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

SYLLABUS

(Approved in the Academic council meeting dated 27/06/2023)

F. Y. B. Sc. Information Technology Undergraduate Certificate in the field of Information Technology

Designed as per
NEP 2020
Choice Based Credit System (60:40)
w.e.f. Academic Year 2023-2024
BACHELOR'S IN SCIENCE (B. Sc.)

Programme Outcomes

Sr. No.	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 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, 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 understanding values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness

Program Specific outcomes

	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.

Examination Scheme

Choice Based Credit System (CBCS)

➢ Revised Scheme of Examination

1. For Major Courses (100 Marks)

The performance of the learners shall be evaluated into two components, as the first component by 'Continuous Internal Assessment (CIA)' with 40% marks and as the second component by conducting the 'Semester End Examinations (SEE)' with 60% marks. The allocation of marks for the Continuous Internal Assessment (CIA) and Semester End Examinations are as shown below:

A) Continuous Internal Assessment (CIA): 40 % 40 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 Marks
02	Group/ Individual Survey Project/Presentation and write up on the selected units of the courses /Case studies / Test based on tutorials /Book Review /Poetry Appreciation/ Open Book Test	15 Marks
03	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibition 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/True or False/ 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 (SEE): 60 % 60 Marks

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

Question Paper Pattern

Theory question paper pattern
1. There shall be three/four questions each of 20/15 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.

➢ Practical Examination (PE) for Major Courses: 50 Marks

- The Practical Examination (PE) shall be of 100 marks for Major Courses

2. For Value Education Courses (VEC)/ Ability Enhancement Courses (AEC) /Indian Knowledge System (IKS) (50 Marks)

The performance of the learners shall be evaluated into two components, as the first component by 'Continuous Internal Assessment (CIA)' with 40% marks and as the second component by conducting the 'Semester End Examinations (SEE)' with 60% marks. The allocation of marks for the Continuous Internal Assessment (CIA) and Semester End Examinations (SEE) are as shown below:

A) Continuous Internal Assessment (CIA): 40 % 20 Marks

Sr. No.	Particular	Marks
01	One periodical class test / online examination to be conducted in the given semester	20 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 (SEE): 60 % 30 Marks

- Duration: The examination shall be of 1 hour's duration.

Question Paper Pattern

Theory question paper pattern
1. There shall be two/three questions each of 15/10 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.

3. Co-Curricular Courses (CC) (50 Marks)

The performance of the learners shall be evaluated into two components. The allocation of marks are as shown below:

A) Continuous Internal Assessment (CIA): 40 % 20 Marks

Sr. No.	Particular		Marks
01	One project / case study based on curriculum to be assessed by the teacher concerned		20 Marks
	Written Document	15 Marks	
	Viva/presentation	05 Marks	

B) Semester End Examination (SEE): 60 % 30 Marks

- Duration: The examination shall be of 1 hour's duration.

Question Paper Pattern

Theory question paper pattern
1. There shall be two/three questions each of 15/10 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.

4. For Vocational Skill Courses (VSC), Skill Enhancement Courses (SEC) and Minor Courses (50 Marks)

The performance of the learners shall be evaluated into two components. The allocation of marks are as shown below:

A) Practical Examinations (PE)/Field Work (FW)/Test Based on Tutorials: 40 % 20 Marks

Journal/Lab book/workbook, Viva Voce	05 Marks
Practical/Laboratory Work/field work/Test based on tutorials	15 Marks

B) Semester End Examination (SEE): 60 % 30 Marks

- Duration: The examination shall be of 1 hour's duration.
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Question Paper Pattern

Theory question paper pattern
1. There shall be two/three questions each of 15/10 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.

5. For Open Elective Courses (OE) (50 Marks)

The performance of the learners shall be evaluated into two components. The allocation of marks are as shown below:

A) Continuous Internal Assessment (CIA): 40 % **20 Marks**

Sr. No.	Particular	Marks
01	One project / case study / Test based on Practical skills/test based on tutorials (Workbook)/ Open book test/ Field work based on curriculum to be assessed by the teacher concerned	20 Marks

B) Semester End Examination (SEE): 60 %
30 Marks

- Duration: The examination shall be of 1 hour's duration.

Question Paper Pattern

Theory question paper pattern
1. There shall be two/three questions each of 15/10 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

- For Major courses: The learners shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Continuous Internal Assessment (CIA) and 40% marks in Semester End Examination (SEE) (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 Continuous Internal Assessment (CIA) and Semester End Examination (SEE).
- For AEC, VEC, VSC, SEC, IKS, Minor, OE and CC courses: Learners should remain present for Continuous Internal Assessment (CIA) and Semester End Examination (SEE)/ Practical Examination (PE). A learner will be said to have passed the course if the learner obtains minimum of 40% marks in the Continuous Internal Assessment (CIA) and Semester End Examination (SEE)/ Practical Examination together and obtain minimum 10 marks out of 30 marks in Semester End Examination (SEE)/ Practical Examination (PE).

➢ Rules of A.T.K.T.

I. A learner shall be allowed to keep term for Semester II irrespective of the number of courses of failure in the Semester I.

II. A learner shall be allowed to take Admission to Semester III if he/she passes both Semester I and Semester II

OR

A learner shall be allowed to keep term for Semester III, if he/she fails in not more than two Major courses and not more than eight other courses of Semester I and Semester II taken together with not more than four other courses each in Semester I and Semester II.

III. A learner shall be allowed to keep term for Semester IV irrespective of the number of courses of failure in the Semester III.

IV. A learner shall be allowed to take Admission to Semester V and Keep Terms if he/she Passes in all Semester I and Semester II and failed in not more than two Major courses and not more than eight other courses of Semester III and Semester IV taken together with not more than four other courses each in Semester III and Semester IV

OR

Passes in all Semester III and Semester IV and failed in not more than two Major courses and not more than eight other courses of Semester I and Semester II taken together with not more than four other courses each in Semester I and Semester II.

V. A learner shall be allowed to keep term for Semester VI irrespective of the number of courses of failure in the Semester V.

VI. The result of Semester VI shall be withheld by the College till the learner passes all the Semesters from I – V.

VII. A Learner is allowed to take admission in semester VII (UG Hon. /PG Part I) only if he passed all courses of semesters I to VI (132 Credits).

➢ Eligibility Condition to appear for Additional Examination of any Semester

(Applicable only for Regular Semester End Examinations)

A learner who remains absent in some or all the subjects on medical grounds or for representing the College or University in NSS, NCC, Sports, Cultural Activities or co-curricular/extracurricular/extension activities with prior permission of the Principal or Head of the institute reported to the examination section, by producing necessary documents and

testimonials, will be allowed to appear for the Additional Semester End Examination (ASEE). This is not applicable for any A.T.K.T. / Supplementary Examinations.

- **Supplementary Examination (SE)**
  The college will conduct supplementary examinations for semester II, IV, and VI after the declaration of their respective results.

Note:

1) It is noted that the concerned regulation of the College is amended and implemented to Semester I to Semester II of undergraduate programmes, under faculty of Arts, Commerce and Science with effect from the academic year 2023 - 2024.
2) All these rules maybe amended as and when required with authorisation of Academic bodies.

Sr. No.	Heading	Particulars
1	Title of Course	Information Technology
2	Eligibility for Admission	(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. (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. (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. OR 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.
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	New
9	To be implemented from Academic year	2023-2024

Choice Based Credit System (CBCS)
F.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024
Course Structure

No. of Courses	Semester I	Credits	No. of Courses	Semester II	Credits
A	***Discipline Specific Course (Major)***		**A**	***Discipline Specific Course (Major)***	
1	Introduction to C++ programming	02+01	1	Fundamentals of Python Programming	02+01
2	Computer Organization & Design	02+01	2	Database Management System	02+01
B	***Indian Knowledge System (IKS)***		***B***	***Minor***	
4	History of Evolution and Growth of IT in India	02	3	Introduction to Embedded System	01+01
C	***Vocational Skill Course (VSC)***		***C***	***Vocational Skill Course (VSC)***	
5	Introduction to Statistics	01+01	4	Linear Algebra	01+01
D	***Skill Enhancement Course (SEC)***		***D***	***Skill Enhancement Course (SEC)***	
6	Introduction to Web Designing	01+01	5	Advanced Web Programming	01+01
E	***Open Elective (OE)***		***E***	***Open Elective (OE)***	
7	Multimedia Applications	02	6	Privacy and Security in Online Social Media	02
8	Introduction to Photoshop	02	7	Introduction to Game Designing and Cartoon Animation	02
F	***Value Education Course (Any One)***		***F***	***Value Education Course (Any One)***	
9	Digital Technology and Solutions	02	8	Digital Technology and Solutions	02
10	Understanding India	02	9	Understanding India	02
11	Environmental Studies	02	10	Environmental Studies	02
E	***Ability Enhancement Course (AEC) (Any One)***		***E***	***Ability Enhancement Course (AEC) (Any One)***	
12	Marathi	02	12	Marathi	02
13	Hindi	02	13	Hindi	02
G	***Co-curricular Courses (Any One)***		***G***	***Co-curricular Course (Any One)***	
14	Foundation Course in NSS-I	02	14	Foundation Course in NSS-II	02
15	Foundation Course in NCC-I	02	15	Foundation Course in NCC-II	02
16	Foundation Course in PE-I	02	16	Foundation Course in PE-II	02
17	Foundation Course in PA-I	02	17	Foundation Course in PA-II	02
	Total Credits	22		Total Credits	22

Choice Based Credit System (CBCS)
F.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024

SEMESTER I

Course Code	Course Type	Course Title	Credit
UIT1ICT	Major Subject I	Introduction to C++ programming	02
UIT1ICP	Major Subject I Practical	Introduction to C++ programming practical	01
UIT1COT	Major Subject II	Computer Organization & Design	02
UIT1COP	Major Subject II Practical	Computer Organization & Design Practical	01
UIT1HET	IKS Minor	History of Evolution and Growth of IT in India	02
UIT1IST	VSC1	Introduction to Statistics	01
UIT1ISP	VSC I Practical	Introduction to Statistics Practical	01
UIT1IWT	SEC1	Introduction to Web Designing	01
UIT1IWP	SEC1 Practical	Introduction to Web Designing Practical	01
		Total Credits	**12**

Open Elective Courses

Course Code	Course Type	Course Title	Credit
UOE1MAT	Open Elective 1	Multimedia Applications	02
UOE1IPT	Open Elective 2	Introduction to Photoshop	02
		Total Credits	**04**

Value Added Courses

Course Code	Course Type	Course Title	Credit
UVEC1DTS	VAC	Digital Technology and Solutions	02
		Total Credits	**02**

Semester I

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	Introduction to C++ Programming
Course Code	UIT1ICT
Credit	2
Hours	2 Hrs. per week

Course Objectives	The objective of this course is to introduce the concepts of the basic C++ programming language and object-oriented programming language.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Define basic concepts of C++ programming language.
	2) Illustrate different types of operators of C++ language.
	3) Explain characteristics of object oriented programming approach with C++.
	4) Elaborate Classes and objects in OOPs.

Module/Unit	**Course Description**	**Hrs.**
I	**Programming Logic and Techniques:** Introduction, Algorithm, Flowchart **Introduction to C++:** History of C++, Structure of C++ Program, Variables and Assignments: Variables, variable declarations, Identifiers, local and global variables, Constants, Reference variable, Symbolic constant. **Operators:** Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Operator Precedence **Input and Output:** cin, cout, include directives and Namespaces, Comments, Data types **Decision Making:** if-else, nested if-else, switch Loops: while, for, do while **Manipulators:** setw, endl, sizeof, Increment and decrement operators, Type Cast Operators, Scope resolution operators. String functions.	15hrs

II	**Introduction to OOPs:** Object oriented programming, Comparison of procedural and object oriented approach, Applications of OOPs, Characteristics of OOPs – Objects, Classes, Data Abstraction, Encapsulation, Inheritance, Polymorphism, and Reusability. **Classes and Objects:** Classes, Class declaration, Creating Objects, Member function of a class, Objects as function arguments, Dynamic Memory Allocation, Static Data Members, Friend Function **Constructors:** Introduction, Types of Constructors: Default Constructor, Parameterized Constructor, Copy Constructor Inheritance: Single Inheritance, Multiple Inheritance	15hrs

References:

1. "Let us C++" , Y.P.Kanetkar, Seventh edition, BPB publication
2. Object Oriented programming with C++ , E Balagurusamy , Third Edition ,Tata McGraw Hill.
3. Schaum's outlines "Programming with C++", J.R.Hubbard, Second Edition, Tata McGrawHill

Course Description: B.Sc.(Information Technology)	
Semester	I
Course Name	Introduction to C++ Programming Practical
Course Code	UIT1ICP
Credit	1
Hours	2 Hrs. per week

Course Objectives	The objective of this course is to introduce the programming concepts of the C++ language and object-oriented programming language.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Demonstrate basic C++ programs.
	2) Construct C++ programs using conditional statements and loops.
	3) Explain use of functions and arrays in C++ programs.
	4) Build programs using classes and objects, constructors and inheritance.

Module/Unit	Course Description	Hrs.
1	**Basic Programs:** 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.	**2hrs**
2	**Programs on variables:** a. Write a program to swap two numbers without using a third variable. b. Write a program to find the area of rectangle, square and circle.	**2hrs**
3	**Programs on Decision Making Statements (if-else, nested if-else):** a. Write a program to check whether the number is positive, negative or zero. b. Write a program to find the largest of three numbers.	**2hrs**
4	**Loops (While, do…while, for, Switch)**	**2hrs**

	a. 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. b. Write a program to check whether the number is even or odd.	
5	**Functions:** a. Program on Functions	**2hrs**
6	**Arrays** 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.	**2hrs**
7	String operations for string length , string concatenation, string reverse, string comparison	**2hrs**
8	Write a C++ program using class and object Student to print name of the student, roll no. Display the same.	**2hrs**
9	Write a friend function for adding the two complex numbers, using a single class	**2hrs**
10	Write a friend function for adding the two different distances and display its Sum, using two classes.	**2hrs**
11	Design a class Complex for adding the two complex numbers and also show the use of constructor.	**2hrs**
12	Overload the + for concatenating the two strings. For e.g. “Py” + “thon” = Python.	**2hrs**
13	Overload the operator + for adding the timings of two clocks, And also pass objects as an argument.	**2hrs**
14	Design a class for single level inheritance.	**2hrs**
15	Design a class for multiple inheritances.	**2hrs**

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	Computer Organization and Design
Course Code	UIT1COT
Credit	2
Hours	2 Hrs per week

Course Objectives	To understand the basic structure and organization of computers and to acquire the basic knowledge of digital logic levels and the application of knowledge and to understand digital electronics circuits.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Explain the underlying principles of computers.
	2) Analyse how data is transferred between various peripheral devices in the computer.
	3) Define the various types of number systems and logic gates.
	4) Elaborate the different types of Flip-Flops.

