

Academic Council Date –

Item No. –



Janardan Bhagat Shikshan Prasarak Sanstha's

CHANGU KANA THAKUR

Arts, Commerce and Science College, New Panvel (Autonomous)

Re-accredited A+ Grade by NAAC (Third Cycle-CGPA-3.61)

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

As per National Education Policy - 2020

B. Sc. in Botany

(Faculty of Science)

Syllabus for F.Y. B. Sc. (Botany)

Semester I and II

(With effect from the academic year 2024-25)



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR



Arts, Commerce and Science College, New Panvel (Autonomous)

As per National Education Policy - 2020

Sr. No.	Heading	Particulars
1	Title of program	B. Sc.
2	Eligibility	H.S.C. Pass
3	Duration of program	1 Year
4	Intake Capacity	80
5	Scheme of Examination	Internal: Practical 40Marks External: Theory 60 Marks
6	Standards of Passing	40%
7	Semesters	I and II
8	Program Academic Level	UG
9	Pattern	Revised as per NEP 2020
10	Status	New (Approved in BOS and Academic Council)
11	To be implemented from Academic Year	Academic Year 2024-25

Signature of

Dr. Tanmay P. Patil
Head, Department of Botany
Changu Kana Thakur
A.C.S. College, New Panvel
(Autonomous)

Signature of

Prof. (Dr.) S.K. Patil
Principal
Changu Kana Thakur
A.C.S. College, New Panvel
(Autonomous)



Preamble

1. Introduction

The First Year Bachelor of Science in Botany curriculum is designed to immerse students in a comprehensive exploration of plant sciences, blending foundational knowledge with contemporary advancements.

Emphasizing both traditional botanical disciplines and modern interdisciplinary perspectives, the syllabus integrates core subjects like plant anatomy, morphology, and life cycles with cutting-edge fields such as phytochemistry, molecular biology, and environmental studies.

Students will delve into the ecological significance and economic importance of diverse plant groups—from microscopic algae and fungi to complex angiosperms and gymnosperms—while also exploring practical applications in industries ranging from agriculture to biotechnology.

This curriculum aims to foster a deep understanding of plant biology, inspire curiosity about the natural world, and prepare students for diverse career pathways in plant sciences and beyond.

2. Aims and Objectives

The aim of the Botany curriculum is to provide students with a comprehensive understanding of plant diversity, structure, and function, encompassing microscopic organisms like algae and fungi, primitive plants such as bryophytes, and more advanced groups like pteridophytes, gymnosperms, and angiosperms. Through detailed study of their morphology, life cycles, ecological roles, and economic significance, students will develop a profound appreciation for the complexities and importance of plants in natural ecosystems and human societies alike.

- To introduce the learners to various plant groups from simple to the most advanced.
- To create awareness among the learners about the urgency of environmental conservation and sustainable use of plants
- To make the students aware of applications of different plant systems, processes and products in various industries
- To highlight the entrepreneurial potential of plant sciences to become self-employed in the future.

- To equip the learners with skills of analytical and logical reasoning, keen observation, collection of scientific data, objective recording of results, drawing conclusions etc. and other such fundamental skills associated with the study of any science subject.
- To create a sound foundation for further studies in Botany.
- To facilitate career building in Botany.

3. Learning Outcomes

Upon successful completion of this course, learners will be able to:

1. Explain the distinguishing features, ecological roles, and economic importance of algae and fungi.
2. Analyze the structure, life cycle, and systematic positions of *Nostoc*, *Spirogyra*, *Rhizopus*, *Aspergillus*, and *Riccia*.
3. Describe the general structure and functions of eukaryotic plant cell organelles, including the nucleus, endoplasmic reticulum, chloroplasts, and mitochondria.
4. Discuss the molecular structures and functions of DNA and RNA in plant cells.
5. Compare and contrast the processes of mitosis and meiosis, emphasizing their biological significance.
6. Explain the distinguishing features, ecological roles, and economic importance of Pteridophyta and Gymnosperms with suitable examples.
7. Analyze the structure, life cycle, and alternation of generations of *Nephrolepis* and *Cycas*.
8. Describe the distinguishing features, ecological significance, and economic importance of Angiosperms with suitable examples.
9. Identify and describe leaf morphology in prescribed Angiosperm families, including incisions of leaf, venation, phyllotaxy, types of stipules, leaf apex, leaf margin, leaf base, and leaf shapes.
10. Classify and describe inflorescence types in Angiosperms, including racemose (simple raceme, spike, catkin, spadix, panicle) and cymose (monochasial, dichasial, polychasial) types, as well as compound types (corymb, umbel, cyathium, capitulum, verticillaster, hypanthodium).

