicus* (Blackmouth splitfin)
- Rastrelliger kanagurta* (Mackerel)
- Scomber guttatus* (Seerfish or Surmai)
- Sardinella longiceps* (Indian Oil Sardine)

1.2 : Deep sea fisheries (more than 45 fathoms) of Indian exclusive economic zone

- *Thunnus alalunga* (Longfin tuna)
- *Sarda orientalis* (Striped bonito)

1.3 : Commercial potential and major landing centers of the above fishes

Unit 2: Marine shell fish of India

Learning Objective:

- *To develop an in-depth understanding of crustacean and molluscan fisheries*

Desired outcome:

- *Learner shall understand crustacean and molluscan fisheries*
- *Learner shall understand the performance of landing centers of above fisheries*

2.1 : Crustacean fisheries

- Penaeus monodon* (Giant tiger prawn)
- Fenneropenaeus indicus* (Indian prawn)
- Metapenaeus affinis* (Jinga shrimp)
- Parapenaeopsis styliifera* (Kiddi shrimp)
- Acetes indicus* (Jawala paste shrimp)
- Panulirus polyphagus* (Mud spiny lobster)
- Scylla serrata* (Giant mud crab)

2.2 : Molluscan fisheries

- Crassostrea spp.* (Oyster)
- Sepia pharaonis* (Pharaoh cuttlefish)
- Loligo duvaucelii* (Indian squid)

2.3 : Commercial potential and major landing centers of the above shell fishes

Unit 3: Nutrition

Learning Objective:

- *To study, acquaint and discover the growing market for fish nutrition*

Desired outcome:

- *Learner will get acquainted with basics of nutritional requirements at various developmental stages of fish and crustaceans*

3.1 : Nutritional requirements at various stages of development of fish and crustaceans

3.2 : Culture of natural feed:

- Chaetoceros*
- Infusoria*
- Artemia*
- Brachionus*
- Daphnia / Moina spp.*

3.3 Algology – Identification and culture of commercially important nutritious algae and its products

3.4 Formulated / Pelleted feed – Understanding the composition and use of formulated

feed for fish and prawns / shrimps at various stages

Unit 4: Diseases

Learning Objective:

- *To acquire knowledge of the various aspects of diseases affecting fishes*

Desired outcome:

- *Learner will be oriented towards understanding causes, pathogenicity, prophylaxis and preventive measures of various fish diseases and physiological disorders*

4.1 Viral diseases, prophylaxis and preventive measures

4.2 Bacterial, fungal, protozoan infections and treatment

4.3 Crustacean infections and treatment

4.4 Physiological disorders (Dropsy) / diseases and treatment

Unit 5: Preservation and Processing

Learning Objective:

- *To derive knowledge about various fish preservation and processing methods*

Desired outcome:

- *Learners will acquire the knowledge and would put in to practice the preservation and processing techniques for commercial ventures*

5.1 Traditional methods and their modifications:

- i)** Icing
- ii)** Drying
- iii)** Salting

5.2 i) Introduction to refrigeration: Types and properties of refrigerants

- i)** Types of freezers:
 - a.** Brine
 - b.** Air blast
 - c.** Tunnel
 - d.** Contact plate
 - e.** Cryo-quick
 - f.** IQF: Individual Quick Freezing

ii) Freezing Procedures:

- a.** PUD (Peeled and Un-deveined)
- b.** DV (Deveined)

5.3 Principle and steps involved in can reform and canning of fish and shrimp in various

media.

5.4 Equipment and utensils used in seafood processing

Unit 6: By-products and Value-Added Products

Learning Objective:

- *To acquire knowledge of fish by-products, value-added products and good manufacturing practices*

Desired outcome:

- *Learner will gain sound knowledge about the fish by-products and value-added products*
- *Learner will explore good manufacturing practices while manufacturing these products*

6.1 Proximate composition of fish meat and products

6.2 Introduction to by-products

i) Fish protein concentrate

ii) Fish maws / Isinglass

iii) Fish hydrolysates

iv) Chitin, Chitosan

v) Glucosamine hydrochloride

vi) Gelatin

vii) Fish silage

viii) Surimi and imitation products

ix) Pearl essence

6.3 Different types of value-added products from fish and shell fish

i) Fish / Prawn / Shrimp pickle

ii) Fish wafers

iii) *Acetes indicus* (Prawn) chutney

iv) Fish soup powder

v) Fish / Crab steaks

vi) RTE (Ready To Eat)

vii) Battered and breaded products

viii) Marinated tandoori prawns

ix) Prawn curry

6.4 Good manufacturing practices: Health and training of personnel, hygiene

Unit 7: Farm engineering

Learning Objective:

- *To acquire knowledge about farm engineering and novel fish culture practices*

Desired outcome:

- *Learner will understand the selection process of hatchery sites and various types of designs and construction of aquaculture farm practices*
- *Learners will comprehend the uses of equipment and accessories involved in aquaculture farms*

7.1 Site selection, designing and construction of hatchery and farms for extensive, semi-intensive and intensive freshwater / brackish-water aquaculture

7.2 i) Raft culture

ii) Rope culture

iii) Pen culture

iv) Cage culture with special reference to *Rachycentron canadum* (Cobia)

7.3 Equipment and accessories used in various aqua farms

Unit 8: Open Unit

Open unit is one of the eight units which may or may not be opted by the college. Teachers in consultation with the students shall define syllabus under this unit every year, if required, and shall seek endorsement of the Head and the Principal.

Colleges/institutes have to select the topics as per their needs and available resources. It is pertinent to note that the open unit shall be operational and available in the syllabus only till it comes under the scope of internal assessment.

Learning Objective:

- *To teach any one of the units prescribed in the syllabus with more details and in-depth knowledge leading to specialization in the capsule of units selected.*
- *To incorporate the topics of special need of the area which are otherwise not covered in the syllabus.*
- *To give scope to creativity and wisdom of a teacher who wants to deal with the latest developments in the subject without waiting for the university to revise the Syllabus.*

Semester VI Practicals

Course code: USCFB601P

Skill Enhancing Course 2

1) Identification of marine fishes.

- *Pampus argenticus* (Silver pomfret)
- *Parastromateus niger* (Black pomfret)
- *Eleutheronema tetradactylum* (Threadfin)
- *Protonibea diacanthus* (Two-spined Jewfish or Ghol)
- *Nemipterus japonicus* (Blackmouth splitfin)
- *Rastrelliger kanagurta* (Mackerel)
- *Scomber guttatus* (Seerfish or Surmai)
- *Sardinella longiceps* (Indian Oil Sardine)
- *Thunnus alalunga* (Longfin tuna)

2) Identification of Crustaceans and Molluscs.

- *Penaeus monodon* (Giant Tiger Prawn)
- *Fenneropenaeus indicus* (Indian prawn)
- *Metapenaeus affinis* (Jinga shrimp)
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- *Crassostrea spp.* (Oyster)
- *Sepia pharaonis* (Pharaoh cuttlefish)
- *Loligo duvaucelii* (Indian squid)
-

3) Preparation of formulated feed for fish and prawn.

4) Identification of parasitic infections in aquatic organisms.

- Fungal – Dermatomycosis
- Bacterial – Fin/Tail rot and Dropsy
- Protozoan – Costiasis and White Spot
- Crustacean – Argulosis

5) Fish dressing, filleting, prawn peeling – PUD, DV and grading.

6) Fish morphometry – Length weight relationship of a suitable fish.

- 7) Preparation of Surimi, Fish protein concentrate.
- 8) Preparations of fish burger, fish fingers, fish/prawn pickle, fish chutney, fish curry.
- 9) Preparation of Chitin – Chitosan, Pearl essence.
- 10) Identification of various farm equipment such as:
 - Feeding cups / Trays
 - Paddle wheel aerator
 - Fountains
 - Sluice gate models
 - Elbow pipe outlets
- 11) Study of models of raft, pen, cage culture and materials used in rope culture.
- 12) Project – Feasibility / Scientific.
- 13) Field Visit Report.

Please refer the Annexure II for the suggested field visits and Annexure – III for suggested topics for projects for Course code USACFBIO6P1.

***Note – The practicals may be conducted by using specimens authorized by the wild life and such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/simulations/ models etc. as recommended by the UGC and as envisaged in the regulation of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practical mentioned here-in above.**

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References and Additional Reading

1. A Text Book of Marine Ecology by Nair M.B. and Thumpy D.H. – Tata MacGraw Hill Pub. – New Delhi.
2. An Introduction to Fishes by Khanna S.S. – Central Book Depot, Allahabad (1993).
3. Aquaculture, Principles and Practices by Pillay T.V.R. – Fishing News Books (1988).
4. Course Manual in Fishing Technology by Latha Shenoy, CIFE, Versova, Mumbai.
5. Crafts and Gear of India by Y. Shrikrishnan and Latha Shenoy – ICAR Pub.
6. Ecological Methods for Field and Laboratory Investigations by P. Michael. The Oceans By Svedrup H.V. – et.al. - Asian Pub. House.
7. Financial management by Prasanna Chandra- Seventh Edition.
8. Financial management by Khan and Jain.
9. Financial management by I. M. Pandey.
10. Fish Biology by C.B.C. Srivastava – Narendra Pub. House.
11. Fish and Fisheries by Chandy – National Book Trust.
12. Fish and Fisheries in India – by Jhingran V.G. – Hindustan Pub. Corporation – New Delhi.
13. Fisheries Biology, Assessment and Management by Michael King – Fishing News Publishers (1995).
14. Fishery Science by Samtharam R. – Daya Pub. House – 1990.
15. Fisheries Bioeconomics – Theory, Modelling and Management – FAO Fisheries Technical Paper 368 – FAO, 2001.
16. General and Applied Ichthyology by Gupta and Gupta, S Chand Publishers.
17. Handbook of Fish Biology and Fisheries Edited By J.B. Hart and John Reynold.
18. Hand Book of Fresh Water Fishes of India by Beaven C.R. – Narendra Pub. House.
19. Introductory Oceanography by Harold Thurman – Printis Hall Pub. London – 8th Edition.
20. Marine Ecology by Tait R.B. – Oxford Press.
21. Marine Fish and Fisheries by Dr. D. V. Bal and K.V. Rao - Tata MacGraw Hill Pub. New Delhi.
22. New Delhi.

23. Marketing Management by Philip Kotler.
 24. Modern Fishing Gear Technology by N. Shahul Hameed, Boopendranath – Daya Pub. House – 2000.
 25. Prawn and Prawn Fisheries by Kurian and Sebastian.
 26. Project Management by Prasanna Chandra.
 27. Refrigeration and air conditioning By C. P. Arora published in 1981.
 28. Technology for forming of Pacific White Shrimp *Litopenaeus vannamei* in inland saline soils using ground saline water by Lakra, Reddy and Harikrishna, CIFE and ICAR.
 29. Text Book of Fish Biology and Indian Fisheries by Dr. R. P. Parihar, Central Pub. House, Allahabad.
 30. The Book of Indian Shells by Deepak Apte – Oxford Uni. Press.
 31. Wealth of India – Vol. IV – CSIR Pub.
- For Additional and Latest Information on the topics, various Web Sites can be visited.**



University of Mumbai

॥ विद्या विनयेन शोभते ॥

Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
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Choice Based Credit & Grading System (60:40)
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JANARDAN BHAGAT SHIKSHAN PRASARAKSANSTHA'S

CHANGU KANA THAKUR

ART'S, COMMERCE AND SCIENCE COLLEGE, NEW PANVEL

AUTONOMOUS



BOARD OF STUDIES IN MATHEMATICS

FROM THE ACADEMIC YEAR 2023-2024



S.Y.B.Sc.

Introduction:

Mathematics pervades all aspects of life, whether at home, in civic life or in the workplace. It has been central to nearly all major scientific and technological advances. Many of the developments and decisions made in our community rely to an extent on the use of mathematics. Besides foundation skills and knowledge in mathematics for all citizen in the society, it is important to widen mathematical experience for those who are mathematically inclined.

Aims and Objectives:

1. Giving students sufficient knowledge of fundamental principles, methods and a clear perception of boundless power of mathematical ideas and tools and know how to use them by analysing, modeling, solving and interpreting.
2. Reflecting on the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science
3. Enhancing students overall development and to equip them with mathematical modeling abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment
4. A student should get adequate exposure to global and local concerns by looking at many aspects of mathematical Sciences

Outcomes:

1. Students knowledge and skills will get enhanced and they will get confidence and interest in mathematics, so that they can master mathematics effectively and will be able to formulate and solve problems from mathematical perspective.
2. Students thinking ability and attitude will change towards learning mathematics and practicals will improve their logical and analytical thinking.

Teaching Pattern for Semester-III

1. Three lectures per week per course. Each lecture is of 48 minutes duration.
2. One Practical (2L) per week per batch for courses USC3MT1, USC3MT2 combined and one Practical (3L) per week for course USC3MT3 (the batches to be formed as prescribed by the University). Each practical session is of 48 minutes duration.

Teaching Pattern for Semester-IV

1. Three lectures per week per course. Each lecture is of 48 minutes duration.
2. One Practical (2L) per week per batch for courses USC3MT1, USC3MT2 combined and one Practical (3L) per week for course USC3MT3 (the batches to be formed as prescribed by the University). Each practical session is of 48 minutes duration.

Scheme of Examination

Faculty of Science

(Undergraduate Programmes)

Choice Based Credit System (CBCS)

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component. The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 % (40 Marks)

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Test on Practical Skills/ Case studies /Group/ Individual Survey Project/Presentation and write up on the selected topics of the subjects/ Test based on tutorials /Book Review / Open Book Test	15 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05 Marks

Question Paper Pattern (Periodical Class Test)

Maximum Marks: 20

Duration: 40 Minutes

Questions to be set: 02

All Questions are Compulsory

Question No.	Particular	Marks
Q-1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ Answer in One or Two Lines (Concept based Questions) (1 Marks / 2 Marks each)	10 Marks
Q-2	Answer in Brief (Attempt any Two of the Three) (5 Marks each)	10 Marks

B) Semester End Examination: 60 % (60 Marks)

- Duration: The examination shall be of 2 hours duration.

Question Paper Pattern

Theory question paper pattern

1. There shall be four questions of 15 marks each (30 marks with internal options).
2. On each unit there will be one question and fourth question will be based on entire syllabus.
3. All questions shall be compulsory with internal options.
4. Question may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

➤ Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment and Semester End Examination. The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 Out of 60) separately, to pass the course and minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

Semester End Practical Examinations

At the end of the Semesters III & IV, Practical examinations of three hours duration and 150 marks shall be conducted for the courses USC3MTP, USC4MTP.

In semester III, the Practical examinations for USC3MT1 and USC3MT2 are held together by the college. The Practical examination for USC3MT3 is held separately by the college.

In semester IV, the Practical examinations for USC4MT1 and USC4MT2 are held together by the college. The Practical examination for USC4MT3 is held separately by the college.

Paper Pattern

The question paper shall have three parts A, B, C.

Each part shall have two Sections.

Section I: Objective in nature: Attempt any Eight out of Twelve multiple choice questions.
($8 \times 3 = 24$ Marks)

Section II: Problems: Attempt any Two out of Three. ($8 \times 2 = 16$ Marks)

Practical Course	Part A	Part B	Part C	Marks out of	Duration
USC3MTP	Questions from USC3MT1	Questions from USC3MT2	Questions from USC3MT3	120	03
USC4MTP	Questions from USC4MT1	Questions from USC4MT2	Questions from USC4MT3	120	03

Marks for Journals and Viva

For each course USC3MT1, USC3MT2, USC3MT3 and USC4MT1, USC4MT2, USC4MT3

1. Journals: 05 Marks.

2. Viva: 05 Marks.

List of Courses for Semester-III

PAPER I: CALCULUS-III

Course Code	Unit	Topic	Credit	Lecture per Week
USC3MT1	Unit I	Functions of several variables	02	03
	Unit II	Differentiation		
	Unit III	Applications		

PAPER II: LINEAR ALGEBRA-I

Course Code	Unit	Topic	Credit	Lecture per Week
USC3MT2	Unit I	Vector spaces over \mathbb{R}	02	03
	Unit II	Linear Transformations and Matrices		
	Unit III	Determinants		

PAPER III: DISCRETE MATHEMATICS-II

Course Code	Unit	Topic	Credit	Lecture per Week
USC3MT3	Unit I	Graphs	02	03
	Unit II	Trees		
	Unit III	Algorithms		

PRACTICAL-III

Course Code	Part	Paper	Credit	Lecture per Week
USC3MTP	A	USC3MT1	03	05
	B	USC3MT2		
	C	USC3MT3		

List of Courses for Semester-IV

PAPER I: CALCULUS-IV

Course Code	Unit	Topic	Credit	Lecture per Week
USC4MT1	Unit I	Riemann Integration	02	03
	Unit II	Indefinite Integrals and Improper Integrals		
	Unit III	Applications		

PAPER II: LINEAR ALGEBRA-II

Course Code	Unit	Topic	Credit	Lecture per Week
USC4MT2	Unit I	Inner Product Spaces	02	03
	Unit II	Eigenvalues and Eigenvectors		
	Unit III	Diagonalization		

PAPER III: ORDINARY DIFFERENTIAL EQUATIONS

Course Code	Unit	Topic	Credit	Lecture per Week
USC4MT3	Unit I	Second order differential equations	02	03
	Unit II	Power Series solution of ordinary differential equations		
	Unit III	Laplace Transform		

PRACTICAL-IV

Course Code	Part	Paper	Credit	Lecture per Week
USC4MTP	A	USC4MT1	03	05
	B	USC4MT2		
	C	USC4MT3		

Syllabus for Semester - III

USC3MT1: CALCULUS-III

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

Course Outcomes:

Student will be able to:

- (1) Evaluate limit of a functions of several variables
 - (2) Examine continuity of a functions of several variables
 - (3) Identify the differentiable functions
 - (4) Apply multivariable calculus in optimization problems
-

Unit I: Functions of several variables

(15 Lectures)

- (a) The Euclidean inner product on \mathbb{R}^n and Euclidean norm function on \mathbb{R}^n , distance between two points, open ball in \mathbb{R}^n , definition of an open subset of \mathbb{R}^n , neighborhood of a point in \mathbb{R}^n , sequences in \mathbb{R}^n , convergence of sequences-these concepts should be specially discussed for $n = 2$ and $n = 3$.
 - (b) Functions from $\mathbb{R}^n \rightarrow \mathbb{R}$ (scalar fields) and from $\mathbb{R}^n \rightarrow \mathbb{R}^m$ (vector fields), limits, continuity of functions, basic results on limits and continuity of sum, difference, scalar multiples of vector fields, continuity and components of a vector fields.
 - (c) Directional derivatives and partial derivatives of scalar fields.
 - (d) Mean value theorem for derivatives of scalar fields.
-

Unit II: Differentiation

(15 Lectures)

- (a) Differentiability of a scalar field at a point of \mathbb{R}^n (in terms of linear transformation) and on an open subset of \mathbb{R}^n , the total derivative, uniqueness of total derivative of a differentiable function at a point, simple examples of finding total derivative of functions such as $f(x, y) = x^2 + y^2$, $f(x, y) = x + y + z$, differentiability at a point of a function f implies continuity and existence of directional derivatives of f at the point, the existence of continuous partial derivatives in a neighborhood of a point implies differentiability at the point.
 - (b) Gradient of a scalar field, geometric properties of gradient, level sets and tangent planes.
 - (c) Chain rule for scalar fields.
 - (d) Second order partial derivatives, mixed partial derivatives, sufficient condition for equality of mixed partial derivative.
-

Unit III: Applications

(15 lectures)

- (a) Second order Taylor's formula for scalar fields.
- (b) Differentiability of vector fields, definition of differentiability of a vector field at a point, Jacobian matrix, differentiability of a vector field at a point implies continuity. The chain rule for derivative of vector fields (statements only).
- (c) Mean value inequality.
- (d) Second derivative test for extrema of functions of two variables.
- (e) Hessian matrix, Maxima, minima and saddle points of functions of two variables.
- (f) Method of Lagrange Multipliers.

Recommended Text Books:

1. T. Apostol: Calculus, Vol. 2, John Wiley.
2. J. Stewart, Calculus, Brooke/ Cole Publishing Co.

Additional Reference Books:

1. G.B. Thoman and R. L. Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley, 1998.
2. Sudhir R. Ghorpade and Balmohan V. Limaye, A Course in Multivariable Calculus and Analysis, Springer International Edition.
3. Howard Anton, Calculus- A new Horizon, Sixth Edition, John Wiley and Sons Inc, 1999.