Module/ Unit	**Course Description**	**Hrs.**
I	Computer Abstractions and Technology: Basic structure and operation of a computer, Computer Hardware, Software, functional units and their interaction , Types of Operating Systems – Android OS, Linux OS, Windows OS, Memory and its types. Number System & Binary Arithmetic: 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, Error detection and correction. Binary Addition, Binary Subtraction, Subtraction Using 1's Complement , Subtraction Using 2's Complement, Binary Multiplication , Binary Division, Octal Addition, Octal Subtraction, Hexadecimal Addition, Hexadecimal Subtraction, BCD Addition, BCD Subtraction , Code Addition , Code Subtraction 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	**15hrs**

	gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level.	
II	**Minterm, Maxterm and Karnaugh Maps**: Introduction, minterms and sum of minterm form, maxterm and Product of maxterm form, 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 clusky Arithmetic Circuits : Introduction to Arithmetic Circuits: Adder, BCD Adder, Excess – 3 Adder, Binary Subtractors, BCD Subtractors. Multiplexer, Demultiplexer, ALU, Encoder and Decoder: Introduction, Multiplexer, Demultiplexer, Encoder, Decoder, ALU. Sequential Circuits: Flip-Flop: Introduction, Terminologies used, S-R flip-flop, D flip-fop, JK flip-flop, Race-around condition, Master – slave JK flip-flop, T flip-flop, Application of flip-flops, Counters, Registers	**15hrs**

References:

1) Digital Electronics and Logic Design, N. G. Palan, Technova
2) Patterson and Hennessy, Computer Organization and Design, Morgan Kaufmann, ARM Edition, 2011
3) R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd., 4th Edition, 2010.

Course Description: B.Sc.(Information Technology)	
Semester	I
Course Name	Computer Organization and Design Practical
Course Code	UIT1COP
Credit	1
Hours	2Hrs per week

Course Objectives	To acquire the basic knowledge of digital logic levels and to understand digital electronics circuits As well as prepare the learners to perform the analysis and design of various digital electronic circuits.

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 arithmetic circuits.
	4) Design Encoder, Decoder, Multiplexer and Demultiplexer.

Module/Unit	**Course Description**	**Hrs**
1	Study and verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, and EX-NOR).	**2hrs**
2	Simplify given Boolean expression and realize it.	**2hrs**
3	Design and implement a circuit based on the problem given and minimizing using K-maps.	**2hrs**
4	.Verifying De Morgan's laws.	**2hrs**
5	Implement other given expressions using minimum number of gates.	**2hrs**
6	Design and implement Binary – to – Gray code converter.	**2hrs**
7	Design and implement Gray – to – Binary code converter.	**2hrs**
8	Design and implement Binary – to – BCD code converter	**2hrs**
9	Design and implement Binary – to – XS-3 code converter	**2hrs**
10	Design and verify a half adder.	**2hrs**

11	Design and verify a full adder	**2hrs**
12	Design and verify full subtractor.	**2hrs**
13	Design and verify full subtractor.	**2hrs**
14	Design and verify the operation of flip-flops using logic gates.	**2hrs**
15	Implementation of digits using seven segment displays.	**2hrs**

Indian Knowledge System (Credit 2)

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	History of Evolution and growth of IT in India
Course Code	UIT1HET
Credit	2
Hours	2 Hrs per week

Course Objectives	The objective of this course is to promote and introduce evolution and growth of information technology over the period.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Define Indian Knowledge System.
	2) Demonstrate History of IT in India.
	3) Determine growth of IT education in India.
	4) Elaborate challenges and future aspects of Indian IT industry.

Module/Unit	Course Description	Hrs.
I	**Introduction to Indian Knowledge System,** **Relevance of Indian knowledge system in the context of IT,** **History of IT in India,** **Philosophical Foundation:** Philosophical schools like Navya and their impact on logical reasoning, Connection between ancient Indian philosophy and modern IT & AI. **Ancient language in relevance with natural language processing.**	**15hrs**
II	**Growth of IT Education in India,** **Integration of traditional Indian knowledge system with modern concepts:** Ayurveda and Modern Medicine, Yoga and Mental Health, Vedic Mathematics and Education, Environmental Sustainability and Vastu Shastra, Philosophy and Ethics, Integration of Art and Technology, Astronomy and Space Research, Holistic Wellness and Wellness Tourism, **Key player companies in Growth of IT Sector,** **Contribution of Pioneers in Indian Computing,** **Challenges and Future Prospects:** Chanllenges faced by the Indian IT industry, Future trends and prospects of IT in India	**15 hrs**

Reference books:

1) Fundamental of Information Technology, Deepak Bharihoke
2) Information Technology: History, Practice and Implications for Development, Kyle Eischen, November 2000.

Vocational Skill Course (Credit 1+1)

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	Introduction to Statistics
Course Code	UIT1IST
Credit	1
Hours	1 Hr per week

Course Objectives	The objective of this course is to provide an understanding for the learners of statistical concepts to include measures of dispersion, probability distribution.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Recall measures of central tendency.
	2) Describe the measures of dispersion.
	3) Classify discrete and continuous probability distribution.
	4) Solve various problems with help of probability

Module/Unit	**Course Description**	**Hrs.**
I	Measures of central tendency and dispersion: Averages, Arithmetic Mean, Median, Mode, Empirical Relation Between the Mean, Median, and Mode, Geometric Mean, Harmonic Mean, Relation Between the Arithmetic, Geometric, and Harmonic Means, Quartiles, deciles and percentiles. Standard Deviation and Other Measures of Dispersion: Dispersion, or Variation, Range, Mean Deviation, Semi-Interquartile Range, 10–90 Percentile Range, Standard Deviation, Variance. Elementary Probability Theory: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Mathematical Expectation, Discrete and continuous Probability distribution.	**15hrs**

Course Description: B.Sc.(Information Technology)	
Semester	I
Course Name	Introduction to Statistics Practical
Course Code	UIT1ISP
Credit	1
Hours	2 Hrs per week

Course Objectives	The objective of this course is to introduce statistical programming skills through R studio.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Make use of basic commands of R programming.
	2) Analyse the concepts of various descriptive statistical functions.
	3) Analyse the concepts of various Graphical functions.
	4) Explain the probability using programming.

Module/ Unit	**Course Description**	**Hrs**
1	Using R execute the basic commands, array, list and frames, sequences and repetition.	2 hrs
2	Executing basics commands of R to solve the problems.	2 hrs
3	Create a Matrix using R and Perform the operations: addition, multiplication	2 hrs
4	Create a Matrix using R and Perform the operations inverse Transpose.	2 hrs
5	Create Graph: scatter plot, line plots, multiple lines	2 hrs
6	Create Graph: Bar plot, Histogram, Box plot, pie chart	2 hrs
7	Using R Execute the statistical function: mean, median. Mode.	2 hrs
8	Using R Execute the statistical functions: quartiles.	2 hrs
9	Using R Execute the statistical functions: range.	2 hrs
10	Using R Execute the statistical function: inter quartile range histogram.	2 hrs
11	Using R import the data from Excel / .CSV file and perform the above functions	2 hrs

12	Using R import the data from Excel / .CSV file and calculate the standard deviation.	2 hrs
13	Using R import the data from Excel / .CSV file and calculate the variance, co-variance.	2 hrs
14	Using R, compute the probability.	2 hrs
15	Using R, compute the conditional probability.	2 hrs

Reference Books:

1. STATISTICS, Murray R Spiegel, Larry J. Stephens, Mcgraw –Hill Iternational, 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.

Skill Enhancement Course (Credit 1+1)

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	Introduction to Web Designing
Course Code	UIT1IWT
Credit	1
Hours	1 Hr per week

Course Objectives	To develop web pages using web technologies. Learners will gain the skills and project-based experience needed for entry into web application and development careers.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Define fundamentals of Internet, and the principles of web design.
	2) Build semantic, HTML and CSS web page.
	3) Code a handful and useful HTML & CSS examples.
	4) To understand implementation of Hyperlink.

Module/ Unit	**Course Description**	**Hrs.**
I	HTML5: Introduction, Why HTML5? HTML Tags and Attributes, Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Style sheets. Lists: Unordered Lists, Ordered Lists, Definition list, Image: Image and Image mapping. CSS : Introduction, Features and benefits of CSS, CSS Syntax, External style sheet using <link>, Basic CSS Properties, Multiple Style Sheets. 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. Creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5.	**15hrs**

Reference Books:

1. Jon Duckett, HTML and CSS : Design And Build Websites , Wiley.
2. Jennifer Niderst Robbins, Learning Web Design : A Beginner's Guide To HTML, CSS, JavaScript, And Web Graphics O'reilly.
3. Thomas A powell, The Complete Refrence To HTML.

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	Introduction to Web Designing Practical
Course Code	UIT1IWP
Credit	1
Hours	2 Hrs per week

Course Objectives	To learn how to combine basic HTML elements to create Web pages. Understand how to use HTML tags and tag attributes to control a Web page's appearance.

Course Outcomes	**After completing the course, Student will be able to:**
	1. Explain head tag and body tag in the give web page.
	2. Creating static web pages using HTML5 and CSS
	3. Design a responsive website using HTML5 and CSS.
	4. Describe the procedure to organize display as per given screen layout using frames.

Module/Unit	**Course Description**	**Hrs**
1	Design a home page which displays information about your college department using headings, HTML entities and paragraphs.	2 hrs.
2	Implement different types of list tags in the college departmental homepage.	2 hrs.
3	Create a webpage for any clinic using Marquee and HTML formatting tags.	2 hrs.
4	Create 3 Hyperlink in home page connecting it to 3 different pages.	2 hrs.
5	Create 3 Hyperlink in a page, which jumps to 3 different heading on same page.	2 hrs.
6	Create a web page having two links .When link is clicked appropriate content should be displayed in another tab.	2 hrs.
7	Design a timetable and display it in tabular format.	2 hrs.
8	Create a HTML form with the use of cascading style sheet.	2 hrs.
9	Create a sample code to illustrate the Inline style sheet for your web page.	2 hrs.
10	Create a sample code to illustrate the External style sheet for your web page.	2 hrs.
11	Design a web page by using different CSS border styles.	2 hrs.

12	Design an admission form for any course in your college with text, password field, drop-down list, check-boxes, radio button, submit and reset button.	2 hrs.
13	Demonstrate difference between “get” and “post” method of form tag in a form with name and password text fields.	2 hrs.
14	Insert image on the webpage as an hyperlink.	2 hrs.
15	Design a web of your Home town with a attractive background color, text color, and image, font face by using Internal CSS formatting.	2 hrs.

Open Elective to be offered to other Department (Credit 2)
Open Elective - I

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	Introduction to Photoshop
Course Code	UOE1IPT
Credit	2
Hours	2 Hrs per week

Course Objectives	Enhance images using advance editing tools to create magazine covers. Work with the Type tools and panels to type, insert and manage text.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Understand the basics of Adobe Photoshop to create and edit images.
	2) Develop images using Photoshop tools.
	3) Demonstrate the models and layers in images.
	4) Design RGB, 3d objects using models and layers.

Module/Unit	**Course Description**	**Hrs.**
I	**Introduction:** Introduction Variations in Photoshop applications, About Photoshop, Photoshop Features, Key Board practice, Editing Photo in camera raw, Creating Web Galleries, PDF converts, Opening and Importing images, Creating Documents with different sizes. **Tools:** Rectangular Marquee Tool & Elliptical marquee tool & single row marquee tool ,single column marquee tool, Move tool, magic wand tool, quick selection tool, lasso tool, polygonal lasso tool, magnetic lasso tool, Crop tool, slice tool, slice select tool, eyedropper tool, colour sampler tool, ruler tool, note tool, count tool, Spot healing brush tool, healing brush tool, patch tool, red eye tool, brush tool, pencil tool, colour replacement tool, mixer brush tool, Clone stamp tool, pattern tool, history brush tool, art history tool, Eraser tool, background eraser tool magic eraser, gradient tool paint bucket tool, Pen tool, freeform pen tool, add anchor point	**15hrs**

	tool, delete anchor point tool, convert to point tool, horizontal type tool, vertical type tool, horizontal type mask tool, vertical type mask tool, Path selection tool, direct selection tool, custom shape tools, hand tool, zoom tool, Blur tool, sharpen tool, smudge tool, dodge tool, burn tool, sponge tool	
II	**Modes & Layers:** About colour information, Colour Modes, Working with layers & layer styles, Create Droplet & Conditional Mode Change, Fit Image, Picture Package, Web Photo Gallery in Bridge cs5, Use the Merge To HDR command to combine multiple images & Export Layers To Files, About Copy Merged, Paste in to, Clear, Fill, Stroke, Define Brush Preset , Define Pattern, Define Custom Shape, Free Transform, Scale, Rotate, Distort, Skew, Content-Aware Scale, Perspective, Auto Blend Layers, Auto Align layers, RGB or grayscale images, Adjustments, Exposure, Curves Colour Balance, Black & White Selective Colour, Match colour Desaturate, Replace colour, Channel Mixer, Gradient Map Photo Filter Shadow/Highlight Invert, Equalize, Variations, Canvas, Size Calculations, Apply Image, Layer Mask, Vector Mask Merge Layers, Flatten all layers Matting, Colour Range, Grow, Similar Blur Filters, 3d object creation	**15hrs**

Reference Books:

1. Adobe Photoshop Elements 2021 User Guide
2. Basics Of Adobe Photoshop Make Photo Manipulation , Photo Editing Technique

Open Elective - II

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	Multimedia Applications
Course Code	UOE1MAT
Credit	2
Hours	2 Hrs per week
Course Objectives	This course aims to introduce the fundamental elements of multimedia. It will provide an understanding of the fundamental elements in multimedia. The emphasis will be on learning the representations, perceptions and applications of multimedia. Software skills and hands on work on digital media will also be emphasized.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Summarize the key concepts in current multimedia technology.
	2) Find different Image Format and study it.
	3) List the different types of audio and video format.
	4) Create quality multimedia software titles.

Module/Unit	**Course Description**	**Hrs.**
I	**Introduction to Multimedia :** What is multimedia, Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media. **Audio fundamentals and representations :** Digitization of sound, frequency and bandwidth, decibel system, data rate, audio file format, Sound synthesis, MIDI, wavetable, Compression and transmission of audio on Internet, Adding sound to your multimedia project, Audio software and hardware.	**15hrs**
II	**Image fundamentals and representations :** Colour Science, Colour, Colour Models, Colour palettes, Dithering, 2D Graphics, Image Compression and File Formats: GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF, Basic Image Processing [Can Use Photoshop], Use of image editing software, White balance correction, Dynamic range correction, Gamma correction, Photo Retouching.	**15hrs**

	Video and Animation : Video Basics , How Video Works, Broadcast Video Standards, Analog video, Digital video, Video Recording and Tape formats, Shooting and Editing Video (Use Adobe Premier for editing), Video Compression and File Formats. Video compression based on motion compensation, MPEG-1, MPEG-2, MPEG-4, MPEG-7, MPEG-21, Animation: Cell Animation, Computer Animation, Morphing.	

Reference Books:

1) Tay Vaughan, "Multimedia making it works", Tata McGraw-Hill, 2008.
2) Rajneesh Aggarwal & B. B Tiwari, "Multimedia Systems", Excel Publication, New Delhi, 2007.
3) Li & Drew, "Fundamentals of Multimedia", Pearson Education, 2009.

