

BOTANY (*FACULTY OF SCIENCE*)

Programme outcomes (POs):	
Transformed curriculum shall develop educated outcome-oriented candidature, fostered with discovery-learning, equipped with practice & skills to deal practical problems and versed with recent pedagogical trends in education including e-learning, flipped class and hybrid learning to develop into responsible citizen for nation-building and transforming the country towards the future with their knowledge gained in the field of plant science.	
PO 1	CBCS syllabus with a combination of general and specialized education shall introduce the concepts of breadth and depth in learning
PO 2	Shall produce competent plant biologists who can employ and implement their gained knowledge in basic and applied aspects that will profoundly influence the prevailing paradigm of agriculture, industry, healthcare and environment to provide sustainable development.
PO 3	Will increase the ability of critical thinking, development of scientific attitude, handling of problems and generating solutions, improve practical skills, enhance communication skill, social interaction, increase awareness in judicious use of plant resources by recognizing the ethical value system.
PO 4	The training provided to the students will make them competent enough for doing jobs in Govt. and private sectors of academia, research and industry along with graduate preparation for national as well as international competitive examinations, especially UGC-CSIR NET, UPSC Civil Services Examination, IFS, NSC, FCI, BSI, FRI etc.
PO 5	Certificate and diploma courses are framed to generate self- entrepreneurship and self-employability, if multi exit option is opted.
PO 6	Lifelong learning be achieved by drawing attention to the vast world of knowledge of plants and their domestication.
Programme specific outcomes (PSOs):	
<i>B.Sc. I Year / Certificate course in Microbial Technology & Classical Botany</i>	
This Programme imparts knowledge on various fields of plant biology through teaching, interactions and practical classes. It shall maintain a balance between the traditional botany and modern science for shifting it towards the frontier areas of plant sciences with applied approach. This syllabus has been drafted to enable the learners to prepare them for self-entrepreneurship and employment in various fields including academics as well as competitive exams. Students would gain wide knowledge in following aspects:	
<ol style="list-style-type: none"> 1. Diversity of plants and microbes, their habitat, morphology, architecture and reproduction. 2. Plant disease causing microbes, symptoms & control. 3. Economic value of plants and their use in Human Welfare. 	
Programme specific outcomes (PSOs):	
<i>B.Sc. II Year/ (Diploma in Plant Identification, Utilization & Ethno medicine)</i>	
This course provides a broad understanding of identifying, growing and using plants. This course is primarily aimed to introduce people to the richness of plant diversity found in surrounding areas. Lecture sessions are designed to cover fundamental topics concerning classification of plants and their utilization required for understanding the flora and vegetation. Practical sessions are organized following theory for easy understanding of the various parts of the plants, structural organization of floral parts and diversity therein. Participants are taken to different locations covering a variety of habitats and forest types to acquaint them with the native flora. in the long run, will contribute towards building momentum for people's participation in environmental conservation without compromising on academic rigor and our rich wealth of knowledge inherited over generations.	
<ol style="list-style-type: none"> 1. The course will cover conventional topics in Field Botany like Evolutionary History & Diversity of plants, Complete Morphology, Nomenclature of plants, Systems of Classification, Keys to important Families of Flowering Plants, Field Data Collection & Herbarium Techniques. 2. The course is designed to become a commercial crop grower, florist, protected cultivator, green belt plant advisor to industries, pharmacologist & taxonomist. 	

Programme specific outcomes (PSOs): B.Sc. III Year / Bachelor of Science

The learning outcomes of a three years graduation course are aligned with programme learning outcomes but these are specific to-specific courses offered in a program. The core courses shall be the backbone of this framework whereas discipline electives, generic electives and skill enhancement courses would add academic excellence in the subject together with a multi-dimensional and multidisciplinary approach.

