

B.Sc., Botany (UGBOT)

Program Specific Outcomes

After Successful completion of B.Sc. degree in Botany students would be able to:

PSO 1: Understand the importance of plants, their diversity and conservation.

PSO 2: Acquire knowledge on pure and applied botany.

PSO 3: Understand the contribution of botany in improvement of crop productivity to meet the demand in the supply of food, medicines and other plant products.

PSO 4 : Understand the importance of health and environmental protection and to solve the pollution problems.

PSO 5 : Understand the importance of knowledge in botany for applied sciences like Agriculture, Horticulture, Sericulture, Forestry, Pharmacology and Medicine.

PSO 6: Understand to care Nature

PSO 7: Understand experiments in botany.

Course Specific Outcomes

CORE COURSE IBACTERIA, VIRUSES, ALGAE, FUNGI AND LICHENS(16SCCBO1)

After completion of the course a student will be able to

PCO1: Understand the salient features in the structure, reproduction, culture, classification and economic importance of bacteria and viruses.

PCO2: Understand the Classification, ecology, distribution, morphology, life-cycle and economic importance of Algae and Fungi.

PCO3: Comprehend the structure and reproduction of various genera mentioned in the syllabus

PCO3: Aware of the distribution, classification, structure, physiology, reproduction and function of lichens and significance of ectomycorrhiza and endomycorrhiza.

PCO5: To learn the mass culture technique of commercially important algae

PCO6: . To conserve them in their natural environment.

CORE PRACTICAL I

BACTERIA, VIRUS, ALGAE, AND FUNGI AND LICHENS & PLANT PATHOLOGY AND PLANT PROTECTION (P) (16SCCSBO1P)

After completion of the course a student will be able to

PCO1: Appreciate the importance in Structure and reproduction of Bacteria, Viruses, fungi and lichens

PCO2: Critically understand the range of organization in thallus seen in Bryophytes

PCO3: Know the Tools and equipments used in microbiology: Spirit lamp, Inoculation loop, Hot air oven, Autoclave, Pressure cooker, Laminar air flow chamber, Incubator, etc.

PCO4: Make suitable micropreparations and identify the diseases mentioned in theory with due emphasis on symptoms and causative organisms.

PCO5: Identify the various plant protection appliances mentioned in the syllabus and their working mechanism.

CORE COURSE II : PLANT PATHOLOGY AND PLANT PROTECTION (16SCCB02)

After completion of the course a student will be able to

PCO1: Understand plant pathogenesis, classification and host-parasite interaction.

PCO2: Study plant diseases in crops and their management, significant contributions of plant pathologists and usage of various techniques in plant protection.

PCO3: After completion of the course a student will be able to

PCO4: To impart knowledge on distribution, classification, structure, physiology, reproduction and function of lichens

PCO5: Understand the significance of ectomycorrhiza and endomycorrhiza.

CORE COURSE III : BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY (16SCCB03)

After completion of the course a student will be able to

PCO1: Understand the salient features of Bryophytes, Pteridophytes and Gymnosperms.

PCO2: Understand the structure and reproduction of various genera mentioned in the syllabus. economic importance of pteridophytes and gymnosperms.

PCO3: Understand the salient features and importance of fossils and fossilization process in tracing evolution

CORE PRACTICAL II BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY & ANATOMY AND EMBRYOLOGY (16SCCSB02P)

After completion of the course a student will be able to

PCO1: Understand the diversity of both vegetative and reproductive structures of Genera included in the theory.

PCO2: Appreciate the morphology and anatomy of both vegetative and reproductive parts of the Living genera and fossil forms of the gymnosperms

PCO3: Understand the importance of fossils and fossilization process

CORE COURSE IV ANATOMY AND EMBRYOLOGY (16SCCB04)

After completion of the course a student will be able to

PCO1: Inculcate the basics of tissues and anatomical features of plants.

PCO2: Impart the knowledge about the various aspects of morphogenesis.

