Course Outcome (CBCS)
B.Sc. Botany (Generic)

Department of Botany
Nalbari College, Nalbari, Assam - 781335

Botany Regular
Course Outcomes

Core Papers

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

CO1. Understand the origin, structure, reproduction pattern and economic importance of virus and bacteria
CO2. Knowledge on characteristics features, classifications, reproductive mechanisms, life cycle pattern and ecology of different genera of algae and fungi
CO3. Understand the importance/significance and mechanism of symbiotic associations of algae-fungi and fungi-higher plants
CO4. Knowledge on archegoniate and alternation of generations
CO5. Knowledge on classifications, reproductive mechanisms, ecology, evolution and economic significances of bryophyte, pteridophyte and gymnosperm
CO6. Knowledge on T phage and TMV, lytic and lysogenic cycles of viruses
CO7. Know about different types of bacteria, their structure and reproduction types, gram staining procedures
CO8. Knowledge on morphology, anatomy and reproductive structures of different general of algae, fungi, bryophytes, pteridophyte and gymnosperms

BOT-RC-2016: Plant Ecology and Taxonomy

CO1. Basic knowledge on Ecology, Know about ecological factors, law of tolerance, Adaptation of hydrophytes and xerophytes

CO2. Knowledge on plant communities and its characteristics, processes and types of succession
CO3. Understanding concept of ecosystem and its structure, knowledge on production and productivity in ecological pyramids, biogeochemical cycles of Carbon, Nitrogen and Phosphorus
CO4. Knowledge on phytogeography and principle of biogeographical zones of India
CO5. Knowledge on plant taxonomy, its identification, Classification and Nomenclature
CO6. Understanding on plant Identification, importance of herbarium and botanical gardens of the world and India, documentation and Keys
CO7. Knowledge on taxonomic evidences from palynology, cytology, phytochemistry and molecular data, understanding about taxonomic hierarchy such as ranks, categories and taxonomic groups
CO8. Knowledge on Botanical nomenclature, binominal system Principles and rules (ICN), classifications and types of classification
CO9. Knowledge on characters used in taxonomy and variations of biometrics, numerical taxonomy and cladistics
CO10. Practical Knowledge on ecological instruments such as Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter
CO11. Practical knowledge on determination of minimal quadrat size for the study of herbaceous vegetation by species area curve method
CO12. Practical knowledge on Quantitative analysis of herbaceous vegetation for frequency and comparison with Raunkiaer's frequency distribution law
CO13. Practical knowledge on vegetative and floral characters of plant family Brassicaceae, Solanaceae and Lamiaceae
CO14. Hands on preparation of herbarium sheet with proper mounting and pressing of dried wild plant specimen

BOT-RC-3016: Plant Physiology and Metabolism

CO1. Knowledge on different types of plant-water relationship, their significance and factors
CO2. Knowledge on different mineral nutrients, their roles on plants, different types of transport and their mechanisms, knowledge on different carriers, channels and pumps
CO3. Understanding phloem loading and unloading, pressure flow model
CO4. 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
CO5. Basic knowledge on different pathways of respiration
CO6. Knowledge on structure and properties of enzyme and their catalysis and inhibition mechanisms
CO7. Knowledge on biological nitrogen fixation and metabolism
CO8. Knowledge on discovery and physiological roles of different plant growth regulators, Understanding plant responses to light and temperature
CO9. 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
CO10. 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

CO1. Understand the meristematic and permanent tissue of plants
CO2. Knowledge on the structure of monocot and dicot root, stem and leaf
CO3. Basic knowledge on vascular cambium, secondary growth in root and stem
CO4. Knowledge on epidermis, cuticle, stomata, adaptation in xerophytes and helophytes
CO5. Knowledge on the structure of anther and pollen, structure and types of ovules, types of embryo sacs,
organization and ultrastructure of mature embryo sac
CO6. Understand the mechanism of pollination and adaptations, double fertilization, seed structure, and
dispersal mechanism
CO7. Knowledge on endosperm types, structure, functions, and embryo-endosperm relationship
CO8. Basic knowledge on apomixis, polyembryony and their applications
CO9. 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: Cell and Molecular Biology