4.Credit Structure of the F.Y.B. Sc. (Botany) Semester I and II

No. of Courses	Semester I	Credits	No. of Courses	Semester II	Credits
A	Discipline Specific Course (Major)		A	Discipline Specific Course (Major)	
1	Botany I (Plant Diversity and Cell biology)	3	1	Botany II (Plant Diversity and Anatomy)	3
2	Botany I (Plant Diversity and Cell biology) Practical	1	2	Botany II (Plant Diversity and Anatomy) Practical	1
B	Open Elective		B	Open Elective	
	-		1	Plants in Health care and Cosmetics	2
Total Credits		04	Total Credits		06

Abbreviations Used

- POs: Program Outcomes
- PS: Program Structure
- PSOs: Program Specific Outcomes
- COs: Course Outcomes
- TLP: Teaching-Learning Process
- AM: Assessment Method
- DSC: Discipline Specific Core
- DSE: Discipline Specific Elective
- GE: Generic Elective
- OE: Open Elective
- VSC: Vocational Skill Course
- SEC: Skill Enhancement Course
- IKS: Indian Knowledge System
- AEC: Ability Enhancement Course
- VEC: Value Education Course
- OJT: On Job Training (Internship)
- FP: Field project
- CEP: Community engagement and service
- CC: Co-curricular Courses
- RM: Research Methodology
- RP: Research Project
- MJ: Major Course
- MN: Minor Course



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Arts, Commerce and Science College, New Panvel (Autonomous)

Program Outcomes (POs)

PO No.	POs Statement	Knowledge and Skill
	After completing the Bachelor of Science Program, students will be able to-	
PO-1	The knowledge of the disciplines and in-depth and extensive knowledge, understanding and skills in a specific field of interest.	Disciplinary knowledge
PO-2	An ability to develop and conduct experiments, analyze, and interpret data and use scientific judgment to draw conclusions	Scientific reasoning
PO-3	An ability to use current technology, and modern tools necessary for creation, analysis, dissemination of information.	Digital literacy
PO-4	Innovative, professional, and entrepreneurial skills needed in various disciplines of science.	Life-long learning
PO-5	An ability to achieve high order communication skills.	Communication skills
PO-6	An ability to collect, analyze and evaluate information and ideas and apply them in problem solving using conventional as well as modern approaches	Problem solving
PO-7	A sense of social responsibility; intellectual and practical skills and demonstration of ability to apply it in real-world settings.	Reflective thinking
PO-8	An ability to engage in independent and life-long learning through openness, curiosity, and a desire to meet new challenges.	Life-long learning
PO-9	A capacity to relate, collaborate, and lead others, and to exchange views and ideas to work in a team to achieve desired outcomes	Teamwork
PO-10	An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	Leadership
PO-11	An ability to understanding values, ethics, and morality in a multidisciplinary context.	Moral and ethical awareness



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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B. Sc. (Botany) Semester I
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

Course Structure

Course Code	SEM-I	Credits
USC2BO1	Botany I (Plant Diversity and Cell biology)	3 Credits (45 Lectures)
Unit-I	Algae and Fungi	15
1.	Distinguishing features, Ecological significance and Economic importance of Algae and Fungi with suitable example	
2.	Structure, life cycle and Systematic position of <i>Nostoc</i> and <i>Spirogyra</i>	
3.	Structure, life cycle and Systematic position of <i>Rhizopus</i> and <i>Aspergillus</i>	
Unit-II	Bryophyta	15
1.	Distinguishing features, Ecological significance and Economic importance of Bryophytes with suitable example.	
2.	Structure, life cycle and Systematic position of <i>Riccia</i>	
Unit-III	Cell biology	15
1.	General Structure of Eukaryotic Plant Cell, Ultrastructure and function of Nucleus, Endoplasmic reticulum, Chloroplast and Mitochondria	
2.	Structure of DNA and RNA	
3.	Cell Division: Mitosis & Meiosis, Differences between Mitosis and Meiosis	



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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B. Sc. Semester I
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

Course Code: USC1BO1

Course Title: Botany I (Plant Diversity and Cell biology)

Course Type: Major

No. of Credits: 3

Course Outcomes (Cos)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Differentiate between the different plant groups namely Algae and Bryophyta, as well as Fungi.
CO-2	Understand Ecological significance and Economic importance of Algae, Fungi, Bryophytes
CO-3	Identify various plant cell organelles, structure of DNA & RNA
CO-4	Understand the Cell division -Mitosis and Meiosis