Value Education Course (Credit 2)

Course Description: B.Sc. (Information Technology)	
Semester	I
Course Name	Foundation Course in Digital and Technology Solutions
Course Code	UVEC1DTS
Credit	2
Hours	2 Hrs per week

Course Objectives	• To gain familiarity with digital paradigms. • To sensitize about role & significance of digital technology. • To provide a knowledge of major technological trends. • To bring awareness about the e-governance and Digital India initiatives.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Build knowledge about digital paradigm.
	2) Elaborate the importance of digital technology, digital financial tools, e-commerce.
	3) List the e-governance and Digital India initiatives
	4) Explain use & applications of digital technology

Module/Unit	**Course Description**	**Hrs.**
I	**Introduction & Evolution of Digital Systems**: Introduction, Fundamental components of Digital System, Role & Significance of Digital Technology. Information & Communication Technology & Tools: Advantages & Disadvantages, Importance of ICT in Education. **Major technological trends:** Internet of Things, Artificial Intelligence, Blockchain Technologies, Cloud Adoption, and Data Security & Cyber Protection. **Communication Systems:** Principles, Model & Transmission Media. Computer Networks. **Internet Concept & Applications:** WWW, Web Browsers, Search Engines, Messaging, Email, Social Networking. **Computer Based Information System**: Significance & Types. E-commerce & Digital Marketing: Basic Concepts, Benefits & Challenges.	**15 hrs**

II	**Digital India & e-Governance**: Initiatives, Infrastructure, Services and Empowerment. **Application of Digital Financial Services**: Savings and its future needs, Bank and banking products, Banking Service Delivery Channels –I, Banking Service Delivery Channels – II. **Digital Financial Tools**: OTP, QR Code, Unified Payment Interface, Aadhar Enabled Payment System, USSD, Credit/ Debit Cards, e-Wallets.	**15 hrs**

Reference Books:

1. Digital Systems Engineering William J. Dally, John W. Poulton Cambridge University Press
2. Principles of Digital Communication – Robert G. Gallager
3. E-Governance in India: The Progress Status Sunil K. Muttoo, Rajan Gupta, Saibal K. Pal · 2019

Choice Based Credit System (CBCS)
F.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024
SEMESTER II

Course Code	Course Type	Course Title	Credit
UIT2PPT	Major Subject I	Fundamentals of Python Programming	02
UIT2PPP	Major Subject I Practical	Fundamentals of Python Programming Practical	01
UIT2DMT	Major Subject II	Database Management System	02
UIT2DMP	Major Subject II Practical	Database Management System Practical	01
UIT2EST	Minor	Introduction to Embedded System	01
UIT2ESP	Minor Practical	Introduction to Embedded System Practical	01
UIT2LAT	VSC2	Linear Algebra	01
UIT2LAP	VSC2 Practical	Linear Algebra Practical	01
UIT2AWT	SEC2	Advanced Web Programming	01
UIT2AWP	SEC2 Practical	Advanced Web Programming Practical	01
		Total Credits	**12**

Open Elective Courses

Course Code	Course Type	Course Title	Credit
UOE2PSO	Open Elective 3	Privacy and Security in Online Social Media	02
UOE2GDC	Open Elective 4	Introduction to Game Designing and Cartoon Animation	02
		Total Credits	**04**

Value Added Courses

Course Code	Course Type	Course Title	Credit
UVEC2DTS	VAC	Digital Technology and Solutions	02
		Total Credits	**02**

Semester- II
Major I (Credit 2+1)

Course Description: B.Sc. (Information Technology)	
Semester	II
Course Name	Fundamentals of Python Programming
Course Code	UIT2PPT
Credit	2
Hours	2 Hrs per week

Course Objectives	•Understand Python syntax and basic programming concepts. •Learn control flow statements (if-else, loops) for program control and logic. •Acquire knowledge of built-in data structures like lists, tuples, and dictionaries. •Understand and utilize data types, variables, and operators in Python.

Course Outcomes	**After completing the course, Student will be able to:**
	1. Understand Python syntax and basic programming concepts.
	2. Understand and utilize data types, variables, and operators in Python.
	3. Learn control flow statements (if-else, loops) for program control and logic.
	4. Acquire knowledge of built-in data structures like lists, tuples, and dictionaries.

Module/Unit	**Course Description**	**Hrs.**
I	**Introduction to Features and Applications of Python**; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. **Python Basics**: Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples. **Python Control Flow**: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions.	**15 hrs**

	Exception Handling: Types of Errors; Exceptions; Exception Handling using try, except and finally. **File Handling**: File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator.	
II	**Python Functions**: Types of Functions; Function Definition-Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions. Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; **Lists:** Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists. **Dictionaries:** Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. **Tuples and Sets:** Creating Tuples; Operations on Tuples; Built-in Functions on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.	**15 hrs**

Reference Books:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online @ https://www.greenteapress.com/thinkpython/thinkCSpy.pdf, 2015.
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall 2012.

Course Description: B.Sc.(Information Technology)	
Semester	II
Course Name	Fundamentals of Python Programming Practical
Course Code	UIT2PPP
Credit	1
Hours	2 Hrs per week

Course Objectives	To introduce learners with fundaments of python programming language.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Understanding the Scripting and Automation in python
	2) Implement the Handling of User Input
	3) Implement Programming Concepts like structure, pattern , etc.
	4) Identify the methods to create and manipulate programs.

Module/Unit	**Course Description**	**Hrs**
1	Demonstrate a keyboard input program.	**2 hrs**
2	Check if a number belongs to the Fibonacci Sequence	**2 hrs**
3	Solve Quadratic Equations	**2 hrs**
4	Find the sum of n natural numbers	**2 hrs**
5	Display Multiplication Tables	**2 hrs**
6	Check if a given number is a Prime Number or not	**2 hrs**
7	Create a calculator program	**2hrs**
8	Explore string functions	**2 hrs**
9	Implement Selection Sort	**2 hrs**
10	Read and write into a file	**2 hrs**
11	Demonstrate usage of basic regular expression	**2 hrs**
12	Demonstrate use of List	**2 hrs**
13	Demonstrate use of Dictionaries	**2hrs**
14	Demonstrate Exceptions in Python	**2 hrs**
15	Demonstrate use of Tuple	**2 hrs**

Major II
(Credit 2+1)

Course Description: B.Sc. (Information Technology)	
Semester	II
Course Name	Database Management System
Course Code	UIT2DMT
Credit	2
Hours	2 Hrs 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.

Course Outcomes	**After completing the course, Student will be able to:**
	1. Design E-R model to represent normalized database.
	2. Explain the fundamental of RDBMS.
	3. Explain the transactions of database.
	4. Elaborate the View in DBMS.

Module/Unit	**Course Description**	**Hrs.**
I	**Introduction:** What is database system, purpose of database system, view of data, relational databases, database architecture, transaction management, **Data Models**: The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction. **Database Design, ER-Diagram** Database design and ER Model: overview, ER-Model, ER Diagrams, ERD Issues, weak entity sets, Codd's rules, Constraints, Relational Schemas, Introduction to Logical view of data, keys, integrity rules, normalization.	**15Hrs**
II	**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 **SQL**: SQL Commands, Null Values, Joins (Displaying Data from Multiple Tables) Transaction management and Concurrency control: Transaction management: ACID	**15Hrs**

	properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.	

Reference Books:

1. "Database System Concepts" by Silberschatz, Korth, Sudarshan, 4th Edition, McGraw Hill Publication.
2. Fundamentals of Database System "By Elmasri Ramez and Navathe Shamkant".

Course Description: B.Sc.(Information Technology)	
Semester	II
Course Name	Database Management System Practical
Course Code	UIT2DMP
Credit	1
Hours	2 Hrs per week

Course Objective	To specify the functional and data requirements for a typical database application and to understand creation, manipulation and querying of data in databases.

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	Design E-R diagram for college management system and Railway Reservation System.	**2Hrs**
2	Design E-R diagram for ATM system and Hospital Management System	
3	Convert college management system E-R diagram into relational database.	
4	Convert Bank management system E-R diagram into relational database.	
5	Design a Database and create required tables. Creating Bank database	
6	Writing Basic SQL SELECT Statements a) Restricting data b) Sorting Data	

7	Applying the constraints Table Level	
8	Applying the constraints Column Level	
9	Manipulating Data a) Using INSERT b) Using UPDATE c) Using DELETE	
10	Write a SQL statement for Creating and Managing Tables a) Alter b) Drop	
11	Write the query to create the database objects Views	
12	Write the query to implement the outer join.	

Minor (Credit 1)

Course Description: B.Sc. (Information Technology)	
Semester	II
Course Name	Introduction to Embedded System
Course Code	UIT2EST
Credit	1
Hours	1 Hr per week

Course Objectives	To introduce learners with the core components of embedded system, 8085 microprocessor and 8051 microcontroller.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Explain Microprocessor, Microcontroller.
	2) Make use of Assembly Language Programming
	3) Define core components of embedded system.
	4) Elaborate 8051 embedded c.

Module/Unit	**Course Description**	**Hrs.**
I	**Microprocessor, Microcontrollers and Assembly Language**: Microprocessor, overview of 8085 Instruction Set, 8085 microprocessor architecture Writing and Assembling Program, Overview of 8051 microcontroller family. **Introduction to Embedded System:** Embedded Systems and general purpose computer systems, embedded firmware, 8051 Programming in C- Data Types and time delay in 8051 C, I/O Programming, Data conversion Programs, structure of embedded program, compiling, linking and debugging, difference between C and embedded C.	**15Hrs**

Reference Books:

1. Introduction to embedded systems ,Shibu K V, First, Tata Mcgraw-Hill
2. Embedded Systems Rajkamal Tata Mcgraw-Hill
3. Microprocessors Architecture, Programming and Applications with the 8085, Ramesh Gaonkar, Fifth Edition, PENRAM

Course Description: B.Sc.(Information Technology)	
Semester	II
Course Name	Introduction to Embedded System Practical
Course Code	UIT2ESP
Credit	1
Hours	2 Hrs per week

Course Objectives	To introduce learners with the assembly language programme and 8051 programming in embedded C.

Course Outcomes	**After completing the course, Student will be able to:**
	1. Create simple Assembly Language Program.
	2. Evaluate Operations on Memory Locations.
	3. Design a reprogrammable embedded computer using 8051 microcontroller.
	4. Make use of components like seven-segment display, Oscilloscope, Stepper motor and create traffic signals.

Module/Unit	**Course Description**	**Hrs**
1	Store the data byte 32H into memory location C000H.	**2 hrs**
2	Exchange the content of memory location C200 and C300.	**2 hrs**
3	Subtract the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.	**2 hrs**
4	Subtract any two 8-bit number.	**2 hrs**
5	Write a program to sort given 5 numbers from memory location C220H in the ascending order.	**2 hrs**
6	Find the square of the given number from the memory location C200 and store the result in memory location C300.	**2 hrs**
7	Write a program to shift an eight bit data four bits right. assume that the data is in memory location C300H.	**2hrs**
8	Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects. a. Programming	**2 hrs**

	b. Execution c. Debugging	
9	Configure timer control registers of 8051 and develop a program to generate given time delay.	**2 hrs**
10	To demonstrate use of general purpose port i.e. Input/ output port of two controllers for data transfer between them.	**2 hrs**
11	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	**2 hrs**
12	To interface 8 LEDs at Input-output port and create different patterns.	**2 hrs**
13	To demonstrate interfacing of seven-segment LED display and generate counting from 0 to 99 with fixed time delay.	**2hrs**
14	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.	**2 hrs**
15	Generate traffic signal.	**2 hrs**

Vocational Skill Course- 2 Credit (1+1)

Course Description: B.Sc. (Information Technology)	
Semester	II
Course Name	Linear Algebra
Course Code	UIT2LAT
Credit	1
Hours	1 Hr per week

Course Objectives	The objective of this course is to provide an understanding of vector spaces and linear transformation to the learners.

Course Outcomes	**After completing the course, Student will be able to:**
	1. Define vector spaces and subspaces.
	2. Relate matrices and linear transformation.
	3. Find kernel and image of linear transformation.
	4. Evaluate matrix representation.

Module/Unit	**Course Description**	**Hrs.**
I	**Vector Spaces:** Vector Spaces: Definition and examples, Subspaces: Definition and examples. Matrices and Linear transformations: Matrices, properties of matrices, Transpose of a matrix and its properties, Type of matrices, determinant, inverse of a matrix, echelon form, rank of a matrix, Linear transformation: definition and examples, kernel and image of a linear transformation: definition and examples, Rank-Nullity Theorem (only statement) and examples, Matrix representation of a linear Transformation.	**15 hrs**

Reference Books:

1. Serge Lang, Introduction to Linear Algebra, Second Edition, Springer.
2. S. Kumaresan, Linear Algebra, A Geometric Approach, Prentice Hall of India, Pvt. Ltd, 2000.
3. K. Hoffman and R. Kunze: Linear Algebra, Tata McGraw-Hill, New Delhi, 1971.
4. Vikas Bisht and Vivek Sahai, Linear Algebra, Alpha Science International Limited, 2002.

Course Description: B.Sc.(Information Technology)	
Semester	II
Course Name	Linear Algebra Practical
Course Code	UIT2LAP
Credit	1
Hours	2 Hrs per week

Course Objectives	The objective of this course is to introduce mathematical programming skills through python.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Make use of basic commands of python programming.
	2) Explain properties of vector spaces.
	3) Analyse the concept of properties of linear transformation.
	4) Evaluate determinant and inverse of matrix.

Module/Unit	**Course Description**	**Hrs**
1	Write a program to do the following: a. Enter an r by c matrix M (r and c being positive integers) b. Display M in matrix format.	**2 hrs**
2	Write a program to do the following: a. Display the rows and columns of the matrix M	**2hrs**
3	Write a program to do the following: a. Find the scalar multiplication of M for a given scalar.	**2 hrs**
4	Write a program to do the following: Find the transpose of the matrix M.	**2 hrs**
5	Write a program to do the following: a)Find the vector –matrix multiplication of a r by c matrix M with a c-vector u.	**2 hrs**
6	Write a program to do the following: a)Find the matrix-matrix product of M with a c by p matrix N.	**2 hrs**
7	Write a program to do the following: a)Enter a vector u as a n-list b) Enter another vector v as a n-list	**2 hrs**
8	Enter two distinct faces as vectors u and v.	**2 hrs**

9	Write a program to do the following: a)Find the vector au+bv for different values of a and b.	**2 hrs**
10	Write a program to do the following: a)Find the vector au+bv for different values of a and b.	**2 hrs**
11	Write a program to do the following: a) find determinant of a matrix	**2 hrs**
12	Write a program to enter a matrix and check if it is invertible. If the inverse exists, find the inverse.	**2 hrs**
13	Write a program to convert a matrix into its row echelon form.	**2 hrs**
14	To determine linearity.	**2 hrs**
15	To find matrix representation of a linear transformation.	**2 hrs**

Reference Books:

1. Davis, Ernest - Linear Algebra and Probability for Computer Science Applications-CRC Press (2012)
2. PHILIP N. KLEIN, Coding the Matrix Linear Algebra through Applications to Computer Science Edition 1, Newtonian Press (2013)

Skill Enhancement Course (Credit 2)

Course Description: B.Sc. (Information Technology)	
Semester	II
Course Name	Advanced Web Programming
Course Code	UIT2AWT
Credit	1
Hours	1 Hr per week

Course Objectives	To develop dynamic and interactive web pages using PHP as server side scripting language. To create well-formed documents using XML and JQuery.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Elaborate the creation of dynamic web pages using server side PHP programming.
	2) Explain use of advanced technologies such as JQuery to create attractive interactive web pages.
	3) Make use of MySQL to integrate web forms and databases.
	4) Explain the basics of XML markup Language.

Module/ Unit	**Course Description**	**Hrs.**
I	**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. **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 Introduction to JQuery: Fundamentals, Selectors, Methods to access HTML attributes. **XML:** Comparing XML with HTML, Advantages and Disadvantages of XML, Structure of an XML Document, XML entity references, DTD, XSLT.	**15 Hrs.**

Reference Books:

1. Steven Holzner,The Complete Reference PHP,McGraw Hill,Indian Edition
2. David Hunter Jeff Rafter,Beginning XML, Wiley India, 4th Edition

Course Description: B.Sc. (Information Technology)	
Semester	II
Course Name	Advanced Web Programming Practical
Course Code	UIT2AWP
Credit	1
Hours	2 Hrs per week

Course Objectives	To develop dynamic and interactive web pages using PHP as server side scripting language. To create well-formed documents using XML and JQuery.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Use PHP to create dynamic web pages.
	2) Create responsive web pages to interact with databases.
	3) Develop attractive web pages using advanced technologies such as JQuery and XML.