1. Understanding of plant classification systematics, evolution, ecology, developmental biology, physiology, biochemistry, plant interactions with microbes and insects, morphology, anatomy, reproduction, genetics and molecular biology of various life-forms.
2. This course is suitable to produce expertise in conservation biology like ex-situ conservation, response to habitat change, genotype characterization and reproductive biology.
3. Understanding of various analytical techniques of plant sciences, use of plants as industrial resources or as a human livelihood support system and is well versed with the use of transgenic technologies for basic and applied research in plants.
4. Understanding of various life forms of plants, morphology, anatomy, reproduction, genetics, microbiology, molecular biology, recombinant DNA technology, transgenic technology and use of bioinformatics tools and databases and the application of statistics to biological data.
5. Entrepreneurship Skill Development, Understand the issues of environmental contexts and sustainable development, Inculcation of human values,
6. Strengthen mathematical and computational skills. Enable students to use ICT & AI effectively.
7. Develop good skills in the laboratory such as observation and evaluation by the use of modern tools and technology.

PSO 1

Understanding the nature and basic concepts of all the plant groups, their metabolism, components at the molecular level, biochemistry, taxonomy and ecology. The course will make them aware of natural resources and the environment and the importance of conserving it. Hands-on training in various fields will develop practical skills, handling equipment and laboratory use along with collection and interpretation of biological materials and data. Knowledge gained through theoretical and lab-based experiments will generate technical personnel in various priority areas such as genetics, cell and molecular biology, plant systematics and biotechnology.

CERTIFICATE COURSE IN MICROBIAL TECHNOLOGY & CLASSICAL BOTANY / B.Sc.-I

Programme: *Certificate Course in Microbial Technology & Classical Botany* | Year: I | Semester: I/Paper-I

Subject: **Botany**

Course Code: B040101T

Course Title: **Microbiology & Plant Pathology**

Course outcomes: After the completion of the course the students will be able to:

1. Develop understanding about the classification and diversity of different microbes including viruses, Algae, Fungi & Lichens & their economic importance.
2. Develop conceptual skill about identifying microbes, pathogens, bio fertilizers & lichens.
3. Gain knowledge about developing commercial enterprise of microbial products.
4. Learn host –pathogen relationship and disease management.
5. Learn Presentation skills (oral & writing) in life sciences by usage of computer & multimedia.
6. Gain Knowledge about uses of microbes in various fields.
7. Understand the structure and reproduction of certain selected bacteria algae, fungi and lichens
8. Gain Knowledge about the economic values of this lower group of plant community.

CERTIFICATE COURSE IN MICROBIAL TECHNOLOGY & CLASSICAL BOTANY / B.Sc.-I

Programme: *Certificate Course In Microbial Technology & Classical Botany* | Year: I | Semester: I/Paper-II

Subject: **Botany**

Course Code: B040102P

Course Title: **Techniques in Microbiology & Plant Pathology**

Course outcomes: After the completion of the course the students will be able:

1. Understand the instruments, techniques, lab etiquettes and good lab practices for working in a microbiology laboratory.
2. Develop skills for identifying microbes and using them for Industrial, Agriculture and Environment purposes.
3. Practical skills in the field and laboratory experiments in Microbiology & Pathology.
4. learn to identify Algae, Lichens and plant pathogens along with their Symbiotic and Parasitic associations.
5. Can initiate his own Plant & Seed Diagnostic Clinic
6. Can start own enterprise on microbial products