CO1. Understand the basic principle, function and working of microscopy used in research
CO2. Learn about the basics of cell and cell theory
CO3. Learn about the structure, composition and function of different cell organelles
CO4. Understand the structure and functions of cell membrane, membrane proteins and carbohydrates, membrane permeability and cell wall
CO5. Learn about cell cycle and its regulation at molecular level
CO6. Knowledge on history of DNA discovery, experiments related to DNA as the genetic material, structure and types of DNA and different modes of replication
CO7. Learn about types and structure of RNA, various types of RNA polymerases, basic knowledge on prokaryotic and eukaryotic translation and genetic code
CO8. Understand about regulation of gene expression in prokaryotes and eukaryotes
CO9. Practical knowledge on prokaryotic cells (bacteria), viruses and eukaryotic cells with the help of light and electron micrographs
CO10. Practical knowledge on photomicrographs of cell organelles
CO11. Practical knowledge on the structure of plant cell through temporary mounts
CO12. Practical knowledge on mitosis and meiosis
CO13. Practical knowledge on plasmolysis and deplasmolysis
CO14. Practical knowledge on micrometry
CO15. Understand the structure of nuclear pore complex by photograph and learn about special chromosomes either by slides or photographs.
CO16. Practical knowledge on micrograph study of DNA packaging
CO17. Practical knowledge on karyotype and ideogram preparation

BOT-RE-5026: Economic Botany and Biotechnology

CO1. Learn about the centres of origin of cultivated plants with special reference to Vavilov's work
CO2. Learn about the origin, morphology and uses of cereals
CO3. Understand about legumes with special reference to Gram and soybean
CO4. Learn about botanical name, family, part used, morphology and uses of spices with special reference to clove and black pepper
CO5. Knowledge on morphology, processing and uses of tea
CO6. Learn about fats and oils with special reference to groundnut
CO7. Knowledge on botanical name, family, parts used, morphology and uses of fiber yielding plants with special reference to cotton
CO8. A brief knowledge on biotechnology
CO9. Knowledge on plant tissue culture techniques
CO10. 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
CO11. Understand the aim, scope and branches of bioinformatics, repositories of Biological Data Knowledge and retrieval system
CO12. Learn about molecular phylogeny, basics in proteomics and genomics and their applications in crop improvement and drug discovery

PRACTICAL

CO13. Practical knowledge on economically important plants through specimens, sections and microchemical tests
CO14. Practical knowledge on basic equipments used in tissue culture
CO15. Understand anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation through photograph
CO16. Practical knowledge on molecular techniques
CO17. Practical knowledge on data base searching, and retrieval of Sequence from databases
CO18. Practical knowledge on sequence alignment, Homology and Phylogenetic tree

BOT-RE-5036: Genetics and Plant Breeding

CO1. Understand laws of inheritance, modified mendelian ratios, chi square, pedigree analysis, cytoplasmic inheritance, multiple allelism, pleiotropism and chromosomal theory of inheritance.
CO2. Understand basics of sex determination and sex-linked inheritance
CO3. Learn about types of linkage, bridges experiment, coupling & repulsion, recombination frequency, linkage maps, crossing over and cytological proof of crossing over
CO4. Knowledge on types of mutation, mutagens, numerical and structural chromosomal changes
CO5. Learn about basics of plant breeding, important achievements and undesirable consequences of plant breeding
CO6. Learn about centres of origin and domestication of crop plants, plant genetic resources; acclimatization, selection methods, hybridization procedure, advantages and limitations
CO7. Understand the concept and mechanism of quantitative inheritance

CO8. Understand genetic basis of inbreeding depression and heterosis.
CO9. Learn about role of mutations, polyploidy, distant hybridization and role of biotechnology in crop improvement.

PRACTICAL

CO10. Practical knowledge on Mendel's law
CO11. Practical knowledge on chromosome mapping using point test cross data
CO12. Practical knowledge on incomplete dominance and gene interaction
CO13. Knowledge of aneuploidy: Down's, Klinefelter's and Turner's syndromes through photographs
CO14. Practical knowledge of Translocation Ring, Laggards and Inversion Bridge
CO15. Practical knowledge of hybridization technique
CO16. Practical knowledge on induction of polyploidy conditions in plants