Module/Unit	**Course Description**	**Hrs**
1	Write a PHP Program to accept a number from the user and print it factorial.	**2 hrs**
2	Write a PHP program to accept a number from the user and print whether it is prime or not.	**2 hrs**
3	Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.	**2 hrs**
4	Write a PHP program to accept a number from the user and display whether it is odd or even.	**2 hrs**
5	Write a PHP program to display the following Binary Pyramid: 1 0 1 1 0 1 0 1 0 1	**2 hrs**
6	Write a PHP program to demonstrate different string functions.	**2 hrs**

7	Write a PHP program to create one dimensional array.	**2 hrs**
8	Write a PHP code to create a database College and create a table Department (Dname, Dno, Number_Of_faculty)	**2 hrs**
9	Write a PHP program to create a database named "College". Create a table named "Student" with following fields (sno, sname, percentage).Insert 3 records of your choice. Display the names of the students whose percentage is between 35 to 75 in a tabular format.	**2 hrs**
10	Write a program using JQuery to select all the elements whose class is demo and change the background color of those elements.	**2 hrs**
11	Write a jQuery program to get href and title attributes of an anchor <a> element.	**2 hrs**
12	Write a jQuery program to get author-name and year attributes of a element.	**2 hrs**
13	Write an XML program to demonstrate the structure of a simple XML document.	**2 hrs**
14	Create a well formed XML document using DTD.	**2 hrs**
15	Create a web page demonstrating use of AJAX.	**2 hrs**

Open Elective III (Credit 2)

Course Description: B.Sc. (Information Technology)	
Semester	II
Course Name	Privacy and Security in Online Social Media
Course Code	UOE2PSO
Credit	2
Hours	2 Hrs per week

Course Objectives	To understand the importance of privacy and security in online social media and explore measures to protect personal information and ensure a safe digital environment

Course Outcomes	**After completing the course, Student will be able to:**
	1. Understand the importance of privacy in the digital age.
	2. Identify common security threats in online social media.
	3. Implement measures to protect privacy and enhance security.
	4. Understand online social media policy and privacy.

Module/Unit	Course Description	Hrs.
I	Introduction: Security threats - Sources of security threats- Motives - Target Assets and vulnerabilities – Consequences of threats- E-mail threats - Web-threats - Intruders and Hackers, Insider threats, Cyber-crimes. Network Threats: Active/ Passive – Interference – Interception – Impersonation – Worms –Virus – Spam's – Ad ware - Spy ware – Trojans and covert channels –Backdoors – Bots – IP, Spoofing - ARP spoofing - Session Hijacking - Sabotage- Internal treats Environmental threats - Threats to Server security	**15hrs**
II	Introduction to Online Social Networks, data collection from social networks, challenges, opportunities, and pitfalls in online social networks, APIs Collecting data from Online Social Media. Online social Media and Policing Privacy in OSM,Information privacy disclosure, revelation and its effects in OSM and online social networks Phishing in OSM & Identifying fraudulent entities in online social networks	**15hrs**

Reference Books:

1. Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press, 2004.
2. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall, 2008.
3. Online Privacy and Social Media, Privacy in the online world Carla Mooney, ReferencePoint Press, 2015.
4. Security and privacy in social networks, Yaniv Altshuler, Alex Pentland, Springer Science & Business Media, Aug-2012.

Open Elective IV (Credit 2)

Course Description: B.Sc. (Information Technology)	
Semester	II
Course Name	Introduction to Game Designing and Cartoon Animation
Course Code	UOE2GDC
Credit	2
Hours	2 Hrs per week

Course Objectives	To explore a new programming environment, to identify the objects in a Scratch project (sprites, backdrops), explain that objects in Scratch have attributes (linked to), recognise that commands in Scratch are represented as blocks.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Summarize Scratch Interfaces
	2) Create the Scratch mini Projects
	3) Discuss advanced Programming in Scratch
	4) Elaborate Planning and Designing of Games

Module/Unit	**Course Description**	**Hrs.**
I	Introduction to Scratch Programming: Introduction to Scratch Interface, Coding: The First Steps., Placing Sounds in a Script, Making the Sprite Walk Better, Multi-Coloured Sprites, Changing the Backdrop (Stage), Barking Dog Chases Cat, Creating a Sprite, Cursor-controlled Sprites, The Psychedelic Sprite, Sprite Interaction, Two Sprites having a Chat, Creating a Coral Reef, Target Ball, Dancing Sprites	**15hrs**
II	Advanced Programming: - Drawing Shapes, Bouncing Ball, Drawing Free Hand, Walking the Dog, Planning & Designing A Game, Game: Shark Attack!, Shark Attack Advanced, Tennis Solitaire, Adventure Games: The Amazing Maze!, Demon Chaser, Extending the Demon Chaser Game, Shooter Games: Asteroids, Two Player Games, Two Player Games: Tennis for Two, Geography Quiz: Travelling across a Continent	**15hrs**

References Books:

1. An Introduction to the Scratch Programming Language by Brendan Smith, Camden Education Trust, Ireland
2. Scratch Programming for Teens Jerry Lee Ford, Jr. Course Technology PTR
3. Sean McManus updated for Scratch 3 Scratch Programming in easy steps.

Value Education Course (Credit 2)

Course Description: B.Sc. (Information Technology)	
Semester	II
Course Name	Foundation Course in Digital and Technology Solutions
Course Code	UVEC2DTS
Credit	2
Hours	2 Hrs per week

Course Objectives	• To gain familiarity with digital paradigms. • To sensitize about role & significance of digital technology. • To provide a knowledge of major technological trends.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Knowledge about digital paradigm.
	2) Realization of importance of digital technology, digital financial tools, e-commerce.
	3) Familiarity with the e-governance and Digital India Initiatives
	4) An understanding of use & applications of digital technology.

Module/Unit	**Course Description**	**Hrs.**
I	**Cybersecurity: F**undamental concepts of Cybersecurity including threats, vulnerabilities, encryption, network security. **Ethical and Legal Considerations**: Ethical and legal aspects of digital and technology solutions, Privacy, data protection regulations, intellectual property rights, and ethical considerations in technology development and usage. **Data Privacy and Security:** Importance of data privacy and security in e-governance initiatives like encryption techniques, the confidentiality, integrity, and availability of data.	**15 hrs**

II	**Government-to-Citizen (G2C) Services:** The digital services provided by the government to citizens like online portals, mobile applications, and other digital platforms to access government services. **Government-to-Business (G2B) Services:** The digital services and platforms provided by the government to businesses such as e-filing of taxes, online business registration, and digital procurement systems. **Government-to-Government (G2G) Services:** The digital platforms and systems that facilitate interactions between government departments and agencies like e-office, e-procurement, and data sharing frameworks **Digital Identity and Authentication:** Digital identity management systems, such as Aadhaar in India, and the use of biometrics or unique identification numbers for secure authentication of citizens accessing government services.	**15 hrs**

Reference Books:

1. Digital Systems Engineering William J. Dally, John W. Poulton Cambridge University Press
2. Principles of Digital Communication – Robert G. Gallager
3. E-Governance in India: The Progress Status Sunil K. Muttoo, Rajan Gupta, Saibal K. Pal · 2019

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: Bachelor's in Science (B. Sc.)

Revised Syllabus of S.Y.B.Sc. Information Technology
Choice Based Credit System (60:40)
w.e.f. Academic Year 2023-2024

BACHELOR'S IN SCIENCE (B. Sc.)

Preamble of the Syllabus:

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.

Objectives of the Course:

The new syllabus is aimed to achieve the objectives. The syllabus spanning three years covers the industry relevant courses. The students will be ready for the jobs available in different fields like:

- Software Development (Programming)
- Website Development
- Mobile app development
- Embedded Systems Programming
- Embedded Systems Development
- Software Testing
- Networking
- Database Administration
- System Administration
- Cyber Law Consultant
- GIS (Geographic Information Systems)
- IT Service Desk
- Security

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

- Learners are able to use and apply current technical concepts and practices in the core information technologies.
- Learners are able to apply knowledge of computing and mathematics appropriate to the discipline.
- Learners are able to analyse a problem, and identify and define the computing requirements appropriate to its solution.
- Learners are able to effectively integrate IT based solutions into the user environment.
- Learners are able to design, implement, and evaluate a computer based system, process, component, or program to meet desired needs.

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	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 for Class Test

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.

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.

Choice Based Credit Grading and Semester System (CBCS)
S.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024
SEMESTER III

Course Code	Course Type	Course Title	Credits
UIT3PYP	Skill Enhancement Course	Python Programming	2
UIT3DST	Core Subject	Data Structures	2
UIT3CNT	Core Subject	Computer Networks	2
UIT3DMS	Core Subject	Advanced SQL	2
UIT3MAT	Core Subject	Applied Mathematics	2
UIT3PPP	Skill Enhancement Course Practical	Python Programming Practical	2
UIT3DSP	Core Subject Practical	Data Structures Practical	2
UIT3CNP	Core Subject Practical	Computer Networks Practical	2
UIT3DMP	Core Subject Practical	Advanced SQL Practical	2
UIT3MPP	Core Subject Practical	Mobile Programming Practical	2
UIT3GCM	Vocational Enhancement Course	Green Computing	2
	Total Credits		**22**

Choice Based Credit Grading and Semester System (CBCS)
S.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024
SEMESTER IV

Course Code	Course Type	Course Title	Credits
UIT4CJT	Skill Enhancement Course	Core Java	2
UIT4EMB	Core Subject	Introduction to Embedded Systems	2
UIT4COS	Core Subject	Computer Oriented Statistical Techniques	2
UIT4SWE	Core Subject	Software Engineering	2
UIT4CGA	Core Subject	Computer Graphics and Animation	2
UIT4CJP	Skill Enhancement Course Practical	Core Java Practical	2
UIT4ESP	Core Subject Practical	Introduction to Embedded Systems Practical	2
UIT4COP	Core Subject Practical	Computer Oriented Statistical Techniques Practical	2
UIT4SEP	Core Subject Practical	Software Engineering Practical	2
UIT4CGP	Core Subject Practical	Computer Graphics and Animation Practical	2
UIT4DMT	Vocational Enhancement Course	Digital marketing	2

Total Credits	**22**

Semester III

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Python Programming
Course Code	UIT3PYP
Credit	2
Hours	4 Hrs per week

Course Objectives	The objective of this course is to understand the fundamentals of coding in Python and problem-solving skills to enable students to develop simple programs.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Explain the basic principles of Python programming language
	2) Create the python programs in functions, strings, file handling and exception handling.
	3) Explain the facts of object oriented concepts and modules.
	4) Design GUI and database applications.

Module/ Unit	**Course 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 Keywords, Type conversion, Operators and Operands, Expressions, Interactive Mode and Script Mode, Order of Operations. **Conditional Statements:** if, if-else, nested if –else **Looping**: for, while, nested loops	12 hrs

	Control statements: Terminating loops, skipping specific conditions	
II	**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 **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.	12 hrs
III	**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 **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 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 **Files:** Text Files, The File Object Attributes, Directories **Exceptions:** Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions	12 hrs
IV	**Regular Expressions –** Concept of regular expression, various types of regular expressions, using match function. **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 **Multithreaded Programming:** Thread Module, creating a thread, synchronizing threads, multithreaded priority queue **Modules:** Importing module, Creating and exploring modules, Math module, Random module, Time module	12 hrs

V	**Creating the GUI Form and Adding Widgets:** **Widgets:** Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, text, Toplevel, Spinbox, PanedWindow, LabelFrame, tkMessagebox. Handling Standard attributes and Properties of Widgets. **Layout Management:** Designing GUI applications with proper Layout Management features. **Look and Feel Customization**: Enhancing Look and Feel of GUI using different appearances of widgets. **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.	12 hrs

References:

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	Python Programming Practical
Course Code	UIT3PPP
Credit	2
Hours	2Hrs per week

Course Objectives	The objective of this course is to understand the fundamentals of coding in Python and problem-solving skills to enable students to develop simple programs.

Course Outcomes	**After completing the course, Learners will be able to:**
	1) Create programs of objects, strings, array, functions, etc.
	2) Solve programming errors using exception handling.
	3) Construct the concepts of OOP like class, inheritance, polymorphism, encapsulation, etc.
	4) Design GUI using database applications.

Module/ Unit	**Course Description**	**Hrs**
1	**Write the program for the following:** a. 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. b. Enter the number from the user and depending on whether the number is even or odd, print out an appropriate message to the user. c. Write a program to generate the Fibonacci series.	2hrs

2	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.	2hrs
3	a. Write a recursive function to print the factorial for a given number. b.Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise.	2hrs
4	**Write the program for the following:** a. Define a function that computes the *length* of a given list or string. b. Define a procedurehistogram() that takes a list of integers and prints a histogram to the screen. For example, histogram([4, 9, 7]) should print the following: **** ********* *******	2hrs
5	**Write the program for the following:** 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. 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.	2hrs
6	**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	2hrs
7	**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.	2hrs
8	**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.	2hrs

9	**Write the program for the following:** Design a class that store the information of student and display the same Implement the concept of Inheritance using python.	2hrs
10	**Write the program for the following:** a. Open a new file in IDLE ("NewWindow" 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: Write a program to implement exception handling.	2hrs
11	**Write the program for the following:** Try to configure the widget with various options like: bg="red", family="times", size=18 Try to change the widget type and configuration options to experiment with other widget types like Message, Button, Entry, Checkbutton, Radiobutton, Scale etc.	2hrs
12	Write a program to Design Registration Page.	2hrs
13	Design a simple database application that stores the records and retrieve the same.	2hrs
14	Design a database application to search the specified record from the database.	2hrs
15	Design a database application to that allows the user to add, delete and modify the records.	2hrs

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	4 Hrs per week

Course Objectives	The objective of this course is to introduce the basic knowledge of algorithms and its complexity, array, linked list, stack, queue, tree, searching and sorting techniques, graph and hashing.

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	**Course 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.	12 hrs

	Array: Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Traversing, Insertion, Deletion, Searching,Fibonacci search, 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, Header Linked List, Applications of the Linked list, Representation of Polynomials, Storage of Sparse Arrays, Implementing other Data Structures.	12 hrs
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**.** Recurrence relation. **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 hrs
IV	**Sorting and Searching Techniques** Bubble, Selection, Insertion, Merge Sort. **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,2-3 Tree, B-Tree, B+ tree	12 hrs

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 hrs

References:

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 RukadikarTata McGraw Hill

Course Description: B.Sc.(Information Technology)	
Semester	III
Course Name	Data Structure Practical
Course Code	UIT3DSP
Credit	2
Hours	2Hrs per week

Course Objectives	The objective of this course is to introduce the basic knowledge of algorithms and its complexity, array, linked list, stack, queue, tree, searching and sorting techniques, graph and hashing.