Programme /Class: B.Sc.-I/ Certificate Course In Microbial Technology & Classical Botany		Year: I	Semester: II Paper-I
Subject: Botany			
Course Code: B040201T		Course Title: Archegoniate and Plant Architecture	
Course outcomes: After the completion of the course the students will be able to: <ol style="list-style-type: none"> 1. Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms 2. Understanding of plant evolution and their transition to land habitat. 3. Understand morphology, anatomy, reproduction and developmental changes therein through typological study and create a knowledge base in understanding the basis of plant diversity, economic values & taxonomy of plants 4. Understand the details of external and internal structures of flowering plants. 			
Programme/Class: Certificate Course In Microbial Technology & Classical Botany		Year: I	Semester: II Paper-II (Practical)
Subject: Botany			
Course Code: B040202P		Course Title: Land Plants Architecture	
Course outcomes: <ol style="list-style-type: none"> 1. The students will be made aware of the group of plants that have given rise to land habit and the flowering plants. Through field study they will be able to see these plants grow in nature and become familiar with the biodiversity. 2. Students would learn to create their small digital reports where they can capture the zoomed in and zoomed out pictures as well as videos in case they are able to find some rare structure or phenomenon related to these plants. 3. Develop an understanding by observation and table study of representative members of phylogenetically important groups to learn the process of evolution in a broad sense. 4. Understand morphology, anatomy, reproduction and developmental changes therein through typological study and create a knowledge base in understanding plant diversity, economic values & taxonomy of lower group of plants 5. Understand the composition, modifications, internal structure & architecture of flowering plants for becoming a Botanist. 			
Programme /Class: Diploma in Plant Identification, Utilization & Ethno medicine		Year: II	Semester: III Paper-I
Subject: Botany			
Course Code: B040301T		Course Title: Flowering Plants Identification & Aesthetic Characteristics	
Course outcomes: After the completion of the course the students will be able to: <ol style="list-style-type: none"> 1. To gain an understanding of the history and concepts underlying various approaches to plant taxonomy and classification. 2. To learn the major patterns of diversity among plants, and the characters and types of data used to classify plants. 3. To compare the different approaches to classification with regard to the analysis of data. 4. To become familiar with major taxa and their identifying characteristics, and to develop in depth knowledge of the current taxonomy of a major plant family. 5. To discover and use diverse taxonomic resources, reference materials, herbarium collections, publications. 6. For the entrepreneur career in plants, one can establish a nursery, Start a landscaping business, Set up a farm Or Run a plantation consultancy firm 			
Programme/Class: : Diploma in Plant Identification, Utilization & Ethnomedicine		Year: II	Semester: III Paper-II (Practical)
Subject: Botany			
Course Code: B040302P		Course Title: Plant Identification technology	
Course outcomes: After the completion of the course the students will be able: <ol style="list-style-type: none"> 1. To learn how plant specimens are collected, documented, and curated for a permanent record. 2. To observe, record, and employ plant morphological variation and the accompanying descriptive terminology. 3. To gain experience with the various tools and means available to identify plants. 4. To develop observational skills and field experience. 5. To identify a taxonomically diverse array of native plants. 6. To recognize common and major plant families. 7. To Understand aesthetic characters of flowering plants by making-landscapes, gardens, bonsai, miniatures 8. Comprehend the concepts of plant taxonomy and classification of Angiosperms. 			

Programme /Class: <i>Diploma in Plant Identification, Utilization & Ethnomedicine</i>	Year: II	Semester: IV Paper-I
Subject: Botany		
Course Code: B040401T	Course Title: Economic Botany, Ethnomedicine and Phytochemistry	
Course outcomes: After the completion of the course the students will be able to: <ol style="list-style-type: none"> 1. Understand about the uses of plants –will know one plant-one employment 2. Understand phytochemical analysis related to medicinally important plants and economic products produced by the plants 3. know about the importance of Medicinal plants and its useful parts, economically important plants in our daily life and also about the traditional medicines and herbs, and its relevance in modern times. 		
Programme: <i>Diploma in Plant Identification, Utilization & Ethnomedicine</i>	Year: II	Semester: IV Paper-II
Subject: Botany		
Course Code: B040402P	Course Title: Commercial Botany & Phytochemical Analysis	
Course outcomes: After the completion of the course the students will be able to: <ol style="list-style-type: none"> 1. Know about the commercial products produced from plants. 2. Gain the knowledge about cultivation practices of some economic crops. 3. Understand about the ethnobotanical details of plants. 4. Learn about the chemistry of plants &herbal preparations 5. Can become a protected cultivator, aromatic oil producer, Pharmacologist or quality analyst in drug company. 		
BACHELOR OF SCIENCE (BOTANY)		
Programme/Class: <i>Bachelor of Science</i>	Year: III	Semester: V Paper-I
Subject: BOTANY		
Course Code: B040501T	Course Title: Plant Physiology, Metabolism & Biochemistry	
Course outcomes: After the completion of the course the students will be able to: <ol style="list-style-type: none"> 1. Understand the role of Physiological and metabolic processes for plant growth and development. 2. Learn the symptoms of Mineral Deficiency in crops and their management. 3. Assimilate Knowledge about Biochemical constitution of plant diversity. 4. Know the role of plants in development of natural products, nutraceuticals, dietary supplements, antioxidants 		
Programme/Class: <i>Bachelor of Science</i>	Year: III	Semester: V Paper-II
Subject: BOTANY		
Course Code: B040502T	Course Title: Molecular Biology & Bioinformatics	
Course outcomes: After the completion of the course the students will be able to: <ol style="list-style-type: none"> 1. Understand nucleic acids, organization of DNA in prokaryotes and Eukaryotes, DNA replication mechanism, genetic code and transcription process. 2. Know about Processing and modification of RNA and translation process, function and regulation of expression. 3. Gain working knowledge of the practical and theoretical concepts of bioinformatics 		
Programme/Class: <i>Bachelor of Science</i>	Year: III	Semester: V Paper-III
Subject: Botany		
Course Code: B040503P	Course Title: <i>Experiments in physiology, Biochemistry & molecular biology</i>	
Course outcomes: After the completion of the course the students will be able to: <ol style="list-style-type: none"> 1. Know and authentic the physiological processes undergoing in plants along with their metabolism 2. Identify Mineral deficiencies based on visual symptoms 3. Understand and develop skill for conducting molecular experiments for genetic engineering 		