Practicals for USC3MT1

1. Sequences in \mathbb{R}^2 and \mathbb{R}^3 limits and continuity of scalar fields and vector fields, using definition and otherwise, iterated limits.
 2. Computing directional derivatives, partial derivatives and mean value theorem of scalar fields.
 3. Total derivative, gradient, level sets and tangent planes.
 4. Chain rule, higher order derivatives and mixed partial derivatives of scalar fields.
 5. Taylor's formula, differentiation of a vector field at a point, Hessian/Jacobian matrix, Mean Value Inequality.
 6. Finding maxima, minima and saddle points, second derivative test for extrema of functions of two variables and method of Lagrange multipliers.
 7. Miscellaneous Theoretical Questions based on full paper.
-

USC3MT2: LINEAR ALGEBRA-I

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

Course Outcomes:

Student will be able to:

- (1) Define vector spaces and subspaces
 - (2) Relate Matrices and linear transformations
 - (3) Find basis and dimension of a vector space over \mathbb{R}
 - (4) Evaluate the determinant
-

Unit I: Vector Spaces over \mathbb{R}

(15 Lectures)

- (a) Definition of a Vector Spaces over \mathbb{R} and examples.
 - (b) Subspaces - definition and examples.
 - (c) The sum and intersection of subspaces, direct sum of vector spaces.
 - (d) Linear combination of vectors, linear span of a subset of a vector space.
 - (e) Linear dependence and independence of a set.
 - (f) Basis of a vector space, basis as a maximal linearly independent set and a minimal set of generators. Dimension of a vector space.
-

Unit II: Linear Transformations and Matrices

(15 Lectures)

- (a) Linear transformations: definition, properties and examples, Kernel and image of a linear transformation, Rank-Nullity theorem (with proof), Linear isomorphisms, inverse of a linear isomorphism, Matrix representation of a linear transformation.
 - (b) The matrix units and elementary matrices.
 - (c) Row space, column space of an $m \times n$ matrix, row rank and column rank of a matrix.
 - (d) Equivalence of rank of an $m \times n$ matrix A and rank of the linear transformation $L_A: \mathbb{R}^n \rightarrow \mathbb{R}^m$ ($L_A(A) = AX$). The dimension of solution space of the system of linear equations $AX = 0$ equals $n - \text{rank}(A)$.
 - (e) The solutions of non-homogeneous systems of linear equations represented by $AX = B$ and the general solution of the homogeneous system.
-

Unit III: Determinants

(15 Lectures)

- (a) Definition of determinant as an n-linear skew-symmetric function. Determinant of a matrix as determinant of its column vectors (or row vectors).
 - (b) Existence and uniqueness of determinant function via permutations.
 - (c) Laplace expansion of a determinant, Vandermonde determinant, determinant of upper triangular and lower triangular matrices.
 - (d) Linear dependence and independence of vectors in \mathbb{R}^n using determinants, The existence and uniqueness of the system $AX = B$, where A is an $n \times n$ matrix with $\det(A) \neq 0$.
 - (e) Cofactors and minors of a matrix, Adjoint of an $n \times n$ matrix A .
 - (f) Cramer's rule.
 - (g) Determinant as area and volume.
-

Recommended Books:

1. Serge Lang: Introduction to Linear Algebra, Springer Verlag.
 2. S. Kumaresan: Linear Algebra A geometric approach, Prentice Hall of India Private Limited.
-

Additional Reference Books:

1. M. Artin: Algebra, Prentice Hall of India Private Limited.
 2. K. Hoffman and R. Kunze: Linear Algebra, Tata McGraw-Hill, New Delhi.
 3. Gilbert Strang: Linear Algebra and its applications, International Student Edition.
 4. L. Smith: Linear Algebra, Springer Verlag.
 5. A. Ramachandra Rao and P. Bhima Sankaran: Linear Algebra, Tata McGrawHill, New Delhi.
 6. T. Banchoff and J. Wermer: Linear Algebra through Geometry, Springer Verlag Newyork, 198
 7. Sheldon Axler : Linear Algebra done right, Springer Verlag, Newyork.
 8. Klaus Janich : Linear Algebra.
 9. Otto Bretcher: Linear Algebra with Applications, Pearson Education.
 10. Gareth Williams: Linear Algebra with Applications, Narosa Publication.
-

Practicals for USC3MT2

1. Subspaces: Determine whether a given subset of a vector space is a subspace.
2. Linear dependence and independence of subsets of a vector space.

3. Rank-Nullity Theorem.
 4. System of linear equations.
 5. Determinant, calculating determinants of 2×2 matrices, $n \times n$ diagonal, upper triangular matrices using definition and laplace expansion.
 6. Finding inverses of Finding inverses of $n \times n$ matrices using adjoint
 7. Determinant, calculating determinants of 2×2 matrices, 3×3 matrices using adjoint.
 8. Miscellaneous Theoretical Questions based on full paper
-

USC3MT3: DISCRETE MATHEMATICS-II

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

Course Outcomes:

Student will be able to:

- (1) Define the basic concepts of graph theory
 - (2) Examine the properties and applications of graph
 - (3) Analyze the properties of permutation functions, Pascal's Identity, Circular Permutation and Stirling numbers.
 - (4) Apply Pigeonhole Principle, Binomial Theorem, Inclusion and Exclusion Principle.
-

Unit I: Graphs

(15 Lectures)

- A. Introduction to graphs: Types of graphs: Simple graph, directed graph, (One example/graph model of each type to be discussed).
- B. (a) Graph Terminology: Adjacent vertices, degree of a vertex, isolated vertex, pendant vertex in an undirected graph.
- (b) The handshaking Theorem for an undirected graph (statement only), Theorem: An undirected graph has an even number of odd vertices (statement only).
- C. Some special simple graphs (by simple examples): Complete graph, cycle, wheel in a graph, Bipartite graph, regular graph.
- D. Representing graphs and graph isomorphism:
- (a) Adjacency matrix of a simple graph.
- (b) Incidence matrix of an undirected graph.
- E. Connectivity:
- (a) Paths, circuits, simple paths, simple circuits in a graph (simple examples).
- (b) Connecting paths between vertices (simple examples).
- (c) Euler paths and circuits, Hamilton paths and circuits, Dirac's Theorem (statement only), Ore's Theorem (statement only)
- (d) Planar graphs, planar representation of graphs, Euler's formula. Kuratowski's Theorem (statement only).
-

Unit II: Trees

(15 Lectures)

A. (a) Trees: Definition and Examples.

(b) Forests, binary trees

(c) Trees as models.

(d) Properties of Trees (no proofs).

B. Application of Trees:

(a) Binary Search Trees, Algorithm for locating an item in or adding an item to a Binary Search Tree.

(b) Decision Trees (simple examples).

(c) Algorithm for Huffman's coding, construction of Huffman's code by examples.

Unit III. Algorithms

(15 Lectures)

A) Definition of an algorithm, characteristics of an algorithm, Selection and iteration constructs in pseudocode

B. Searching and sorting algorithms including the following:

(a) Finding maximum and/or minimum element in a finite sequence of integers,

(b) The linear search and binary search algorithms of an integer x in a finite sequence of distinct integers,

(c) Sorting of a finite sequence of integers in ascending order, selection sort.

B. Algorithms on integers:

(a) Modular exponent,

(b) Euclidean algorithm to find the g.c.d of two non-zero integers.

C. Complexity of algorithm: Big O notation, Growth of functions, Time complexity, Best case, Average case, Worst Case complexity. Using big O notation to express the best, average and worst case behaviour for sorting and searching algorithms.

D. Shortest path problem: Construction of Eulerian path by Fleury's Algorithm, The shortest path algorithm - Dijkstra's Algorithm, Floyd's Algorithm to find the length of the shortest path.

E. Minimum Spanning Trees, Prim's Algorithm, Kruskal's Algorithm (The Proofs of the results

in this unit are not required and may be omitted).

Recommended Books:

1. R. Wilson, Introduction to Graph theory, Fourth Edition, Prentice Hall.
 2. K. H. Rosen, Discrete Mathematics and Its Applications, McGraw Hill Edition.
 3. B. Kolman, Robert Busby, Sharon Ross: Discrete Mathematical Structures, Prentice-Hall India.
 4. N. Biggs, Discrete Mathematics, Oxford.
 5. Norman Biggs: Discrete Mathematics, Oxford University Press.
 6. Richard Brualdi: Introductory Combinatorics, John Wiley and sons.
 7. V. Krishnamurthy: Combinatorics-Theory and Applications, Affiliated East West Press.
 8. Discrete Mathematics and its Applications, Tata McGraw Hills.
 9. Schaums outline series: Discrete mathematics,
 10. Applied Combinatorics: Allen Tucker, John Wiley and Sons
-

Additional Reference Books:

1. D. B. West, Introduction to graph Theory, Pearson.
 2. F. Harary, Graph Theory, Narosa Publication.
 3. Graham, Knuth and Patashnik, Concrete Mathematics, Pearson Education Asia Low Price Edition.
-

Practicals for USC3MT3

1. Drawing a graph, counting the degree of vertices and number of edges.
 2. Representing a given graph by an adjacency matrix and drawing a graph having given matrix as adjacency matrix.
 3. Determining whether the given graph is connected or not. Finding connected components of a graph. Finding strongly connected components of a graph. Finding cut vertices.
 4. Problems based Trees.
 5. Problems on Algorithm of Graph
 7. Problems on Algorithm of Trees
 8. Miscellaneous Theoretical Questions based on full paper
-

Syllabus for Semester-IV

USC4MT1: CALCULUS-IV

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

Course Outcomes:

Student will be able to:

- (1) Identify Riemann integrability of functions
- (2) Apply fundamental theorem to definite integrals
- (3) Define Beta and Gamma functions
- (4) Examine convergence of Improper Integrals

Unit I: Riemann Integration

(15 Lectures)

Approximation of area, Upper/Lower Riemann sums and properties, Upper/Lower integrals, Definition of Riemann integral on a closed and bounded interval, Criterion of Riemann integrability, if $a < c < b$, then $f \in R[a, b]$ if and only if $f \in R[a, c]$ and $f \in R[c, b]$ and

$\int_a^b f = \int_a^c f + \int_c^b f$, Properties:

(a) $f, g \in R[a, b] \Rightarrow f + g, f - g, \lambda f \in R[a, b]$

(b) $\int_a^b (f + g) = \int_a^b f + \int_a^b g$

(c) $\int_a^b \lambda(f) = \lambda \int_a^b f$

(d) $f \in R[a, b] \Rightarrow |f| \in R[a, b]$ and $\left| \int_a^b f \right| \leq \int_a^b |f|$

(e) If $f \geq 0$ and $f \in C[a, b] \Rightarrow f \in R[a, b]$

(f) If f is bounded with finite number of discontinuities, then $f \in R[a, b]$ generalize this if f is monotone, then $f \in R[a, b]$

Unit II : Indefinite and improper integrals

(15 lectures)

Continuity of $F(x) = \int_a^x f(t) dt$, where $f \in R[a, b]$, Fundamental theorem of calculus, Mean value theorem, Integration by parts, Leibnitz rule, Improper integrals type 1 and type 2,

Absolute convergence of improper integrals, Comparison tests, Abels and Dirichlets tests (without proof).

Unit III : Applications (15 lectures)

(a) β and Γ functions and their properties, relationship between β and Γ functions (without proof).

(b) Applications of definite Integrals : Area between curves, finding volumes by slicing, volumes of solids of revolution Disks and Washers, Cylindrical Shells, Lengths of plane curves, Areas of surfaces of revolution.

References:

1. Calculus Thomas Finney, ninth edition section 5.1, 5.2, 5.3, 5.4, 5.5, 5.6.
 2. R. R. Goldberg, Methods of Real Analysis, Oxford and IBH, 1964.
 3. Ajit Kumar, S. Kumaresan, A Basic Course in Real Analysis, CRC Press, 2014.
 4. T. Apostol, Calculus Vol.2, John Wiley.
 5. K. Stewart, Calculus, Booke/Cole Publishing Co, 1994.
 6. J. E. Marsden, A.J. Tromba and A. Weinstein, Basic multivariable calculus.
 7. Bartle and Sherbet, Real analysis.
-

Practicals for USC4MT1

1. Calculation of upper sum, lower sum and Riemann integral.
 2. Problems on properties of Riemann integral.
 3. Problems on fundamental theorem of calculus, mean value theorems, integration by parts, Leibnitz rule.
 4. Convergence of improper integrals, applications of comparison tests, Abels and Dirichlets tests, and functions.
 5. Beta Gamma Functions
 6. Problems on area, volume, length.
 7. Miscellaneous Theoretical Questions based on full paper
-

USC4MT2: LINEAR ALGEBRA-II

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

Course Outcomes:

Student will be able to:

- (1) Explain properties of inner product space
 - (2) Determine orthogonality in inner product space
 - (3) Find eigenvalues and eigenvectors
 - (4) Identify diagonalizable matrix
-

Unit I: Inner Product Spaces

(15 Lectures)

- (a) Dot product in \mathbb{R}^n , Definition of general inner product on a vector space over \mathbb{R} and examples
 - (b) Norm of a vector in an inner product space. Cauchy-Schwarz inequality, Triangle inequality, Orthogonality of vectors, Pythagoras theorem and geometric applications in \mathbb{R}^2 , Projections on a line, The projection being the closest approximation, Orthogonal complements of a subspace, Orthogonal complements in \mathbb{R}^2 and \mathbb{R}^3 . Orthogonal sets and orthonormal sets in an inner product space, Orthogonal and orthonormal bases. Gram-Schmidt orthogonalization process, Simple examples in \mathbb{R}^3 , \mathbb{R}^4 .
-

Unit II: Eigenvalues and eigenvectors

(15 Lectures)

- (a) Eigenvalues and eigenvectors of a linear transformation $T : V \rightarrow V$, where V is a finite dimensional real vector space, Eigenvalues and eigenvectors of linear transformations examples.
- (b) Eigenvalues of $n \times n$ real matrices.
- (c) The linear independence of eigenvectors corresponding to distinct eigenvalues of a linear transformation.

- (d) The characteristic polynomial of an $n \times n$ real matrix, characteristic roots.
 - (e) Similar matrices, characteristic polynomials of similar matrices.
 - (f) The characteristic polynomial of a linear transformation $T : V \rightarrow V$, where V is a finite dimensional real vector space.
-

Unit III: Diagonalization

(15 Lectures)

- (a) Diagonalizability of an $n \times n$ real matrix and a linear transformation of a finite dimensional real vector space to itself. Definition: Geometric multiplicity and Algebraic multiplicity of eigenvalues of an $n \times n$ real matrix and of a linear transformation.
 - (b) An $n \times n$ matrix A is diagonalisable if and only if \mathbb{R}^n has a basis of eigenvectors of A if and only if the sum of dimension of eigenspaces of A is n if and only if the algebraic and geometric multiplicities of eigenvalues of A coincide. Examples of non diagonalizable matrices.
 - (c) orthogonal diagonalization and Quadratic Forms.
 - (d) orthogonal diagonalization of $n \times n$ real symmetric matrices.
-

Recommended Books:

1. Serge Lang: Introduction to Linear Algebra, Springer Verlag.
 2. S. Kumaresan: Linear Algebra A geometric approach, Prentice Hall of India Private Limited.
-

Additional Reference Books:

1. M. Artin: Algebra, Prentice Hall of India Private Limited.
2. K. Hoffman and R. Kunze: Linear Algebra, Tata McGraw-Hill, New Delhi.
3. Gilbert Strang: Linear Algebra and its applications, International Student Edition.
4. L. Smith: Linear Algebra, Springer Verlag.
5. A. Ramachandra Rao and P. Bhima Sankaran: Linear Algebra, Tata McGrawHill, New Delhi.
6. T. Banchoff and J. Wermer: Linear Algebra through Geometry, Springer Verlag Newyork, 198

7. Sheldon Axler : Linear Algebra done right, Springer Verlag, Newyork.
 8. Klaus Janich : Linear Algebra.
 9. Otto Bretcher: Linear Algebra with Applications, Pearson Education.
 10. Gareth Williams: Linear Algebra with Applications, Narosa Publication.
-

Practicals for USC4MT2

1. Inner Product Spaces, examples. Orthogonal complements in \mathbb{R}^2 and \mathbb{R}^3
 2. Gram-Schmidt method.
 3. Finding characteristic polynomial, eigenvalues of 2×2 and 3×3 matrices.
 4. Eigenvalues and eigenvectors of linear transformation.
 5. Diagonalization and orthogonal diagonalization.
 6. Orthogonal Diagonalization Forms
 7. Miscellaneous Theoretical Questions based on full paper
-

USC4MT3: ORDINARY DIFFERENTIAL EQUATIONS

Note: All topics have to be covered with proof in details (unless mentioned otherwise) and with examples.

Course Outcomes:

Student will be able to:

- (1) Recall the methods to solve the first order differential equations.
- (2) Solve second order linear differential equations by using variation of parameter, reduction method and method of undetermined coefficients
- (3) Apply the power series method to find the solution of second order differential equations.
- (4) Solve second order differential equations by using Laplace Transform

Unit I: Second order Linear Differential equations (15 Lectures)

- (a) Prerequisites: First order and first degree differential equations
- (b) Homogeneous and second order linear differentiable equations: The space of solutions of the homogeneous equation as a vector space. The general solution of a non-homogeneous second order equation. Complementary functions and particular integrals. Wronskian and linear independence of the solutions. The general solution of homogeneous differential equations.
- (c) The homogeneous equation with constant coefficients, Auxiliary equation. The general solution corresponding to real and distinct roots, real and equal roots and complex roots of the auxiliary equation.
- (d) Non-homogeneous equations: The method of undetermined coefficients. The method of variation of parameters.

Unit II: Power Series solution of ordinary differential equations (15 Lectures)

- (a) An introduction to power series.
- (b) Power series solutions of first order ordinary differential equations.
- (c) Regular singular points of second order ordinary differential equations.
- (d) Frobenius series solution of second order ordinary differential equations with regular singular points.

Unit III: Laplace Transforms (15 Lectures)

- (a) Introduction, Properties of Laplace transform
- (b) Laplace transform of elementary functions Problems using properties-Laplace transform of special function, unit step function and Dirac delta function

- (c) Laplace transform of derivatives and Integrals, Evaluation of integral using Laplace Transform, Initial Value Theorem, Final Value Theorem and problems, Laplace Transform of periodic function
- (d) Introduction, Properties of inverse Laplace transform, Problems (usual types)
- (e) Convolution Theorem, Inverse Laplace Transform using Convolution theorem

Recommended Books:

1. G. F. Simmons, Differential Equations with Applications and Historical Notes, McGraw Hill, 1972.
2. E. A. Coddington , An Introduction to Ordinary Differential Equations. Prentice Hall, 1961.
3. W. E. Boyce, R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, Wiley, 2013.
4. D. A. Murray, Introductory Course in Differential Equations, Longmans, Green and Co., 1897.
5. A. R. Forsyth, A Treatise on Differential Equations, MacMillan and Co., 1956.
6. Dr. S. Sreenath, S.Ranganatham, Dr. M.V.S.S.N.Prasad and Dr. V. Ramesh Babu, Fourier Series and Integral Transforms, S.Chand and Company Ltd

Additional Reference Books:

1. M.K. Venkataraman, Engineering Mathematics volume 3, National Publishing Co.
2. P.Kandasamy and others, Engineering Mathematics volume 3, S.Chand and Co.
3. Stanley Grossman and William R. Devit, Advanced Engineering Mathematics, Harper and Row publishers
4. Murray R Spiegel, Schaum's Outline of Laplace Transforms

Practicals for USC4MT3

1. Finding general solution of homogeneous and non-homogeneous equations, use of known solutions to find the general solution of homogeneous equations.
 2. Solving equations using method of undetermined coefficients and method of variation of parameters.
 3. Power series solutions of first order ordinary differential equations.
 4. Frobenius series method for second order ordinary differential equations.
 5. Laplace transform of elementary functions
 6. Laplace transform of derivatives and Integrals
 7. Inverse Laplace transform & Convolution theorem
 8. Miscellaneous
-



॥ विद्या विनयेन शोभते ॥



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: Bachelor's in Science (B. Sc.)

Credits: 132

SYLLABUS

(Approved in the Academic council meeting held on 26 July, 2022)

F. Y. B. Sc. Physics

Revised as per

Choice Based Credit System (60:40)

w. e. f. Academic Year 2022-23

**BACHELOR'S IN SCIENCE (B. Sc.)
Programme Outcomes**

S. N.	After completion of B.Sc. program students will acquire	Graduate Attribute
PO1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO2	An ability to develop and conduct experiments, analyse, and interpret data and use scientific judgement to draw conclusions	Scientific reasoning
PO3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyse and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understand values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Preamble:

The curriculum is framed to equip students to grasp the basic concepts of physics and in addition have a broader vision. A dynamic curriculum accommodates fast faced developments in the knowledge of the subject concerned by introducing innovative concepts, multidisciplinary profile and standard education.

The programme also aims to provide an intellectually stimulating environment to develop skills and enthusiasm of students to the best of their potential. It also helps in giving need based education in physics of the highest quality at the undergraduate level.

In this programme, we aim to provide a solid foundation in all aspects of physics and to show a broad spectrum of modern trends in physics and to develop experimental, computational and mathematical skills of students. The syllabus is framed in such a way that it bridges the gap between the plus two and the postgraduate level of physics by providing a more complete and logical framework in almost all areas of basic physics.

Semester - I
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry I	Core	USC1CH1	3	40	60	100	2
Chemistry II	Core	USC1CH2	3	40	60	100	2
Physics I	Core	USC1PH1	3	40	60	100	2
Physics II	Core	USC1PH2	3	40	60	100	2
Mathematics I	Core	USC1MT1	3	40	60	100	2
Mathematics II	Core	USC1MT2	3	40	60	100	2
Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement	USC1FC1/ USC1PE1/ USC1NS1/ USC1NC1	3	40	60	100	2
Environmental Studies	Ability enhancement	USC1EVS	2	40	60	100	2
Chemistry Practical	Core	USC1CHP	6	--	100	100	2
Physics Practical	Core	USC1PHP	6	--	100	100	2
Mathematics Practical	Core	USC1MTP	3	--	100	100	2

Semester - II
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry I	Core	USC2CH1	3	40	60	100	2
Chemistry II	Core	USC2CH2	3	40	60	100	2
Physics I	Core	USC2PH1	3	40	60	100	2
Physics II	Core	USC2PH2	3	40	60	100	2
Mathematics I	Core	USC2MT1	3	40	60	100	2
Mathematics II	Core	USC2MT2	3	40	60	100	2
Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement	USC2FC2/ USC2PE2/ USC2NS2/ USC2NC2	3	40	60	100	2
Effective Communication Skill	Ability enhancement	USC2CSK	2	40	60	100	2
Chemistry Practical	Core	USC2CHP	6	--	100	100	2
Physics Practical	Core	USC2PHP	6	--	100	100	2
Mathematics Practical	Core	USC2MTP	6	--	100	100	2

Examination Scheme

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component.