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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B. Sc. Semester I
Choice Based Credit System
Under New Education Policy (NEP) 2020

Course Code: USC1BO1P

Course Title: Botany I (Plant Diversity and Cell biology)

Course Type: Major

No. of Credits: 1

Course Code	SEM-I	Credits
USC2BO1P	Practicals Botany I (Plant Diversity and Cell biology)	1 Credit
1	Study of stages in the life cycle of <i>Nostoc</i> from fresh/ preserved material and permanent slides.	
2	Study of stages in the life cycle of <i>Spirogyra</i> from fresh/ preserved material and permanent slides.	
3	Economic importance of Algae: Phytoremediation and Food: <i>Nostoc</i> , <i>Spirulina</i> , Biofuel: <i>Ulva</i> , Algin: <i>Laminaria</i> , Agar: <i>Gelidium</i> , Diatomite: Diatoms	
4	Study of stages in the life cycle of <i>Rhizopus</i> from fresh/ preserved material and permanent slides.	
5	Study of stages in the life cycle of <i>Aspergillus</i> from fresh/ preserved material and permanent slides.	
6	Economic importance of Fungi: Food: <i>Agaricus</i> , <i>Pleurotus</i> , <i>Yeast</i> , Plant Pathogens: Any Plant pathogenic fungus, Recycling of nutrients: Any saprophytic fungus.	
7	Study of stages in the life cycle of <i>Riccia</i> from fresh/ preserved material	
8	Ecological Significance of Algae, Fungi and Bryophytes: Lichens, Mycorrhizae, Symbiotic association of <i>Nostoc</i> and <i>Anthoceros</i> .	
9	Identification of cell organelles in a plant cell with the help of photomicrograph (Chloroplast, Mitochondria, Endoplasmic reticulum, Nucleus)	
10	Study of Mitosis with the help of <i>Onion</i> root tip	
11	Study of Meiosis with the help of <i>Tradescantia</i> flower buds	



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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B. Sc. Semester I

Choice Based Credit System

Under New Education Policy (NEP) 2020

Course Code: USC1BO1P

Course Title: Botany I (Plant Diversity and Cell biology)

Course Type: Major

No. of Credits: 1

Course Outcomes (Cos)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Identify <i>Nostoc</i> , <i>Spirogyra</i> , <i>Rhizopus</i> , <i>Aspergillus</i> , <i>Riccia</i> , <i>Anthoceros</i> and different cell organelles
CO-2	Explain ecological significance and economic importance of algae, fungi and bryophytes
CO-3	Differentiate between algae, fungi and bryophytes, cell organelles.
CO-4	Prepare the slides to show different stages of cell division.



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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B. Sc. Semester I
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

References:

Semester I

Unit I: Algae and Fungi

1. College Botany Volume I and II Gangulee, Das and Dutta latest edition. Central Education enterprises
2. Cryptogamic Botany Volume I and II by G M Smith McGraw Hill.
3. Botany for Degree Students, Algae by B.R.Vasishtha S. Chand Publications
4. Botany for Degree Students, Fungi by B.R. Vasishtha S. Chand Publications
5. Introductory Mycology, Alexopoulos, Mims, Wiley Eastern Publication, latest edition

Unit II: Bryophyta

1. Botany for Degree Students, Bryophyta by B.R.Vasishtha S. Chand Publications

Unit III: Cell biology

1. Cell Biology by De Robertis, Wolters, Kluver
2. Cell Biology by Channarayappa, Universities Press
3. Plant Anatomy by B. P. Pandey, S. Chand Publications
4. Plant Anatomy and Embryology by S.N. Pandey and Chadha, Vikas Publications, latest Edition.



Syllabus for F.Y.B. Sc. (Botany) Semester II
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)
Course Structure

Course Code	SEM-II	Credits
USC2BO2	Botany II (Plant Diversity and Anatomy)	3 Credits (45 Lectures)
Unit-I	Pteridophyta and Gymnosperm	
1.	Distinguishing features, Ecological significance and Economic importance of Pteridophyta and Gymnosperms with suitable examples.	15
2.	Structure, life cycle and Alternation of Generations of <i>Nephrolepis</i>	
3.	Structure, life cycle and Alternation of Generations of <i>Cycas</i>	
Unit-II	Angiosperm	
1.	Distinguishing features, Ecological significance and Economic importance of Angiosperms with suitable examples.	15
2.	Leaf Morphology of the prescribed Angiosperm families with respect to: Incisions of leaf, venation, phyllotaxy, types of stipules, leaf apex, leaf margin, leaf base, leaf shapes.	
3.	Inflorescence: Racemose: simple raceme, spike, catkin, spadix, and panicle. Cymose: monochasial, dichasial, polychasial. Compound: corymb, umbel, cyathium, capitulum, verticillaster, hypanthodium	
Unit-III	Anatomy	
1.	Simple Tissues: Parenchyma, Collenchyma and Sclerenchyma.	15
2.	Complex Tissues: Xylem and Phloem.	
3.	Types of vascular bundles	
4.	Primary Structure of Dicot and Monocot Root, Stem and Leaf	