PCO3: Acquire basic knowledge of the structure and development of male and female gametophytes in plants

PCO4: Acquire knowledge on the structure and development of dicot and monocot embryos

PCO5: Understand the key aspects of embryology of Angiosperms

CORE COURSE V CELL AND MOLECULAR BIOLOGY (16SCCB05)

After completion of the course a student will be able to

PCO1: Understand the organization of cells

PCO2: Understand the structure and organization of various cell organelles

PCO3: Understand cell cycle and methods of cell division

PCO4: Know the structure of DNA and RNA

PCO5: Understand the types of DNA molecules and their mechanism of replication

PCO6: Understand the process of transcription and translation

PCO7: Appreciate the regulation of gene expression in prokaryotes and eukaryotes and comprehend the molecular mechanism of gene regulation

PCO8: Differentiate the regulation of gene expression between the prokaryote and eukaryote.

CORE COURSE VI

GENETICS, BIOSTATISTICS AND EVOLUTION (16SCCBO6)

After completion of the course a student will be able to

PCO1: Understand the Mendelian genetics, recombination of chromosomes, structure and function of genes and their various units

PCO2: Know the importance of mutation, its types and the mechanism involved

PCO3: Acquire knowledge on biostatistics and its applications in biological experiments

PCO4: Better understand the mechanism of evolution and study of population Genetics

CORE COURSE VII

MORPHOLOGY, TAXONOMY AND ECONOMIC BOTANY (16SCCBO7)

The course will enable the students

PCO1: To observe the variations among in angiosperms

PCO2: To understand the basic principles guiding the plant classification

PCO3: To acquire knowledge on morphology and nomenclature

PCO4: To describe and identify plants in technical terms

PCO5: To study morphological features of vegetative, inflorescence, fruits and seed characters.

PCO6: To impart knowledge on botanical nomenclature, classifications, merits and demerits of various systems of classifications.

PCO7: To understand the systematics of the selected families of the flowering plants with their economic importance.

PCO8: To have knowledge on the economically important plants with their systematic treatment.

CORE PRACTICAL III

CELL AND MOLECULAR BIOLOGY & GENETICS, BIOSTATISTICS AND EVOLUTION & MORPHOLOGY, TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY, CELL AND MOLECULAR BIOLOGY (16SCCBO3P)

The course will enable the students

PCO1: To get training in dissection, observation, identification and sketching of floral parts of plants belonging to the families mentioned in the syllabus along with floral diagrams and floral formula.

PCO2: Describe the plants in technical terms.

PCO3: Prepare plants for herbarium

MAJOR-BASED ELECTIVE I

MEDICAL AND APPLIED BOTANY (16SMBEB01)

The course will enable the students

PCO1: To understand the importance of the medicinal plant wealth in India and the role of Medicinal plants in human health care.

PCO2: To know the medicinally useful plants, Herbal medicine preparation for common diseases and adulterants.

PCO3: To understand the importance of biofertilizers and biopesticides and their mode of action.

PCO4: To understand the techniques involved in the cultivation of edible Mushrooms

PCO5: To understand the various recipe prepared from mushrooms.

PCO6: To learn the preservation and storage of mushrooms.

CORE COURSE VIII

PLANT PHYSIOLOGY, BIOCHEMISTRY AND BIOPHYSICS (16SCCB08)

This course will enable the students

PCO1: To understand the relationship of water, mechanism of ascent of sap and translocation of solutes

PCO2: To understand the mechanism of photosynthesis, types and its importance

PCO3: To understand the structure, types and importance of biomolecules

PCO4: To understand the role of enzymes in various metabolic activities of plants

PCO5: To know the application of the laws of physics in biological phenomena

CORE COURSE IX

PLANT ECOLOGY AND CONSERVATION (16SCCB09)

This course will enable the students

PCO1: To realize the values of plants and animals of the ecosystem

PCO2: To learn various ecosystems and their components

PCO3: To learn various biogeochemical cycles and their significance

PCO4: To know about the hazards of pollution and the importance of keeping his/her environment clean

PCO5: To know in detail on various types of vegetation

PCO6: To know about his/her environment and mould the students to become managers of various ecological systems

CORE PRACTICAL IV

PLANT PHYSIOLOGY, BIOCHEMISTRY AND BIOPHYSICS & PLANT ECOLOGY AND CONSERVATION, PLANT PHYSIOLOGY, BIOCHEMISTRY & BIOPHYSICS (16SCCB04P)

This course will enable students

PCO1: To perform various experiments in Physiology

PCO2: Understand the process of Photosynthesis, transpiration, seed germination

PCO3: To acquire knowledge on working principles of pH meter, Spectrophotometer, Centrifuge

