

Programme & Course Outcomes

B.Sc. Botany Regular

Core Papers:

BOT-RC-1016: Biodiversity (Microbes, Algae, Fungi and Archegoniate)

1. Understand the origin, structure, reproduction pattern and economic importance of virus and bacteria.
2. Knowledge on characteristics features, classifications, reproductive mechanisms, life cycle pattern and ecology of different genera of algae and fungi.
3. Understand the importance/significance and mechanism of symbiotic associations of algae-fungi and fungi-higher plants.
4. Knowledge on archegoniate and alternation of generations.
5. Knowledge on classifications, reproductive mechanisms, ecology, evolution and economic significances of bryophyte, pteridophyte and gymnosperm.
6. Knowledge on T phage and TMV, lytic and lysogenic cycles of viruses.
7. Know about different types of bacteria, their structure and reproduction types, gram staining procedures.
8. Knowledge on morphology, anatomy and reproductive structures of different general of algae, fungi, bryophytes, pteridophytes and gymnosperms

BOT-RC-2016: Plant Ecology and Taxonomy

1. Basic knowledge on Ecology, Know about ecological factors, law of tolerance, Adaptation of hydrophytes and xerophytes.
2. Knowledge on plant communities and its characteristics, processes and types of succession.
3. Understanding concept of ecosystem and its structure, knowledge on production and productivity in ecological pyramids, biogeochemical cycles of Carbon, Nitrogen and Phosphorus.
4. Knowledge on phytogeography and principle of biogeographical zones of India.
5. Knowledge on plant taxonomy, its identification, Classification and Nomenclature.
6. Understanding on plant Identification, importance of herbarium and botanical gardens of the world and India, documentation and Keys.
7. Knowledge on taxonomic evidences from palynology, cytology, phytochemistry and molecular data, understanding about taxonomic hierarchy such as ranks, categories and taxonomic groups.
8. Knowledge on Botanical nomenclature, binominal system Principles and rules (ICN), classifications and types of classification.
9. Knowledge on characters used in taxonomy and variations of biometrics, numerical taxonomy and cladistics.
10. Practical Knowledge on ecological instruments such as Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.
11. Practical knowledge on determination of minimal quadrat size for the study of herbaceous vegetation by species area curve method.
12. Practical knowledge on Quantitative analysis of herbaceous vegetation for frequency and comparison with Raunkiaer's frequency distribution law.
13. Practical knowledge on vegetative and floral characters of plant family Brassicaceae, Solanaceae and Lamiaceae.

14. Hands on preparation of herbarium sheet with proper mounting and pressing of dried wild plant specimen.

BOT-RC-3016: Plant Physiology and Metabolism

1. Knowledge on different types of plant-water relationship, their significance and factors.
2. Knowledge on different mineral nutrients, their roles on plants, different types of transport and their mechanisms, knowledge on different carriers, channels and pumps.
3. Understanding phloem loading and unloading, pressure flow model.
4. Knowledge on different types of photosynthetic pigments, Photosystem I and II, electron transport and mechanism of ATP synthesis, different types of pathways of photorespiration and carbon fixation.
5. Basic knowledge on different pathways of respiration.
6. Knowledge on structure and properties of enzyme and their catalysis and inhibition mechanisms.
7. Knowledge on biological nitrogen fixation and metabolism.
8. Knowledge on discovery and physiological roles of different plant growth regulators, understanding plant responses to light and temperature.
9. Knowledge on estimation of osmotic potential, understanding on effects of light on transpiration, basic idea on stomatal index and frequency, knowledge on enzyme activity and effect of pH, knowledge on bicarbonate concentration and O₂ evolution in photosynthesis of some plants.
10. Understanding on Bolting, RQ and root respiration, Knowledge on auxin's role on rooting, basic idea on transpiration suction.