The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination	20 Marks
02	1. Test on Practical Skills 2. Open Book Test	20 Marks

B) Semester End Examination: 60 % 60 Marks

Undergraduate Programmes of F.Y.B.Sc. (Sem. I & II) and S.Y.B.Sc. (Sem. III & IV)

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
1. There shall be four questions of 15 marks each (30 marks with internal options). 2. On each unit there will be one question and the fourth question will be based on the entire syllabus. 3. All questions shall be compulsory with internal options. 4. Questions may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Question Paper Pattern for Semester End Examination

Theory	All questions are compulsory and will have internal options.		
	Q-1 (Unit-I, II, III)	A) Multiple Choice Questions (Attempt any 12 out of 15)	12 Marks
		B) Answer in one line C) (Attempt 3 out of 6)	03 Marks
	Q-2 (Unit – I)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
	Q-3 (Unit – II)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
	Q-4 (Unit III)	A) Attempt any one out of two.	08 Marks
B) Attempt any one out of two.		07 Marks	
TOTAL		60 Marks	

Question Paper Pattern for Continuous Internal Assessment

Sr.No.	Particular	Marks
1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20
2	Open Book Test - High order thinking questions (HOTS)	20(converted to 10)
3	Test on Practical Skills	20 (converted to 10)
3.1	Demonstration of skill	5
3.2	Viva	5
3.3	Report	5
3.4	Problem solving ability	5

Question Paper Pattern for Practical Examination

Practical	The External examination for practical courses will be conducted as per the following scheme.		
	Sr. No.	Particulars of External Practical Examination	Marks
	1	Laboratory Work	40 + 40
	2	Journal	05 + 05
	3	Viva	05 + 05
	TOTAL		100 Marks

Course Descriptions	
Semester	I
Course Name	Physics-1
Course Code	USC1PH1
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To state the First Law of thermodynamics and to define heat, work, thermal efficiency and the difference between various forms of energy.
2. To describe the different types of coordinate systems.
3. To explain the physical properties of a fluid and the consequence of such properties on fluid flow & Basics of Solid State Physics.

Course Outcomes

After completing the course, Student will able to:

- CO1 Summarise properties of matter, vectors algebra, laws of thermodynamics.
- CO2 Apply the laws of thermodynamics to formulate the relations necessary to analyse a thermodynamic process, laws of vector algebra, elasticity, fluid dynamics concepts in various physical situations.
- CO3 Explain crystal system, crystal planes and its direction, different coordinate system and interconversion between them, mechanical properties of matter and fluid with its application,
- CO4 Solve sums based on miller indices, Bravais lattices, vector algebra, elasticity, fluid dynamics, thermodynamics.

Classical Physics, Basic of Solid State Physics, Mathematical Physics, Thermodynamics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Elasticity: Review of Elastic constants Y , K , η and σ ; Equivalence of shear strain to compression and extension strains. Relations between elastic constants, Couple for twist in cylinder. [DSM] : : 8.1,8.2,8.3,8.8,8.0,8.12,8.13,8.14,8.15,8.17	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.2	Fluid Dynamics: Equation of continuity, Bernoulli's equation, applications of Bernoulli's equation, streamline and turbulent flow, lines of flow in airfoil, Poiseullies equation. [DSM] : : 12.1,12.3,12.5, 12.6(2),12.7,12.11		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.3	Crystalline Structure : Introduction, Lattice points and space lattice, The basis and crystal structure, Unit Cells and lattice parameters, Primitive Cells, Crystal Systems, Crystal		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7

	Symmetry, Bravais space lattices, Metallic crystal structure, directions, planes, miller indices [SOP] : 4.1,4.2,4.3,4.4,4.5,4.6,4.14,4.15,4.18			
2.1	Vector Algebra: Vectors, Scalars, Vector algebra, Laws of Vector algebra, Unit vector, Rectangular unit vectors, Components of a vector, Scalar fields, Vector fields, Problems based on Vector algebra. Dot or Scalar product, Cross or Vector product, Commutative and Distributive Laws, Scalar Triple product, Vector Triple product (Omit proofs). Problems and applications based on Dot, Cross and Triple products. [SLS] : 1.1,1.2,1.3,1.4,1.6,1.7,2.1,2.2,2.3,2.4	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
2.2	Coordinate System : Introduction of coordinate system, types of coordinate system, Curvilinear Coordinates: Cylindrical Coordinates, Spherical Coordinates, Transformation of Cartesian coordinates to curvilinear coordinates and vice versa and Problems [SLS] : 7.1,7.2,7.3,7.4 [CH] :1.6.1,1.6.2,1.6.8		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.1	Behaviour of real gases: Behaviour of real gases and real gas equation, Van der Waal equation [BSH]: 2.1 to 2.12	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.2	Thermodynamics: Thermodynamic Systems, Zeroth law of thermodynamics, Concept of Heat, The first law, Non Adiabatic process and Heat as a path function, Internal energy, , Heat Capacity and specific heat, Applications of first law to simple processes, general relations from the first law, Indicator diagrams, Work done during isothermal and adiabatic processes, Worked examples, Problems.. [BSH]: 4.1 to 4.14		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7

References

- [DSM] : D S Mathur, Element of Properties of Matter, S Chand & Co
- [HCV] : H. C. Verma, Concepts of Physics – (Part–I), 2002 Ed. Bharati Bhavan Publishers.
- [SOP] : S.O.Pillai, Solid state Physics, New Age International Publishers
- [SLS] : Vector Analysis , Murray Spiegel, Seymour Lipschutz, Deniis Spellman, 2nd Edition.
- [CH] : Introduction to Mathematical Physics, Charlie Harper, PH publishers
- [BSH] :Brijlal, Subramanyam and Hemne, Heat Thermodynamics and Statistical Physics, S Chand, Revised, Multi-coloured,2007 Ed.

Additional Reference:

1. Thornton and Marion, Classical Dynamics – (5th Ed)
2. Halliday, Resnick and Walker, Fundamental of Physics (extended) – (6th Ed.), John Wiley and Sons
3. R Murugesan and K Shivprasath, Properties of Matter and Acoustics S Chand.
4. M W Zemansky and R H Dittman, Heat and Thermodynamics, McGraw Hill.
5. D K Chakrabarti, Theory and Experiments on Thermal Physics, (2006 Ed) Central books.
6. C L Arora, Optics, S Chand.
7. Hans and Puri, Mechanics –, 2nd Ed. Tata McGraw Hill
8. Charlie Harper, Introduction to Mathematical Physics , 2009 (EEE) PHI Learning Pvt. Ltd
9. S.O.Pillai , Problems in Solid State Physics
10. B.S.Rajput - Mathematical Physics

Course Descriptions	
Semester	I
Course Name	Physics-II
Course Code	USC1PH2
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To understand the principal, construction & working of Nuclear Detectors & their applications.
2. To study response of Alternating Current (AC) to electrical components like resistors, capacitors and inductors
3. To evaluate balancing conditions for AC Bridges.
4. To study different number systems and Interconversion between them

Course Outcomes

After completing the course, Student will able to:

- CO1 Explain nuclear reactions, interactions between subatomic particles, construction & working of gas filled nuclear detectors, digital electronic circuits, number systems, AC Circuits & AC Bridges
- CO2 Solve numerical problems related to Binary Addition & subtraction, Nuclear Reactions, response of purely resistive, capacitive & inductive circuits, RC circuit, LR circuit and LCR circuits to an AC Signal using phasor diagrams and AC Bridges.
- CO3 Evaluate the balancing conditions for Maxwell's Bridge, de-Sauty's Bridge, Wien Bridge, Hay Bridge.
- CO4 Determine the equations of total current(I) impedance(Z) & phase angle for purely resistive, capacitive & inductive circuits, RC circuit, LR circuit and LCR circuit using phasor diagram.

Nuclear Physics & Analog Electronics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Nuclear Detectors: Review (Structure of Nuclei: Basic properties of nuclei, Composition, Charge, Size, Rutherford's expt. for estimation of nuclear size, density of nucleus, Radioactivity), Interaction between particles and matter, Ionization chamber, Proportional counter and GM counter, problems [Kaplan] : Nuclear Detectors: 2.8 [SBP]: Nuclear Detectors: 1.1.2, 1.1.3(i and ii)	15 Hrs	CO1, CO2,	PO1, PO2, PO3, PO6, PO7
1.2	Nuclear Reactions: Types of Reactions and Conservation Laws. Concept of Compound and Direct Reaction, Q value equation and solution of the Q equation, problems. Fusion and fission definitions and qualitative discussion with examples [SBP]: Nuclear Reactions: 3.1 to 3.5 [BSS]: Nuclear Fusion & Fission: 12.3 and 12.7		CO1, CO2,	PO1, PO2, PO3, PO6, PO7
2.1	Circuit theorems: (Review: ohm's law, Kirchhoff's laws) Superposition Theorem, Thevenin's Theorem, Ideal Current Sources, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem. Numericals related to circuit analysis using the above theorems. [CR]: Circuit Theorems: 7.7 to 7.11	15 hrs	CO2 CO3 CO4	PO1, PO2, PO3, PO6, PO7
2.2	DC power supply: Bridge rectifier, its PIV and its Ripple factor, Capacitor Filter, Inductor filter, CLC or Pi Filter. Zener diode as voltage stabiliser [VKM]: DC: 6.8 to 6.15, 6.17 to 6.20, 6.21, 6.27		CO2 CO3 CO4	PO1, PO2, PO3, PO6, PO7
3.1	Alternating current theory: (Review :Concept of L, R, and C, AC circuit containing pure R, pure L and pure C) Representation of sinusoids by complex numbers using Phasor diagram, Series L-R, C-R and LCR circuits. Resonance in LCR series circuit, Power in ac circuit. Q-factor [CR]: 15.5 to 15.11	15 Hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.2	AC bridges: AC-bridges: General AC bridge, Maxwell's Bridge, de-Sauty's Bridge, Wien Bridge, Hay Bridge [CR]: 7.12(i),15.14		CO3	PO1, PO2, PO3, PO6, PO7

References

1. [Kaplan]: Nuclear Physics, Irving Kaplan, 2nd Ed. Narosa Publishing House
2. [SBP]: Dr. S. B. Patel, Nuclear Physics Reprint 2009, New Age International
3. [BSS]: N Subrahmanyam, Brijlal and Seshan, Atomic and Nuclear Physics Revised Ed. Reprint 2012, S. Chand
4. [CR]: D. Chattopadhyay, P C Rakshit , Electricity and Magnetism 7th Ed. New Central Book agency
5. [VKM]: V K Mehta and R Mehta Electronics Principals, Multi coloured Revised 11th Ed. reprint in 2012, S Chand.

Additional References:

- 1 Arthur Beiser, Perspectives of Modern Physics : Tata McGraw Hill
- 2 S N Ghosal, Atomic Physics S Chand
- 3 S N Ghosal, Nuclear Physics 2nd ed. S Chand

Course Descriptions	
Semester	I
Course Name	Physics Practical
Course Code	USC1PHP
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To determine mechanical properties of solids like the Moment of Inertia, Modulus of Elasticity, Coefficient of Viscosity, temperature coefficient of resistance of Thermistor and Joule's Constant.
2. To measure the frequency of Alternating Current (AC) & study its response to electrical components like resistor, capacitor & Inductor.
3. To obtain the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
4. To study the light sensing characteristics of LDR & temperature sensing characteristics of Thermistor

Course Outcomes

After completing the course, Student will able to:

- CO1 Make use of measuring devices such as Digital Multimeter, Vernier Calliper, Micrometre Screw Gauge, Travelling Microscope , spectrometer.
- CO2 Construct circuits using Resistors, Inductors, Capacitors, Voltmeter, Ammeter, LDR, transformers and logic gates
- CO3 Measure different mechanical properties of Solids like the Moment of Inertia, Modulus of Elasticity, Coefficient of Viscosity, temperature coefficient of resistance of Thermistor and Joule's Constant.

CO4 Determine capacitance, inductance, frequency of AC mains, lattice parameters and interplanar spacing.

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular experiments			
A.1	<p>Group 1</p> <ol style="list-style-type: none"> 1. J by Electrical Method: To determine mechanical equivalent of heat 2. Torsional Oscillation: To determine modulus of rigidity η of a material of wire by torsional oscillations 3. Bifilar Pendulum 4. To determine Coefficient of Viscosity (η) of a given liquid by Poiseuille's Method 5. To study Thermistor characteristic 6. Y by vibrations: To determine Y Young's Modulus of a wire material by method of vibrations- Flat spiral Spring 7. Study of crystal structures 	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
A.2	<p>Group 2</p> <ol style="list-style-type: none"> 1. CR Circuit: To determine value of given capacitor and Phase angle 2. Frequency of AC Mains: To determine frequency of AC mains. 3. LR Circuit: To determine the value of given inductance and phase angle 4. Zener Diode as a Voltage Regulator 5. Bridge Rectifier 6. Norton's Theorem 7. Thevenin's Theorem 	15 hrs	CO2, CO4	PO1, PO2, PO3, PO6
B	<p>Skill Experiments:(Any 4)</p> <ol style="list-style-type: none"> 1. Use of Vernier callipers, Micrometre Screw Gauge, Travelling Microscope 2. Graph Plotting : Experimental, Straight Line with intercept, Resonance Curve etc. 3. Spectrometer: Schuster's Method 4. Use of DMM 5. Absolute and relative errors calculation. 	15 hrs	CO1	PO1, PO3, PO6
C	<p>Any one out of following is equivalent to two experiments from section A and/ or B</p> <ol style="list-style-type: none"> 1. Students should collect the information of at least five Physicists with their work. Report that in a journal. 2. Students should carry out mini-project upto the satisfaction of professor In-charge of practical. 3. Study tour. Students participating in the study tour must submit a study tour report. 	15 hrs	CO1, CO2, CO3, CO4	-

References

1. D. C. Tayal, edited by Ila Agarwal, University Practical Physics, 1st edition, Himalaya Publishing House
 2. Harman Singh, B.Sc. Practical Physics, 7th edition, S. Chand Publication.
 3. C. L. Arora, B.Sc. Practical Physics, 21st edition, S. Chand Publication.
- Minimum 4 experiments from each group should be completed in the first semester.
 - Any four skill experiments are to be reported in journal
 - Certified journal is a must to be eligible to appear for the semester end practical Exam.
 - The scheme of examination for the revised course in Physics at the First Year B.Sc. Semester end examination will be Semester End Practical Examination:
 - Scheme of examination for Practical: There will be no internal assessment for practical.
 - A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that he candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement.
 - The duration of the practical examination will be two hours per experiment.
 - There will be two experiments through which the candidate will be examined in practical examination.

Semester II

Course Descriptions	
Semester	II
Course Name	Physics-I
Course Code	USC2PH1
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To explain the lens defects due to the spherical nature of the lens.
2. To explain transient response of AC Circuits using differential equations.
3. To differentiate between reversible & irreversible heat engines.
4. To define the second law of thermodynamics in various forms.

Course Outcomes

After completing the course, Student will able to:

- CO1 Apply lens maker equation, concepts of differential equation in circuits, second law of thermodynamics to Heat Engines.
- CO2 Deduct current, charge in LR,RC circuit in terms of equation and graph, equivalent focal length, cardinal points for thin and thick lens, work done in Carnot cycle, efficiencies of heat engines.
- CO3 Discuss natural physical processes related to light waves , lens system, aberration, Heat Engines, Second law of thermodynamics.
- CO4 Solve numerical problems related to homogenous and inhomogenous equations, lens, Aberration, Carnot Cycle, Carnot heat Engine & other Heat Engine.

Optics, Applied Mathematics, Thermal Physics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Lens : Lens Maker's Formula (Review), Newton's lens equation, magnification-lateral, longitudinal and angular, Equivalent focal length of two thin lenses, thick lens, cardinal points of combination of two lens, cardinal points of thick lens [BSA] : 4.2,4.3,4.8,4.9,4.10,4.12,4.17,5.2	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.2	Aberration: Spherical Aberration, Reduction of Spherical Aberration, Chromatic aberration and condition for achromatic aberration [BSA] : 9.1,9.2,9.5,9.10,9.11,9.13		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
2.1	Differential equations:		CO1, CO2,	PO1, PO2,

	Introduction, Ordinary differential equations, First order homogeneous and non- homogeneous equations with variable coefficients, Exact differentials, General first order Linear Differential Equation, Second-order homogeneous equations with constant coefficients. Problems depicting physical situations like LC and LR circuits, Simple Harmonic motion (spring mass system) [CH]: 5.1, 5.2,5.2.1 (A, B, C) (Omit D)	15hrs	CO3, CO4	PO3, PO6, PO7 ₂
2.2	Transient response of circuits: Series LR, CR (Growth and decay of currents/charge.) LCR circuits. Growth of currents/charge. [CR]: 14.1 to 14.3		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.1	Ideal Heat Engine : Conversion of Heat into Work, Heat Engine, Efficiency of Heat Engines, Slope of Isothermal and Adiabatic Process on P-V Graph, Carnot's Ideal Heat Engine, Carnot's Cycle, Net Work Done in One Cycle, It's Efficiency, Numerical. [BSH]: 4.2-4.7, 4.21-4.27		CO1, CO2, CO3, CO4	PO1, PO2 ₂
3.2	Second Law Of Thermodynamics : Second Law of Thermodynamics, Kelvin-Planck Statement, Clausius Statement, Equivalence of Kelvin-Planck & Clausius Statement, Carnot's Theorems, Reversible And Irreversible Process, Absolute Scale of Temperature. [BSH]: 4.20, 4.28-4.29, 5.11-5.13	15hrs	CO1, CO2, CO3, CO4	PO1, PO2 ₂
3.3	Combustion Engines : Steam Engine, Rankine Cycle, Otto Engine, Efficiency Of Otto Cycle, Diesel Cycle, Efficiency Of Diesel Cycle, Comparison Between Otto And Diesel Engine. [BSH]: 4.30-4.33 (pg.141-148)		CO1, CO2, CO3, CO4	PO1, PO2

References

- [BSA] : Brijlal, Subramanyam and Avadhanulu A Textbook of Optics, 25th revised ed.(2012) S. Chand
- [CH] : Charlie Harper, Introduction to Mathematical Physics , 2009 (EEE) PHI Learning Pvt. Ltd.
- [CR]: D. Chattopadhyay, P C Rakshit , Electricity and Magnetism 7th Ed. New Central Book
- [BSH] Heat thermodynamics and Statistical Physics, Brijlal, N.Subramanyam, P. S. Hemne, S. Chand, edition 2007
- [TGR] Thermal Physics, AB Gupta and H. Roy, Book and Allied (P) Ltd, Reprint 2009

Additional References:

- A K Ghatak, Chua, Mathematical Physics, 1995, Macmillan India Ltd.
- Ken Riley, Michael Hobson and Stephen Bence, Mathematical Methods for Physics and Engineering, Cambridge (Indian edition).

3. H. K. Dass, Mathematical Physics, S. Chand & Co.
4. Jon Mathews & R. L. Walker, Mathematical Methods of Physics: W A Benjamin Inc. 11
5. Basic Thermodynamics: Evelyn Guha (Narosa Publications).
6. A treatise on heat: Meghanad Saha and BN Srivastava , 1969, India Press.

Course Descriptions	
Semester	II
Course Name	Physics-II
Course Code	USC2PH2
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To study the molecular structure of the crystal using X-rays.
2. To design regulated power supply using rectifier and filter circuits.
3. To explain the analogy between electric field and magnetic field.

Course Outcomes

After completing the course, Student will able to:

- CO1 Explain the wavelike behaviour of a particle, the concept of matter wave and the distribution of Energy for a Black body radiator.
- CO2 Solve numerical problems based on matter waves, D. C. Circuits, Network theorems, Electric field and magnetic field.
- CO3 Analyse electric network circuits using Thevenin's theorem, Norton theorem, Superposition theorem, Reciprocity theorem and Maximum Power Transfer theorem..
- CO4 Discuss on rectifier circuits, Capacitor Filter circuits, Inductor filter circuits, CLC or Pi Filter circuits. and voltage regulator circuits.

Modern Physics, Digital Electronics and Electrodynamics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Origin of Quantum Mechanics Origin of Quantum theory, Black body (definition), Black Body spectrum, Wien's displacement law, Matter waves, wave particle duality, Heisenberg's uncertainty Principle. Davisson-Germer experiment. [BSS]: Origin of Quantum Mechanics: 2.1 to 2.6, 3.1 to 3.5 and 3.9(without applications)	15 hrs	CO1, CO2	PO1, PO2, PO3, PO6, PO7
1.2	X rays X-Rays production and properties. Continuous and characteristic X-Ray spectra, Bragg's Law, Applications of X-Rays [AB]: X- Rays: 2.5, 2.6		CO1 CO2	PO1, PO2, PO3, PO6, PO7

	[BSS]: X- Rays: 6.2 to 6.4			
1.3	Compton effect: Compton effect, Pair production, Photons & Gravity, Gravitational Red Shift [AB]: Compton Effect: 2.7 to 2.9		CO1 CO2	PO1, PO2, PO3, PO6, PO7
2.1	Number System: Binary number system , Arithmetic building blocks , Types of registers, Digital IC, signal levels, Binary to Decimal ,Decimal to binary , Hexadecimal number, Hexadecimal to decimal Conversion, Decimal to hexadecimal conversion, Hexadecimal to binary conversion, Binary to hexadecimal conversion, Binary addition, Unsigned binary numbers, Sign magnitude numbers , 1's complement , 2's complement , Converting to and from 2's complement representation , 2's complement arithmetic, The adder- subtractor (ignore IC specific diagrams) [LMS] : Number System : 5.1, 5.2, 5.3, 5.5, 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8 [VKM]: 26.1 to 26.9	15 hrs		PO1, PO2, PO3, PO6, PO7
2.2	Digital Electronics: Logic gates (Review), NAND and NOR as universal building blocks. EX-OR gate: logic expression, logic symbol, truth table, Implementation using basic gates and its applications, Boolean algebra, Boolean theorems. De-Morgan theorems, Half adder and Full adder [VKM]: Digital electronics: 26.15 to 26.17, 26.20, 26.21, 26.22, 26.32			PO1, PO2, PO3, PO6, PO7
3.1	Electrostatics: The Coulomb's Law, The Electric Field, Discrete & Continuous Charge Distribution, Electric Potential, The Potential of a Localised Charge Distribution, Electric Potential Energy due to Discrete & Continuous charge Distribution, Comments on Potential, Numericals [DJG]: 2.1.1 to 2.1.4, 2.3.1, 2.3.2, 2.3.4, 2.4.1, 2.4.2 [BS] : 13.1 to 13.6, 13.11,13.12,13.18		CO2	PO1 PO2, PO6, PO7
3.2	Magnetostatics: Magnetic Fields due to Steady Currents, The Biot Savart Law & its applications, The Magnetic Field due a straight current carrying wire, Circular coil, Helmholtz coils, solenoid and Toroid, Numericals [DJG] :5.1.1, 5.2.1, 5.2.2 [BS] : 16.7 to 16.12	15 hrs	CO2	PO1 PO2, PO6, PO7
3.3	Electromagnetic Waves: Maxwell's Equations, Electrodynamics before Maxwell, How Maxwell Fixed Ampere's Law [DJG] :7.3.1 to 7.3.3 [BS]: 18.1, 18.2		CO2	PO1 PO2, PO6, PO7

References

- [BSS]: N Subrahmanyam, Brijlal and Seshan, Atomic and Nuclear Physics Revised Ed. Reprint 2012, S. Chand
- [AB]: Arthur Beiser, Concepts of Modern Physics 6th Ed. Tata McGraw Hill
- [CR]: D. Chattopadhyay, P C Rakshit, Electricity and Magnetism 7th Ed. New Central Book agency.
- [VKM]: V K Mehta and R Mehta Electronics Principals, Multi coloured Revised 11th Ed. reprint in 2012, S Chand.
- [DJG]: David J. Griffiths: Introduction to Electrodynamics, Prentice Hall India(EEE)3rd Ed.
- [BS]: Mechanics & Electrodynamics, 7th Edition, 2011, Brij Lal, Subramanyam & Jeevan Seshan
- [LMS] : Digital Principles and Applications By Leach, Malvino, Saha Seventh edition.