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

Module/ Unit	**Course Description**	**Hrs**
1	Write a program to store the elements in 1-D array & perform the operations like searching, sorting, reversing the elements.	2hrs
2	Read the two arrays from user & merge them & display the element in sorted order.	2hrs

3	Write a program to perform the Matrix addition, multiplication, and transpose operations.	2hrs
4	Write a program to implement the concept of Stack Push, Pop, Display and Exit operations.	2hrs
5	Write a program to implement the concept of Queue Insert, Delete, Display and Exit operations.	2hrs
6	Write a program to implement bubble sort.	2hrs
7	Write a program to implement selection sort.	2hrs
8	Write a program to implement insertion sort.	2hrs
9	Write a program to implement the merge sort.	2hrs
10	Write a program to search the element using sequential search.	2hrs
11	Write a program to search the element using binary search.	2hrs
12	Write a program to create a single link list and its node element.	2hrs
13	Write a program to create a tree and display the element.	2hrs
14	Write a program to insert the element into a maximum heap.	2hrs
15	Write a program to insert the element into a minimum heap.	2hrs

References:

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 RukadikarTata McGraw Hill

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Computer Networks
Course Code	UIT3CNT
Credit	2
Hours	4 Hrs 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.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Learners will be able to explain the functions of each layer in OSI and TCP/IP model.
	2) Learners will be able to elaborate functions of data link layer and its protocol.
	3) Learners will be able to define the concepts of network layer routing protocol and IP addressing.
	4) Learners will be able to explain the working of different transport layer protocols.

Module/ Unit	**Course Description**	**Hrs.**
I	**Introduction:** Data communications, networks, network types, Internet history, standards and administration. **Network Models:** Protocol layering, TCP/IP protocol suite, The OSI model. **Introduction to Physical layer:** Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. **Digital and Analog transmission**: Digital-to-digital conversion, analog-to-digital conversion, transmission modes, digital-to-analog conversion, analog-to-analog conversion.	12hrs

II	**Bandwidth Utilization**: Multiplexing and Spectrum Spreading: Multiplexing, Spread Spectrum **Transmission media**: Guided Media, Unguided Media **Switching**: Introduction, circuit switched networks, packet switching, and structure of a switch. **Introduction to the Data Link Layer**: Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes.	12hrs
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, gigabitethernet, 10 gigabit Ethernet. **Wireless LANs:** Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. **Connecting devices and Virtual LANs.**	12hrs
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.	12hrs
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.	12hrs

References:

1) "Data Communication and Networking", Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
2) "TCP/IP protocol suite", Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
3) "Computer Networks", Andrew Tanenbaum ,Pearson , Fifth Edition,2013

Course Description: B.Sc.(Information Technology)	
Semester	III
Course Name	Computer Networks Practical
Course Code	UIT3CNP
Credit	2
Hours	2 Hrs per week

Course Objectives	Objective of this course is gaining practical experience in installation, monitoring, and troubleshooting of current network systems.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Learners should be able to determine information about IP address.
	2) Learners should be able to apply network commands for network configuration.
	3) Learners should be able to utilize IP routing using routing techniques.
	4) Learners should be able to make use of wireshark tools for IP packet scanning.

Module/Unit	**Course Description**	Hrs
1	**IPv4 Addressing and Subnetting** Given an IP address and network mask, determine other information about the IP address such as: • Network address • Network broadcast address	2hrs
2	Given an IP address and network mask, determine other information • Total number of host bits • Number of hosts	2hrs
3	Given an IP address and network mask, determine other information about the IP address such as:	

	• The subnet address of this subnet • The broadcast address of this Subnet • The number of hosts for each subnet	2hrs
4	Given an IP address and network mask, determine other information about the IP address such as: • The range of host addresses for this subnet • The maximum number of subnets for this subnet mask.	2hrs
5	Given an IP address and network mask, determine other information about the IP address such as: • The number of subnet bits • The number of this subnet	2hrs
6	Use of ping and tracert / traceroute, ipconfig / ifconfig, route and arp utilities.	2hrs
7	Configure IP static routing.	2hrs
8	Configure IP routing using RIP.	2hrs
9	Configuring Simple OSPF.	2hrs
10	Configuring DHCP server and client.	2hrs
11	Create virtual PC based network using virtualization software and virtual NIC.	2hrs
12	Configuring DNS Server and client.	2hrs
13	Configuring OSPF with multiple areas.	2hrs
14	Use of Wireshark to scan and check the packet information of following protocols • HTTP • ICMP	2hrs
15	Use of Wireshark to scan and check the packet information of following protocols • TCP • SMTP • POP3	2hrs

Reference Books:

1) "Data Communication and Networking", Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
2) "TCP/IP protocol suite", Behrouz A. Forouzan , Tata McGraw Hill , Fifth Edition , 2013.
3) "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	4 Hrs 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.

Course Outcomes	**After completing the course, Learners 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 advanced database objects required for PL/SQL programs
	4) Explain the basic concepts of Big Data Analytics

Module/ Unit	**Course 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, DateTime 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, **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
IV	**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
V	**Unit V:** **Introduction to Big data Analytics:** Characteristics of data, Definition of Big data, Evolution of Big data, Challenges with Big data, 3 Vs of Big data, Why Big data, Data Warehousing Environment, Hadoop Environment, What is Big Data Analytics, Classification of Big Data Analytics,Data Analytics Life cycle	12

References:

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
4) PL/SQL Programming, Ivan Bayross, FirstEdition, BPB 2010
5) Big Data and Hadoop: V.K Jain, Khanna Publishing, First, 2018

Course Description: B.Sc.(Information Technology)	
Semester	III
Course Name	Advanced SQL Practical
Course Code	UIT3DMP
Credit	2
Hours	2Hrs 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.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Apply DDL and DML statements to access database.
	2) Create database objects using SET operators.
	3) Build basic PL/SQL programs
	4) Develop PL/SQL program using Advanced Database objects.

Module/ Unit	**Course Description**	**Hrs**
1	**Select queries** a. Select queries on single table using alias, where and order by clause. b. Select queries on single table using aggregate	2hrs
2	**Select queries using joins and unions** a. Querying data from multiple tables using all types of joins. b. Querying data from multiple tables using all types of joins.	2hrs
3	**Subqueries, DML and DDL** a. Querying single and multiple tables using subqueries. b. Manipulating data (Insert, update and delete) c. Creating simple tables and tables with constraints.	2hrs
4	**Creating database objects, using set operators** a. Creating Views, Sequences, Indexes and synonyms. b. Using set operators, date-time functions.	2hrs

5	**Working with advanced subqueries and WITH clause** a. Multiple column subqueries, subqueries in from clause. b. WITH Clause and hierarchical retrieval.	2hrs
6	**Basic PL/SQL, INDEX BY tables, PL/SQL Record and FOR loop.** Creating anonymous PL/SQL blocks.	2hrs
7	**Basic PL/SQL, INDEX BY tables, PL/SQL Record and FOR loop.** Define, create, and use INDEX BY tables and a PL/SQL record.	2hrs
8	**Cursors, Exceptions and procedures issuing DML and query commands.** Cursors with parameters to process a number of rows from multiple table	2hrs
9	**Cursors, Exceptions and procedures issuing DML and query commands.** Create exception handlers for specific situations.	2hrs
10	**Functions and Stored Procedures** Creating and invoking functions from SQL statements.	2hrs
11	**Functions and Stored Procedures** Creating and invoking stored procedures.	2hrs
12	**Working with packages** Create package specifications and package bodies. Invoke the constructs in the packages.	2hrs
13	**Working with packages** Create a package containing an overloaded function.	2hrs
14	**Working with Large Objects and triggers** Create statement triggers.	2hrs
15	**Working with Large Objects and triggers** Create row triggers.	2hrs

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
4) PL/SQL Programming, Ivan Bayross, FirstEdition, BPB 2010

Course Description: B.Sc. (Information Technology)	
Semester	III
Course Name	Applied Mathematics
Course Code	UIT3MAT
Credit	2
Hours	4 Hrs 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.

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	**Course Description**	**Hrs**.
I	**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, Caley-Hamilton Theorem. **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	12hrs

	operation with complex numbers and their representation on Argand's Diagram, Circular functions of complex angles.	
II	**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. **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, Particular integral : Short methods.	12hrs
III	**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, **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.	12hrs
IV	**Multiple Integrals:** Double Integral, Change of the order of the integration, Double integral in polar co-ordinates, Triple integrals. **Applications of integration:** Areas, Volumes of solids.	12hrs
V	**Beta and Gamma Functions –** Definitions**,** Properties and Problems. Duplication formula. **Differentiation Under the Integral Sign** Error Functions	12hrs

References:

1) A text book of Applied Mathematics Vol I, P. N. Wartikar and J. N. Wartikar ,PuneVidyathiGraha
2) Applied Mathematics II , P. N. Wartikar and J. N. Wartikar ,Pune VidyathiGraha
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	2 Hrs per week

Course Objectives	The student will learn the basics of platform and get to understand the application lifecycle student will be able to write simple GUI applications, use built-in widgets and components, work with the database to store data locally, and much more.

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.

Module/ Unit	**Course Description** **List of Practical**	Hrs
1	Setting up CORDOVA, PhoneGAP Project and environmental variable.	2hrs
2	1. Creating and building simple "Hello World" App using cordova. 2. Adding and Using Buttons	2hrs
3	1. Adding and Using Event Listeners	2hrs
4	1. Creating and Using Functions 2. Handling and Using Back Button	2hrs
5	1. Installing and Using Plugins 2. Installing and Using Battery Plugin	2hrs
6	1. Installing and Using Camera Plugin	2hrs

7	1. Installing and Using Contacts Plugin 2. Installing and Using Device Plugin	2hrs
8	1. Installing and Using Accelerometer Plugin	2hrs
9	1. Install and Using Device Orientation plugin 2. Install and Using Device Orientation plugin	2hrs
10	1. Create and Using Prompt and Confirm Function	2hrs
11	1. Installing and Using File Plugin 2. Installing and Using File Transfer Plugin 3. Using Download and Upload functions	2hrs
12	1. Installing and Using Globalization Plugin 2. Installing and Using Media Plugin 3. Installing and Using Media Capture Plugin	2hrs
13	1. Installing and Using Network Information Plugin 2. Installing and Using Splash Screen Plugin 3. Installing and Using Vibration Plugin	2hrs
14	1. Developing Single Page Apps 2. Developing Multipage Apps 3. Storing Data Locally in a Cordova App	2hrs
15	1. Use of sqlite plugin with PhoneGap / apache Cordova 2. Using Sqlite read/write and search 3. Populating Cordova SQLite storage with the JQuery API	2hrs

Reference Books:

1) Apache Cordova 4 Programming John M. Wargo Addison- Wesley Professional 1st 2015
2) Apache Cordova in Action Raymond Camden Manning Publications 1st 2015
3) PhoneGap By Example Andrey Kovalenko PACKT Publishing 1st 2015

2- Credit Courses

Course Description: B.Sc.(Information Technology)	
Semester	III
Course Name	Green Computing
Course Code	UIT3GCM
Credit	2
Hours	2 Hrs per week

Course Objectives	To acquire knowledge to adopt green computing for minimising negative impact on the environment.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Explain overview and issues of green computing.
	2) Elaborate the concept of minimising power usage.
	3) Make use of knowledge for going paperless using green computing.

Course Code	**Unit No.**	**Topics**	**Duration**
UIT3GCM	I	**Unit-I** **Overview and Issues:** Problems: Toxins, Power Consumption, Equipment Disposal, Company's Carbon Footprint: Measuring, Details, reasons to bother, Plan for the Future, Cost Savings: Hardware, Power. **Initiatives and Standards:** Global Initiatives: United Nations, Basel Action Network, Basel Convention, North America: The United States, Canada, Australia, Europe, WEEE Directive, RoHS, National Adoption, Asia: Japan, China, Korea. **Minimizing Power Usage:** Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Data De-Duplication, Virtualization, Bigger Drives, Involving the Utility Company, Low-Power Computers: PCs,	15 L

		Linux, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software.	
	II	**Unit-II** **Cooling:** Cooling Costs, Power Cost, Causes of Cost, Calculating Cooling Needs, Reducing Cooling Costs, Economizers, On-Demand Cooling, Optimizing Airflow, Aisle, Raised Floors, Cable Management, Prevent Recirculation of Equipment Exhaust, System Design, Datacentre Design, Centralized Control. **Going Paperless:** Paper Problems, General impact of paper making on Environment, Costs: Paper and Office, Storage, Destruction, Going Paperless, Organizational Realities, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets **Recycling :** Introduction and Problems, Recycling in China and Africa, Recyclable Materials, Means of Disposal, Refurbishing, Make the Decision, Green Design, Recycling companies in Mumbai, Good and Bad about CDs and DVDs Disposal, Change the Mindset.	15 L

Semester IV

Course Description: B.Sc. (Information Technology)	
Semester	IV
Course Name	Core Java
Course Code	UIT4CJT
Credit	2
Hours	4 Hrs per week

Course Objectives	The objective of this course is to introduce the concept of the java programming language and understand its fundamentals.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Explain the basic concepts of java programming.
	2) Build java code using control structures, iteration.
	3) Explain advance class features.
	4) Elaborate multithreading, IO File handling and exception handling and AWT application.

Module/Unit	**Course Description**	**Hrs**.
I	**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	**12Hrs**

	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.	
II	**Control Flow Statements**: The If…Else If…Else Statement, The Switch…Case Statement **Iterations:** The While Loop, The Do … While Loop, The For Loop, The Foreach Loop, Labelled Statements, The Break And Continue Statements, The Return Statement **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	**12hrs**
III	**Inheritance:** Derived Class Objects, Inheritance and Access Control, Default Base Class Constructors, this and super keywords. 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. **Packages:** Creating Packages, Default Package, Importing Packages, Using A Package.	**12Hrs**
IV	**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. **Multithreading:** the thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class. **Exceptions:** Catching Java Exceptions, Catching Run-Time Exceptions, Handling Multiple Exceptions, The finally Clause, The throws Clause **Byte streams:** reading console input, writing console output, reading file, writing file, writing binary data, reading binary	**12Hrs**

	data, getting started with character streams, writing file, reading file	
V	**Event Handling:** Delegation Event Model, Events, Event classes, Event listener interfaces, Using delegation event model, adapter classes and inner classes. **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 **Layouts:** Flow Layout, Grid Layout, Border Layout, Card Layout.	**12Hrs**

References:

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	2 Hrs per week

Course Objectives	The objective of this course is to introduce the concept of the java basic programming including multithreading and Exception handling.

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, packages and arrays, multithreading and file handling concepts.
	4) Design GUI by using Exception handling.