BOT-RC-4016: Plant Anatomy and Embryology

1. Understand the meristematic and permanent tissue of plants.
2. Knowledge on the structure of monocot and dicot root, stem and leaf.
3. Basic knowledge on vascular cambium, secondary growth in root and stem.
4. Knowledge on epidermis, cuticle, stomata, adaptation in xerophytes and helophytes.
5. Knowledge on the structure of anther and pollen, structure and types of ovules, types of embryo sacs, organization and ultrastructure of mature embryo sac.
6. Understand the mechanism of pollination and adaptations, double fertilization, seed structure, and dispersal mechanism.
7. Knowledge on endosperm types, structure, functions, and embryo-endosperm relationship .
8. Basic knowledge on apomixis, polyembryony and their applications.
9. Knowledge on meristems, parenchyma, collenchyma, sclerenchyma, xylem, phloem, anatomy of root, stem, and leaf, adaptations in xerophytes, helophytes, structure of anther, types of ovules, female gametophyte, pollination, seed dispersal embryo and endosperm.

Discipline Specific Elective Papers

BOT-RE-5016:

1. Cell and Molecular Biology.
2. Understand the basic principle, function and working of microscopy used in research.
3. Learn about the basics of cell and cell theory.
4. Learn about the structure, composition and function of different cell organelles.
5. Understand the structure and functions of cell membrane, membrane proteins and carbohydrates, membrane permeability and cell wall.
6. Learn about cell cycle and its regulation at molecular level.

7. Knowledge on history of DNA discovery, experiments related to DNA as the genetic material, structure and types of DNA and different modes of replication.
8. Learn about types and structure of RNA, various types of RNA polymerases, basic knowledge on prokaryotic and eukaryotic translation and genetic code.
9. Understand about regulation of gene expression in prokaryotes and eukaryotes.
10. Practical knowledge on prokaryotic cells (bacteria), viruses and eukaryotic cells with the help of light and electron micrographs.
11. Practical knowledge on photomicrographs of cell organelles.
12. Practical knowledge on the structure of plant cell through temporary mounts.
13. Practical knowledge on mitosis and meiosis.
14. Practical knowledge on plasmolysis and deplasmolysis.
15. Practical knowledge on micrometry.
16. Understand the structure of nuclear pore complex by photograph and learn about special chromosomes either by slides or photographs.
17. Practical knowledge on micrograph study of DNA packaging.
18. Practical knowledge on karyotype and ideogram preparation.

BOT-RE-5026: Economic Botany and Biotechnology

1. Learn about the centres of origin of cultivated plants with special reference to Vavilov's work.
2. Learn about the origin, morphology and uses of cereals.
3. Understand about legumes with special reference to Gram and soybean.
4. Learn about botanical name, family, part used, morphology and uses of spices with special reference to clove and black pepper.
5. Knowledge on morphology, processing and uses of tea .
6. Learn about fats and oils with special reference to groundnut.
7. Knowledge on botanical name, family, parts used, morphology and uses of fiber yielding plants with special reference to cotton.
8. A brief knowledge on biotechnology.
9. Knowledge on plant tissue culture techniques.
10. Learn about blotting techniques, DNA fingerprinting, molecular markers, DNA sequencing and types of PCR. Knowledge on hybridoma technology, ELISA, molecular diagnosis of human disease, and human gene Therapy.
11. Understand the aim, scope and branches of bioinformatics, repositories of Biological Data Knowledge and retrieval system.
12. Learn about molecular phylogeny, basics in proteomics and genomics and their applications in crop improvement and drug discovery.
13. Practical knowledge on economically important plants through specimens, sections and microchemical tests.
14. Practical knowledge on basic equipments used in tissue culture.
15. Understand anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation through photograph.
16. Practical knowledge on molecular techniques.
17. Practical knowledge on data base searching, and retrieval of Sequence from databases.
18. Practical knowledge on sequence alignment, Homology and Phylogenetic tree.