Additional References:

- B.L. Theraja and A.K. Theraja , A Textbook of Electrical Technology Vol. I , S. Chand Publication
- A B Bhattacharya, Electronics Principles and Applications, Central publisher.
- A P Malvino, Digital Principles and Applications: Tata McGraw Hill
- Tokhiem, Digital electronics, 4th ed, McGraw Hill International Edition.
- BN Boylestad and Nashelsky, Electronic devices and Circuit Theory: 7th edition, Prentice Hall of India.

Course Descriptions	
Semester	II
Course Name	Physics Practical II
Course Code	USC2PHP
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

- To demonstrate the applications of semiconductor devices as voltage regulators, rectifiers and amplifiers.
- To find the Refractive Index of transparent material.
- To determine the radius of curvature & cardinal points of the lens system.
- To analyse the electrical circuits using network theorems.

Course Outcomes

After completing the course, Student will able to:

- CO1 Utilise Optical Instruments such as the Spectrometer, Prism, Lenses for finding Optical properties like the Refractive Index of the material of the Prism, equivalent focal length.
- CO2 Determine moment of inertia & acceleration due to gravity.
- CO3 Justify Norton's & Thevenin's theorem, Zener diode, Bridge rectifier as voltage regulator, Transistor characteristics.
- CO4 Design circuits using Diodes, transistors, resistors, transformers.
- CO5 Explain concepts in physics like conservation of angular momentum , divergence of light, charging & discharging of capacitor and wave characteristics using demonstration.

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular Experiments			
A.1	Group 1 1. Flywheel 2. Newton's Rings: To determine radius of curvature of a given convex lens using Newton's rings 3. Spectrometer: To determine refractive index μ of the material of prism 4. Spectrometer: To determine the angle of Prism. 5. To determine Cardinal points of the Lens system. 6. Bar pendulum	15 hrs	CO1, CO2,	PO1, PO2, PO3, PO6
A.2	Group 2 1. LDR Characteristics 2. Study of Logic Gates 3. To verify De Morgan's Theorems 4. NAND & NOR Gates as Universal Building Gates 5. Half Adder 6. Full Adder	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
B	List of Demo-experiments: (Any four) 1. Angular Momentum conservation (Rotating Platform) 2. Light dependent switch 3. Laser beam divergence, Intensity 4. Use of Oscilloscope 5. Charging and discharging of a capacitor	15 hrs	CO5	PO1, PO3, PO6
C	Any one out of following is equivalent to two experiments from section A and/or B 1. Students should collect the information of at least five Physicists with their work. Report that in a journal. 2. Students should carry out mini-project upto the satisfaction of professor In-charge of practical. 3. Study tour. Students participating in the study tour must submit a study tour report.	15 hrs	-	-

References

Revised Syllabus in Physics (C.B.C.S) with effect from 2022-23

1. D. C. Tayal, edited by Ila Agarwal, University Practical Physics, 1st edition, Himalaya Publishing House
2. Harman Singh, B.Sc. Practical Physics, 7th edition, S. Chand Publication.
3. C. L. Arora, B.Sc. Practical Physics, 21st edition, S. Chand Publication.

- Minimum 4 experiments from each group should be completed in the second semester.
- Any four skill experiments are to be reported in a journal.
- Certified journal is a must to be eligible to appear for the semester end practical.
- The scheme of examination for the revised course in Physics at the First Year B.Sc. Semester end examination will be Semester End Practical Examination:
- Scheme of examination for Practical: There will be no internal assessment for practical.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that he candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement.
- The duration of the practical examination will be two hours per experiment.
- There will be two experiments through which the candidate will be examined in practical.



॥ विद्या विनयेन शोभते ॥



Janardan Bhagat Shikshan Prasarak Sanstha's

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SYLLABUS

(Approved in the Academic council meeting held on 26 July, 2022)

F. Y. B. Sc. Physics

Revised as per

Choice Based Credit System (60:40)

w. e. f. Academic Year 2022-23

SEM 1 : Physics practical : skill development

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular experiments			
A.1	Group 1 1. J by Electrical Method: To determine mechanical equivalent of heat 2. Torsional Oscillation: To determine modulus of rigidity η of a material of wire by torsional oscillations 3. Bifilar Pendulum 4. To determine Coefficient of Viscosity (η) of a given liquid by Poiseuille's Method 5. To study Thermistor characteristic 6. Y by vibrations: To determine Y Young's Modulus of a wire material by method of vibrations- Flat spiral Spring 7. Study of crystal structures	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
A.2	Group 2 1. CR Circuit: To determine value of given capacitor and Phase angle 2. Frequency of AC Mains: To determine frequency of AC mains. 3. LR Circuit: To determine the value of given inductance and phase angle 4. Zener Diode as a Voltage Regulator 5. Bridge Rectifier 6. Norton's Theorem 7. Thevenin's Theorem	15 hrs	CO2, CO4	PO1, PO2, PO3, PO6
B	Skill Experiments:(Any 4) 1. Use of Vernier callipers, Micrometre Screw Gauge, Travelling Microscope 2. Graph Plotting : Experimental, Straight Line with intercept, Resonance Curve etc. 3. Spectrometer: Schuster's Method 4. Use of DMM 5. Absolute and relative errors calculation.	15 hrs	CO1	PO1, PO3, PO6

SEM II : Physics practical : skill development

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular Experiments			
A.1	Group 1 1. Flywheel 2. Newton's Rings: To determine radius of curvature of a given convex lens using Newton's rings	15 hrs	CO1, CO2,	PO1, PO2, PO3, PO6

	3. Spectrometer: To determine refractive index μ of the material of prism 4. Spectrometer: To determine the angle of Prism. 5. To determine Cardinal points of the Lens system. 6. Bar pendulum			
A.2	Group 2 1. LDR Characteristics 2. Study of Logic Gates 3. To verify De Morgan's Theorems 4. NAND & NOR Gates as Universal Building Gates 5. Half Adder 6. Full Adder	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
B	List of Demo-experiments: (Any four) 1. Angular Momentum conservation (Rotating Platform) 2. Light dependent switch 3. Laser beam divergence, Intensity 4. Use of Oscilloscope 5. Charging and discharging of a capacitor	15 hrs	CO5	PO1, PO3, PO6

BACHELOR'S IN SCIENCE (B. Sc.) Programme Outcomes

S. N.	After completion of B.Sc. program students will acquire	Graduate Attribute
PO1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO2	An ability to develop and conduct experiments, analyse, and interpret data and use scientific judgement to draw conclusions	Scientific reasoning
PO3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyse and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking

PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understand values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Preamble:

The curriculum is framed to equip students to grasp the basic concepts of physics and in addition have a broader vision. A dynamic curriculum accommodates fast faced developments in the knowledge of the subject concerned by introducing innovative concepts, multidisciplinary profile and standard education.

The programme also aims to provide an intellectually stimulating environment to develop skills and enthusiasm of students to the best of their potential. It also helps in giving need based education in physics of the highest quality at the undergraduate level.

In this programme, we aim to provide a solid foundation in all aspects of physics and to show a broad spectrum of modern trends in physics and to develop experimental, computational and mathematical skills of students. The syllabus is framed in such a way that it bridges the gap between the plus two and the postgraduate level of physics by providing a more complete and logical framework in almost all areas of basic physics.

Semester - I ***[Under CBCS Scheme]***

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry I	Core	USC1CH1	3	40	60	100	2
Chemistry II	Core	USC1CH2	3	40	60	100	2
Physics I	Core	USC1PH1	3	40	60	100	2
Physics II	Core	USC1PH2	3	40	60	100	2

Mathematics I	Core	USC1MT1	3	40	60	100	2
Mathematics II	Core	USC1MT2	3	40	60	100	2
Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement	USC1FC1/ USC1PE1/ USC1NS1/ USC1NC1	3	40	60	100	2
Environmental Studies	Ability enhancement	USC1EVS	2	40	60	100	2
Chemistry Practical	Core	USC1CHP	6	--	100	100	2
Physics Practical	Core	USC1PHP	6	--	100	100	2
Mathematics Practical	Core	USC1MTP	3	--	100	100	2

Semester - II
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry I	Core	USC2CH1	3	40	60	100	2
Chemistry II	Core	USC2CH2	3	40	60	100	2
Physics I	Core	USC2PH1	3	40	60	100	2
Physics II	Core	USC2PH2	3	40	60	100	2
Mathematics I	Core	USC2MT1	3	40	60	100	2
Mathematics II	Core	USC2MT2	3	40	60	100	2

Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement	USC2FC2/ USC2PE2/ USC2NS2/ USC2NC2	3	40	60	100	2
Effective Communication Skill	Ability enhancement	USC2CSK	2	40	60	100	2
Chemistry Practical	Core	USC2CHP	6	--	100	100	2
Physics Practical	Core	USC2PHP	6	--	100	100	2
Mathematics Practical	Core	USC2MTP	6	--	100	100	2

Examination Scheme

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component.

The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination	20 Marks
02	1. Test on Practical Skills 2. Open Book Test	20 Marks

B) Semester End Examination: 60 %**60 Marks****Undergraduate Programmes of F.Y.B.Sc. (Sem. I & II) and S.Y.B.Sc. (Sem. III & IV)**

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
1. There shall be four questions of 15 marks each (30 marks with internal options).
2. On each unit there will be one question and the fourth question will be based on the entire syllabus.
3. All questions shall be compulsory with internal options.
4. Questions may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Question Paper Pattern for Semester End Examination

Theory	All questions are compulsory and will have internal options.		
	Q-1 (Unit-I, II, III)	A) Multiple Choice Questions (Attempt any 12 out of 15)	12 Marks
		B) Answer in one line C) (Attempt 3 out of 6)	03 Marks
	Q-2 (Unit – I)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
	Q-3 (Unit – II)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
	Q-4 (Unit III)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
TOTAL		60 Marks	

Question Paper Pattern for Continuous Internal Assessment

Sr.No.	Particular	Marks
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1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20
2	Open Book Test - High order thinking questions (HOTS)	20(converted to 10)
3	Test on Practical Skills	20 (converted to 10)
3.1	Demonstration of skill	5
3.2	Viva	5
3.3	Report	5
3.4	Problem solving ability	5

Question Paper Pattern for Practical Examination

Practical	The External examination for practical courses will be conducted as per the following scheme.		
	Sr. No.	Particulars of External Practical Examination	Marks
	1	Laboratory Work	40 + 40
	2	Journal	05 + 05
	3	Viva	05 + 05
	TOTAL		100 Marks

EMPLOYABILITY/ENTREPRENEURSHIP/ SKILL DEVELOPMENT

Course Descriptions	
Semester	I
Course Name	Physics-1
Course Code	USC1PH1
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To state the First Law of thermodynamics and to define heat, work, thermal efficiency and the difference between various forms of energy.
2. To describe the different types of coordinate systems.
3. To explain the physical properties of a fluid and the consequence of such properties on fluid flow & Basics of Solid State Physics.

Course Outcomes

After completing the course, Student will able to:

- CO1 Summarise properties of matter, vectors algebra, laws of thermodynamics.
 CO2 Apply the laws of thermodynamics to formulate the relations necessary to analyse a thermodynamic process, laws of vector algebra, elasticity, fluid dynamics concepts in various physical situations.
 CO3 Explain crystal system, crystal planes and its direction, different coordinate system and interconversion between them, mechanical properties of matter and fluid with its application,
 CO4 Solve sums based on miller indices, Bravais lattices, vector algebra, elasticity, fluid dynamics, thermodynamics.

Classical Physics, Basic of Solid State Physics, Mathematical Physics, Thermodynamics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Elasticity: Review of Elastic constants Y , K , η and σ ; Equivalence of shear strain to compression and extension strains. Relations between elastic constants, Couple for twist in cylinder. [DSM] : : 8.1,8.2,8.3,8.8,8.0,8.12,8.13,8.14,8.15,8.17	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.2	Fluid Dynamics: Equation of continuity, Bernoulli's equation, applications of Bernoulli's equation, streamline and turbulent flow, lines of flow in airfoil, Poiseuillies equation. [DSM] : : 12.1,12.3,12.5, 12.6(2),12.7,12.11		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.3	Crystalline Structure : Introduction, Lattice points and space lattice, The basis and crystal structure, Unit Cells and lattice parameters, Primitive Cells, Crystal Systems, Crystal Symmetry, Bravais space lattices, Metallic crystal structure, directions, planes, miller indices [SOP] : 4.1,4.2,4.3,4.4,4.5,4.6,4.14,4.15,4.18		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
2.1	Vector Algebra: Vectors, Scalars, Vector algebra, Laws of Vector algebra, Unit vector, Rectangular unit vectors, Components of a vector, Scalar fields, Vector fields, Problems based on Vector algebra. Dot or Scalar product, Cross or Vector product, Commutative and Distributive Laws, Scalar Triple product, Vector Triple product (Omit proofs). Problems and applications based on Dot, Cross and Triple products. [SLS] : 1.1,1.2,1.3,1.4,1.6,1.7,2.1,2.2,2.3,2.4	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
2.2	Coordinate System : Introduction of coordinate system, types of coordinate system, Curvilinear Coordinates: Cylindrical Coordinates, Spherical Coordinates, Transformation of Cartesian coordinates to curvilinear coordinates and vice versa and Problems [SLS] : 7.1,7.2,7.3,7.4		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7

	[CH] :1.6.1,1.6.2,1.6.8			
3.1	Behaviour of real gases: Behaviour of real gases and real gas equation, Van der Waal equation [BSH]: 2.1 to 2.12	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.2	Thermodynamics: Thermodynamic Systems, Zeroth law of thermodynamics, Concept of Heat, The first law, Non Adiabatic process and Heat as a path function, Internal energy, , Heat Capacity and specific heat, Applications of first law to simple processes, general relations from the first law, Indicator diagrams, Work done during isothermal and adiabatic processes, Worked examples, Problems.. [BSH]: 4.1 to 4.14		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7

References

- [DSM] : D S Mathur, Element of Properties of Matter, S Chand & Co
- [HCV] : H. C. Verma, Concepts of Physics – (Part–I), 2002 Ed. Bharati Bhavan Publishers.
- [SOP] : S.O.Pillai, Solid state Physics, New Age International Publishers
- [SLS] :Vector Analysis , Murray Spiegel, Seymour Lipschutz, Deniis Spellman, 2nd Edition.
- [CH] : Introduction to Mathematical Physics,Charlie Harper, PH publishers
- [BSH] :Brijlal, Subramanyam and Hemne, Heat Thermodynamics and Statistical Physics, S Chand, Revised, Multi-coloured,2007 Ed.

Additional Reference:

- Thornton and Marion, Classical Dynamics – (5th Ed)
- Halliday, Resnick and Walker, Fundamental of Physics (extended) – (6th Ed.), John Wiley and Sons
- R Murugesan and K Shivprasath, Properties of Matter and Acoustics S Chand.
- M W Zemansky and R H Dittman, Heat and Thermodynamics, McGraw Hill.
- D K Chakrabarti, Theory and Experiments on Thermal Physics, (2006 Ed) Central books.
- C L Arora, Optics, S Chand.
- Hans and Puri, Mechanics –, 2nd Ed. Tata McGraw Hill
- Charlie Harper, Introduction to Mathematical Physics , 2009 (EEE) PHI Learning Pvt. Ltd
- S.O.Pillai , Problems in Solid State Physics
- B.S.Rajput - Mathematical Physics

Course Descriptions	
Semester	I
Course Name	Physics-II
Course Code	USC1PH2

Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To understand the principal, construction & working of Nuclear Detectors & their applications.
2. To study response of Alternating Current (AC) to electrical components like resistors, capacitors and inductors
3. To evaluate balancing conditions for AC Bridges.
4. To study different number systems and Interconversion between them

Course Outcomes

After completing the course, Student will able to:

- CO1 Explain nuclear reactions, interactions between subatomic particles, construction & working of gas filled nuclear detectors, digital electronic circuits, number systems, AC Circuits & AC Bridges
- CO2 Solve numerical problems related to Binary Addition & subtraction, Nuclear Reactions, response of purely resistive, capacitive & inductive circuits, RC circuit, LR circuit and LCR circuits to an AC Signal using phasor diagrams and AC Bridges.
- CO3 Evaluate the balancing conditions for Maxwell's Bridge, de-Sauty's Bridge, Wien Bridge, Hay Bridge.
- CO4 Determine the equations of total current(I) impedance(Z) & phase angle for purely resistive, capacitive & inductive circuits, RC circuit, LR circuit and LCR circuit using phasor diagram.

Nuclear Physics & Analog Electronics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Nuclear Detectors: Review (Structure of Nuclei: Basic properties of nuclei, Composition, Charge, Size, Rutherford's expt. for estimation of nuclear size, density of nucleus, Radioactivity), Interaction between particles and matter, Ionization chamber, Proportional counter and GM counter, problems [Kaplan] : Nuclear Detectors: 2.8 [SBP]: Nuclear Detectors: 1.1.2, 1.1.3(i and ii)	15 Hrs	CO1, CO2,	PO1, PO2, PO3, PO6, PO7
1.2	Nuclear Reactions: Types of Reactions and Conservation Laws. Concept of Compound and Direct Reaction, Q value equation and solution of the Q equation, problems. Fusion and fission definitions and qualitative discussion with examples [SBP]: Nuclear Reactions: 3.1 to 3.5 [BSS]: Nuclear Fusion & Fission: 12.3 and 12.7		CO1, CO2,	PO1, PO2, PO3, PO6, PO7

2.1	Circuit theorems: (Review: ohm's law, Kirchhoff's laws) Superposition Theorem, Thevenin's Theorem, Ideal Current Sources, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem. Numericals related to circuit analysis using the above theorems. [CR]: Circuit Theorems: 7.7 to 7.11	15 hrs	CO2 CO3 CO4	PO1, PO2, PO3, PO6, PO7
2.2	DC power supply: Bridge rectifier, its PIV and its Ripple factor, Capacitor Filter, Inductor filter, CLC or Pi Filter. Zener diode as voltage stabiliser [VKM]: DC: 6.8 to 6.15, 6.17 to 6.20, 6.21, 6.27		CO2 CO3 CO4	PO1, PO2, PO3, PO6, PO7
3.1	Alternating current theory: (Review :Concept of L, R, and C, AC circuit containing pure R, pure L and pure C) Representation of sinusoids by complex numbers using Phasor diagram, Series L-R, C-R and LCR circuits. Resonance in LCR series circuit, Power in ac circuit. Q-factor [CR]: 15.5 to 15.11	15 Hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.2	AC bridges: AC-bridges: General AC bridge, Maxwell's Bridge, de-Sauty's Bridge, Wien Bridge, Hay Bridge [CR]: 7.12(i),15.14		CO3	PO1, PO2, PO3, PO6, PO7

References

- [Kaplan]: Nuclear Physics, Irving Kaplan, 2nd Ed. Narosa Publishing House
- [SBP]: Dr. S. B. Patel, Nuclear Physics Reprint 2009, New Age International
- [BSS]: N Subrahmanyam, Brijlal and Seshan, Atomic and Nuclear Physics Revised Ed. Reprint 2012, S. Chand
- [CR]: D. Chattopadhyay, P C Rakshit , Electricity and Magnetism 7th Ed. New Central Book agency
- [VKM]: V K Mehta and R Mehta Electronics Principals, Multi coloured Revised 11th Ed. reprint in 2012, S Chand.

Additional References:

- 1 Arthur Beiser, Perspectives of Modern Physics : Tata McGraw Hill
- 2 S N Ghosal, Atomic Physics S Chand
- 3 S N Ghosal, Nuclear Physics 2nd ed. S Chand

Course Descriptions	
Semester	I

Course Name	Physics Practical
Course Code	USC1PHP
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To determine mechanical properties of solids like the Moment of Inertia, Modulus of Elasticity, Coefficient of Viscosity, temperature coefficient of resistance of Thermistor and Joule's Constant.
2. To measure the frequency of Alternating Current (AC) & study its response to electrical components like resistor, capacitor & Inductor.
3. To obtain the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
4. To study the light sensing characteristics of LDR & temperature sensing characteristics of Thermistor

Course Outcomes

After completing the course, Student will able to:

- CO1 Make use of measuring devices such as Digital Multimeter, Vernier Calliper, Micrometre Screw Gauge, Travelling Microscope , spectrometer.
- CO2 Construct circuits using Resistors, Inductors, Capacitors, Voltmeter, Ammeter, LDR, transformers and logic gates
- CO3 Measure different mechanical properties of Solids like the Moment of Inertia, Modulus of Elasticity, Coefficient of Viscosity, temperature coefficient of resistance of Thermistor and Joule's Constant.
- CO4 Determine capacitance, inductance, frequency of AC mains, lattice parameters and interplanar spacing.