Module/ Unit	**Course Description**	Hrs
1	**Java Basics** a. Write a Java program that takes a number as input and prints its multiplication table upto 10. b. Write a Java program to display the patterns.	2 hrs
2	**Use of Operators** a. Write a Java program to print the area and perimeter of a circle. **b.** Write a Java program to add two binary numbers.	2 hrs
3	**Use of Operators** a. Write a Java program to convert a decimal number to binary number and vice versa. b. Write a Java program to reverse a string.	2 hrs
4	**Java Data Types** a. Write a Java program to count the letters, spaces, numbers and other characters of an input string.	2 hrs

	b. Find the smallest and largest element from the array.	
5	**Methods and Constructors** a. Designed a class SortData that contains the method asec() and desc(). b. Designed a class that demonstrates the use of constructor and destructor.	2 hrs
6	**Abstract class and method overloading** a. Write a java program to demonstrate the implementation of abstract class. b. Write a java program to implement method overloading	2 hrs
7	**Inheritance** a. Write a java program to implement single level inheritance. b. Write a java program to implement multiple inheritance.	2 hrs
8	**Packages** a. Create a package, Add the necessary classes and import the package in java class.	2 hrs
9	**Arrays** a. Write a java program to add two matrices and print the resultant matrix. b. Write a java program for multiplying two matrices and print the product for the same.	2 hrs
10	**Vectors** a. Write a java program to implement the vectors.	2hrs
11	**Multithreading** a. Write a java program to implement thread life cycle. b. Write a java program to implement multithreading.	2 hrs
12	**File Handling** a. Write a java program to copy the contents from one file to other file. b. Write a java program to read the student data from user and store it in the file.	2hrs
13	**GUI** a. Design a AWT program to print the factorial for an input value.	2 hrs
14	**Exception Handling** a. Write a java program to implement exception handling.	2 hrs
15	**GUI Programming.** a. Design an AWT application that contains the interface to add student information and display the same.	2 hrs

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	Introduction to Embedded System
Course Code	UIT4EMB
Credit	2
Hours	4 Hrs per week

Course Objectives	To introduce learner with the core components of embedded system and 8051 programing in C. They will also be able to differentiate types of operating system.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Become familiar with classification, characteristics, core components of embedded system.
	2) Become familiar with memory, types of memory, registers Acquire skills in 8051 programing in C.
	3) Acquire skills for selecting microcontroller and developing basic applications.
	4) Become familiar with different types of operating system and its characteristics.

Module/Unit	**Course 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, embedded firmware, other system components. **Characteristics and quality attributes of embedded systems:** Characteristics, operational and non-operational quality attributes.	**12Hrs**

II	**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	**12Hrs**
III	**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.	**12Hrs**
IV	**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	**12Hrs**
V	**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.	**12Hrs**

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	Introduction to Embedded System Practical
Course Code	UIT4ESP
Credit	2
Hours	2Hrs per week

Course Objectives	To provide basic knowledge and skills in embedded system, design and program an embedded system at the basic level.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Design a reprogrammable embedded computer using 8051 microcontroller.
	2) Develop a program to generate given time delay by using timer control registers.
	3) Make use of components like seven-segment display, Oscilloscope, D/A Converter and Stepper motor.
	4) Create a program to generate traffic signals, Temperature and Elevator controller and flash magic.

Module/ Unit	**Course Description**	Hrs
1	Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects. a. Programming b. Execution c. Debugging	2hrs
2	a) Configure timer control registers of 8051 and develop a program to generate given time delay. b) To demonstrate use of general purpose port i.e. Input/ output port of two controllers for data transfer between them.	2hrs
3	a) 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	2hrs

	LED's b) To interface 8 LEDs at Input-output port and create different patterns.	
4	To demonstrate timer working in timermode and blink LED without using any loop delay routine.	2hrs
5	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.	2hrs
6	To demonstrate interfacing of seven-segment LED display and generate counting from 0 to 99 with fixed time delay.	2hrs
7	Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.	2hrs
8	Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope.	2hrs
9	Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051.	2hrs
10	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.	2hrs
11	Generate traffic signal.	2hrs
12	Implement Temperature controller.	2hrs
13	Implement Elevator control.	2hrs
14	**Using Flash Magic** a. To demonstrate the procedure for flash programming for reprogrammable embedded system board using Flash Magic.	2hrs
15	**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.	2hrs

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	4 Hrs 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, and hypothesis testing, and regression and correlation analysis.

Course Outcomes	**After completing the course, Student will be able to:**
	1) To calculate and apply measures of dispersion and to apply discrete and continuous probability distribution to various problems.
	2) The test of hypothesis as well as calculate confidence interval for a population parameter and learn the concept to p-value.
	3) Learn non parametric test such as the Chi- Square test for Independence as well as goodness of fit.
	4) To compute and interpret the results of bivariate and multivariate regression and correlation analysis and to perform ANOVA. Be able to perform multiple regression using computer software R.

Module/ Unit	**Course Description**	**Hrs**.
I	**Measures of Central Tendency and measures of dispersion**: 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, Quartiles, Deciles, and Percentiles, **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, , Absolute and Relative Dispersion; Coefficient of Variation, Standardized Variable.	12hrs

	Moments, Skewness, and Kurtosis : Moments , Moments for Grouped Data ,Relations Between Moments , , Skewness, Kurtosis, Population Moments, Skewness, and Kurtosis,	
II	**Elementary Probability Theory**: Definitions of Probability, Conditional Probability; Independent and Dependent Events, Mutually Exclusive Events, Probability Distributions, Mathematical Expectation, Probability distributions: Binomial. Poisson, Normal **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 .	12hrs
III	**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. **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.	12hrs
IV	**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. **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	12hrs
V	**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. **Correlation Theory:** Correlation and Regression, Linear Correlation, Measures of Correlation, The Least-Squares	12hrs

	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	

References:

1) STATISTICS, Murray R Spiegel, Larry J. Stephens, McGRAW –HILL ITERNATIONAL, 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	Computer Oriented Statistical Techniques Practical
Course Code	UIT4COP
Credit	2
Hours	2 Hrs per week

Course Objectives	The objective of this course is to provide an understanding for the learners on statistical concepts and implementing various commands to calculate all these statistical measures with the help of R tool.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Illustrate basic commands and basic operations of the R tool.
	2) Make use of R tool commands to calculate summary statistics.
	3) Evaluate testing of hypothesis estimate probability distribution using R tool.
	4) Develop the R programme to infer statistical analysis.

Module/ Unit	**Course Description**	Hrs
1	Getting start with R, data entry. Commands for basic algebraic functions, entering sequences, repetition of observations, inclusion and exclusion of observations from data sets.	2hrs
2	Using R execute the basic commands, arrays, lists and data frames	2hrs
3	Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.	2hrs
4	Import the data files, datasets, packages.	2hrs
5	Using R import the data from Excel / .CSV file and Perform the statistical functions: mean, median, mode,	2hrs
6	Using R import the data from Excel / .CSV file and executing functions as standard deviation, variance, co-variance, quartiles, range, inter quartile range	2hrs
7	Using R, executing graphs and plots.	2hrs
8	Using R import the data from Excel / .CSV file and draw the scenes and kurtosis.	2hrs

9	Using R perform the binomial distribution on the data.	2hrs
10	Using R perform normal distribution on the data.	2hrs
11	Import the data from Excel / .CSV and perform the hypothetical testing.	2hrs
12	Import the data from Excel / .CSV and perform the Chi-squared Test.	2hrs
13	Perform the Linear Regression using R.	2hrs
14	Compute the Least squares means using R.	2hrs
15	Compute the Linear Least Square Regression	2hrs

Reference Books:

1) 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	UIT4SWE
Credit	2
Hours	4 Hrs per week

Course Objectives	Basic knowledge and understanding of the analysis and design of complex systems. Ability to apply software engineering principles and techniques. Ability to develop, maintain and evaluate large-scale software systems. To produce efficient, reliable, robust and cost-effective software solutions.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Explain software life cycle model and knowledge about different phases of software life cycle.
	2) Make use of different methodologies in software engineering.
	3) Explain current theories, models and techniques that provide a basis for the software life cycle.
	4) Elaborate techniques and tools necessary for engineering practice.

Module/Unit	**Course Description**	**Hrs**.
I	**Introduction:** What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc. Software Requirements: Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements. **Software Processes:** Process and Project, Component Software Processes. **Software Development Process Models.** • Waterfall Model. • Prototyping. • Iterative Development. • Rational Unified Process.	12hrs

	• The RAD Model • Time boxing Model. **Agile software development**: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.	
II	**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. **Critical system:** Types of critical system, A simple safety critical system, Dependability of a system, Availability and Reliability, Safety and Security of Software systems. **Requirements Engineering Processes:** Feasibility study, Requirements elicitation and analysis, Requirements Validations, Requirements Management. **System Models:** Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.	12hrs
III	**Architectural Design:** Architectural Design Decisions, System Organisation, Modular Decomposition Styles, Control Styles, Reference Architectures. **User Interface Design:** Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation. **Project Management:** Software Project Management, Management activities, Project Planning, Project Scheduling, and Risk Management. **Quality Management:** Process and Product Quality, Quality assurance and Standards, Quality Planning, Quality Control, Software Measurement and Metrics.	12hrs
IV	**Verification and Validation:** Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods. **Software Testing:** System Testing, Component Testing, Test Case Design, Test Automation. **Software Measurement**: Size-Oriented Metrics, Function-Oriented Metrics, Extended Function Point Metrics **Software Cost Estimation:** Software Productivity, Estimation Techniques, Algorithmic Cost Modelling, Project Duration and Staffing	12hrs
V	**Process Improvement:** Process and product quality, Process Classification, Process Measurement, Process Analysis and Modelling, Process Change, The CMMI Process Improvement Framework. **Service Oriented Software Engineering:** Services as reusable components, Service Engineering, Software Development with Services. **Software reuse:** The reuse landscape, Application frameworks, Software product lines, COTS product reuse.	12hrs

	Distributed software engineering: Distributed systems issues, Client–server computing, Architectural patterns for distributed systems, Software as a service.	

References:

1) Software Engineering, edition, Ian Somerville Pearson Education. Edition Ninth
2) Software Engineering Pankaj JaloteNarosa 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	Software Engineering Practical
Course Code	UIT4SEP
Credit	2
Hours	2 Hrs per week

Course Objectives	Basic knowledge and understanding of the analysis and design of complex systems. Ability to apply software engineering principles and techniques. Ability to develop, maintain and evaluate large-scale software systems. To produce efficient, reliable, robust and cost-effective software solutions.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Evaluate products-startups implementing software process models in software engineering methods.
	2) Design the diagram in an open-source tool: Star UML.
	3) Construct systems using design principles.
	4) Design the existing software using UML diagrams.

Module/Unit	**Course Description**	Hrs
1	Study and implementation of class diagrams.	2hrs
2	Study and implementation of Use Case Diagrams.	2hrs
3	Study and implementation of Entity Relationship Diagrams.	2hrs
4	Study and implementation of Entity Relationship Diagrams in Hospital Management System.	2hrs
5	Study and implementation of Entity Relationship Diagrams in Company Management System.	2hrs
6	Study and implementation of Sequence Diagrams.	2hrs
7	Study and implementation of State Transition Diagrams.	2hrs
8	Study and implementation of Data Flow Diagrams.	2hrs

9	Study and implementation of Data Flow Diagrams Level-0	2hrs
10	Study and implementation of Data Flow Diagrams Level-1	2hrs
11	Study and implementation of Data Flow Diagrams Level-1	2hrs
12	Study and implementation of Collaboration Diagrams.	2hrs
13	Study and implementation of Activity Diagrams.	2hrs
14	Study and implementation of Component Diagrams.	2hrs
15	Study and implementation of Deployment Diagrams.	2hrs

Reference Books:

1) Software Engineering, edition, Ian Somerville Pearson Education. Edition Ninth
2) Software Engineering Pankaj JaloteNarosa 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	4 Hrs 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.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Classify various 2D & 3D transformation.
	2) Define the basic computer graphics applications.
	3) Examine algorithm of visible surface detection.
	4) Elaborate principles of animation.

Module/Unit	**Course Description**	**Hrs**.
I	**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. **Scan conversion** – Digital Differential Analyzer (DDA) algorithm, Bresenhams' Line drawing algorithm. Bresenhams' 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,	12 hrs

	Cohen-Sutherland and Liang-Barsky, Clipping Polygons, problem with multiple components. • Time boxing Model. **Agile software development**: Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, Scaling agile methods.	
II	**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 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. **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.	12 hrs
III	**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	12 hrs
IV	**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. **Plane Curves and Surfaces:**	12 hrs

	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.	
V	**Computer Animation:** Principles of Animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects. **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.	12 hrs

References:

1) 1.Computer Graphics - Principles and Practice J. D. Foley, A. Van Dam, S. K. Feiner and J.F.
2) Hughes Pearson 2nd edition.
3) Computer Graphics Hearn, Baker Pearson 2nd edition.
4) Fundamentals of Computer Graphics Steve Marschner, Peter Shirley 4th edition.

Course Description: B.Sc.(Information Technology)	
Semester	IV
Course Name	Computer Graphics and Animation Practical
Course Code	UIT4CGP
Credit	2
Hours	2 Hrs per week

Course Objectives	This course provides an introduction to the principle of computer graphics. In particular, the course will consider method for modeling 2-D/ 3-D objects. The emphasis of the course will be placed on understanding how the various elements that like algebra, geometry, algorithms and data structures interact in design of graphics.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Make use of the graphics function.
	2) Create 2D, 3D animation
	3) Simplify line drawing, circle generation with the help of algorithm.
	4) Design program for circle using flood fill, boundary fill algorithm.

Module/Unit	**Course Description**	Hrs
1	**Solve the following:** a. Study and enlist the basic functions used for graphics in C / C++ / Python language. b. Give an example for each of them. Draw a co-ordinate axis at the centre of the screen.	2hrs
2	**Solve the following**: a. Divide your screen into four region, draw circle, rectangle, ellipse and half ellipse in each region with appropriate message.	2hrs

3	Draw a simple hut on the screen.	2hrs
4	**Draw the following basic shapes in the center of the screen :** i. Circle ii. Rectangle iii. Square iv. Concentric Circles v. Ellipse vi. Line	2hrs
5	**Solve the following:** Develop the program for the mid-point circle drawing algorithm.	2hrs
6	Develop the program for the mid-point ellipse drawing algorithm.	2hrs
7	**Solve the following:** a. Write a program to implement 2D scaling. b. Write a program to perform 2D translation	2hrs
8	a. Write a program to perform 2D Rotation. b. Write a program to perform 2D Reflection	2hrs
9	**Solve the following:** 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.	2hrs
10	**Solve the following:** Write a program to implement Cohen-Sutherland clipping.	2hrs
11	Write a program to implement Liang - Barsky Line Clipping Algorithm	2hrs
12	**Solve the following:** a. Write a program to fill a circle using Flood Fill Algorithm. b. Write a program to fill a circle using Boundary Fill Algorithm.	2hrs
13	**Solve the following:** a. Develop a simple text screen saver using graphics functions.	2hrs
14	Perform smiling face animation using graphic functions.	2hrs
15	Draw the moving car on the screen.	2hrs

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.

2- Credit Course

Course Description: B.Sc.(Information Technology)	
Semester	IV
Course Name	Digital marketing
Course Code	UIT4DGM
Credit	2
Hours	2 Hrs per week

Course Objectives	This course provides an introduction to the digital marketing, Social Media Marketing, Email Marketing, Content Marketing, Mobile Marketing, Video Marketing.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Explain basics of Digital Marketing.
	2) Analyse emerging trends in Digital Marketing.
	3) Demonstrate Different types of social marketings.

Course Code	**Unit No.**	**Topics**	**Duration**
UIT4DGM	I	**Unit-I** **Introduction:** What is Digital Marketing?, Importance of Digital Marketing, Traditional Vs. Digital Marketing, Types of Digital Marketing **Website Design and Development:** Basics of website design and development, Elements of a good website, Responsive web design and its importance, Understanding user experience and user interface design, Basics of HTML, CSS, and JavaScript **Search Engine Optimization (SEO):** Introduction to Search Engine Optimization, On-page and off-page SEO techniques, Keyword research and analysis	15L

	II	**Unit-II** **Pay-Per-Click Advertising (PPC):** Introduction to Pay-Per-Click Advertising, Google Ads and Bing Ads, Keyword research and selection **Social Media Marketing:** Introduction to social Media Marketing, Understanding different social media platforms **Content Marketing:** Introduction to Content Marketing, Understanding different types of content **Mobile Marketing:** Introduction to Mobile Marketing, Mobile website design and development, Mobile apps and app store optimization **Video Marketing:** Introduction to Video Marketing, Different types of video content, Creating and Managing a Youtube Channel.	15L

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: Bachelor's in Science (B. Sc.)