MAJOR-BASED ELECTIVE II

PLANT BREEDING, HORTICULTURE AND LANDSCAPING (16SMBEBO2)

This course introduces the students to

PCO1: Understand the aim and objectives of plant breeding

PCO2: Acquire knowledge on various techniques of plant breeding

PCO3: Acquire knowledge on methods of breeding economically important crops

PCO4: The various methods of plant breeding and plant propagation

PCO5: To study the importance of horticultural crops and their propagation methods

PCO6: To understand the types of gardens and their establishment

PCO7: The Art of growing plants for a pre-defined purpose and pleasure and facilitates students to become an entrepreneur

MAJOR-BASED ELECTIVE III

PLANT BIOTECHNOLOGY AND BIOINFORMATICS (16SMBEBO3)

This course will enable students to

PCO1: Comprehend the advances made in the field of plant biotechnology; and bioinformatics

PCO2: Understand the principles of genetic engineering

PCO3: Study the mechanism of generating rDNA

PCO4: Learn the types and application of cloning vectors

PCO5: Study the different types of gene transfer methods

PCO6: Acquire knowledge on the principles and applications of plant tissue culture

M.Sc., Botany - PGBOT

Program Specific Outcomes

- PSO1: Postgraduates will acquire knowledge of various groups of plants and study their utilization and conservation
- PSO2: Postgraduates will learn about the internal organization of plants and their role in functioning of plant system
- PSO3: Postgraduates will understand the importance of ecological principles for sustainable utilization
- PSO4: Postgraduates will learn various techniques of plant breeding to enable better crop production for human welfare.
- PSO5: Postgraduates will acquire basic knowledge of statistics and learn its application in biological studies.
- PSO6: Postgraduates will develop skills of bioprocess technology which enable the scientific production of bioactive compounds of economic value.
- PSO7: Postgraduates will acquire knowledge of the production of GMOs which play a significant role in field of agriculture and medicine.
- PSO8: Postgraduates will learn the principles and methodology of thesis writing and research publications.

Course Outcomes

CORE COURSE I : PLANT BIODIVERSITY I (ALGAE, FUNGI, LICHENS AND BRYOPHYTES) (P16SBO11)

This course will enable students to:

- PCO1: Understand the major groups of cryptogamic plants and their characteristics.
- PCO2: Know the classification, life cycle and economic importance of Algae.
- PCO3: Study the general features, classification and economic importance of Fungi.
- PCO4: Acquire basic knowledge on Lichens and their economic importance
- PCO5: To understand Bryophytes their salient features, classification and economic importance

CORE COURSE II PLANT BIODIVERSITY II

(PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY) (P16SB012)

This course will enable students to

- PCO1: Understand the major groups of lower vascular plants and their characteristics.
- PCO2: Trace their interrelationships and study their evolutionary trends.
- PCO3: Study their classification and life cycle patterns of representative genera.
- PCO4: Study the classification, phylogeny and economic importance of Gymnosperms.
- PCO5: Acquire knowledge on Geological periods, fossilization and types of fossils.

CORE COURSE III

MICROBIOLOGY, PLANT PATHOLOGY AND IMMUNOLOGY (P16SB013)

This course will enable students to

- PCO1: Study the microorganisms and their activities.
- PCO2: Understand the application of microbes in food and dairy microbiology.
- PCO3: Exploit their potentialities in agriculture, industry and therapeutic aspects.
- PCO4: Understand the process of plant pathogenesis and disease establishment
- PCO5: Understand the basis of defence mechanism against pathogens
- PCO6: Acquire knowledge on the effect of infection on host physiology
- PCO7: Understand the various types of defence mechanism
- PCO8: Acquire knowledge on some common plant diseases
- PCO9: Learn the different types of disease control mechanism
- PCO10: Understand the basics of immune system, types, immunoglobulins, blood groups and techniques

CORE COURSE IV

BIOFERTILIZERS AND MUSHROOM TECHNOLOGY

This course will enable the student:

- PCO1: To understand the importance of biofertilizers and biopesticides and their mode of action.
- PCO2: To understand the methods that can be used for the mass cultivation of biofertilizers
- PCO2: To understand the techniques involved in the cultivation of edible Mushrooms
- PCO3: To understand the various recipe prepared from mushrooms.
- PCO4: To learn the preservation and storage of mushrooms.