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular experiments			
A.1	<p>Group 1</p> <p>8. J by Electrical Method: To determine mechanical equivalent of heat</p> <p>9. Torsional Oscillation: To determine modulus of rigidity η of a material of wire by torsional oscillations</p> <p>10. Bifilar Pendulum</p> <p>11. To determine Coefficient of Viscosity (η) of a given liquid by Poisseuli's Method</p> <p>12. To study Thermistor characteristic</p> <p>13. Y by vibrations: To determine Y Young's Modulus of a wire material by method of vibrations- Flat spiral Spring</p> <p>14. Study of crystal structures</p>	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6

A.2	<p style="text-align: center;">Group 2</p> <p>8. CR Circuit: To determine value of given capacitor and Phase angle</p> <p>9. Frequency of AC Mains: To determine frequency of AC mains.</p> <p>10. LR Circuit: To determine the value of given inductance and phase angle</p> <p>11. Zener Diode as a Voltage Regulator</p> <p>12. Bridge Rectifier</p> <p>13. Norton's Theorem</p> <p>14. Thevenin's Theorem</p>	15 hrs	CO2, CO4	PO1, PO2, PO3, PO6
B	<p>Skill Experiments:(Any 4)</p> <p>1. Use of Vernier callipers, Micrometre Screw Gauge, Travelling Microscope</p> <p>2. Graph Plotting : Experimental, Straight Line with intercept, Resonance Curve etc.</p> <p>3. Spectrometer: Schuster's Method</p> <p>4. Use of DMM</p> <p>5. Absolute and relative errors calculation.</p>	15 hrs	CO1	PO1, PO3, PO6
C	<p>Any one out of following is equivalent to two experiments from section A and/ or B</p> <p>1. Students should collect the information of at least five Physicists with their work. Report that in a journal.</p> <p>2. Students should carry out mini-project upto the satisfaction of professor In-charge of practical.</p> <p>3. Study tour. Students participating in the study tour must submit a study tour report.</p>	15 hrs	CO1, CO2, CO3, CO4	-

References

1. D. C. Tayal, edited by Ila Agarwal, University Practical Physics, 1st edition, Himalaya Publishing House
2. Harman Singh, B.Sc. Practical Physics, 7th edition, S. Chand Publication.
3. C. L. Arora, B.Sc. Practical Physics, 21st edition, S. Chand Publication.

- Minimum 4 experiments from each group should be completed in the first semester.
- Any four skill experiments are to be reported in journal
- Certified journal is a must to be eligible to appear for the semester end practical Exam.
- The scheme of examination for the revised course in Physics at the First Year B.Sc. Semester end examination will be Semester End Practical Examination:
- Scheme of examination for Practical: There will be no internal assessment for practical.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that he candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement.

- The duration of the practical examination will be two hours per experiment.
- There will be two experiments through which the candidate will be examined in practical examination.

Semester II

Course Descriptions	
Semester	II
Course Name	Physics-I
Course Code	USC2PH1
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To explain the lens defects due to the spherical nature of the lens.
2. To explain transient response of AC Circuits using differential equations.
3. To differentiate between reversible & irreversible heat engines.
4. To define the second law of thermodynamics in various forms.

Course Outcomes

After completing the course, Student will able to:

- CO1 Apply lens maker equation, concepts of differential equation in circuits, second law of thermodynamics to Heat Engines.
- CO2 Deduct current, charge in LR,RC circuit in terms of equation and graph, equivalent focal length, cardinal points for thin and thick lens, work done in Carnot cycle, efficiencies of heat engines.
- CO3 Discuss natural physical processes related to light waves , lens system, aberration, Heat Engines, Second law of thermodynamics.
- CO4 Solve numerical problems related to homogenous and inhomogenous equations, lens, Aberration, Carnot Cycle, Carnot heat Engine & other Heat Engine.

Optics, Applied Mathematics, Thermal Physics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Lens : Lens Maker's Formula (Review), Newton's lens equation, magnification-lateral, longitudinal and angular, Equivalent focal length of two thin lenses, thick lense, cardinal points of combination of two lense, cardinal points of thick lens [BSA] : 4.2,4.3,4.8,4.9,4.10,4.12,4.17,5.2	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.2	Aberration: Spherical Aberration, Reduction of Spherical Aberration, Chromatic aberration and condition for achromatic aberration [BSA] : 9.1,9.2,9.5,9.10,9.11,9.13		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7 ₂
2.1	Differential equations: Introduction, Ordinary differential equations, First order homogeneous and non- homogeneous equations with variable coefficients, Exact differentials, General first order Linear Differential Equation, Second-order homogeneous equations with constant coefficients. Problems depicting physical situations like LC and LR circuits, Simple Harmonic motion (spring mass system) [CH]: 5.1, 5.2,5.2.1 (A, B, C) (Omit D)	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7 ₂
2.2	Transient response of circuits: Series LR, CR (Growth and decay of currents/charge.) LCR circuits. Growth of currents/charge. [CR]: 14.1 to 14.3		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.1	Ideal Heat Engine : Conversion of Heat into Work, Heat Engine, Efficiency of Heat Engines, Slope of Isothermal and Adiabatic Process on P-V Graph, Carnot's Ideal Heat Engine, Carnot's Cycle, Net Work Done in One Cycle, It's Efficiency, Numerical. [BSH]: 4.2-4.7, 4.21-4.27	15hrs	CO1, CO2, CO3, CO4	PO1, PO2 ₂

3.2	Second Law Of Thermodynamics : Second Law of Thermodynamics, Kelvin-Planck Statement, Clausius Statement, Equivalence of Kelvin-Planck & Clausius Statement, Carnot's Theorems, Reversible And Irreversible Process, Absolute Scale of Temperature. [BSH]: 4.20, 4.28-4.29, 5.11-5.13		CO1, CO2, CO3, CO4	PO1, PO2 ₄
3.3	Combustion Engines : Steam Engine, Rankine Cycle, Otto Engine, Efficiency Of Otto Cycle, Diesel Cycle, Efficiency Of Diesel Cycle, Comparison Between Otto And Diesel Engine. [BSH]: 4.30-4.33 (pg.141-148)		CO1, CO2, CO3, CO4	PO1, PO2

References

- [BSA] : Brijlal, Subramanyam and Avadhanulu A Textbook of Optics, 25th revised ed.(2012) S. Chand
- [CH] : Charlie Harper, Introduction to Mathematical Physics , 2009 (EEE) PHI Learning Pvt. Ltd.
- [CR]: D. Chattopadhyay, P C Rakshit , Electricity and Magnetism 7th Ed. New Central Book
- [BSH] Heat thermodynamics and Statistical Physics, Brijlal, N.Subramanyam, P. S. Hemne, S. Chand, edition 2007
- [TGR] Thermal Physics, AB Gupta and H. Roy, Book and Allied (P) Ltd, Reprint 2009

Additional References:

- A K Ghatak, Chua, Mathematical Physics, 1995, Macmillan India Ltd.
- Ken Riley, Michael Hobson and Stephen Bence, Mathematical Methods for Physics and Engineering, Cambridge (Indian edition).
- H. K. Dass, Mathematical Physics, S. Chand & Co.
- Jon Mathews & R. L. Walker, Mathematical Methods of Physics: W A Benjamin Inc. 11
- Basic Thermodynamics: Evelyn Guha (Narosa Publications).
- A treatise on heat: Meghanad Saha and BN Srivastava , 1969, India Press.

Course Descriptions	
Semester	II
Course Name	Physics-II
Course Code	USC2PH2
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

- To study the molecular structure of the crystal using X-rays.
- To design regulated power supply using rectifier and filter circuits.
- To explain the analogy between electric field and magnetic field.

Course Outcomes

After completing the course, Student will able to:

- CO1 Explain the wavelike behaviour of a particle, the concept of matter wave and the distribution of Energy for a Black body radiator.
- CO2 Solve numerical problems based on matter waves, D. C. Circuits, Network theorems, Electric field and magnetic field.
- CO3 Analyse electric network circuits using Thevenin's theorem, Norton theorem, Superposition theorem, Reciprocity theorem and Maximum Power Transfer theorem..
- CO4 Discuss on rectifier circuits, Capacitor Filter circuits, Inductor filter circuits, CLC or Pi Filter circuits. and voltage regulator circuits.

Modern Physics, Digital Electronics and Electrodynamics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Origin of Quantum Mechanics Origin of Quantum theory, Black body (definition), Black Body spectrum, Wien's displacement law, Matter waves, wave particle duality, Heisenberg's uncertainty Principle. Davisson-Germer experiment. [BSS]: Origin of Quantum Mechanics: 2.1 to 2.6, 3.1 to 3.5 and 3.9(without applications)	15 hrs	CO1, CO2	PO1, PO2, PO3, PO6, PO7
1.2	X rays X-Rays production and properties. Continuous and characteristic X-Ray spectra, Bragg's Law, Applications of X-Rays [AB]: X- Rays: 2.5, 2.6 [BSS]: X- Rays: 6.2 to 6.4		CO1 CO2	PO1, PO2, PO3, PO6, PO7
1.3	Compton effect: Compton effect, Pair production, Photons & Gravity, Gravitational Red Shift [AB]: Compton Effect: 2.7 to 2.9		CO1 CO2	PO1, PO2, PO3, PO6, PO7
2.1	Number System: Binary number system , Arithmetic building blocks , Types of registers, Digital IC, signal levels, Binary to Decimal ,Decimal to binary , Hexadecimal number, Hexadecimal to decimal Conversion, Decimal to hexadecimal conversion, Hexadecimal to binary conversion, Binary to hexadecimal conversion, Binary addition, Unsigned binary numbers, Sign magnitude numbers , 1's complement , 2's complement , Converting to and from 2's complement representation , 2's complement arithmetic, The adder- subtractor (ignore IC specific diagrams) [LMS] : Number System : 5.1, 5.2, 5.3, 5.5, 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8 [VKM]: 26.1 to 26.9	15 hrs		PO1, PO2, PO3, PO6, PO7

2.2	Digital Electronics: Logic gates (Review), NAND and NOR as universal building blocks. EX-OR gate: logic expression, logic symbol, truth table, Implementation using basic gates and its applications, Boolean algebra, Boolean theorems. De-Morgan theorems, Half adder and Full adder [VKM]: Digital electronics: 26.15 to 26.17, 26.20, 26.21, 26.22, 26.32			PO1, PO2, PO3, PO6, PO7
3.1	Electrostatics: The Coulomb's Law, The Electric Field, Discrete & Continuous Charge Distribution, Electric Potential, The Potential of a Localised Charge Distribution, Electric Potential Energy due to Discrete & Continuous charge Distribution, Comments on Potential, Numericals [DJG]: 2.1.1 to 2.1.4, 2.3.1, 2.3.2, 2.3.4, 2.4.1, 2.4.2 [BS]: 13.1 to 13.6, 13.11,13.12,13.18	15 hrs	CO2	PO1, PO2, PO6, PO7
3.2	Magnetostatics: Magnetic Fields due to Steady Currents, The Biot Savart Law & its applications, The Magnetic Field due a straight current carrying wire, Circular coil, Helmholtz coils, solenoid and Toroid, Numericals [DJG] : 5.1.1, 5.2.1, 5.2.2 [BS] : 16.7 to 16.12		CO2	PO1, PO2, PO6, PO7
3.3	Electromagnetic Waves: Maxwell's Equations, Electrodynamics before Maxwell, How Maxwell Fixed Ampere's Law [DJG] : 7.3.1 to 7.3.3 [BS]: 18.1, 18.2		CO2	PO1, PO2, PO6, PO7

References

- [BSS]: N Subrahmanyam, Brijlal and Seshan, Atomic and Nuclear Physics Revised Ed. Reprint 2012, S. Chand
- [AB]: Arthur Beiser, Concepts of Modern Physics 6th Ed. Tata McGraw Hill
- [CR]: D. Chattopadhyay, P C Rakshit, Electricity and Magnetism 7th Ed. New Central Book agency.
- [VKM]: V K Mehta and R Mehta Electronics Principals, Multi coloured Revised 11th Ed. reprint in 2012, S Chand.
- [DJG]: David J. Griffiths: Introduction to Electrodynamics, Prentice Hall India(EEE)3rd Ed.
- [BS]: Mechanics & Electrodynamics, 7th Edition, 2011, Brij Lal, Subramanyam & Jeevan Seshan
- [LMS] : Digital Principles and Applications By Leach, Malvino, Saha Seventh edition.

Additional References:

- B.L. Theraja and A.K. Theraja , A Textbook of Electrical Technology Vol. I , S. Chand Publication

2. A B Bhattacharya, Electronics Principles and Applications, Central publisher.
3. A P Malvino, Digital Principles and Applications: Tata McGraw Hill
4. Tokhiem, Digital electronics, 4th ed, McGraw Hill International Edition.
5. BN Boylestad and Nashelsky, Electronic devices and Circuit Theory: 7th edition, Prentice Hall of India.

Course Descriptions	
Semester	II
Course Name	Physics Practical II
Course Code	USC2PHP
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To demonstrate the applications of semiconductor devices as voltage regulators, rectifiers and amplifiers.
2. To find the Refractive Index of transparent material.
3. To determine the radius of curvature & cardinal points of the lens system.
4. To analyse the electrical circuits using network theorems.

Course Outcomes

After completing the course, Student will able to:

- CO1 Utilise Optical Instruments such as the Spectrometer, Prism, Lenses for finding Optical properties like the Refractive Index of the material of the Prism, equivalent focal length.
- CO2 Determine moment of inertia & acceleration due to gravity.
- CO3 Justify Norton's & Thevenin's theorem, Zener diode, Bridge rectifier as voltage regulator, Transistor characteristics.
- CO4 Design circuits using Diodes, transistors, resistors, transformers.
- CO5 Explain concepts in physics like conservation of angular momentum, divergence of light, charging & discharging of capacitor and wave characteristics using demonstration.

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular Experiments			
A.1	Group 1 7. Flywheel	15 hrs	CO1, CO2,	PO1, PO2,

	8. Newton's Rings: To determine radius of curvature of a given convex lens using Newton's rings 9. Spectrometer: To determine refractive index μ of the material of prism 10. Spectrometer: To determine the angle of Prism. 11. To determine Cardinal points of the Lens system. 12. Bar pendulum			PO3, PO6
A.2	Group 2 7. LDR Characteristics 8. Study of Logic Gates 9. To verify De Morgan's Theorems 10. NAND & NOR Gates as Universal Building Gates 11. Half Adder 12. Full Adder	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
B	List of Demo-experiments: (Any four) 6. Angular Momentum conservation (Rotating Platform) 7. Light dependent switch 8. Laser beam divergence, Intensity 9. Use of Oscilloscope 10. Charging and discharging of a capacitor	15 hrs	CO5	PO1, PO3, PO6
C	Any one out of following is equivalent to two experiments from section A and/or B 1. Students should collect the information of at least five Physicists with their work. Report that in a journal. 2. Students should carry out mini-project upto the satisfaction of professor In-charge of practical. 3. Study tour. Students participating in the study tour must submit a study tour report.	15 hrs	-	-

References

1. D. C. Tayal, edited by Ila Agarwal, University Practical Physics, 1st edition, Himalaya Publishing House
2. Harman Singh, B.Sc. Practical Physics, 7th edition, S. Chand Publication.
3. C. L. Arora, B.Sc. Practical Physics, 21st edition, S. Chand Publication.

- Minimum 4 experiments from each group should be completed in the second semester.
- Any four skill experiments are to be reported in a journal.
- Certified journal is a must to be eligible to appear for the semester end practical.
- The scheme of examination for the revised course in Physics at the First Year B.Sc. Semester end examination will be Semester End Practical Examination:
- Scheme of examination for Practical: There will be no internal assessment for practical.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester

or a certificate from the Head of the Department /Institute to the effect that he candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement.

- The duration of the practical examination will be two hours per experiment.
- There will be two experiments through which the candidate will be examined in practical.



॥ विद्या विनयेन शोभते ॥



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai

Program: Bachelor's in Science (B. Sc.)

Credits: 132

SYLLABUS

(Approved in the Academic council meeting held on 26 July, 2022)

F. Y. B. Sc. Physics

Revised as per

Choice Based Credit System (60:40)

w. e. f. Academic Year 2022-23

**BACHELOR'S IN SCIENCE (B. Sc.)
Programme Outcomes**

S. N.	After completion of B.Sc. program students will acquire	Graduate Attribute
PO1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO2	An ability to develop and conduct experiments, analyse, and interpret data and use scientific judgement to draw conclusions	Scientific reasoning
PO3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyse and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understand values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Preamble:

The curriculum is framed to equip students to grasp the basic concepts of physics and in addition have a broader vision. A dynamic curriculum accommodates fast faced developments in the knowledge of the subject concerned by introducing innovative concepts, multidisciplinary profile and standard education.

The programme also aims to provide an intellectually stimulating environment to develop skills and enthusiasm of students to the best of their potential. It also helps in giving need based education in physics of the highest quality at the undergraduate level.

In this programme, we aim to provide a solid foundation in all aspects of physics and to show a broad spectrum of modern trends in physics and to develop experimental, computational and mathematical skills of students. The syllabus is framed in such a way that it bridges the gap between the plus two and the postgraduate level of physics by providing a more complete and logical framework in almost all areas of basic physics.

Semester - I
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry I	Core	USC1CH1	3	40	60	100	2
Chemistry II	Core	USC1CH2	3	40	60	100	2
Physics I	Core	USC1PH1	3	40	60	100	2
Physics II	Core	USC1PH2	3	40	60	100	2
Mathematics I	Core	USC1MT1	3	40	60	100	2
Mathematics II	Core	USC1MT2	3	40	60	100	2
Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement	USC1FC1/ USC1PE1/ USC1NS1/ USC1NC1	3	40	60	100	2
Environmental Studies	Ability enhancement	USC1EVS	2	40	60	100	2
Chemistry Practical	Core	USC1CHP	6	--	100	100	2
Physics Practical	Core	USC1PHP	6	--	100	100	2
Mathematics Practical	Core	USC1MTP	3	--	100	100	2

Semester - II
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry I	Core	USC2CH1	3	40	60	100	2
Chemistry II	Core	USC2CH2	3	40	60	100	2
Physics I	Core	USC2PH1	3	40	60	100	2
Physics II	Core	USC2PH2	3	40	60	100	2
Mathematics I	Core	USC2MT1	3	40	60	100	2
Mathematics II	Core	USC2MT2	3	40	60	100	2
Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement	USC2FC2/ USC2PE2/ USC2NS2/ USC2NC2	3	40	60	100	2
Effective Communication Skill	Ability enhancement	USC2CSK	2	40	60	100	2
Chemistry Practical	Core	USC2CHP	6	--	100	100	2
Physics Practical	Core	USC2PHP	6	--	100	100	2
Mathematics Practical	Core	USC2MTP	6	--	100	100	2

Examination Scheme

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component.

The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination	20 Marks
02	1. Test on Practical Skills 2. Open Book Test	20 Marks

B) Semester End Examination: 60 % 60 Marks

Undergraduate Programmes of F.Y.B.Sc. (Sem. I & II) and S.Y.B.Sc. (Sem. III & IV)

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
1. There shall be four questions of 15 marks each (30 marks with internal options). 2. On each unit there will be one question and the fourth question will be based on the entire syllabus. 3. All questions shall be compulsory with internal options. 4. Questions may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Question Paper Pattern for Semester End Examination

Theory	All questions are compulsory and will have internal options.		
	Q-1 (Unit-I, II, III)	A) Multiple Choice Questions (Attempt any 12 out of 15)	12 Marks
		B) Answer in one line C) (Attempt 3 out of 6)	03 Marks
	Q-2 (Unit – I)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
	Q-3 (Unit – II)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
	Q-4 (Unit III)	A) Attempt any one out of two.	08 Marks
B) Attempt any one out of two.		07 Marks	
TOTAL		60 Marks	

Question Paper Pattern for Continuous Internal Assessment

Sr.No.	Particular	Marks
1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20
2	Open Book Test - High order thinking questions (HOTS)	20(converted to 10)
3	Test on Practical Skills	20 (converted to 10)
3.1	Demonstration of skill	5
3.2	Viva	5
3.3	Report	5
3.4	Problem solving ability	5

Question Paper Pattern for Practical Examination

Practical	The External examination for practical courses will be conducted as per the following scheme.		
	Sr. No.	Particulars of External Practical Examination	Marks
	1	Laboratory Work	40 + 40
	2	Journal	05 + 05
	3	Viva	05 + 05
	TOTAL		100 Marks

Course Descriptions	
Semester	I
Course Name	Physics-1
Course Code	USC1PH1
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To state the First Law of thermodynamics and to define heat, work, thermal efficiency and the difference between various forms of energy.
2. To describe the different types of coordinate systems.
3. To explain the physical properties of a fluid and the consequence of such properties on fluid flow & Basics of Solid State Physics.

Course Outcomes

After completing the course, Student will able to:

- CO1 Summarise properties of matter, vectors algebra, laws of thermodynamics.
- CO2 Apply the laws of thermodynamics to formulate the relations necessary to analyse a thermodynamic process, laws of vector algebra, elasticity, fluid dynamics concepts in various physical situations.
- CO3 Explain crystal system, crystal planes and its direction, different coordinate system and interconversion between them, mechanical properties of matter and fluid with its application,
- CO4 Solve sums based on miller indices, Bravais lattices, vector algebra, elasticity, fluid dynamics, thermodynamics.