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Syllabus for F.Y.B. Sc. Semester II
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

Course Code: USC1BO2

Course Title: Botany II (Plant Diversity and Anatomy)

Course Type: Major

No. of Credits: 3

Course Outcomes (Cos)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Explain Ecological significance and Economic importance of Pteridophyta, Gymnosperms and Angiosperm
CO-2	Differentiate between the different plant groups namely Pteridophyta, Gymnosperms and Angiosperm
CO-3	Understand the leaf morphology.
CO-4	Identify simple and complex tissue as well as primary structure of dicot. monocot root, stem and leaf



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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B. Sc. Semester II

Choice Based Credit System

Under New Education Policy (NEP) 2020

Course Code: USC1BO2P

Course Title: Botany II (Plant Diversity and Anatomy)

Course Type: Major

No. of Credits: 1

Course Code	SEM-II	Credits
USC2BO2P	Practicals Botany II (Plant Diversity and Anatomy)	1 Credit
1	Study of stages in the life cycle of <i>Nephrolepis</i> : Mounting of ramentum, hydathode, T.S. of rachis.	
2	T.S. of pinna of <i>Nephrolepis</i> passing through sorus.	
3	<i>Cycas</i> : T.S of leaflet (<i>Cycas</i> pinna)	
4	Megasporophyll, microsporophyll, coralloid root, microspore, L.S. of ovule of <i>Cycas</i> – all specimens to be shown.	
5	Economic importance of Gymnosperms: <i>Pinus</i> (turpentine, wood, seeds)	
6	Leaf morphology: as per theory	
7	Types of inflorescences: as per theory	
8	Study of Simple tissue: Parenchyma, Collenchyma and Sclerenchyma	
9	Study of Complex tissue: Xylem and Phloem	
10	Study of Primary structure T.S of monocot root (<i>Maize</i>) and dicot root (<i>Sunflower</i>)	
11	Study of Primary structure T.S of monocot stem (<i>Maize</i>) and dicot stem (<i>Sunflower</i>)	
12	Study of Primary structure of monocot leaf (<i>Maize</i>) and dicot leaf (<i>Sunflower</i>)	



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Syllabus for F.Y.B. Sc. Semester II
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

Course Code: USC1BO2P

Course Title: Botany II (Plant Diversity and Anatomy)

Course Type: Major

No. of Credits: 1

Course Outcomes (Cos)

CO No.	COs Statement
	After completing the Bachelor of Science Program, students will be able to-
CO-1	Identify <i>Nephrolepis</i> , <i>Cycas</i> and leaf morphology.
CO-2	Prepare slides to show the internal structure of <i>Nephrolepis</i> and <i>Cycas</i>
CO-3	Explain the economic importance of Gymnosperms
CO-4	Differentiate between simple and complex tissues and the primary structures of monocot and dicot roots stems, and leaves



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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B. Sc. (Botany) Semester II
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

References:

Semester II

Unit I: Plant Diversity

1. College Botany Volume I and II Gangulee, Das and Dutta latest edition. Central Education enterprises
2. Botany for Degree Students, Pteridophyta By B..R.Vasishtha S.Chand Publication.
3. Botany for Degree Students, Gymnosperms By P.C..Vasishtha S.Chand Publication.

Unit II: Angiosperm

1. Taxonomy of Angiosperms by B.P. Pandey S. Chand Publications
2. Taxonomy of Angiosperms, AVSS Sambamurthy,
3. Text Book of Botany, Angiosperms, B.P. Pandey, S. Chand Publications

Unit III: Anatomy

1. Plant Anatomy by B. P. Pandey, S. Chand Publications
2. Plant Anatomy and Embryology by S.N. Pandey and Chadha, Vikas Publications, latest Edition.
3. Introduction to Plant anatomy, Eames A J, Mc Graw Hill publications, latest Edition.
4. Physiological Plant Anatomy, Haberlandt G
5. Plant Anatomy, Katherine Esau

Academic Council Date –

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Arts, Commerce and Science College, New Panvel (Autonomous)

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'College with Potential for Excellence' Status Awarded by UGC

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As per National Education Policy - 2020