BOT-RE-5036: Genetics and Plant Breeding

1. Understand laws of inheritance, modified Mendelian ratios, chi square, pedigree analysis, cytoplasmic inheritance, multiple allelism, pleiotropism and chromosomal theory of inheritance.
2. Understand basics of sex determination and sex-linked inheritance.
3. Learn about types of linkage, bridges experiment, coupling & repulsion, recombination frequency, linkage maps, crossing over and cytological proof of crossing over.
4. Knowledge on types of mutation, mutagens, numerical and structural chromosomal changes.
5. Learn about basics of plant breeding, important achievements and undesirable consequences of plant breeding.
6. Learn about centres of origin and domestication of crop plants, plant genetic resources; acclimatization, selection methods, hybridization procedure, advantages and limitations.
7. Understand the concept and mechanism of quantitative inheritance.
8. Understand genetic basis of inbreeding depression and heterosis.
9. Learn about role of mutations, polyploidy, distant hybridization and role of biotechnology in crop improvement.
10. Practical knowledge on Mendel's law.
11. Practical knowledge on chromosome mapping using point test cross data.
12. Practical knowledge on incomplete dominance and gene interaction.
13. Knowledge of aneuploidy: Down's, Klinefelter's and Turner's syndromes through photographs.
14. Practical knowledge of Translocation Ring, Laggards and Inversion Bridge.
15. Practical knowledge of hybridization technique.
16. Practical knowledge on induction of polyploidy conditions in plants.

BOT-RE-6016: Analytical Techniques in Plant Sciences

1. Learn about principle of microscopy, flow cytometry, applications of fluorescence microscopy, chromosome banding, FISH, chromosome painting; transmission and scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.
2. Knowledge on different types of centrifugation, marker enzymes.
3. Learn about use of Radioisotopes in biological research, auto-radiography, pulse chase experiment.
4. Learn about principle and application of spectrophotometer in biological research.
5. Knowledge on different chromatographic techniques used in research.
6. Learn about mass spectrometry, X-ray diffraction, X-ray crystallography, characterization of proteins and nucleic acids, electrophoresis.
7. Understand various statistical methods of analysis, measures of central tendency: arithmetic mean, mode, median; measures of dispersion: Range, mean deviation, variation, standard deviation, chi-square test for goodness of fit.
8. Understand the concept of blotting technique, DNA finger printing, DNA sequencing and PCR through photograph.
9. Understand the concept of ELISA.
10. Practical knowledge on TLC.
11. Practical knowledge on isolation of Chloroplasts by differential centrifugation.
12. Practical knowledge on column chromatography.
13. Practical knowledge on protein estimation through Lowry's method.

14. Practical knowledge on PAGE.
15. Practical knowledge on separation of DNA (marker) using AGE.
16. Practical knowledge on different microscopic techniques using photographs/micrographs.

BOT-RE-6026: Dissertation

1. Practical knowledge on addressing relevant scientific questions through experimentation.

Skill Enhancement Papers

BOT-SE-3014: Biofertilizers

1. Basic knowledge on the microbes used as biofertilizer, and understanding the process of their isolation, identification, mass multiplication, carrier based inoculants and knowledge on Actinorrhizal symbiosis.
2. Concept on the general characteristics, isolation, mass multiplication carrier based inoculants of *Azospirillum* and *Azotobacter* also the knowledge on the crop response to *Azotobacter*.
3. Basic knowledge on Cyanobacteria including factors affecting growth of Cyanobacteria, concept on the nitrogen fixation and use of blue green algae in rice cultivation.
4. Brief knowledge on the Mycorrhizal association and understand the details of various types, taxonomy, occurrence, distribution and growth parameters of Mycorrhiza.
5. Details about the organic farming, maintenance and recycling of biodegradable waste material and understand the methods of making biocompost and vermicompost with application.