Classical Physics, Basic of Solid State Physics, Mathematical Physics, Thermodynamics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Elasticity: Review of Elastic constants Y , K , η and σ ; Equivalence of shear strain to compression and extension strains. Relations between elastic constants, Couple for twist in cylinder. [DSM] : : 8.1,8.2,8.3,8.8,8.0,8.12,8.13,8.14,8.15,8.17	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.2	Fluid Dynamics: Equation of continuity, Bernoulli's equation, applications of Bernoulli's equation, streamline and turbulent flow, lines of flow in airfoil, Poiseullies equation. [DSM] : : 12.1,12.3,12.5, 12.6(2),12.7,12.11		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.3	Crystalline Structure : Introduction, Lattice points and space lattice, The basis and crystal structure, Unit Cells and lattice parameters, Primitive Cells, Crystal Systems, Crystal		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7

	Symmetry, Bravais space lattices, Metallic crystal structure, directions, planes, miller indices [SOP] : 4.1,4.2,4.3,4.4,4.5,4.6,4.14,4.15,4.18			
2.1	Vector Algebra: Vectors, Scalars, Vector algebra, Laws of Vector algebra, Unit vector, Rectangular unit vectors, Components of a vector, Scalar fields, Vector fields, Problems based on Vector algebra. Dot or Scalar product, Cross or Vector product, Commutative and Distributive Laws, Scalar Triple product, Vector Triple product (Omit proofs). Problems and applications based on Dot, Cross and Triple products. [SLS] : 1.1,1.2,1.3,1.4,1.6,1.7,2.1,2.2,2.3,2.4	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
2.2	Coordinate System : Introduction of coordinate system, types of coordinate system, Curvilinear Coordinates: Cylindrical Coordinates, Spherical Coordinates, Transformation of Cartesian coordinates to curvilinear coordinates and vice versa and Problems [SLS] : 7.1,7.2,7.3,7.4 [CH] :1.6.1,1.6.2,1.6.8		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.1	Behaviour of real gases: Behaviour of real gases and real gas equation, Van der Waal equation [BSH]: 2.1 to 2.12		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.2	Thermodynamics: Thermodynamic Systems, Zeroth law of thermodynamics, Concept of Heat, The first law, Non Adiabatic process and Heat as a path function, Internal energy, , Heat Capacity and specific heat, Applications of first law to simple processes, general relations from the first law, Indicator diagrams, Work done during isothermal and adiabatic processes, Worked examples, Problems.. [BSH]: 4.1 to 4.14	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7

References

- [DSM] : D S Mathur, Element of Properties of Matter, S Chand & Co
- [HCV] : H. C. Verma, Concepts of Physics – (Part–I), 2002 Ed. Bharati Bhavan Publishers.
- [SOP] : S.O.Pillai, Solid state Physics, New Age International Publishers
- [SLS] : Vector Analysis , Murray Spiegel, Seymour Lipschutz, Deniis Spellman, 2nd Edition.
- [CH] : Introduction to Mathematical Physics, Charlie Harper, PH publishers
- [BSH] :Brijlal, Subramanyam and Hemne, Heat Thermodynamics and Statistical Physics, S Chand, Revised, Multi-coloured,2007 Ed.

Additional Reference:

1. Thornton and Marion, Classical Dynamics – (5th Ed)
2. Halliday, Resnick and Walker, Fundamental of Physics (extended) – (6th Ed.), John Wiley and Sons
3. R Murugesan and K Shivprasath, Properties of Matter and Acoustics S Chand.
4. M W Zemansky and R H Dittman, Heat and Thermodynamics, McGraw Hill.
5. D K Chakrabarti, Theory and Experiments on Thermal Physics, (2006 Ed) Central books.
6. C L Arora, Optics, S Chand.
7. Hans and Puri, Mechanics –, 2nd Ed. Tata McGraw Hill
8. Charlie Harper, Introduction to Mathematical Physics , 2009 (EEE) PHI Learning Pvt. Ltd
9. S.O.Pillai , Problems in Solid State Physics
10. B.S.Rajput - Mathematical Physics

Course Descriptions	
Semester	I
Course Name	Physics-II
Course Code	USC1PH2
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To understand the principal, construction & working of Nuclear Detectors & their applications.
2. To study response of Alternating Current (AC) to electrical components like resistors, capacitors and inductors
3. To evaluate balancing conditions for AC Bridges.
4. To study different number systems and Interconversion between them

Course Outcomes

After completing the course, Student will able to:

- CO1 Explain nuclear reactions, interactions between subatomic particles, construction & working of gas filled nuclear detectors, digital electronic circuits, number systems, AC Circuits & AC Bridges
- CO2 Solve numerical problems related to Binary Addition & subtraction, Nuclear Reactions, response of purely resistive, capacitive & inductive circuits, RC circuit, LR circuit and LCR circuits to an AC Signal using phasor diagrams and AC Bridges.
- CO3 Evaluate the balancing conditions for Maxwell's Bridge, de-Sauty's Bridge, Wien Bridge, Hay Bridge.
- CO4 Determine the equations of total current(I) impedance(Z) & phase angle for purely resistive, capacitive & inductive circuits, RC circuit, LR circuit and LCR circuit using phasor diagram.

Nuclear Physics & Analog Electronics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Nuclear Detectors: Review (Structure of Nuclei: Basic properties of nuclei, Composition, Charge, Size, Rutherford's expt. for estimation of nuclear size, density of nucleus, Radioactivity), Interaction between particles and matter, Ionization chamber, Proportional counter and GM counter, problems [Kaplan] : Nuclear Detectors: 2.8 [SBP]: Nuclear Detectors: 1.1.2, 1.1.3(i and ii)	15 Hrs	CO1, CO2,	PO1, PO2, PO3, PO6, PO7
1.2	Nuclear Reactions: Types of Reactions and Conservation Laws. Concept of Compound and Direct Reaction, Q value equation and solution of the Q equation, problems. Fusion and fission definitions and qualitative discussion with examples [SBP]: Nuclear Reactions: 3.1 to 3.5 [BSS]: Nuclear Fusion & Fission: 12.3 and 12.7		CO1, CO2,	PO1, PO2, PO3, PO6, PO7
2.1	Circuit theorems: (Review: ohm's law, Kirchhoff's laws) Superposition Theorem, Thevenin's Theorem, Ideal Current Sources, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem. Numericals related to circuit analysis using the above theorems. [CR]: Circuit Theorems: 7.7 to 7.11	15 hrs	CO2 CO3 CO4	PO1, PO2, PO3, PO6, PO7
2.2	DC power supply: Bridge rectifier, its PIV and its Ripple factor, Capacitor Filter, Inductor filter, CLC or Pi Filter. Zener diode as voltage stabiliser [VKM]: DC: 6.8 to 6.15, 6.17 to 6.20, 6.21, 6.27		CO2 CO3 CO4	PO1, PO2, PO3, PO6, PO7
3.1	Alternating current theory: (Review :Concept of L, R, and C, AC circuit containing pure R, pure L and pure C) Representation of sinusoids by complex numbers using Phasor diagram, Series L-R, C-R and LCR circuits. Resonance in LCR series circuit, Power in ac circuit. Q-factor [CR]: 15.5 to 15.11	15 Hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.2	AC bridges: AC-bridges: General AC bridge, Maxwell's Bridge, de-Sauty's Bridge, Wien Bridge, Hay Bridge [CR]: 7.12(i),15.14		CO3	PO1, PO2, PO3, PO6, PO7

References

1. [Kaplan]: Nuclear Physics, Irving Kaplan, 2nd Ed. Narosa Publishing House
2. [SBP]: Dr. S. B. Patel, Nuclear Physics Reprint 2009, New Age International
3. [BSS]: N Subrahmanyam, Brijlal and Seshan, Atomic and Nuclear Physics Revised Ed. Reprint 2012, S. Chand
4. [CR]: D. Chattopadhyay, P C Rakshit , Electricity and Magnetism 7th Ed. New Central Book agency
5. [VKM]: V K Mehta and R Mehta Electronics Principals, Multi coloured Revised 11th Ed. reprint in 2012, S Chand.

Additional References:

- 1 Arthur Beiser, Perspectives of Modern Physics : Tata McGraw Hill
- 2 S N Ghosal, Atomic Physics S Chand
- 3 S N Ghosal, Nuclear Physics 2nd ed. S Chand

Course Descriptions	
Semester	I
Course Name	Physics Practical
Course Code	USC1PHP
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To determine mechanical properties of solids like the Moment of Inertia, Modulus of Elasticity, Coefficient of Viscosity, temperature coefficient of resistance of Thermistor and Joule's Constant.
2. To measure the frequency of Alternating Current (AC) & study its response to electrical components like resistor, capacitor & Inductor.
3. To obtain the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
4. To study the light sensing characteristics of LDR & temperature sensing characteristics of Thermistor

Course Outcomes

After completing the course, Student will able to:

- CO1 Make use of measuring devices such as Digital Multimeter, Vernier Calliper, Micrometre Screw Gauge, Travelling Microscope , spectrometer.
- CO2 Construct circuits using Resistors, Inductors, Capacitors, Voltmeter, Ammeter, LDR, transformers and logic gates
- CO3 Measure different mechanical properties of Solids like the Moment of Inertia, Modulus of Elasticity, Coefficient of Viscosity, temperature coefficient of resistance of Thermistor and Joule's Constant.

CO4 Determine capacitance, inductance, frequency of AC mains, lattice parameters and interplanar spacing.

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular experiments			
A.1	<p>Group 1</p> <ol style="list-style-type: none"> 1. J by Electrical Method: To determine mechanical equivalent of heat 2. Torsional Oscillation: To determine modulus of rigidity η of a material of wire by torsional oscillations 3. Bifilar Pendulum 4. To determine Coefficient of Viscosity (η) of a given liquid by Poiseuille's Method 5. To study Thermistor characteristic 6. Y by vibrations: To determine Y Young's Modulus of a wire material by method of vibrations- Flat spiral Spring 7. Study of crystal structures 	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
A.2	<p>Group 2</p> <ol style="list-style-type: none"> 1. CR Circuit: To determine value of given capacitor and Phase angle 2. Frequency of AC Mains: To determine frequency of AC mains. 3. LR Circuit: To determine the value of given inductance and phase angle 4. Zener Diode as a Voltage Regulator 5. Bridge Rectifier 6. Norton's Theorem 7. Thevenin's Theorem 	15 hrs	CO2, CO4	PO1, PO2, PO3, PO6
B	<p>Skill Experiments:(Any 4)</p> <ol style="list-style-type: none"> 1. Use of Vernier callipers, Micrometre Screw Gauge, Travelling Microscope 2. Graph Plotting : Experimental, Straight Line with intercept, Resonance Curve etc. 3. Spectrometer: Schuster's Method 4. Use of DMM 5. Absolute and relative errors calculation. 	15 hrs	CO1	PO1, PO3, PO6
C	<p>Any one out of following is equivalent to two experiments from section A and/ or B</p> <ol style="list-style-type: none"> 1. Students should collect the information of at least five Physicists with their work. Report that in a journal. 2. Students should carry out mini-project upto the satisfaction of professor In-charge of practical. 3. Study tour. Students participating in the study tour must submit a study tour report. 	15 hrs	CO1, CO2, CO3, CO4	-

References

1. D. C. Tayal, edited by Ila Agarwal, University Practical Physics, 1st edition, Himalaya Publishing House
 2. Harman Singh, B.Sc. Practical Physics, 7th edition, S. Chand Publication.
 3. C. L. Arora, B.Sc. Practical Physics, 21st edition, S. Chand Publication.
- Minimum 4 experiments from each group should be completed in the first semester.
 - Any four skill experiments are to be reported in journal
 - Certified journal is a must to be eligible to appear for the semester end practical Exam.
 - The scheme of examination for the revised course in Physics at the First Year B.Sc. Semester end examination will be Semester End Practical Examination:
 - Scheme of examination for Practical: There will be no internal assessment for practical.
 - A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that he candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement.
 - The duration of the practical examination will be two hours per experiment.
 - There will be two experiments through which the candidate will be examined in practical examination.

Semester II

Course Descriptions	
Semester	II
Course Name	Physics-I
Course Code	USC2PH1
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To explain the lens defects due to the spherical nature of the lens.
2. To explain transient response of AC Circuits using differential equations.
3. To differentiate between reversible & irreversible heat engines.
4. To define the second law of thermodynamics in various forms.

Course Outcomes

After completing the course, Student will able to:

- CO1 Apply lens maker equation, concepts of differential equation in circuits, second law of thermodynamics to Heat Engines.
- CO2 Deduct current, charge in LR,RC circuit in terms of equation and graph, equivalent focal length, cardinal points for thin and thick lens, work done in Carnot cycle, efficiencies of heat engines.
- CO3 Discuss natural physical processes related to light waves , lens system, aberration, Heat Engines, Second law of thermodynamics.
- CO4 Solve numerical problems related to homogenous and inhomogenous equations, lens, Aberration, Carnot Cycle, Carnot heat Engine & other Heat Engine.

Optics, Applied Mathematics, Thermal Physics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Lens : Lens Maker's Formula (Review), Newton's lens equation, magnification-lateral, longitudinal and angular, Equivalent focal length of two thin lenses, thick lens, cardinal points of combination of two lens, cardinal points of thick lens [BSA] : 4.2,4.3,4.8,4.9,4.10,4.12,4.17,5.2	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.2	Aberration: Spherical Aberration, Reduction of Spherical Aberration, Chromatic aberration and condition for achromatic aberration [BSA] : 9.1,9.2,9.5,9.10,9.11,9.13		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
2.1	Differential equations:		CO1, CO2,	PO1, PO2,

	Introduction, Ordinary differential equations, First order homogeneous and non-homogeneous equations with variable coefficients, Exact differentials, General first order Linear Differential Equation, Second-order homogeneous equations with constant coefficients. Problems depicting physical situations like LC and LR circuits, Simple Harmonic motion (spring mass system) [CH]: 5.1, 5.2, 5.2.1 (A, B, C) (Omit D)	15hrs	CO3, CO4	PO3, PO6, PO7 ₂
2.2	Transient response of circuits: Series LR, CR (Growth and decay of currents/charge.) LCR circuits. Growth of currents/charge. [CR]: 14.1 to 14.3		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.1	Ideal Heat Engine : Conversion of Heat into Work, Heat Engine, Efficiency of Heat Engines, Slope of Isothermal and Adiabatic Process on P-V Graph, Carnot's Ideal Heat Engine, Carnot's Cycle, Net Work Done in One Cycle, It's Efficiency, Numerical. [BSH]: 4.2-4.7, 4.21-4.27		CO1, CO2, CO3, CO4	PO1, PO2 ₂
3.2	Second Law Of Thermodynamics : Second Law of Thermodynamics, Kelvin-Planck Statement, Clausius Statement, Equivalence of Kelvin-Planck & Clausius Statement, Carnot's Theorems, Reversible And Irreversible Process, Absolute Scale of Temperature. [BSH]: 4.20, 4.28-4.29, 5.11-5.13	15hrs	CO1, CO2, CO3, CO4	PO1, PO2 ₂
3.3	Combustion Engines : Steam Engine, Rankine Cycle, Otto Engine, Efficiency Of Otto Cycle, Diesel Cycle, Efficiency Of Diesel Cycle, Comparison Between Otto And Diesel Engine. [BSH]: 4.30-4.33 (pg.141-148)		CO1, CO2, CO3, CO4	PO1, PO2

References

- [BSA] : Brijlal, Subramanyam and Avadhanulu A Textbook of Optics, 25th revised ed.(2012) S. Chand
- [CH] : Charlie Harper, Introduction to Mathematical Physics , 2009 (EEE) PHI Learning Pvt. Ltd.
- [CR]: D. Chattopadhyay, P C Rakshit , Electricity and Magnetism 7th Ed. New Central Book
- [BSH] Heat thermodynamics and Statistical Physics, Brijlal, N.Subramanyam, P. S. Hemne, S. Chand, edition 2007
- [TGR] Thermal Physics, AB Gupta and H. Roy, Book and Allied (P) Ltd, Reprint 2009

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- A K Ghatak, Chua, Mathematical Physics, 1995, Macmillan India Ltd.
- Ken Riley, Michael Hobson and Stephen Bence, Mathematical Methods for Physics and Engineering, Cambridge (Indian edition).

3. H. K. Dass, Mathematical Physics, S. Chand & Co.
4. Jon Mathews & R. L. Walker, Mathematical Methods of Physics: W A Benjamin Inc. 11
5. Basic Thermodynamics: Evelyn Guha (Narosa Publications).
6. A treatise on heat: Meghanad Saha and BN Srivastava , 1969, India Press.

Course Descriptions	
Semester	II
Course Name	Physics-II
Course Code	USC2PH2
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To study the molecular structure of the crystal using X-rays.
2. To design regulated power supply using rectifier and filter circuits.
3. To explain the analogy between electric field and magnetic field.

Course Outcomes

After completing the course, Student will able to:

- CO1 Explain the wavelike behaviour of a particle, the concept of matter wave and the distribution of Energy for a Black body radiator.
- CO2 Solve numerical problems based on matter waves, D. C. Circuits, Network theorems, Electric field and magnetic field.
- CO3 Analyse electric network circuits using Thevenin's theorem, Norton theorem, Superposition theorem, Reciprocity theorem and Maximum Power Transfer theorem..
- CO4 Discuss on rectifier circuits, Capacitor Filter circuits, Inductor filter circuits, CLC or Pi Filter circuits. and voltage regulator circuits.

Modern Physics, Digital Electronics and Electrodynamics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Origin of Quantum Mechanics Origin of Quantum theory, Black body (definition), Black Body spectrum, Wien's displacement law, Matter waves, wave particle duality, Heisenberg's uncertainty Principle. Davisson-Germer experiment. [BSS]: Origin of Quantum Mechanics: 2.1 to 2.6, 3.1 to 3.5 and 3.9(without applications)	15 hrs	CO1, CO2	PO1, PO2, PO3, PO6, PO7
1.2	X rays X-Rays production and properties. Continuous and characteristic X-Ray spectra, Bragg's Law, Applications of X-Rays [AB]: X- Rays: 2.5, 2.6		CO1 CO2	PO1, PO2, PO3, PO6, PO7

	[BSS]: X- Rays: 6.2 to 6.4			
1.3	Compton effect: Compton effect, Pair production, Photons & Gravity, Gravitational Red Shift [AB]: Compton Effect: 2.7 to 2.9		CO1 CO2	PO1, PO2, PO3, PO6, PO7
2.1	Number System: Binary number system , Arithmetic building blocks , Types of registers, Digital IC, signal levels, Binary to Decimal ,Decimal to binary , Hexadecimal number, Hexadecimal to decimal Conversion, Decimal to hexadecimal conversion, Hexadecimal to binary conversion, Binary to hexadecimal conversion, Binary addition, Unsigned binary numbers, Sign magnitude numbers , 1's complement , 2's complement , Converting to and from 2's complement representation , 2's complement arithmetic, The adder- subtractor (ignore IC specific diagrams) [LMS] : Number System : 5.1, 5.2, 5.3, 5.5, 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8 [VKM]: 26.1 to 26.9	15 hrs		PO1, PO2, PO3, PO6, PO7
2.2	Digital Electronics: Logic gates (Review), NAND and NOR as universal building blocks. EX-OR gate: logic expression, logic symbol, truth table, Implementation using basic gates and its applications, Boolean algebra, Boolean theorems. De-Morgan theorems, Half adder and Full adder [VKM]: Digital electronics: 26.15 to 26.17, 26.20, 26.21, 26.22, 26.32			PO1, PO2, PO3, PO6, PO7
3.1	Electrostatics: The Coulomb's Law, The Electric Field, Discrete & Continuous Charge Distribution, Electric Potential, The Potential of a Localised Charge Distribution, Electric Potential Energy due to Discrete & Continuous charge Distribution, Comments on Potential, Numericals [DJG]: 2.1.1 to 2.1.4, 2.3.1, 2.3.2, 2.3.4, 2.4.1, 2.4.2 [BS] : 13.1 to 13.6, 13.11,13.12,13.18		CO2	PO1 PO2, PO6, PO7
3.2	Magnetostatics: Magnetic Fields due to Steady Currents, The Biot Savart Law & its applications, The Magnetic Field due a straight current carrying wire, Circular coil, Helmholtz coils, solenoid and Toroid, Numericals [DJG] :5.1.1, 5.2.1, 5.2.2 [BS] : 16.7 to 16.12	15 hrs	CO2	PO1 PO2, PO6, PO7
3.3	Electromagnetic Waves: Maxwell's Equations, Electrodynamics before Maxwell, How Maxwell Fixed Ampere's Law [DJG] :7.3.1 to 7.3.3 [BS]: 18.1, 18.2		CO2	PO1 PO2, PO6, PO7

References

- [BSS]: N Subrahmanyam, Brijlal and Seshan, Atomic and Nuclear Physics Revised Ed. Reprint 2012, S. Chand
- [AB]: Arthur Beiser, Concepts of Modern Physics 6th Ed. Tata McGraw Hill
- [CR]: D. Chattopadhyay, P C Rakshit, Electricity and Magnetism 7th Ed. New Central Book agency.
- [VKM]: V K Mehta and R Mehta Electronics Principals, Multi coloured Revised 11th Ed. reprint in 2012, S Chand.
- [DJG]: David J. Griffiths: Introduction to Electrodynamics, Prentice Hall India(EEE)3rd Ed.
- [BS]: Mechanics & Electrodynamics, 7th Edition, 2011, Brij Lal, Subramanyam & Jeevan Seshan
- [LMS] : Digital Principles and Applications By Leach, Malvino, Saha Seventh edition.

Additional References:

- B.L. Theraja and A.K. Theraja , A Textbook of Electrical Technology Vol. I , S. Chand Publication
- A B Bhattacharya, Electronics Principlesand Applications, Central publisher.
- A P Malvino, Digital Principles and Applications: Tata McGraw Hill
- Tokhiem, Digital electronics, 4thed, McGraw Hill International Edition.
- BN Boylestad and Nashelsky, Electronic devices and Circuit Theory: 7th edition, Prentice Hall of India.

Course Descriptions	
Semester	II
Course Name	Physics Practical II
Course Code	USC2PHP
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

- To demonstrate the applications of semiconductor devices as voltage regulators, rectifiers and amplifiers.
- To find the Refractive Index of transparent material.
- To determine the radius of curvature & cardinal points of the lens system.
- To analyse the electrical circuits using network theorems.

Course Outcomes

After completing the course, Student will able to:

- CO1 Utilise Optical Instruments such as the Spectrometer, Prism, Lenses for finding Optical properties like the Refractive Index of the material of the Prism, equivalent focal length.
- CO2 Determine moment of inertia & acceleration due to gravity.
- CO3 Justify Norton's & Thevenin's theorem, Zener diode, Bridge rectifier as voltage regulator, Transistor characteristics.
- CO4 Design circuits using Diodes, transistors, resistors, transformers.
- CO5 Explain concepts in physics like conservation of angular momentum , divergence of light, charging & discharging of capacitor and wave characteristics using demonstration.