Programme/Class: Bachelor of Science	Year: III	Semester: V Paper-IV
Subject: BOTANY		
Course Code: - B040504R	Course Title: Project in Botany for Pre-graduation	
Course outcomes: <ul style="list-style-type: none"> ● Project work will supplement field experimental learning and deviations from classroom and laboratory transactions. ● project work will enhance the capability to apply gained knowledge and understanding for selecting, solving and decision-making processes. ● It will promote creativity and the spirit of enquiry in learners. ● They will learn to consult Scientists, libraries, laboratories and herbariums and learn importance of discussions, Botanical & field trips, print and electronic media, internet etc. along with data documentation, compilation, analysis & representation in form of dissertation writing. ● It will enhance their abilities, enthusiasm, and interest. 		
Programme/Class: Bachelor of Science	Year: III	Semester: VI Paper-I
Subject: Botany		
Course Code: B040601T	Course Title: Cytogenetics, Plant Breeding & Nanotechnology	
Course outcomes: After the completion of the course the students will be able: <ol style="list-style-type: none"> 1. Acquire knowledge on cell ultrastructure. 2. Understand the structure and chemical composition of chromatin and concept of cell division. 3. Interpret the Mendel's principles, acquire knowledge on cytoplasmic inheritance and sex-linked inheritance. 4. Understand the concept of 'one gene one enzyme hypothesis' along with the molecular mechanism of mutation. 		
Programme/Class: Bachelor of Science	Year: III	Semester: VI Paper-II
Subject: Botany		
Course Code: B040602T	Course Title: Ecology & Environment	
Course outcomes: <ol style="list-style-type: none"> 1. acquaint the students with complex interrelationship between organisms and environment; 2. make them understand methods for studying vegetation, community patterns and processes, ecosystem functions, and principles of phytogeography. 3. This knowledge is critical in evolving strategies for sustainable natural resource management and biodiversity conservation. 		
Programme/Class: Bachelor of Science	Year: III	Semester: VI Paper-III
Subject: Botany		
Course Code: B040603P	Course Title: Lab on Cytogenetics, Conservation & Environment management	
Course outcomes: After the completion of the course the students will be able: <ol style="list-style-type: none"> 1. To perform all experiments related to the semester-i.e. Plant tissue cultured plants, conducting breeding on field, conserving and depolluting the environment. 2. Can be employed in environment impact assessment companies & start his own venture 		
Programme/Class: Bachelor of Science	Year: III	Semester: VI/Project- II/ Paper-IV
Subject: BOTANY		
Course Code: - B040604R	Course Title: Project in Botany for Graduation	
Course outcomes: <p>After completing this course a student will have:</p> <ul style="list-style-type: none"> ● Project work will supplement field experimental learning and deviations from classroom and laboratory transactions. ● project work will enhance the capability to apply gained knowledge and understanding for selecting, solving and decision-making processes ● It will promote creativity and the spirit of enquiry in learners. ● They will learn to consult Scientists, libraries, laboratories and herbariums and learn importance of discussions, Botanical & field trips, print and electronic media, internet etc. along with data documentation, compilation, analysis & representation in form of dissertation writing ● It will enhance their abilities, enthusiasm, and interest. 		