CORE PRACTICAL I

PLANT BIODIVERSITY – I & II, MICROBIOLOGY, PLANT PATHOLOGY AND IMMUNOLOGY & BIOFERTILIZERS AND MUSHROOM TECHNOLOGY (P) (P16SBO15P)

This course will enable students to

- PCO1: Perform dissections on genera mentioned in the syllabus and appreciate the structural diversity
- PCO2: Prepare media, sterilize, perform serial dilution and isolate microbes
- PCO3: Perform gram staining and differentiate microbe
- PCO4: Be aware of the method of blood grouping

CORE COURSE V

ANATOMY, EMBRYOLOGY AND MORPHOGENESIS (P16SBO21)

This course will enable students:

- PCO1: To inculcate the basics of tissues and anatomical features of plants.
- PCO2: To understand various types of tissues present in plants
- PCO3: To acquire knowledge about the tissues of stem, root and leaves
- PCO4: To understand the primary and secondary structure of dicots and monocots with reference to root, stem and leaves
- PCO5: To acquire basic knowledge of the structure and development of male and female gametophytes in plants
- PCO6: To acquire knowledge on the structure and development of dicot and monocot embryos
- PCO7: To impart the knowledge about the various aspects of morphogenesis.
- PCO8: To understand the key aspects of embryology of angiosperms

COURSE VI

ANGIOSPERM TAXONOMY, ECOLOGY AND CONSERVATION (P16SBO22)

This course will enable students to understand:

- PCO1: Different systems of classification of Angiosperms, taxonomic literature, botanical nomenclature
- PCO2: Preparation of description of plant species, herbarium techniques and interpretation of allied disciplines and molecular taxonomy to resolve the disputes in modern taxonomy
- PCO3: Systematic treatment, diagnostic features, characters and economic importance of selected families in Angiosperms
- PCO4: Components, dynamics, trophic level and biogeochemical cycles in different ecosystems
- PCO5: The causes and consequences of climate change.
- PCO6: Biodiversity its importance and their conservation by *in situ* and *ex situ* methods

CORE PRACTICAL II

ANATOMY, EMBRYOLOGY AND MORPHOGENESIS & ANGIOSPERM TAXONOMY, ECOLOGY AND CONSERVATION (P) (P16BO23P)

This course will enable students to:

- PCO1: Prepare Transverse sections of plant parts to observe and record the internal structure.
- PCO2: Prepare key and use flora to identify genera
- PCO3: Dissect and identify the floral parts of the genera mentioned in the syllabus
- PCO4: Prepare herbarium species

ELECTIVE COURSE I

FORESTRY AND WOOD SCIENCE (P16SBOE1)

This course will enable students to:

- PCO1: Acquire knowledge on forest resources and their utilization.
- PCO2: Understand the physical, chemical and mechanical properties of commercial wood.
- PCO3: To acquire knowledge on developmental anatomy of woody plants
- PCO4: Understand the techniques of wood seasoning and wood preservation

- PCO5: Study the agents responsible for wood deterioration
PCO6: Understand the principles underlying paper and pulp preparation
PCO7: Study the natural defects of wood
PCO8: Acquire knowledge on wood substitution and products obtained from wood.
PCO9: Prepare for careers in the forest service's and wood products industry.

ELECTIVE COURSE II **INDUSTRIAL MICROBIOLOGY (P16SBOE2)**

This course will enable students to:

- PCO1: Understand the importance of microbes, basics of a sterilization, fermenter design and types
PCO2: To get introduced about the principle, importance and components of a fermenter.
PCO3: To study the basic concepts of unit operations and unit processes.
PCO4: To study the production strategies of commercial products.
PCO5: To understand the separation techniques, types and various effluent treatment process.