B.Sc. in Botany

(Faculty of Science)

Syllabus for F.Y.B.A

(Open elective -Plants in Health care and Cosmetics)

Semester II

(With effect from the academic year 2024-25)

CHANGU KANA THAKUR

Arts, Commerce and Science College, New Panvel (Autonomous)

As per National Education Policy - 2020

Sr. No.	Heading	Particulars
1	Title of program	B.A.
2	Eligibility	H.S.C. Pass
3	Duration of program	One semester
4	Intake Capacity	60
5	Scheme of Examination	Internal: Practical 40Marks External: Theory 60 Marks
6	Standards of Passing	40%
7	Semesters	II
8	Program Academic Level	UG
9	Pattern	Revised as per NEP 2020
10	Status	New (Approved in BOS and Academic Council)
11	To be implemented from Academic Year	Academic Year 2024-25

Signature of

Dr. Tanmay P. Patil
Head, Department of Botany
Changu Kana Thakur
A.C.S. College, New Panvel
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Signature of

Prof. (Dr.) S.K. Patil
Principal
Changu Kana Thakur
A.C.S. College, New Panvel
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Preamble:

Syllabus for Plants in Health Care and Cosmetics has been prepared to incorporate various applications of Plant Sciences in human health care and cosmetics. The syllabus has been designed so as to make it more contextual, relevant and commensurate with the learning capabilities of the learners of first year B.Sc.

Human health is of paramount importance to the development and progress of human society in general and our nation in particular. Study of Plant sciences is vital for advances in medicine, and for the discovery of novel phytochemical based therapeutic approaches for improved health care in the current scenario as well as in future. Role of plants in human cosmetology is well known and has historical significance in addition to being relevant in the contemporary times.

The well- organized curriculum including units on Medicinal Botany, Nutraceuticals and Herbals as well as Herbal cosmetics shall develop interest in the minds of the learners and inspire them to pursue higher studies in Plant Sciences. The curriculum would expose the learners to the entrepreneurial potential of plant sciences so as to become self-employed or obtain gainful employment in Plant Sciences based industries.



Janardan Bhagat Shikshan Prasarak Sanstha's
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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B.A. Semester II
Choice Based Credit System
Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

Course Structure

Course Code	Semester II	L	CR
UA1PHCC	Plants in Health care and Cosmetics	30	2
Unit I	Medicinal Botany	15	
1.	Phytoconstituents: Classification, properties, general methods of extraction, plant sources and uses of: alkaloids, tannins, glycosides, essential oils, gums and resins.		
2.	Grandma's pouch: Study of Tulsi, Neem, Aloe, Adulsa, Turmeric and Ginger with reference to botanical source, phyto-constituents, cosmetic and medicinal uses.		
Unit II	Nutraceuticals, Herbals and Dietary Supplements	15	
1.	Concept and Current Scope of Nutraceuticals, Herbals and Dietary Supplements		
2.	Study of the following with reference to production, consumption nutritional and health benefits: Spirulina, Chlorella, Vanillin, Garcinia, Kale		



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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B.A. Semester II
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Under New Education Policy (NEP) 2020
(To be implemented from the academic year 2024-2025)

Course Code: UA1PHCC

Course Title: Plant Health care and Cosmetics.

Course Type: Open Elective

No. of Credits: 2

Course Outcomes (Cos)

CO1	Differentiate between the different types of phytochemicals, nutraceuticals and dietary supplements
CO2	Describe types of phytoconstituents, medicinal uses of plants from Grandma's pouch
CO3	Identify various plants in Grandma's pouch, and plants used as nutraceuticals
CO4	Explain concept and current scope of Nutraceuticals, Herbals and Dietary Supplements

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Arts, Commerce and Science College, New Panvel (Autonomous)

Syllabus for F.Y.B.A. Semester II

Choice Based Credit System

Under New Education Policy (NEP) 2020

(To be implemented from the academic year 2024-2025)

Semester II

References:

1. Plant Physiology, by Lincoln Taiz and Eduardo Zeiger, Sinauer Associates
2. Experimental Biochemistry by Beedu Shashidhar Rao and Vijay Deshpande, IK International Pvt. Ltd.
3. Biochemistry by U. Satyanarayan, Books and Allied P. Ltd.
4. Pharmacognosy by Kokate, Purohit and Gokhale, Nirali Prakashan
5. Practical Pharmacognosy by Khandelwal, Nirali Prakashan
6. Shah and Qadry's Pharmacognosy by J. S. Qadry, B. S. Shah Prakashan
7. Handbook of Ayurvedic Medicinal Plants by L. D. Kapoor, Herbal Reference Library
8. Encyclopedia of Medicinal Plants-1 and 2 by Roger Pamplo, Education and Health Library
9. Indian Medicinal Plants by Khar C.P., Springer Publication.
10. Medicinal Natural products-A Biosynthetic approach, John Wiley Sons.
11. Ayurveda Ahar/Diet by P.H.Kulkarni, Shri Satguru Prakashan
12. Ayurveda Unravalled by Dahanukar and Thatte National Book Trust India
13. Guide to Essential Oils and Aromatherapy by James David Rockefeller