Revised Syllabus of T.Y.B.Sc. Information Technology
Choice Based Credit System (60:40)
w.e.f. Academic Year 2023-2024

Sr. No.	Heading	Particulars
1	Title of Course	Information Technology
2	Eligibility for Admission	(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. (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. (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. OR 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.
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	2023-2024

Preamble of the Syllabus:

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.

Objectives of the Course:

The new syllabus is aimed to achieve the objectives. The syllabus spanning three years covers the industry relevant courses. The students will be ready for the jobs available in different fields like:

- Software Development (Programming)
- Website Development
- Mobile app development
- Embedded Systems Programming
- Embedded Systems Development
- Software Testing
- Networking
- Database Administration
- System Administration
- Cyber Law Consultant
- GIS (Geographic Information Systems)
- IT Service Desk
- Security

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

- Learners are able to use and apply current technical concepts and practices in the core information technologies.
- Learners are able to apply knowledge of computing and mathematics appropriate to the discipline.
- Learners are able to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- Learners are able to effectively integrate IT based solutions into the user environment.

- Learners are able to design, implement, and evaluate a computer based system, process, component, or program to meet desired needs.

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	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 for Class Test

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.

Theory question paper pattern
4. There shall be five questions each of 12 marks. 5. All questions shall be compulsory with internal options. 6. 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.

Choice Based Credit System (CBCS)
T.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024
SEMESTER V

Course Code	Course Type	Course Title	Credits
UIT5SPM	Skill Enhancement Course	Software Project Management	2
UIT5IOT	Skill Enhancement Course	Internet of Things	2
UIT5AWP	Skill Enhancement Course	Advanced Web Programming	2
UIT5LSA	Discipline Specific Elective	Linux System Administration	2
UIT5ENJ	Discipline Specific Elective	Enterprise Java	2
UIT5PDP	Skill Enhancement Course Practical	Project Dissertation	2
UIT5ITP	Skill Enhancement Course Practical	Internet of Things Practical	2
UIT5WPP	Skill Enhancement Course Practical	Advanced Web Programming Practical	2
UIT5LAP	Discipline Specific Elective Practical	Linux Administration Practical	2
UIT5EJP	Discipline Specific Elective Practical	Enterprise Java Practical	2
	Total Credits	**20**	

Choice Based Credit System (CBCS)
T.Y.B. Sc. Information Technology Syllabus
To be implemented from the Academic year 2023-2024
SEMESTER VI

Course Code	Course Type	Course Title	Credits
UIT6SQA	Skill Enhancement Course	Software Quality Assurance	**2**
UIT6SIC	Skill Enhancement Course	Security in Computing	**2**
UIT6BUI	Skill Enhancement Course	Business Intelligence	**2**
UIT6GIS	Discipline Specific Elective	Principles of Geographic Information Systems	**2**
UIT6ISM	Discipline Specific Elective	IT Service Management	**2**
UIT6PIP	Skill Enhancement Course Practical	Project Implementation	**2**
UIT6SCP	Skill Enhancement Course Practical	Security in Computing Practical	**2**
UIT6BIP	Skill Enhancement Course Practical	Business Intelligence Practical	**2**
UIT6GIP	Discipline Specific Elective Practical	Principles of Geographic Information Systems Practical	**2**
UIT6AMP	Skill Enhancement Course Practical	Advanced Mobile Programming	**2**
Total Credits			**20**

Semester V

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Software Project Management
Course Code	UIT5SPM
Credit	2 Credit
Hours	4 Hrs 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.

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 and advance project management tools.

Module/ Unit	**Course Description**	**Hrs.**
I	**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.	12hrs

	Project Evaluation and Programme Management: Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Cost–benefit 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. **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: Analyze 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	
II	**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. **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, taffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb.	12hrs
III	**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. **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.	12hrs

	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.	
IV	**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). **Managing Contracts:** Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, Contract Management, Acceptance. **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 Characteristics Model, Stress, Stress Management, Health and Safety, Some Ethical and Professional Concerns.	12hrs
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. **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 **Emerging Trends in Software Project Management :** Expansion of Artificial Intelligence &Automation, Inclusion of hybrid project management approaches, Impact of Emotional Intelligence, More focus on Data analytics and numbers, Advanced project management tools and solutions, Increased remote working.	12hrs

References:

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	Project Dissertation
Course Code	UIT5PDP
Credit	2 Credit
Hours	2 Hrs 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.

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.

Module/ Unit	**Course Description**	**Hrs**
1	**Project Implementation** Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapter 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**	2hrs

	• 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. • 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. • 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

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
NETWORK/WIRELESS TECHNOLOGIES	-

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	

Reference Books:

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 Credit
Hours	4 Hrs per week

Course Objectives	To assess the vision and introduction of IoT. To Understand IoT Market perspective. To provide an understanding of the technologies and the standards relating to the Internet of Things.

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.

Module/ Unit	**Course Description**	**Hrs.**
I	**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? 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. **Internet Principles**:Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, Static IP Address Assignment,	12 hrs

	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.	
II	**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. **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. **Introduction to Raspberry Pi:** Introduction to Raspberry Pi,Raspberry Pi Hardware,Preparing raspberry Pi. **Introduction to Arduino:** Introduction to Arduino, Arduino Hardware.	12 hrs
III	**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. **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	12 hrs
IV	**Techniques for Writing Embedded Code:** Memory Management, Types of Memory, Making the Most of Your RAM, Performance and Battery Life, Libraries, Debugging, **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.	12 hrs

V	**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. **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 Definition	12 hrs

References:

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	Internet of Things Practical
Course Code	UIT5ITP
Credit	2
Hours	2Hrs per week

Course Objectives	To make the learners familiar with Raspberry Pi components and interface. To connect different hardware device with Raspberry Pi.

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.

Module/ Unit	**Course Description**	**Hrs**
0	Starting Raspbian OS, Familiarising with Raspberry Pi Components and interface,Connecting to Ethernet , Monitor and USB, Linux Commands: Exploring the Raspbian	2hrs
1	Linux Commands: Exploring the Raspbian	2hrs
2	Light the LED with Python	2hrs
3	Displaying different LED patterns with Raspberry Pi.	2hrs
4	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi	2hrs

5	Raspberry Pi Based Oscilloscope.	2hrs
6	Controlling Raspberry Pi with WhatsApp.	2hrs
7	Setting up a Web Server using Raspberry Pi	2hrs
8	Setting up Wireless Access Point using Raspberry Pi	2hrs
9	Fingerprint Sensor interfacing with Raspberry Pi	2hrs
10	Raspberry Pi GPS Module Interfacing	2hrs
11	IoT based Web Controlled Home Automation using Raspberry Pi	2hrs
12	Visitor Monitoring with Raspberry Pi and Pi Camera	2hrs
13	Interfacing Raspberry Pi with RFID	2hrs
14	Building Google Assistant with Raspberry Pi.	2hrs
15	Installing Windows 10 IoT Core on Raspberry Pi	2hrs

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 Credit
Hours	4 Hrs 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.

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 ,XML and Jquary programming skill in ASP.NET.

Module/ Unit	**Course Description**	**Hrs.**
I	**Introducing .NET:** The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library. The C# Language: C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods. Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies, Advanced Class Programming.	12 hrs

II	**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. 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.	12 hrs
III	**Error Handling, Logging, and Tracing :** Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing 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 Styles, Themes, and Master Pages : Styles, Themes, Master Page Basics, Advanced Master Pages	12 hrs
IV	**ADO.NET Fundamentals**: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access. **Data Binding:** Introducing Data Binding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls **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	12 hrs
V	**XML:** XML Explained, The XML Classes, XML Validation, XML Display and Transforms. **Security Fundamentals**: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.	12 hrs

	ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.**JQuery:** Introduction to JQuery, JQuery syntax, Jquery Selector, JQuery events function, effects with JQuery	

References:

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 Bohem

Course Description: B.Sc.(Information Technology)	
Semester	V
Course Name	Advanced Web Programming Practical
Course Code	UIT5WPP
Credit	2 Credit
Hours	2 Hrs 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. web pages in asp.net and xml

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) Build dynamic web page in ASP.NET , XML and Jquery.

Module/ Unit	**Course Description**	**Hrs**
1	**Working with basic C# and ASP .NET** a. Create an application that obtains four int values from the user and displays the product. b. Create an application to demonstrate string operations. 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. Create an application to demonstrate following operations i. Generate Fibonacci series. ii. Test for prime numbers. iii. Test for vowels. iv. Use of for each loop with arrays v. Reverse a number and find sum of digits of a number.	2hrs
2	**Working with Object Oriented C# and ASP .NET** a. Create simple application to perform following operations	2hrs

	i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion b. Create simple application to demonstrate use of following concepts i. Function Overloading ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces c. Create simple application to demonstrate use of following concepts i. Using Delegates and events ii. Exception handling	
3	**Working with Web Forms and Controls** a. Create a simple web page with various sever controls to demonstrate setting and use of their properties. (Example :AutoPostBack) b. Demonstrate the use of Calendar control to perform following operations. Display messages in a calendar control i. Display vacation in a calendar control ii. Selected day in a calendar control using style iii. Difference between two calendar dates c. Demonstrate the use of Treeviewcontrol perform following operations. i. Treeview control and datalist ii. Treeview operations	2hrs
4	**Working with Form Controls** a. Create a Registration form to demonstrate use of various Validation controls. b. Create Web Form to demonstrate use of Adrotator Control. c. Create Web Form to demonstrate use User Controls.	2hrs
5	**Working with Navigation, Beautification and Master page.** a. Create Web Form to demonstrate use of Website Navigation controls and Site Map. b. Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification. c. Create a web application to demonstrate various states of ASP.NET Pages.	2hrs
6	**Working with Database** a. Create a web application bind data in a multiline textbox by querying in another textbox. b. Create a web application to display records by using database. c. Demonstrate the use of Datalist link control.	2hrs
7	**Working with Database** a. Create a web application to display Databinding using dropdownlist control. b. Create a web application for to display the phone no of an author using database.	2hrs

	c. Create a web application for inserting and deleting record from a database. (Using Execute-Non Query).	
8	**Working with data controls** a. Create a web application to demonstrate various uses and properties of SqlDataSource. b. Create a web application to demonstrate data binding using DetailsView and FormView Control.	2hrs
9	Create a web application to display Using Disconnected Data Access and Databinding using GridView.	2hrs
10	**Working with GridView control** Create a web application to demonstrate use of GridView control template andGridView hyperlink.	2hrs
11	**Working with GridView control** Create a web application to demonstrate use of GridView button column and GridView events.	2hrs
12	**Working with GridView control** Create a web application to demonstrate GridView paging and Creating own table format using GridView.	2hrs
13	**Working with XML** Create a web application to demonstrate reading and writing operation with XML.	2hrs
14	**Working with Jquery** Create a web application to demonstrate different types of selector.	2hrs
15	**Working with AJAX** Create a web application to demonstrate use of various Ajax controls.	2hrs

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 Bohem

Course Description: B.Sc. (Information Technology)	
Semester	V
Course Name	Linux System Administration
Course Code	UIT5LSA
Credit	2 credit
Hours	4Hrs 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.

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.

Module/ Unit	**Course Description**	**Hrs.**
I	**Introduction to Red Hat Enterprise Linux:** Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator. **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 **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 Up Rsyslog, Common Log Files, Setting Up Logrotate	12 hrs

	Booting and shutting down: Boot loaders-GRUB, LILO, Bootstrapping, Init process, rc scripts, Enabling and disabling services. **The File System:** Understanding the File System Structure, Working with Linux-Supported File Systems.	
II	**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 **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 **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	12 hrs
III	**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 **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	12 hrs

	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	
IV	**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. **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 **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 and IMAP	12 hrs
V	**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 **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. **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,	12 hrs

	Setting Up Fencing, Creating Resources and Services, Troubleshooting a Nonoperational Cluster, Configuring GFS2 File Systems **Setting Up an Installation Server:** Configuring a Network Server as an Installation Server, Creating a Kickstart File, Using a Kickstart File to Perform an Automated Installation	

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	Linux System Administration Practical
Course Code	UIT5LAP
Credit	2
Hours	2Hrs 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.

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.

Module/ Unit	**Course Description**	**Hrs**
1	Installation of RHEL 6.X	2hrs
2	Graphical User Interface and Command Line Interface and Processes a. Exploring the Graphical Desktop b. The Command Line Interface c. Managing Processes	2hrs
3	Storage Devices and Links, Backup and Repository a. Working with Storage Devices and Links b. Making a Backup c. Creating a Repository	2hrs
4	Working with RPM Storage and Networking a. Using Query Options **b.** Extracting Files From RPMs	2hrs
5	Working with RPM Storage and Networking a. Configuring and Managing Storage b. Connecting to the Network	2hrs
6	Working with Users, Groups, and Permissions	2hrs
7	Securing Server with iptables	2hrs
8	Setting Up Cryptographic Services	2hrs

9	Configuring FTP	2hrs
10	Configuring DNS Server	2hrs
11	Configuring DHCP Server	2hrs
12	Web Server Configuring Apache on Red Hat Enterprise Linux	2hrs
13	a. Writing a Script to Monitor Activity on the Apache Web Server b. Using the select Command	2hrs
14	Shell Scripts and High-Availability Clustering a. Writing Shell Scripts b. Configuring Booting with GRUB **c.** Configuring High Availability Clustering	2hrs
15	Setting Up an Installation Server Configuring Network Server as an Installation Server.	2hrs

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	4 Hrs 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.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Define 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 JND.
	3) Explain JSP applications using JSTL and deploy EJB application and JSF applications.
	4) Make use of knowledge of application using concept of Persistence, Object/Relational Mapping, JPA and Hibernate.

Module/ Unit	**Course Description**	**Hrs.**
I	**Understanding Java EE:** What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server **Java EE Architecture, Server and Containers:** Types of System Architecture, Java EE Server, Java EE Containers. **Introduction to Java Servlets:** The Need for Dynamic Content, Java Servlet Technology, Why Servlets? What can Servlets do? **Servlet API and Lifecycle:** Java Servlet API, The Servlet Skeleton, The Servlet Life Cycle, A Simple Welcome Servlet	12 hrs

	Working With Servlets: Getting Started, Using Annotations Instead of Deployment Descriptor. **Working with Databases:** What Is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example.	
II	**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	12 hrs
III	**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. **Java Server Faces:** What is JSF? Features of JSF, JSF Architecture, The JSF Lifecycle, Java Server Faces' User-	12 hrs

	Interface Components, Additional User-Interface Component Libraries, JSF Development Tools	
IV	**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.	12 hrs
V	**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. **Introduction to Hibernate:** What is Hibernate? Why Hibernate? Hibernate, Database and The Application,	12 hrs

	Components of Hibernate, Architecture of Hibernate, How Hibernate Works? **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 Javabean Class, Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPS, Running The Hibernate Application.	

References:

1) "Java EE 7 For Beginners", Sharanam Shah, Vaishali Shah, First Edition, SPD
2) "Advanced Java Programming",Uttam Kumar Roy, Oxford Press

Course Description: B.Sc.(Information Technology)	
Semester	V
Course Name	Enterprise Java Practical
Course Code	UIT5EJP
Credit	2
Hours	2Hrs per week

Course Objectives	To provide a standard way to implement the server-side business software typically found in enterprise applications.

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 application.
	3) Construct JSP, JSTL, EL and EJB appplications.
	4) Build the EJB applications with different types of beans and JPA applications.