CORE COURSE VII **CELL BIOLOGY, GENETICS AND PLANT BREEDING (P16SBO31)**

This course will enable students to:

- PCO1: Understand the Structure, organization, function, interrelationships of cell membrane and cell organelles and cell communication systems
PCO2: Understand the Cell growth and cell division
PCO3: Know the Mendelian and non-Mendelian genetics and linkage and crossing over
PCO4: Understand Genes and genetic variations
PCO5: Acquire knowledge on plant breeding methods and role of molecular markers in plant breeding

CORE COURSE VIII **PLANT PHYSIOLOGY, BIOCHEMISTRY AND BIOPHYSICS (P16SBO32)**

This course will enable students to understand:

- PCO1: Plant-water relationship, translocation of water and minerals, photosynthesis, respiration and transfer of energy
PCO2: Nitrogen metabolism, plant growth hormones, flowering, dormancy and senescence, stress
PCO3: Chemistry of carbohydrates, proteins, enzymes, lipids, Nucleic acids, vitamins and secondary metabolites
PCO4: Bioenergetics, laws of Thermodynamics and photobiology

CORE PRACTICAL III **CELL BIOLOGY, GENETICS AND PLANT BREEDING & PLANT PHYSIOLOGY, BIOCHEMISTRY AND BIOPHYSICS (P) (P16BO33P)**

This course will enable students to:

- PCO1: Workout problems related to linkage, crossing over and gene mapping, human pedigree analysis.
PCO2: Know the Hybridization techniques in self and cross pollinated plants

PCO3: Understand the structural organization and function of different cell organelles and cell cycle

PCO4: Study the mechanism of transcription in prokaryotes

PCO5: Perform physiology to study photosynthesis, respiration

PCO6: Perform Biochemistry experiments to determine biomolecules and enzymes

ELECTIVE COURSE III

GENETIC ENGINEERING AND BIOTECHNOLOGY (P16SBOE3)

This course will enable the students to:

PCO1: Understand the basic techniques of genetic manipulation

PCO2: To understand the role of enzymes in genetic engineering

PCO3: Acquire knowledge in various cloning vectors

PCO4: Know the art of recombining genes and traits.

PCO5: Understand the sequencing strategies of genomic DNA

ELECTIVE COURSE IV

HORTICULTURE AND LANDSCAPING (P16SBOE4)

This course will enable the students:

PCO1: To understand the main principles and importance of horticulture

PCO2: To know the various methods of plant propagation

PCO3: To understand the importance and divisions of horticulture

PCO4: To know the art of indoor gardening

PCO5: To acquire knowledge on landscaping

PCO6: To develop potential for self-employment

CORE COURSE IX

PLANT TISSUE CULTURE (P16SBO41)

This course will enable students to:

PCO1: Understand the basis of Plant tissue culture

PCO2: Acquire knowledge on media, equipments and other requirements for plant tissue culture

PCO3: Acquire knowledge about the various aspects of tissue culture and their applications

PCO4: Acquire knowledge on secondary metabolites, their importance and *in vitro* production

PCO5: Understand cryopreservation, methods involved and importance of plant tissue culture in agriculture, forestry and medicine

CORE COURSE X

RESEARCH METHODOLOGY (P16BO42)

This course will enable the students to:

PCO1: Know principles involved in microscopy, chromatography, spectroscopy, tracer techniques and electrophoresis method

PCO2: Understand the methods of applying statistical principles to biological studies

PCO3: Acquire knowledge on selecting a problem for research, project design and thesis writing

PCO4: Acquire knowledge on writing papers for publications

PCO5: Acquire knowledge on preparation for oral and poster presentation

CORE PRACTICAL IV

PLANT TISSUE CULTURE & RESEARCH METHODOLOGY (P) (P16BO43P)

This course will expose students to:

PCO1: Sampling by Random Number Table,

PCO2: Data Collection, Classification of Data: Discrete, continuous and cumulative.

PCO3: Statistical diagrams: Histogram, Frequency curve, Bar chart and Ogivecurve

PCO4: Measures of Central Values: Mean, Median and Mode

PCO5: Measures of Dispersion: Range, Mean Deviation and Standard Deviation.

PCO6: Exercises with Tests of Significance

PCO7: Preparation of Index cards, Bibliography, Proof correction

PCO8: Exercises in the calculation of Citation Index,

PCO9: Determination of Impact Factor of Author, Article and Journal.

PCO10: Media preparation, Sterilization and callus induction

PCO11: Protoplast isolation (Mechanical and enzymatic)

PCO12: Synthetic seed production

ELECTIVE COURSE V

FOOD PRESERVATION AND PROCESSING (P16BOE5)

This course will enable students to:

PCO1: Understand the salient features of food preservation and processing.

PCO2: Know the preservation and processing of day to day products by using food additives

PCO3: Know about the common food adulterants and their effects