Academic Council Date – 13/06/2024

Item No-02



CHANGU KANA THAKUR



Arts, Commerce and Science College, New Panvel (Autonomous)

Re-accredited A+ Grade by NAAC (Third Cycle-CGPA-3.61)

'College with Potential for Excellence' Status Awarded by UGC

'Best College Award' by University of Mumbai

As per National Education Policy - 2020

B. Sc. in Botany

(Faculty of Science)

Syllabus for S.Y. B. Sc. (Botany)

Semester III and IV

(With effect from the academic year 2024-25)



Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR



Arts, Commerce and Science College, New Panvel (Autonomous)

As per National Education Policy - 2020

Sr. No.	Heading	Particulars
1	Title of program	B. Sc.
2	Eligibility	F.Y.B.Sc. Pass
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8	Program Academic Level	UG
9	Pattern	Revised as per NEP 2020
10	Status	New (Approved in BOS and Academic Council)
11	To be implemented from Academic Year	Academic Year 2024-25

Signature of

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Signature of

Prof. (Dr.) S.K. Patil
Principal
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(Autonomous)



Preamble

1. Introduction

The Second Year Bachelor of Science in Botany curriculum is designed to immerse students in a comprehensive exploration of plant sciences, blending foundational knowledge with contemporary advancements.

Emphasizing both traditional botanical disciplines and modern interdisciplinary perspectives, the syllabus integrates core subjects like plant anatomy, morphology, and life cycles with cutting-edge fields such as phytochemistry, molecular biology, and environmental studies.

Students will delve into the ecological significance and economic importance of diverse plant groups—from microscopic algae and fungi to complex angiosperms and gymnosperms—while also exploring practical applications in industries ranging from agriculture to biotechnology.

This curriculum aims to foster a deep understanding of plant biology, inspire curiosity about the natural world, and prepare students for diverse career pathways in plant sciences and beyond.

2. Aims and Objectives

The aim of this curriculum is to provide students with an in-depth understanding of Plant Systematics, Genetics, and Palynology, emphasizing the structural, functional, and taxonomic diversity of plants. By exploring various plant families, genetic principles, and the application of palynology in different industries, students will develop a comprehensive knowledge base that prepares them for advanced studies and diverse career opportunities in Botany.

Objectives:

1. To introduce learners to the principles of Plant Systematics, including the goals and objectives of plant taxonomy, nomenclature, and the relationship of taxonomy with various disciplines like anatomy, palynology, and ecology.
2. To provide a thorough understanding of the morphological characteristics, taxonomic significance, and economic importance of specific angiosperm families, focusing on both vegetative and floral traits.
3. To deepen students' knowledge of genetics by exploring Mendelian principles, epistatic and non-epistatic interactions, and the study of karyotypes, with a focus on their applications in plant breeding and conservation.

4. To equip students with practical skills in laboratory techniques related to the study of water relations, photosynthesis, and pollen morphology, including hands-on experience with methodologies like paper chromatography, plasmolysis, and pollen viability analysis.
5. To highlight the applications of Palynology in industries such as honey production, coal and oil exploration, and forensic science, emphasizing the role of pollen analysis in environmental and health-related studies.
6. To foster an appreciation for plant diversity and the significance of plants in both natural ecosystems and human life, encouraging a commitment to environmental conservation and sustainable use of plant resources.

Learning Outcomes

Upon successful completion of this course, learners will be able to:

1. Explain the distinguishing features, ecological roles, and economic importance of algae and fungi.
2. Analyze the structure, life cycle, and systematic positions of *Nostoc*, *Spirogyra*, *Rhizopus*, *Aspergillus*, and *Riccia*.
3. Describe the general structure and functions of eukaryotic plant cell organelles, including the nucleus, endoplasmic reticulum, chloroplasts, and mitochondria.
4. Discuss the molecular structures and functions of DNA and RNA in plant cells.
5. Compare and contrast the processes of mitosis and meiosis, emphasizing their biological significance.
6. Explain the distinguishing features, ecological roles, and economic importance of Pteridophyta and Gymnosperms with suitable examples.
7. Analyze the structure, life cycle, and alternation of generations of *Nephrolepis* and *Cycas*.
8. Describe the distinguishing features, ecological significance, and economic importance of Angiosperms with suitable examples.
9. Identify and describe leaf morphology in prescribed Angiosperm families, including incisions of leaf, venation, phyllotaxy, types of stipules, leaf apex, leaf margin, leaf base, and leaf shapes.
10. Classify and describe inflorescence types in Angiosperms, including racemose (simple raceme, spike, catkin, spadix, panicle) and cymose (monochasial, dichasial, polychasial) types, as well as compound types (corymb, umbel, cyathium, capitulum, verticillaster, hypanthodium).