Module/ Unit	**Course Description**	**Hrs**
1	Create a simple calculator application using servlet.	2hrs
2	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".	2hrs
3	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.	2hrs
4	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	2hrs

	be displayed.	
5	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.	2hrs
6	Create a servlet that uses cookies to store the number of times the user has visited servlet.	2hrs
7	Create a Servlet application to upload and download a file.	2hrs
8	Develop a simple servlet question answer application using database.	2hrs
9	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).	2hrs
10	Create a JSP application to demonstrate the use of JSTL.	2hrs
11	Create a Currency Converter application using EJB.	2hrs
12	Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.	2hrs
13	Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].	2hrs
14	Create a Simple Java Server Faces Application to show message Hello.	2hrs
15	Develop an application to demonstrate Hibernate One- To -One Mapping Using Annotation.	2hrs

Reference Books:

1) “Java EE 7 For Beginners”, Sharanam Shah, Vaishali Shah, First Edition, SPD
2) “Advanced Java Programming”,Uttam Kumar Roy, Oxford Press

Semester- VI

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Software Quality Assurance
Course Code	UIT6SQA
Credit	2 Credit
Hours	4 Hrs 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.

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

Module/ Unit	**Course Description**	**Hrs.**
I	**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. **Software Quality:** Introduction, Constraints of Software Product Quality Assessment, Customer is a King, Quality and	12hrs

	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	
II	**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	12hrs
III	**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.	12hrs

IV	**Software Verification and Validation:** Introduction, Verification, Verification Workbench, Methods of Verification, Types of reviews on the basis od 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 **Automation Testing:** Introduction to Automation Testing, What is Automation testing ,Benefits of Automation Testing.	12hrs
V	**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, eBusinesseCommerce Testing, Agile Development Testing, Data Warehousing Testing.	12hrs

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	Project Implementation
Course Code	UIT6PIP
Credit	2
Hours	2Hrs per week

Course Objectives	To define how exactly all tasks and the entire project will be executed. To create a plan that outlines the steps, timeline, resources and personal required for successful completion.

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

Module/ Unit	**Course Description**	**Hrs**
1	**Project Implementation** Chapter 1 to 4 should be submitted in Semester V in spiral binding. These chapter 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.	2hrs

	• 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. • 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. • 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**	

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
NETWORK/WIRELESS TECHNOLOGIES	-

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 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** **a)Title Page** Sample format of Title page is given in Appendix 1 of this block. Students should follow the given format. **b)Original Copy of the Approved Proforma of the Project Proposal** Sample Proforma of Project Proposal is given in Appendix 2 of this block. Students should follow the given format. 69 **c)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. **d)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. **e)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. **f)Acknowledgements** This should express student's gratitude to those who have helped in the preparation of project. **h)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. **i)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. 70 **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. 71 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, pseudocode and other documentation. 72 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 systematical 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. 73 **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. 74	

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.

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: ……	

Course Description: B.Sc. (Information Technology)	
Semester	VI

Course Name	Security in Computing
Course Code	UIT6SIC
Credit	2 Credit
Hours	4 Hrs per week

Course Objectives	To protect computer systems, networks, and data from unauthorized access, use, or disruption while ensuring confidentiality, integrity, and availability.

Course Outcomes	**After completing the course, learners 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 and cloud computing.

Module/ Unit	**Course Description**	**Hrs.**
I	**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. **Risk Analysis**: Threat Definition, Types of Attacks, Risk Analysis. **Secure Design Principles**: The CIA Triad and Other Models, Defense Models, Zones of Trust, Best Practices for Network Defense.	12hrs
II	**Authentication and Authorization**: Authentication, Authorization **Encryption**: A Brief History of Encryption, Symmetric-Key Cryptography, Public Key Cryptography, Public Key Infrastructure. **Storage Security**: Storage Security Evolution, Modern Storage Security, Risk Remediation, Best Practices. **Database Security**: General Database Security Concepts, Understanding Database Security Layers, Understanding	12hrs

	Database-Level Security, Using Application Security, Database Backup and Recovery, Keeping Your Servers Up to Date, Database Auditing and Monitoring.	
III	**Network Device Security**: Switch and Router Basics, Network Hardening. **Firewalls**: Overview, The Evolution of Firewalls, Core Firewall Functions, Additional Firewall Capabilities, Firewall Design. **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.	12hrs
IV	**Intrusion Detection and Prevention Systems**: IDS Concepts, IDS Types and Detection Models, IDS Features, IDS Deployment Considerations, Security Information and Event Management (SIEM). **Voice over IP (VoIP) and PBX Security**: Background, VoIP Components, VoIP Vulnerabilities and Countermeasures, PBX, TEM: Telecom Expense Management. **Operating System Security Models**: Operating System Models, Classic Security Models, Reference Monitor, Trustworthy Computing, International Standards for Operating System Security.	12hrs
V	**Virtual Machines and Cloud Computing**: Virtual Machines, Cloud Computing. Introduction to Cloud Computing: Introduction, Historical developments, Building Cloud Computing Environments, Working of Cloud Computing, Principles of Parallel and Distributed Computing: Eras of Computing. Parallel v/s Distributed Computing. Elements of Parallel Computing. Elements of Distributed Computing, Technologies of distributed computing. Types of Cloud Computing & usage.	12hrs

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, Greg White, Second,McGraw Hill

Course Description: B.Sc. (Information Technology)	
Semester	VI

Course Name	Security in Computing Practical
Course Code	UIT6SCP
Credit	2 Credit
Hours	4 Hrs per week

Course Objectives	To implement effective measures and controls on computer systems, networks, and dat.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Design Routers by OSPF, NTP, SSH.
	2) Create AAA authentication.
	3) Apply & verify Extended Numbered ACL.
	4) Test IPV6 by using firewalls & ACL

Module/ Unit	**Course Description**	**Hrs**
1	Implement Xen virtualization and Xen Centre.	2hrs
2	Configure AAA Authentication	2hrs
3	Configuring Extended ACLs Configure, Apply and Verify an Extended Numbered ACL	2hrs
4	Configure IP ACLs to Mitigate Attacks and IPV6 ACLs	2hrs
5	Verify connectivity among devices before firewall configuration.	2hrs
6	Configure ACLs on to mitigate attacks.	2hrs
7	Configuring a Zone-Based Policy Firewall	2hrs
8	Configure IOS Intrusion Prevention System (IPS) Using the CLI	2hrs
9	Layer 2 Security Assign the Central switch as the root bridge. Secure spanning-tree parameters to prevent STP manipulation attacks.	2hrs
10	Layer 2 Security Enable port security to prevent CAM table overflow attacks.	2hrs

11	Layer 2 VLAN Security	2hrs
12	Configure and Verify a Site-to-Site IPsec VPN Using CLI	2hrs
13	Configuring ASA Basic Settings and Firewall Using CLI	2hrs
14	Configure basic ASA settings and interface security levels using CLI	2hrs
15	Configure routing, address translation, and inspection policy using CLI Configure DHCP, AAA, and SSH	2hrs

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, Greg White, Second,McGraw Hill

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	Business Intelligence

Course Code	UIT6BUI
Credit	2
Hours	4 Hrs per week

Course Objectives	To become familiar with the ethics and basics of Business Intelligence and Decision Support Systems, define mathematical models, data mining and data preparation, describe classification problems and clustering methods, study marketing models, Logistic and production models and Data envelopment analysis, grasp the objectives of knowledge management and artificial intelligence and expert systems.

Course Outcomes	**After completing the course, Learners will be able to:**
	1) Explain the framework of the computerized Business Intelligence System and Decision support system.
	2) Analyse data by choosing relevant model as an algorithm for respective applications.
	3) Explain classification and clustering algorithms.
	4) Elaborate the applications of Business Intelligence.

Module/ Unit	**Course Description**	**Hrs.**
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, Dimensional Modelling. **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 , Fuzzy Logic	12

References:

1)Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Vercellis, 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	Business Intelligence Practical
Course Code	UIT6BIP
Credit	2

Hours	2 Hrs per week

Course Objectives	To become familiar with the ethics and basics of Business Intelligence and Decision Support Systems, define mathematical models, data mining and data preparation, describe classification problems and clustering methods, study marketing models, Logistic and production models and Data envelopment analysis, grasp the objectives of knowledge management and artificial intelligence and expert systems.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Import legacy data from 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.

Module/ Unit	**Course Description**	**Hrs**
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
2	Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver.	2
3	Data visualization from ETL process.	2
4	Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.	2
5	Perform the data classification using classification algorithm.	2
6	Perform the data clustering using clustering algorithm	2
7	Perform the Linear regression on the given data warehouse data.	2
8	Perform the logistic regression on the given data warehouse data.	2
9	Perform Decision tree using R tool	2
10	Data Analysis using time series Analysis	2

11	Data Modelling and Analytic with pivot table in Excel	2
12	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.	2
13	a.Create the ETL map and setup the schedule for execution. b. Execute the MDX queries to extract the data from the datawarehouse.	2
14	Import the datawarehouse data in Microsoft Excel and create the Pivot table and Pivot Chart.	2
15	Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.	2

Reference Books:

1)Business Intelligence: Data Mining and Optimization for Decision Making, Carlo Vercellis, 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 Geographical Information system
Course Code	UIT6GIS
Credit	2 Credit
Hours	4 Hrs 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.

Course Outcomes	**After completing the course, Learners 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 GIS.
	3) Elaborate Map scale, projection and co-ordinate systems in GIS.
	4) Explain Spatial data analysis and Data visualization.

Module/Unit	**Course Description**	**Hrs.**
I	**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** **The Temporal Dimension**	12hrs
II	**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.	12hrs

	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.	
III	**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.	12hrs
IV	**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 Concepts and Principles of Web GIS, Significance of Web GIS; Transferred Geo data, Interactive Web Maps, Internet Map Services,Web GIS system Integration, Open Source GIS; Web Based Geo Portal, India Geoportal; State Geoportal and District Geoportal.	12hrs

V	**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**.	12hrs

References:

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.

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.

Course Description: B.Sc.(Information Technology)	
Semester	VI
Course Name	Principles of Geographical Information system Practical
Course Code	UIT6GIP
Credit	2
Hours	2Hrs per week

Course Objectives	Objective of this course is to Analyze various mapping techniques and make use of various mapping tools.

Course Outcomes	**After completing the course, Learners 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 operations like Nearest Neighbourhood analysis, automating map creation etc.

Module/ Unit	**Course Description**	Hrs
1	Creating and manging vector data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics.	2hrs
2	Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping.	2hrs
3	Making a Map, Working with Attributes, Importing Spreadsheets or CSV files.	2hrs
	Using Plugins, Searching and Downloading OpenStreetMap Data.	2hrs
4	Working with attributes, terrain Data.	2hrs
5	Working with Projections and WMS Data.	2hrs
6	Georeferencing Topo Sheets.	2hrs

7	Georeferencing Scanned Maps.	2hrs
8	Georeferencing Aerial Imagery.	2hrs
9	Digitizing Map Data.	2hrs
10	Managing Data Tables and Saptial data Sets: Table joins, spatial joins, points in polygon analysis.	2hrs
11	Performing spatial queries.	2hrs
12	Introduction to Bhuvan ISRO software	2hrs
13	Bhuvan 2D.	2hrs
14	Bhuvan 3D.	2hrs
15	Special applications in Bhuvan.	2hrs

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.
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.

Course Description: B.Sc. (Information Technology)	
Semester	VI
Course Name	IT Service Management
Course Code	UIT6ISM
Credit	2 Credit
Hours	4 hrs 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.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Define IT Service management and its framework.
	2) Demonstrate four dimensions of service management.
	3) Explain ITIL service value system, service value chain, and continual improvement model.
	4) Elaborate ITIL management practices.

Module/ Unit	**Course Description**	**Hrs.**
I	**Introduction:** **IT Service Management:** Introduction, What is service management? What are services? Business Process, Principles of Service management: Specialization and Coordination, The agency principle, Encapsulation, Principles of systems, The service Life Cycle, Functions and processes across the life cycle. IT service management in the modern world, The structure and benefits of the ITIL 4 framework, The ITIL SVS, The four dimensions model.	**12hrs**
II	**Service Management:** Fundamentals **Value and value co-creation:** Value co-creation. **Organizations, service providers, service consumers, and other, Stakeholders:** Service providers, Service consumers, Other stakeholders. **Products and services:** Configuring resources for value creation, Service offerings. **Service relationships**: The service relationship model. **Value: outcomes, costs, and risks:** Outcomes, Costs, Risks, Utility and warranty.	**12hrs**

III	**The four dimensions of service management:** Organizations and people**,** Information and technology**,** Partners and suppliers**, Value streams and processes:** Value streams for service management**,** Processes. External factors.	**12hrs**
IV	**The ITIL service value system:** Service value system overview**,** Opportunity, demand, and value. **The ITIL guiding principles:** Focus on value, Start where you are, Progress iteratively with feedback, Collaborate and promote visibility, Think and work holistically, Keep it simple and practical, Optimize and automate, Principle interaction. **Governance:** Governing bodies and governance, Governance in the SVS **Service value chain:** Plan, Improve, Engage, Design and transition, Obtain/build, Deliver and support. **Continual improvement**: Steps of the continual improvement model, Continual improvement and the guiding principles.	**12hrs**
V	**ITIL management practices:** **General management practices:** Architecture management, Continual improvement, Information security management, Knowledge management, Measurement and reporting, Organizational change management, Portfolio management, Project management, Relationship management, Risk management, Service financial management, Strategy management, Supplier management, Workforce and talent management. **Service management practices:** Availability management, Business analysis, Capacity and performance management, Change control, Incident management, IT asset management, Monitoring and event management, Problem management, Release management, Service catalogue management, Service configuration management, Service continuity management, Service design, Service desk, Service level management, Service request management, Service validation and testing.	**12hrs**

Reference Books:

1) ITIL v4 Foundation: ITIL 4 Edition, 2011

Course Description: B.Sc.(Information Technology)	
Semester	VI
Course Name	Advanced Mobile Programming
Course Code	UIT6AMP
Credit	2
Hours	2hrs per week

Course Objectives	The objective of this course is to introduce the concepts of Android Mobile Programming.

Course Outcomes	**After completing the course, Student will be able to:**
	1) Demonstrate basic android app.
	2) Design activity life cycle.
	3) Evaluate different layouts in android app.
	4) Make use of intents, events, listeners and menus, dialog in mobile programming.

Module/ Unit	**Course Description**	**Hrs**
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 hrs**
2	Programming Resources Android Resources: (Color, Theme, String, Drawable, Dimension, Image)	**2 hrs**
3	Programming Activities and fragments: Activity Life Cycle	**2 hrs**
4	Programs related to different Layouts: Linear, Relative	**2 hrs**
5	Programs on Table Layout	**2 hrs**
6	Programming with Frame Layout	**2 hrs**
7	Programming with List View and Grid View	**2 hrs**
8	Programming using Events and Event Listener	**2 hrs**

9	Programming with AppBar	**2 hrs**
10	Programming menus, dialog, dialog fragments	**2 hrs**
11	Programs on Services, notification and broadcast receivers	**2 hrs**
12	Programming Media API	**2 hrs**
13	Programming Telephone API	**2 hrs**
14	Programming Security and permissions	**2 hrs**
15	Programming Network Communications and Services (JSON)	**2 hrs**

Reference Books:

1. Android Programming with Kotlin for Beginners by John Horton
2. Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, 2nd Edition
3. Android Studio Development Essentials - Android 6 Edition