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular Experiments			
A.1	Group 1 1. Flywheel 2. Newton's Rings: To determine radius of curvature of a given convex lens using Newton's rings 3. Spectrometer: To determine refractive index μ of the material of prism 4. Spectrometer: To determine the angle of Prism. 5. To determine Cardinal points of the Lens system. 6. Bar pendulum	15 hrs	CO1, CO2,	PO1, PO2, PO3, PO6
A.2	Group 2 1. LDR Characteristics 2. Study of Logic Gates 3. To verify De Morgan's Theorems 4. NAND & NOR Gates as Universal Building Gates 5. Half Adder 6. Full Adder	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
B	List of Demo-experiments: (Any four) 1. Angular Momentum conservation (Rotating Platform) 2. Light dependent switch 3. Laser beam divergence, Intensity 4. Use of Oscilloscope 5. Charging and discharging of a capacitor	15 hrs	CO5	PO1, PO3, PO6
C	Any one out of following is equivalent to two experiments from section A and/or B 1. Students should collect the information of at least five Physicists with their work. Report that in a journal. 2. Students should carry out mini-project upto the satisfaction of professor In-charge of practical. 3. Study tour. Students participating in the study tour must submit a study tour report.	15 hrs	-	-

References

Revised Syllabus in Physics (C.B.C.S) with effect from 2022-23

1. D. C. Tayal, edited by Ila Agarwal, University Practical Physics, 1st edition, Himalaya Publishing House
2. Harman Singh, B.Sc. Practical Physics, 7th edition, S. Chand Publication.
3. C. L. Arora, B.Sc. Practical Physics, 21st edition, S. Chand Publication.

- Minimum 4 experiments from each group should be completed in the second semester.
- Any four skill experiments are to be reported in a journal.
- Certified journal is a must to be eligible to appear for the semester end practical.
- The scheme of examination for the revised course in Physics at the First Year B.Sc. Semester end examination will be Semester End Practical Examination:
- Scheme of examination for Practical: There will be no internal assessment for practical.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that he candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement.
- The duration of the practical examination will be two hours per experiment.
- There will be two experiments through which the candidate will be examined in practical.



॥ विद्या विनयेन शोभते ॥



Janardan Bhagat Shikshan Prasarak Sanstha's

**CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

Re-accredited 'A+' Grade by NAAC
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'Best College Award' by University of Mumbai

Program: Bachelor's in Science (B. Sc.)

Credits: 132

SYLLABUS

(Approved in the Academic council meeting held on 26 July, 2022)

F. Y. B. Sc. Physics

Revised as per

Choice Based Credit System (60:40)

w. e. f. Academic Year 2022-23

SEM III PHYSICS PRACTICAL : SKILL DEVELOPMENT

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular experiments			
A.1	Group 1 1. J by Electrical Method: To determine mechanical equivalent of heat 2. Torsional Oscillation: To determine modulus of rigidity η of a material of wire by torsional oscillations 3. Bifilar Pendulum 4. To determine Coefficient of Viscosity (η) of a given liquid by Poiseuille's Method 5. To study Thermistor characteristic 6. Y by vibrations: To determine Y Young's Modulus of a wire material by method of vibrations- Flat spiral Spring 7. Study of crystal structures	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
A.2	Group 2 1. CR Circuit: To determine value of given capacitor and Phase angle 2. Frequency of AC Mains: To determine frequency of AC mains. 3. LR Circuit: To determine the value of given inductance and phase angle 4. Zener Diode as a Voltage Regulator 5. Bridge Rectifier 6. Norton's Theorem 7. Thevenin's Theorem	15 hrs	CO2, CO4	PO1, PO2, PO3, PO6
B	Skill Experiments:(Any 4) 1. Use of Vernier callipers, Micrometre Screw Gauge, Travelling Microscope 2. Graph Plotting : Experimental, Straight Line with intercept, Resonance Curve etc. 3. Spectrometer: Schuster's Method 4. Use of DMM 5. Absolute and relative errors calculation.	15 hrs	CO1	PO1, PO3, PO6

SEM IV PHYSICS PRACTICAL : SKILL DEVELOPMENT

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular Experiments			
A.1	Group 1 1. Flywheel	15 hrs	CO1, CO2,	PO1, PO2,

	<ol style="list-style-type: none"> 2. Newton's Rings: To determine radius of curvature of a given convex lens using Newton's rings 3. Spectrometer: To determine refractive index μ of the material of prism 4. Spectrometer: To determine the angle of Prism. 5. To determine Cardinal points of the Lens system. 6. Bar pendulum 			PO3, PO6
A.2	<p style="text-align: center;">Group 2</p> <ol style="list-style-type: none"> 1. LDR Characteristics 2. Study of Logic Gates 3. To verify De Morgan's Theorems 4. NAND & NOR Gates as Universal Building Gates 5. Half Adder 6. Full Adder 	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
B	<p>List of Demo-experiments: (Any four)</p> <ol style="list-style-type: none"> 1. Angular Momentum conservation (Rotating Platform) 2. Light dependent switch 3. Laser beam divergence, Intensity 4. Use of Oscilloscope 5. Charging and discharging of a capacitor 	15 hrs	CO5	PO1, PO3, PO6

BACHELOR'S IN SCIENCE (B. Sc.) Programme Outcomes

S. N.	After completion of B.Sc. program students will acquire	Graduate Attribute
PO1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO2	An ability to develop and conduct experiments, analyse, and interpret data and use scientific judgement to draw conclusions	Scientific reasoning
PO3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO5	An ability to achieve high order communication skills.	Communication skills
PO6	An ability to collect, analyse and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving

PO7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO11	An ability to understand values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Preamble:

The curriculum is framed to equip students to grasp the basic concepts of physics and in addition have a broader vision. A dynamic curriculum accommodates fast faced developments in the knowledge of the subject concerned by introducing innovative concepts, multidisciplinary profile and standard education.

The programme also aims to provide an intellectually stimulating environment to develop skills and enthusiasm of students to the best of their potential. It also helps in giving need based education in physics of the highest quality at the undergraduate level.

In this programme, we aim to provide a solid foundation in all aspects of physics and to show a broad spectrum of modern trends in physics and to develop experimental, computational and mathematical skills of students. The syllabus is framed in such a way that it bridges the gap between the plus two and the postgraduate level of physics by providing a more complete and logical framework in almost all areas of basic physics.

Semester - I ***[Under CBCS Scheme]***

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry I	Core	USC1CH1	3	40	60	100	2
Chemistry II	Core	USC1CH2	3	40	60	100	2

Physics I	Core	USC1PH1	3	40	60	100	2
Physics II	Core	USC1PH2	3	40	60	100	2
Mathematics I	Core	USC1MT1	3	40	60	100	2
Mathematics II	Core	USC1MT2	3	40	60	100	2
Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement	USC1FC1/ USC1PE1/ USC1NS1/ USC1NC1	3	40	60	100	2
Environmental Studies	Ability enhancement	USC1EVS	2	40	60	100	2
Chemistry Practical	Core	USC1CHP	6	--	100	100	2
Physics Practical	Core	USC1PHP	6	--	100	100	2
Mathematics Practical	Core	USC1MTP	3	--	100	100	2

Semester - II
[Under CBCS Scheme]

Course	Course Type	Course code	Hrs/ week	Internal assessment	Semester-end examination	Total	Credits
Chemistry I	Core	USC2CH1	3	40	60	100	2
Chemistry II	Core	USC2CH2	3	40	60	100	2
Physics I	Core	USC2PH1	3	40	60	100	2
Physics II	Core	USC2PH2	3	40	60	100	2
Mathematics I	Core	USC2MT1	3	40	60	100	2
Mathematics II	Core	USC2MT2	3	40	60	100	2

Foundation Course/ Foundation course in PE/NSS/ NCC	Skill enhancement	USC2FC2/ USC2PE2/ USC2NS2/ USC2NC2	3	40	60	100	2
Effective Communication Skill	Ability enhancement	USC2CSK	2	40	60	100	2
Chemistry Practical	Core	USC2CHP	6	--	100	100	2
Physics Practical	Core	USC2PHP	6	--	100	100	2
Mathematics Practical	Core	USC2MTP	6	--	100	100	2

Examination Scheme

The performance of the learners shall be evaluated into two components. The learner's Performance shall be assessed by Internal Assessment with 40% marks in the first component by conducting the Semester End Examinations with 60% marks in the second component.

The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

A) Internal Assessment: 40 %

40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination	20 Marks
02	1. Test on Practical Skills 2. Open Book Test	20 Marks

B) Semester End Examination: 60 %**60 Marks****Undergraduate Programmes of F.Y.B.Sc. (Sem. I & II) and S.Y.B.Sc. (Sem. III & IV)**

- Duration: The examination shall be of 2 hours duration.

Theory question paper pattern
1. There shall be four questions of 15 marks each (30 marks with internal options).
2. On each unit there will be one question and the fourth question will be based on the entire syllabus.
3. All questions shall be compulsory with internal options.
4. Questions may be subdivided into sub-questions a, b, c... and the allocation of marks depends on the weightage of the unit.

Question Paper Pattern for Semester End Examination

Theory	All questions are compulsory and will have internal options.		
	Q-1 (Unit-I, II, III)	A) Multiple Choice Questions (Attempt any 12 out of 15)	12 Marks
		B) Answer in one line C) (Attempt 3 out of 6)	03 Marks
	Q-2 (Unit – I)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
	Q-3 (Unit – II)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
	Q-4 (Unit III)	A) Attempt any one out of two.	08 Marks
		B) Attempt any one out of two.	07 Marks
TOTAL		60 Marks	

Question Paper Pattern for Continuous Internal Assessment

Sr.No.	Particular	Marks
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1	Match the Column / Fill in the Blanks / Multiple Choice Questions/ True/False/Answer in One or Two Lines (Concept based Questions) (1 Marks each)	20
2	Open Book Test - High order thinking questions (HOTS)	20(converted to 10)
3	Test on Practical Skills	20 (converted to 10)
3.1	Demonstration of skill	5
3.2	Viva	5
3.3	Report	5
3.4	Problem solving ability	5

Question Paper Pattern for Practical Examination

Practical	The External examination for practical courses will be conducted as per the following scheme.		
	Sr. No.	Particulars of External Practical Examination	Marks
	1	Laboratory Work	40 + 40
	2	Journal	05 + 05
	3	Viva	05 + 05
	TOTAL		100 Marks

Course Descriptions	
Semester	I
Course Name	Physics-1
Course Code	USC1PH1
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To state the First Law of thermodynamics and to define heat, work, thermal efficiency and the difference between various forms of energy.
2. To describe the different types of coordinate systems.
3. To explain the physical properties of a fluid and the consequence of such properties on fluid flow & Basics of Solid State Physics.

Course Outcomes

After completing the course, Student will able to:

- CO1 Summarise properties of matter, vectors algebra, laws of thermodynamics.

- CO2 Apply the laws of thermodynamics to formulate the relations necessary to analyse a thermodynamic process, laws of vector algebra, elasticity, fluid dynamics concepts in various physical situations.
- CO3 Explain crystal system, crystal planes and its direction, different coordinate system and interconversion between them, mechanical properties of matter and fluid with its application,
- CO4 Solve sums based on miller indices, Bravais lattices, vector algebra, elasticity, fluid dynamics, thermodynamics.

Classical Physics, Basic of Solid State Physics, Mathematical Physics, Thermodynamics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Elasticity: Review of Elastic constants Y , K , η and σ ; Equivalence of shear strain to compression and extension strains. Relations between elastic constants, Couple for twist in cylinder. [DSM] : : 8.1,8.2,8.3,8.8,8.0,8.12,8.13,8.14,8.15,8.17	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.2	Fluid Dynamics: Equation of continuity, Bernoulli's equation, applications of Bernoulli's equation, streamline and turbulent flow, lines of flow in airfoil, Poiseullies equation. [DSM] : : 12.1,12.3,12.5, 12.6(2),12.7,12.11		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.3	Crystalline Structure : Introduction, Lattice points and space lattice, The basis and crystal structure, Unit Cells and lattice parameters, Primitive Cells, Crystal Systems, Crystal Symmetry, Bravais space lattices, Metallic crystal structure, directions, planes, miller indices [SOP] : 4.1,4.2,4.3,4.4,4.5,4.6,4.14,4.15,4.18		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
2.1	Vector Algebra: Vectors, Scalars, Vector algebra, Laws of Vector algebra, Unit vector, Rectangular unit vectors, Components of a vector, Scalar fields, Vector fields, Problems based on Vector algebra. Dot or Scalar product, Cross or Vector product, Commutative and Distributive Laws, Scalar Triple product, Vector Triple product (Omit proofs). Problems and applications based on Dot, Cross and Triple products. [SLS] : 1.1,1.2,1.3,1.4,1.6,1.7,2.1,2.2,2.3,2.4	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
2.2	Coordinate System : Introduction of coordinate system, types of coordinate system, Curvilinear Coordinates: Cylindrical Coordinates, Spherical Coordinates, Transformation of Cartesian coordinates to curvilinear coordinates and vice versa and Problems [SLS] : 7.1,7.2,7.3,7.4 [CH] :1.6.1,1.6.2,1.6.8		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.1	Behaviour of real gases:	15hrs	CO1,	PO1,

	Behaviour of real gases and real gas equation, Van der Waal equation [BSH]: 2.1 to 2.12		CO2, CO3, CO4	PO2, PO3, PO6, PO7
3.2	Thermodynamics: Thermodynamic Systems, Zeroth law of thermodynamics, Concept of Heat, The first law, Non Adiabatic process and Heat as a path function, Internal energy, , Heat Capacity and specific heat, Applications of first law to simple processes, general relations from the first law, Indicator diagrams, Work done during isothermal and adiabatic processes, Worked examples, Problems.. [BSH]: 4.1 to 4.14		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7

References

- [DSM] : D S Mathur, Element of Properties of Matter, S Chand & Co
- [HCV] : H. C. Verma, Concepts of Physics – (Part–I), 2002 Ed. Bharati Bhavan Publishers.
- [SOP] : S.O.Pillai, Solid state Physics, New Age International Publishers
- [SLS] : Vector Analysis , Murray Spiegel, Seymour Lipschutz, Dennis Spellman, 2nd Edition.
- [CH] : Introduction to Mathematical Physics, Charlie Harper, PH publishers
- [BSH] : Brijlal, Subramanyam and Hemne, Heat Thermodynamics and Statistical Physics, S Chand, Revised, Multi-coloured, 2007 Ed.

Additional Reference:

- Thornton and Marion, Classical Dynamics – (5th Ed)
- Halliday, Resnick and Walker, Fundamental of Physics (extended) – (6th Ed.), John Wiley and Sons
- R Murugesan and K Shivprasath, Properties of Matter and Acoustics S Chand.
- M W Zemansky and R H Dittman, Heat and Thermodynamics, McGraw Hill.
- D K Chakrabarti, Theory and Experiments on Thermal Physics, (2006 Ed) Central books.
- C L Arora, Optics, S Chand.
- Hans and Puri, Mechanics –, 2nd Ed. Tata McGraw Hill
- Charlie Harper, Introduction to Mathematical Physics , 2009 (EEE) PHI Learning Pvt. Ltd
- S.O.Pillai , Problems in Solid State Physics
- B.S.Rajput - Mathematical Physics

Course Descriptions	
Semester	I
Course Name	Physics-II
Course Code	USC1PH2
Eligibility for the Course	12th Science of all recognised Board
Credit	02

Hours	45 hours
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Course Objectives

1. To understand the principal, construction & working of Nuclear Detectors & their applications.
2. To study response of Alternating Current (AC) to electrical components like resistors, capacitors and inductors
3. To evaluate balancing conditions for AC Bridges.
4. To study different number systems and Interconversion between them

Course Outcomes

After completing the course, Student will able to:

- CO1 Explain nuclear reactions, interactions between subatomic particles, construction & working of gas filled nuclear detectors, digital electronic circuits, number systems, AC Circuits & AC Bridges
- CO2 Solve numerical problems related to Binary Addition & subtraction, Nuclear Reactions, response of purely resistive, capacitive & inductive circuits, RC circuit, LR circuit and LCR circuits to an AC Signal using phasor diagrams and AC Bridges.
- CO3 Evaluate the balancing conditions for Maxwell's Bridge, de-Sauty's Bridge, Wien Bridge, Hay Bridge.
- CO4 Determine the equations of total current(I) impedance(Z) & phase angle for purely resistive, capacitive & inductive circuits, RC circuit, LR circuit and LCR circuit using phasor diagram.

Nuclear Physics & Analog Electronics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Nuclear Detectors: Review (Structure of Nuclei: Basic properties of nuclei, Composition, Charge, Size, Rutherford's expt. for estimation of nuclear size, density of nucleus, Radioactivity), Interaction between particles and matter, Ionization chamber, Proportional counter and GM counter, problems [Kaplan] : Nuclear Detectors: 2.8 [SBP]: Nuclear Detectors: 1.1.2, 1.1.3(i and ii)	15 Hrs	CO1, CO2,	PO1, PO2, PO3, PO6, PO7
1.2	Nuclear Reactions: Types of Reactions and Conservation Laws. Concept of Compound and Direct Reaction, Q value equation and solution of the Q equation, problems. Fusion and fission definitions and qualitative discussion with examples [SBP]: Nuclear Reactions: 3.1 to 3.5 [BSS]: Nuclear Fusion & Fission: 12.3 and 12.7		CO1, CO2,	PO1, PO2, PO3, PO6, PO7
2.1	Circuit theorems:	15 hrs	CO2 CO3	PO1, PO2,

	(Review: ohm's law, Kirchhoff's laws) Superposition Theorem, Thevenin's Theorem, Ideal Current Sources, Norton's Theorem, Reciprocity Theorem, Maximum Power Transfer Theorem. Numericals related to circuit analysis using the above theorems. [CR]: Circuit Theorems: 7.7 to 7.11		CO4	PO3, PO6, PO7
2.2	DC power supply: Bridge rectifier, its PIV and its Ripple factor, Capacitor Filter, Inductor filter, CLC or Pi Filter. Zener diode as voltage stabiliser [VKM]: DC: 6.8 to 6.15, 6.17 to 6.20, 6.21, 6.27		CO2 CO3 CO4	PO1, PO2, PO3, PO6, PO7
3.1	Alternating current theory: (Review :Concept of L, R, and C, AC circuit containing pure R, pure L and pure C) Representation of sinusoids by complex numbers using Phasor diagram, Series L-R, C-R and LCR circuits. Resonance in LCR series circuit, Power in ac circuit. Q-factor [CR]: 15.5 to 15.11	15 Hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.2	AC bridges: AC-bridges: General AC bridge, Maxwell's Bridge, de-Sauty's Bridge, Wien Bridge, Hay Bridge [CR]: 7.12(i),15.14		CO3	PO1, PO2, PO3, PO6, PO7

References

- [Kaplan]: Nuclear Physics, Irving Kaplan, 2nd Ed. Narosa Publishing House
- [SBP]: Dr. S. B. Patel, Nuclear Physics Reprint 2009, New Age International
- [BSS]: N Subrahmanyam, Brijlal and Seshan, Atomic and Nuclear Physics Revised Ed. Reprint 2012, S. Chand
- [CR]: D. Chattopadhyay, P C Rakshit , Electricity and Magnetism 7th Ed. New Central Book agency
- [VKM]: V K Mehta and R Mehta Electronics Principals, Multi coloured Revised 11th Ed. reprint in 2012, S Chand.

Additional References:

- Arthur Beiser, Perspectives of Modern Physics : Tata McGraw Hill
- S N Ghosal, Atomic Physics S Chand
- S N Ghosal, Nuclear Physics 2nd ed. S Chand

Course Descriptions	
Semester	I
Course Name	Physics Practical

Course Code	USC1PHP
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To determine mechanical properties of solids like the Moment of Inertia, Modulus of Elasticity, Coefficient of Viscosity, temperature coefficient of resistance of Thermistor and Joule's Constant.
2. To measure the frequency of Alternating Current (AC) & study its response to electrical components like resistor, capacitor & Inductor.
3. To obtain the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
4. To study the light sensing characteristics of LDR & temperature sensing characteristics of Thermistor

Course Outcomes

After completing the course, Student will able to:

- CO1 Make use of measuring devices such as Digital Multimeter, Vernier Calliper, Micrometre Screw Gauge, Travelling Microscope , spectrometer.
- CO2 Construct circuits using Resistors, Inductors, Capacitors, Voltmeter, Ammeter, LDR, transformers and logic gates
- CO3 Measure different mechanical properties of Solids like the Moment of Inertia, Modulus of Elasticity, Coefficient of Viscosity, temperature coefficient of resistance of Thermistor and Joule's Constant.
- CO4 Determine capacitance, inductance, frequency of AC mains, lattice parameters and interplanar spacing.

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular experiments			
A.1	<p>Group 1</p> <p>8. J by Electrical Method: To determine mechanical equivalent of heat</p> <p>9. Torsional Oscillation: To determine modulus of rigidity η of a material of wire by torsional oscillations</p> <p>10. Bifilar Pendulum</p> <p>11. To determine Coefficient of Viscosity (η) of a given liquid by Poiseuli's Method</p> <p>12. To study Thermistor characteristic</p> <p>13. Y by vibrations: To determine Y Young's Modulus of a wire material by method of vibrations- Flat spiral Spring</p> <p>14. Study of crystal structures</p>	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6

A.2	<p style="text-align: center;">Group 2</p> 8. CR Circuit: To determine value of given capacitor and Phase angle 9. Frequency of AC Mains: To determine frequency of AC mains. 10. LR Circuit: To determine the value of given inductance and phase angle 11. Zener Diode as a Voltage Regulator 12. Bridge Rectifier 13. Norton's Theorem 14. Thevenin's Theorem	15 hrs	CO2, CO4	PO1, PO2, PO3, PO6
B	<p>Skill Experiments:(Any 4)</p> 1. Use of Vernier callipers, Micrometre Screw Gauge, Travelling Microscope 2. Graph Plotting : Experimental, Straight Line with intercept, Resonance Curve etc. 3. Spectrometer: Schuster's Method 4. Use of DMM 5. Absolute and relative errors calculation.	15 hrs	CO1	PO1, PO3, PO6
C	<p>Any one out of following is equivalent to two experiments from section A and/ or B</p> 1. Students should collect the information of at least five Physicists with their work. Report that in a journal. 2. Students should carry out mini-project upto the satisfaction of professor In-charge of practical. 3. Study tour. Students participating in the study tour must submit a study tour report.	15 hrs	CO1, CO2, CO3, CO4	-

References

1. D. C. Tayal, edited by Ila Agarwal, University Practical Physics, 1st edition, Himalaya Publishing House
2. Harman Singh, B.Sc. Practical Physics, 7th edition, S. Chand Publication.
3. C. L. Arora, B.Sc. Practical Physics, 21st edition, S. Chand Publication.