4. Credit Structure of the S.Y.B. Sc. (Botany) Semester III and IV

No. of Courses	Semester III	Credits	No. of Courses	Semester IV	Credits
A	Discipline Specific Course (Minor)		A	Discipline Specific Course (Minor)	
1	Botany III (Plant Systematics and Genetics)	2	1	Botany IV (Plant Physiology and Palynology)	2
2	Botany III (Plant Systematics and Genetics)) Practical	2	2	Botany II (Plant Physiology and Palynology) Practical	2
Total Credits		04	Total Credits		4

Abbreviations Used

- POs: Program Outcomes
- PS: Program Structure
- PSOs: Program Specific Outcomes
- COs: Course Outcomes
- TLP: Teaching-Learning Process
- AM: Assessment Method
- DSC: Discipline Specific Core
- DSE: Discipline Specific Elective
- GE: Generic Elective
- OE: Open Elective
- VSC: Vocational Skill Course
- SEC: Skill Enhancement Course
- IKS: Indian Knowledge System
- AEC: Ability Enhancement Course
- VEC: Value Education Course
- OJT: On Job Training (Internship)
- FP: Field project
- CEP: Community engagement and service
- CC: Co-curricular Courses
- RM: Research Methodology
- RP: Research Project
- MJ: Major Course
- MN: Minor Course



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Course Structure

Course Code	SEM-III	Credits
USC3BO3M	Botany III (Plant Systematics and Genetics)	2 Credits (30 Lectures)
Unit-I	Plant Systematics	15
1.	Systematics: Objectives and Goals of Plant systematics, Plant Nomenclature.	
2.	Plant Taxonomy: Taxonomy in relation to <ul style="list-style-type: none"> • Anatomy • Palynology • Chemical constituents • Embryology • Cytology • Ecology • External Morphology 	
3.	With the help of Bentham and Hooker's system of classification for flowering plants study the vegetative, floral characters and economic importance of the following families: <ul style="list-style-type: none"> • Apocynaceae • Malvaceae • Palmae • Amaryllidaceae 	
Unit-II	Genetics	15
1.	Phenotype/Genotype, Mendelian Genetics; monohybrid; dihybrid; test cross; back cross ratios.	
2.	Epistatic and non-epistatic interactions, multiple alleles.	



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Course Code: USC3BO3M

Course Title: Botany III (Plant Systematics and Genetics)

Course Type: Minor

No. of Credits: 2

Course Outcomes (Cos)

CO1	Describe the objectives and goals of plant systematics and plant nomenclature.
CO2	Explain the relationship of plant taxonomy with anatomy, palynology, chemical constituents, embryology, cytology, ecology, and external morphology.
CO3	Identify the vegetative and floral characters, as well as the economic importance of families
CO4	Differentiate between the families Apocynaceae, Malvaceae, Palmae, and Amaryllidaceae



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Course Code	SEM-III	Credits
USC3BO3MP	Practicals Botany III (Plant Systematics and Genetics)	2 Credit
1	Study of Anatomy in relation to Taxonomy – Types of stomata, types of trichomes	
2	Morphology of flower	
3	Morphology fruit	
4	Study of plants from each of the following Angiosperm families: <ul style="list-style-type: none">• Apocynceae• Malvaceae• Amaryllidaceae• Palmae.	
5	Morphological peculiarities and economic importance of the members of the above-mentioned Angiosperm families <ul style="list-style-type: none">• Apocynceae• Malvaceae• Amaryllidaceae• Palmae.	
6	Study of Karyotypes: Human: Normal male and female.	
7	visit to botanical garden to study diversity of vegetation. (2 Practicals)	



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Course Code: USC3BO3MP

Course Title: Botany III (Plant Systematics and Genetics)

Course Type: Minor

No. of Credits: 2

Course Outcomes (Cos)

CO1	Identify the types of stomata and trichomes in relation to taxonomy, and the morphology of flowers and fruits.
CO2	Prepare detailed morphological studies and understand the economic importance of plants from the families Apocynaceae, Malvaceae, Amaryllidaceae, and Palmae.
CO3	Explain the morphological peculiarities and economic significance of the members of the angiosperm families
CO4	Differentiate between the karyotypes of normal human males and females and study the diversity of vegetation through a visit to a botanical garden.