BOT-SE-3024: Herbal Technology

1. Concept on the plants used as traditional medicine, and understanding the process of cultivation, harvesting, processing, storage, marketing and utilization of medicinal plants.
2. Brief knowledge on medicinal drugs obtained from plants and comprehensive idea about systematic position, medicinal uses of Tulsi, Ginger, Fenugreek, Indian goose berry and Ashoka.
3. Concept on the phytochemistry of medicinal herbs and identification, utilization of medicinal plants.
4. Basic knowledge on quality control, owing the medicinal properties of herbal drugs including the secondary metabolites and concept of drug adulteration, types, methods of drug evaluation.
5. Understand the process of micro propagation of important medicinal plant species.

BOT-SE-4014: Nursery and Gardening

1. Brief idea about objectives, scope, infrastructure and maintenance of Nursery.
2. Concept on structure, types and dormancy of seeds and brief idea about seed storage including types and process and knowledge on seed production technology.
3. Knowledge on various modes of vegetative propagation and maintenance of plants in green house.
4. Brief idea about development and maintenance of gardening including scope and types and understand the various gardening operations including management of pests and diseases.
5. Detail knowledge on managements of seeds and seedlings and concept about cultivation, storage and marketing of important vegetables.

BOT-SE-4024: Floriculture

1. Basic knowledge including history, importance and scope of floriculture.
2. Brief idea about Nursery management and garden operations and knowledge on the terms related to gardening and concept about role of plant growth regulators.

3. Covers the knowledge of various ornamental plants and concept of cultivations of plants in pots and knowledge about Bonsai.
4. Idea about various garden designs and features of such gardens and knowledge about some famous gardens of India.
5. Knowledge about the process of making garden more attractive by altering the existing design in places of public importance, highways and educational institute.

BOT-SE-4034: Intellectual Property Right

1. Knowledge on IPR, their types and infringement.
2. Understanding about traditional knowledge and their protection, bio-prospecting and bio-piracy.
3. Knowledge on protection of plant varieties, farmer rights.
4. Knowledge on Information technology related IPR; data, database, chips and domain name protection.
5. Knowledge on novelty, bio-based patenting, and moral issues associated with biotechnological inventions.

BOT-SE-5014: Medicinal Botany

1. Knowledge on medicinal plants and indigenous medicinal sciences/systems of India.
2. Understanding about the endangered and endemic medicinal plants, conservation issues and types.
3. Knowledge on ethno-medicinal gardens, nursery and its classifications and components.
4. Understanding ethno-botany, folk medicines and ethnic communities; Knowledge on applications of ethno-medicine/natural products for treatment of jaundice, cardiac, infertility, diabetics, blood pressure and skin diseases.

BOT-SE-5024: Plant Diversity and Human Welfare

1. Understanding diversity of plants at genetic, species and ecosystems level, Knowledge on agrobiodiversity, cultivated and wild taxa, importance of plants and microbes and their uses.
2. Understanding importance of biodiversity, their loss and management/conservation strategies and types of conservation, Knowledge on various associations/organizations associated with biodiversity conservations.
3. Understanding sustainable developments, Knowledge on importance of plants in human welfare.

BOT-SE-6014: Ethnobotany

1. Understanding the concept of ethno-botany and its relation to other branches of science, knowledge on ethnic/tribal groups of India, their life styles and plants used by them for various purposes and their role in conservation of medicinal plants.
2. Knowledge on methodologies of ethno-botanical studies, importance of ethno-botany in modern medicine and to protect the interest of ethnic groups.

BOT-SE-6024: Mushroom Culture Techniques

1. Understanding concept of mushroom culture technology; knowledge on edible and poisonous mushrooms, medicinal values of mushrooms and types of edible mushrooms.
2. Understanding the cultivation techniques of mushrooms and factors associated with their cultivations; knowledge on low cost technology for mushroom production.
3. Knowledge on storage and nutraceutical values of mushrooms; understanding on food preparations and marketing of mushroom.