- Minimum 4 experiments from each group should be completed in the first semester.
- Any four skill experiments are to be reported in journal
- Certified journal is a must to be eligible to appear for the semester end practical Exam.
- The scheme of examination for the revised course in Physics at the First Year B.Sc. Semester end examination will be Semester End Practical Examination:
- Scheme of examination for Practical: There will be no internal assessment for practical.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department /Institute to the effect that he candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement.

- The duration of the practical examination will be two hours per experiment.
- There will be two experiments through which the candidate will be examined in practical examination.

Semester II

Course Descriptions	
Semester	II
Course Name	Physics-I
Course Code	USC2PH1
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To explain the lens defects due to the spherical nature of the lens.
2. To explain transient response of AC Circuits using differential equations.
3. To differentiate between reversible & irreversible heat engines.
4. To define the second law of thermodynamics in various forms.

Course Outcomes

After completing the course, Student will able to:

- CO1 Apply lens maker equation, concepts of differential equation in circuits, second law of thermodynamics to Heat Engines.
- CO2 Deduct current, charge in LR,RC circuit in terms of equation and graph, equivalent focal length, cardinal points for thin and thick lens, work done in Carnot cycle, efficiencies of heat engines.
- CO3 Discuss natural physical processes related to light waves , lens system, aberration, Heat Engines, Second law of thermodynamics.
- CO4 Solve numerical problems related to homogenous and inhomogenous equations, lens, Aberration, Carnot Cycle, Carnot heat Engine & other Heat Engine.

Optics, Applied Mathematics, Thermal Physics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Lens : Lens Maker's Formula (Review), Newton's lens equation, magnification-lateral, longitudinal and angular, Equivalent focal length of two thin lenses, thick lense, cardinal points of combination of two lense, cardinal points of thick lens [BSA] : 4.2,4.3,4.8,4.9,4.10,4.12,4.17,5.2	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
1.2	Aberration: Spherical Aberration, Reduction of Spherical Aberration, Chromatic aberration and condition for achromatic aberration [BSA] : 9.1,9.2,9.5,9.10,9.11,9.13		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7 ₂
2.1	Differential equations: Introduction, Ordinary differential equations, First order homogeneous and non- homogeneous equations with variable coefficients, Exact differentials, General first order Linear Differential Equation, Second-order homogeneous equations with constant coefficients. Problems depicting physical situations like LC and LR circuits, Simple Harmonic motion (spring mass system) [CH]: 5.1, 5.2,5.2.1 (A, B, C) (Omit D)	15hrs	CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7 ₂
2.2	Transient response of circuits: Series LR, CR (Growth and decay of currents/charge.) LCR circuits. Growth of currents/charge. [CR]: 14.1 to 14.3		CO1, CO2, CO3, CO4	PO1, PO2, PO3, PO6, PO7
3.1	Ideal Heat Engine : Conversion of Heat into Work, Heat Engine, Efficiency of Heat Engines, Slope of Isothermal and Adiabatic Process on P-V Graph, Carnot's Ideal Heat Engine, Carnot's Cycle, Net Work Done in One Cycle, It's Efficiency, Numerical. [BSH]: 4.2-4.7, 4.21-4.27	15hrs	CO1, CO2, CO3, CO4	PO1, PO2 ₂

3.2	Second Law Of Thermodynamics : Second Law of Thermodynamics, Kelvin-Planck Statement, Clausius Statement, Equivalence of Kelvin-Planck & Clausius Statement, Carnot's Theorems, Reversible And Irreversible Process, Absolute Scale of Temperature. [BSH]: 4.20, 4.28-4.29, 5.11-5.13		CO1, CO2, CO3, CO4	PO1, PO2 ₄
3.3	Combustion Engines : Steam Engine, Rankine Cycle, Otto Engine, Efficiency Of Otto Cycle, Diesel Cycle, Efficiency Of Diesel Cycle, Comparison Between Otto And Diesel Engine. [BSH]: 4.30-4.33 (pg.141-148)		CO1, CO2, CO3, CO4	PO1, PO2

References

- [BSA] : Brijlal, Subramanyam and Avadhanulu A Textbook of Optics, 25th revised ed.(2012) S. Chand
- [CH] : Charlie Harper, Introduction to Mathematical Physics , 2009 (EEE) PHI Learning Pvt. Ltd.
- [CR]: D. Chattopadhyay, P C Rakshit , Electricity and Magnetism 7th Ed. New Central Book
- [BSH] Heat thermodynamics and Statistical Physics, Brijlal, N.Subramanyam, P. S. Hemne, S. Chand, edition 2007
- [TGR] Thermal Physics, AB Gupta and H. Roy, Book and Allied (P) Ltd, Reprint 2009

Additional References:

- A K Ghatak, Chua, Mathematical Physics, 1995, Macmillan India Ltd.
- Ken Riley, Michael Hobson and Stephen Bence, Mathematical Methods for Physics and Engineering, Cambridge (Indian edition).
- H. K. Dass, Mathematical Physics, S. Chand & Co.
- Jon Mathews & R. L. Walker, Mathematical Methods of Physics: W A Benjamin Inc. 11
- Basic Thermodynamics: Evelyn Guha (Narosa Publications).
- A treatise on heat: Meghanad Saha and BN Srivastava , 1969, India Press.

Course Descriptions	
Semester	II
Course Name	Physics-II
Course Code	USC2PH2
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

- To study the molecular structure of the crystal using X-rays.
- To design regulated power supply using rectifier and filter circuits.
- To explain the analogy between electric field and magnetic field.

Course Outcomes

After completing the course, Student will able to:

- CO1 Explain the wavelike behaviour of a particle, the concept of matter wave and the distribution of Energy for a Black body radiator.
- CO2 Solve numerical problems based on matter waves, D. C. Circuits, Network theorems, Electric field and magnetic field.
- CO3 Analyse electric network circuits using Thevenin's theorem, Norton theorem, Superposition theorem, Reciprocity theorem and Maximum Power Transfer theorem..
- CO4 Discuss on rectifier circuits, Capacitor Filter circuits, Inductor filter circuits, CLC or Pi Filter circuits. and voltage regulator circuits.

Modern Physics, Digital Electronics and Electrodynamics				
Module/ Unit	Course Description	Hrs	CO No.	PO No.
1.1	Origin of Quantum Mechanics Origin of Quantum theory, Black body (definition), Black Body spectrum, Wien's displacement law, Matter waves, wave particle duality, Heisenberg's uncertainty Principle. Davisson-Germer experiment. [BSS]: Origin of Quantum Mechanics: 2.1 to 2.6, 3.1 to 3.5 and 3.9(without applications)	15 hrs	CO1, CO2	PO1, PO2, PO3, PO6, PO7
1.2	X rays X-Rays production and properties. Continuous and characteristic X-Ray spectra, Bragg's Law, Applications of X-Rays [AB]: X- Rays: 2.5, 2.6 [BSS]: X- Rays: 6.2 to 6.4		CO1 CO2	PO1, PO2, PO3, PO6, PO7
1.3	Compton effect: Compton effect, Pair production, Photons & Gravity, Gravitational Red Shift [AB]: Compton Effect: 2.7 to 2.9		CO1 CO2	PO1, PO2, PO3, PO6, PO7
2.1	Number System: Binary number system , Arithmetic building blocks , Types of registers, Digital IC, signal levels, Binary to Decimal ,Decimal to binary , Hexadecimal number, Hexadecimal to decimal Conversion, Decimal to hexadecimal conversion, Hexadecimal to binary conversion, Binary to hexadecimal conversion, Binary addition, Unsigned binary numbers, Sign magnitude numbers , 1's complement , 2's complement , Converting to and from 2's complement representation , 2's complement arithmetic, The adder- subtractor (ignore IC specific diagrams) [LMS] : Number System : 5.1, 5.2, 5.3, 5.5, 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8 [VKM]: 26.1 to 26.9	15 hrs		PO1, PO2, PO3, PO6, PO7

2.2	Digital Electronics: Logic gates (Review), NAND and NOR as universal building blocks. EX-OR gate: logic expression, logic symbol, truth table, Implementation using basic gates and its applications, Boolean algebra, Boolean theorems. De-Morgan theorems, Half adder and Full adder [VKM]: Digital electronics: 26.15 to 26.17, 26.20, 26.21, 26.22, 26.32			PO1, PO2, PO3, PO6, PO7
3.1	Electrostatics: The Coulomb's Law, The Electric Field, Discrete & Continuous Charge Distribution, Electric Potential, The Potential of a Localised Charge Distribution, Electric Potential Energy due to Discrete & Continuous charge Distribution, Comments on Potential, Numericals [DJG]: 2.1.1 to 2.1.4, 2.3.1, 2.3.2, 2.3.4, 2.4.1, 2.4.2 [BS]: 13.1 to 13.6, 13.11,13.12,13.18	15 hrs	CO2	PO1, PO2, PO6, PO7
3.2	Magnetostatics: Magnetic Fields due to Steady Currents, The Biot Savart Law & its applications, The Magnetic Field due a straight current carrying wire, Circular coil, Helmholtz coils, solenoid and Toroid, Numericals [DJG] : 5.1.1, 5.2.1, 5.2.2 [BS] : 16.7 to 16.12		CO2	PO1, PO2, PO6, PO7
3.3	Electromagnetic Waves: Maxwell's Equations, Electrodynamics before Maxwell, How Maxwell Fixed Ampere's Law [DJG] : 7.3.1 to 7.3.3 [BS]: 18.1, 18.2		CO2	PO1, PO2, PO6, PO7

References

- [BSS]: N Subrahmanyam, Brijlal and Seshan, Atomic and Nuclear Physics Revised Ed. Reprint 2012, S. Chand
- [AB]: Arthur Beiser, Concepts of Modern Physics 6th Ed. Tata McGraw Hill
- [CR]: D. Chattopadhyay, P C Rakshit, Electricity and Magnetism 7th Ed. New Central Book agency.
- [VKM]: V K Mehta and R Mehta Electronics Principals, Multi coloured Revised 11th Ed. reprint in 2012, S Chand.
- [DJG]: David J. Griffiths: Introduction to Electrodynamics, Prentice Hall India(EEE)3rd Ed.
- [BS]: Mechanics & Electrodynamics, 7th Edition, 2011, Brij Lal, Subramanyam & Jeevan Seshan
- [LMS] : Digital Principles and Applications By Leach, Malvino, Saha Seventh edition.

Additional References:

- B.L. Theraja and A.K. Theraja , A Textbook of Electrical Technology Vol. I , S. Chand Publication

2. A B Bhattacharya, Electronics Principles and Applications, Central publisher.
3. A P Malvino, Digital Principles and Applications: Tata McGraw Hill
4. Tokhiem, Digital electronics, 4th ed, McGraw Hill International Edition.
5. BN Boylestad and Nashelsky, Electronic devices and Circuit Theory: 7th edition, Prentice Hall of India.

Course Descriptions	
Semester	II
Course Name	Physics Practical II
Course Code	USC2PHP
Eligibility for the Course	12th Science of all recognised Board
Credit	02
Hours	45 hours

Course Objectives

1. To demonstrate the applications of semiconductor devices as voltage regulators, rectifiers and amplifiers.
2. To find the Refractive Index of transparent material.
3. To determine the radius of curvature & cardinal points of the lens system.
4. To analyse the electrical circuits using network theorems.

Course Outcomes

After completing the course, Student will able to:

- CO1 Utilise Optical Instruments such as the Spectrometer, Prism, Lenses for finding Optical properties like the Refractive Index of the material of the Prism, equivalent focal length.
- CO2 Determine moment of inertia & acceleration due to gravity.
- CO3 Justify Norton's & Thevenin's theorem, Zener diode, Bridge rectifier as voltage regulator, Transistor characteristics.
- CO4 Design circuits using Diodes, transistors, resistors, transformers.
- CO5 Explain concepts in physics like conservation of angular momentum, divergence of light, charging & discharging of capacitor and wave characteristics using demonstration.

Module/ Unit	Course Description	Hrs	CO No.	PO No.
A	Regular Experiments			
A.1	Group 1 7. Flywheel	15 hrs	CO1, CO2,	PO1, PO2,

	8. Newton's Rings: To determine radius of curvature of a given convex lens using Newton's rings 9. Spectrometer: To determine refractive index μ of the material of prism 10. Spectrometer: To determine the angle of Prism. 11. To determine Cardinal points of the Lens system. 12. Bar pendulum			PO3, PO6
A.2	Group 2 7. LDR Characteristics 8. Study of Logic Gates 9. To verify De Morgan's Theorems 10. NAND & NOR Gates as Universal Building Gates 11. Half Adder 12. Full Adder	15 hrs	CO3, CO4	PO1, PO2, PO3, PO6
B	List of Demo-experiments: (Any four) 6. Angular Momentum conservation (Rotating Platform) 7. Light dependent switch 8. Laser beam divergence, Intensity 9. Use of Oscilloscope 10. Charging and discharging of a capacitor	15 hrs	CO5	PO1, PO3, PO6
C	Any one out of following is equivalent to two experiments from section A and/or B 1. Students should collect the information of at least five Physicists with their work. Report that in a journal. 2. Students should carry out mini-project upto the satisfaction of professor In-charge of practical. 3. Study tour. Students participating in the study tour must submit a study tour report.	15 hrs	-	-

References

1. D. C. Tayal, edited by Ila Agarwal, University Practical Physics, 1st edition, Himalaya Publishing House
2. Harman Singh, B.Sc. Practical Physics, 7th edition, S. Chand Publication.
3. C. L. Arora, B.Sc. Practical Physics, 21st edition, S. Chand Publication.

- Minimum 4 experiments from each group should be completed in the second semester.
- Any four skill experiments are to be reported in a journal.
- Certified journal is a must to be eligible to appear for the semester end practical.
- The scheme of examination for the revised course in Physics at the First Year B.Sc. Semester end examination will be Semester End Practical Examination:
- Scheme of examination for Practical: There will be no internal assessment for practical.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester

or a certificate from the Head of the Department /Institute to the effect that he candidate has completed the practical course of that semester of F.Y.B.Sc. Physics as per the minimum requirement.

- The duration of the practical examination will be two hours per experiment.
- There will be two experiments through which the candidate will be examined in practical.



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F.Y.B.Sc. Botany Semester I		L	CR
USC1BO1 Paper I Plant Diversity I		45	2
Unit I		15	
Microbiology			
1.	Bacteria: Size, Shape and Arrangement, Ultra structure of Bacterial cell		
2.	General Characters of Cyanophyceae (Cyanobacteria) with reference to thallus structure, pigments, reserve food, reproduction and economic importance		
3.	Structure, life cycle and systematic position of <i>Nostoc</i>		
Unit II		15	
Fungi and Lichens			
Fungi:			
1.	Structure, life cycle and systematic position of <i>Rhizopus</i> and <i>Aspergillus</i>		
2.	Economic importance of Fungi		
Lichens:			
3.	Classification, Structure, Reproduction, Economic and Ecological significance		
Unit III		15	
Algae and Bryophyta			
1.	General Characters of Chlorophyceae with reference to thallus structure, pigments, reserve food, reproduction, life cycle patterns and economic importance		
2.	Structure, life cycle and systematic position of <i>Spirogyra</i>		
3.	Structure, life cycle and systematic position of <i>Riccia</i>		

F.Y.B.Sc. Botany Semester I		L	CR
USC1BO2 Paper II Form and Function I		45	2
Unit I		15	
Cell and Molecular Biology			
1.	General Structure of Eukaryotic Plant Cell, Ultrastructure of Chloroplast and Mitochondria		
2.	Structure of DNA and RNA		
3.	Cell Division: Mitosis		
Unit II		15	
Anatomy			
1	Simple Tissues, Complex Tissues		
2	Types of vascular bundles		
3	Primary Structure of Dicot and Monocot Root, Stem and Leaf		
Unit III		15	
Genetics			
1.	Gene Interaction: Intra locus,(Complete dominance, Incomplete dominance, Co-dominance, Test Cross, Back Cross) Inter locus, (Non-epistatic)		
2.	Epistatic interactions Dominant, Duplicate dominant, Recessive and Duplicate recessive epistasis		
3.	Chromosomal Method of Sex Determination: Heterogametic Male and Heterogametic Female.		

F.Y.B.Sc. Botany Semester I		L	CR
USC1BOP PRACTICAL Paper I – Plant Diversity I		30	1
1.	Gram Staining of Bacteria		
2.	Study of stages in the life cycle of <i>Nostoc</i> from fresh/ preserved material and permanent slides.		
3.	Study of stages in the life cycle of <i>Rhizopus</i> and <i>Aspergillus</i> from fresh/ preserved material and permanent slides.		
4.	Economic importance of Fungi: Mushroom, Yeast, wood rotting fungi (any bracket fungus).		
5.	Study of Lichens: Crustose, Foliose and Fruticose		
6.	Study of stages in the life cycle of <i>Spirogyra</i> from fresh/ preserved material and permanent slides.		
7.	Economic importance of algae: <i>Ulva</i> (Biofuel), <i>Spirulina</i> (Nutraceutical), <i>Nostoc</i> (Bio-fertilizer and agent for Phytoremediation)		
8.	Study of stages in the life cycle of <i>Riccia</i> from fresh/ preserved material.		

F.Y.B.Sc. Botany Semester I		L	CR
USC1BOP PRACTICAL Paper II – Form and Function I		30	1
1.	Cell inclusions: Starch grains (Potato and Rice), Cystolith (<i>Ficus</i>); Raphides (<i>Pistia</i>); Sphaeraphides (<i>Opuntia</i>).		
2.	Identification of cell organelles with the help of photomicrograph: Chloroplast and Mitochondrion Study of Mitosis from suitable plant material		
3.	Primary structure of dicot and monocot root.		
4.	Primary structure of dicot and monocot stem.		
5.	Study of different types of Vascular bundles		
6.	Calculation of mean, median, mode and standard deviation.		
7.	Frequency distribution, graphical representation of data- frequency polygon, histogram, pie chart.		
8.	Study of Karyotypes: Human: Normal male and female.		

F.Y.B.Sc. Botany Semester II		L	CR
USC2BO1 Paper I Plant Diversity I		45	2
Unit I		15	
Pteridophytes and Palaeobotany			
1.	Structure, Life cycle, Systematic Position and Alternation of Generations in <i>Nephrolepis</i>		
2.	Types of Fossils		
Unit II		15	
Gymnosperms			
1.	Structure, Life cycle, Systematic Position and Alternation of Generations in <i>Cycas</i>		
2.	Economic importance of Gymnosperms		
Unit III		15	
Angiosperms			
1.	Systems of Classification: Artificial, Natural and Phylogenetic with one example of each		
2.	Study of following families with reference to classification, morphological peculiarities and economic importance: Cruciferae (Brassicaceae), Apocynaceae, Euphorbiaceae and Amaryllidaceae.		

F.Y.B.Sc. Botany Semester II		L	CR
USC2BO2 Paper II Form and Function I		45	2
Unit I		15	
Physiology			
1.	Transpiration: Types of Transpiration, Mechanism of opening and closing of stomata, factors affecting transpiration, Significance of transpiration, Guttation and Wilting.		
2.	Enzymes: Classification, Factors affecting enzyme action, Mechanism of Action, Kinetics and Inhibition.		
Unit II		15	
Ecology			
1.	Concept of Ecosystem, Components of Ecosystem, Biotic interactions, Energy Pyramids, Energy Flow in an Ecosystem, Food chains		
2.	Abiotic Components: Soil as an edaphic factor, Types of soil, soil composition, soil formation		
Unit III		15	
Medicinal Botany and Plant Biotechnology			
Medicinal Botany			
1.	Concept of primary and secondary metabolites, difference between primary and secondary metabolites. Types of Secondary metabolites		
Plant Biotechnology			
2.	Enzymes used in Gene cloning: Endonucleases, Exonucleases, Ligases, Cloning Vectors: Plasmid, Phage, Cosmid		

F.Y.B.Sc. Botany Semester II		L	CR
USC2BOP PRACTICAL Paper I – Plant Diversity I		30	1
1.	Study of stages in the life cycle of <i>Nephrolepis</i> from fresh/preserved material Mounting of ramentum, hydathode, sporangia, T.S. of rachis.		
2.	Study of stages in the life cycle of <i>Nephrolepis</i> from permanent slides T.S. of pinna of <i>Nephrolepis</i> passing through sorus, prothallus		
3.	Study of stages in the life cycle of <i>Cycas</i> from preserved material/permanent slides: megasporophyll, microsporophyll, coralloid root, ovule, T. S. of pinna		
4.	Economic importance of Gymnosperms: <i>Pinus</i> (turpentine, wood, seeds)		
5.	Cruciferae (Brassicaceae)		
6.	Apocynaceae		
7.	Euphorbiaceae		
8.	Amaryllidaceae		

F.Y.B.Sc. Botany Semester II		L	CR
USC2BOP PRACTICAL Paper II – Form and Function I		30	1
1.	Study of Stomata from dicot leaf and grass leaf		
2.	Study of Activity of Enzyme Amylase		
3.	Study of Activity of Enzyme Lipase		
4.	Biotic Interactions: 1.Mutualism example; Root nodules in Leguminous plants, Lichens and Coralloid roots in <i>Cycas</i> 2. Parasitism example; <i>Cuscuta</i> and any parasitic fungus.		
5.	Quantitative estimation of organic matter of the soil by Walkley and Blacks Rapid titration method, Determination of Soil pH.		
6.	Change in colour because of change in pH: Anthocyanin: Black grapes/Purple cabbage/ <i>Clitoria</i> flowers		
7.	Test for tannins, alkaloids and terpenoids from suitable plant material		
8.	Enzyme Immobilization		