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References:

Semester III

Unit I: Plant Systematics

1. Systematic Botany by S C dutta, New Age International Limited Publisher, Latest Edition
2. Taxonomy of Angiosperms by B.P. Pandey S. Chand Publication.
3. Plant Systematics: A Phylogenetic Approach by Walter S. Judd, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens, Michael J. Donoghue published by Sinauer Associates, Inc.

Unit II: Genetics

1. Genetics by Russel. Wesley Longman Inc. publishers.
2. Principles of Genetics by Gardner, Simmons, Snustad published by Wiley
3. Genetics: A Conceptual Approach by Benjamin A. Pierce published by W.H. Freeman



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Course Structure

Course Code	SEM-IV	Credits
USC4BO4M	Botany IV (Plant Physiology and Palynology)	2 Credits (30 Lectures)
Unit-I	Plant Physiology	15
1.	Water relations in Plants: Water Potential, Pressure Potential, Solute Potential	
2.	Photosynthesis: Light reactions, photolysis of water, photophosphorylation (cyclic and non-cyclic), carbon fixation phase (C3, C4 and CAM pathways).	
Unit-II	Palynology	15
1.	Pollen Morphology.	
2.	Pollen viability – storage .	
3.	Germination and growth of pollen .	
4.	Application of Palynology in honey industry, coal and oil exploration, Aerobiology and pollen allergies, forensic science	



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(To be implemented from the academic year 2024-2025)

Course Code: USC4BO4M

Course Title: Botany IV (Plant Physiology and Palynology)

Course Type: Minor

No. of Credits: 2

Course Outcomes (Cos)

CO1	Describe the water relations in plants
CO2	Explain the processes involved in photosynthesis
CO3	Identify various aspects of palynology including pollen morphology, pollen viability and storage, and the germination and growth of pollen.
CO4	Differentiate the applications of palynology in various fields such as the honey industry, coal and oil exploration, aerobiology and pollen allergies, and forensic science.



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Course Code	SEM-IV Title	Credits
USC4BO4MP	Botany IV (Plant Physiology and Palynology)	2 Credit
1	Study of imbibition by using raisins.	
2	Study of osmosis in Plants	
3	Study of Plasmolysis	
4	Determination of Solute Potential of suitable plant Material by Plasmolytic Method.	
5	Extraction, estimation of total chlorophyll	
6	Study of absorption pattern of chlorophyll.	
7	Separation of photosynthetic pigments by paper chromatography	
8	To demonstrate the evolution of oxygen during photosynthesis in aquatic plant.	
9	Study of pollen morphology (NPC Analysis) of the following by Chitale's Method <ul style="list-style-type: none">• <i>Hibiscus</i>• <i>Datura</i>• <i>Ocimum</i>• <i>Crinum</i>• <i>Panocratium</i>• <i>Canna</i>	
10	Determination of pollen viability	
11	Pollen analysis from honey sample – unifloral and multifloral honey	
12	Effect of varying concentration of sucrose on <i>In vitro</i> Pollen germination	



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Course Code: USC4BO4MP

Course Title: Botany IV (Plant Physiology and Palynology)

Course Type: Minor

No. of Credits: 2

Course Outcomes (Cos)

CO1	Describe the processes of imbibition, osmosis, and plasmolysis in plants, including the determination of solute potential using the plasmolytic method.
CO2	Explain the methods for extracting and estimating total chlorophyll
CO3	Identify pollen morphology through NPC using Chitale's Method, and determine pollen viability.
CO4	Demonstrate the evolution of oxygen during photosynthesis in aquatic plants

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References:

Semester III

Unit I: Plant Physiology

1. Plant Physiology by Lincoln Taiz, Eduardo Zeiger published by Sinauer Associates, Inc.
2. Plant Physiology by V. Verma, Athena Academics
3. Plant Physiology and Development by Lincoln Taiz, Eduardo Zeiger published by Sinauer Associates, Inc.
4. Plant Physiology by Frank B. Salisbury, Cleon W. Ross published by Cengage Learning

Unit II: Palynology

1. Pollen Morphology and Plant Taxonomy by G. Erdtman, Hafner Publ. Co., N.Y.
2. A text Book of Palynology by K Bhattacharya, New Central Book Agency Pvt. Ltd., London