BOT-RE-6016: Analytical Techniques in Plant Sciences

CO1. 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
CO2. Knowledge on different types of centrifugations, marker enzymes
CO3. Learn about use of Radioisotopes in biological research, auto-radiography, pulse chase experiment
CO4. Learn about principle and application of spectrophotometer in biological research
CO5. Knowledge on different chromtoghrapic techniques used in research
CO6. Learn about mass spectrometry, X-ray diffraction, X-ray crystallography, characterization of proteins and nucleic acids, electrophoresis
CO7. 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

PRACTICAL

CO8. Understand the concept of blotting technique, DNA finger printing, DNA sequencing and PCR through
photograph
CO9. Understand the concept of ELISA
CO10. Practical knowledge on TLC
CO11. Practical knowledge on isolation of Chloroplasts by differential centrifugation
CO12. Practical knowledge on column chromatography
CO13. Practical knowledge on protein estimation through Lowry's method
CO14. Practical knowledge on PAGE
CO15. Practical knowledge on separation of DNA (marker) using AGE
CO16. Practical knowledge on different microscopic techniques using photographs/micrographs

BOT-RE-6026: Dissertation

CO1. Practical knowledge on addressing relevant scientific questions through experimentation

Skill Enhancement Papers

BOT-SE-3014: Biofertilizers

CO1. 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
CO2. Concept on the general characteristics, isolation, mass multiplication carrier-based inoculants of *Azospirillum* and *Azotobacter* also the knowledge on the crop response to *Azotobacter*
CO3. Basic knowledge on Cyanobacteria including factors affecting growth of Cyanobacteria, concept on the nitrogen fixation and use of blue green algae in rice cultivation
CO4. Brief knowledge on the Mycorrhizal association and understand the details of various types, taxonomy, occurrence, distribution and growth parameters of Mycorrhiza
CO5. 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

CO1. Concept on the plants used as traditional medicine, and understanding the process of cultivation, harvesting, processing, storage, marketing and utilization of medicinal plants
CO2. Brief knowledge on medicinal drugs obtained from plants and comprehensive idea about systematic position, medicinal uses of Tulsi, Ginger, Fenu greek, Indian goose berry and Ashoka
CO3. Concept on the phytochemistry of medicinal herbs and identification, utilization of medicinal plants
CO4. 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
CO5. Understand the process of micro propagation of important medicinal plant species.

BOT-SE-4014: Nursery and Gardening

CO1. Brief idea about objectives, scope, infrastructure and maintenance of Nursery
CO2. Concept on structure, types and dormancy of seeds and brief idea about seed storage including types and process and knowledge on seed production technology
CO3. Knowledge on various modes of vegetative propagation and maintenance of plants in green house
CO4. Brief idea about development and maintenance of gardening including scope and types and understand the various gardening operations including management of pests and diseases
CO5. Detail knowledge on managements of seeds and seedlings and concept about cultivation, storage and marketing of important vegetables

BOT-SE-4024: Floriculture

CO1. Basic knowledge including history, importance and scope of floriculture
CO2. Brief idea about Nursery management and garden operations and knowledge on the terms related to

gardening and concept about role of plant growth regulators
CO3. Covers the knowledge of various ornamental plants and concept of cultivations of plants in pots and knowledge about Bonsai
CO4. Idea about various garden designs and features of such gardens and knowledge about some famous gardens of India
CO5. 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

CO1. Knowledge on IPR, their types and infringement
CO2. Understanding about traditional knowledge and their protection, bio-prospecting and bio-piracy.
CO3. Knowledge on protection of plant varieties, farmer rights
CO4. Knowledge on Information technology related IPR; data, database, chips and domain name protection
CO5. Knowledge on novelty, bio-based patenting, and moral issues associated with biotechnological inventions

BOT-SE-5014: Medicinal Botany

CO1. Knowledge on medicinal plants and indigenous medicinal sciences/systems of India
CO2. Understanding about the endangered and endemic medicinal plants, conservation issues and types
CO3. Knowledge on ethno-medicinal gardens, nursery and its classifications and components
CO4. 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

CO1. 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
CO2. Understanding importance of biodiversity, their loss and management/conservation strategies and types
of conservation, Knowledge on various associations/organizations associated with biodiversity conservations
CO3. Understanding sustainable developments, Knowledge on importance of plants in human welfare

BOT-SE-6014: Ethnobotany

CO1. 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
CO2. 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

CO1. Understanding concept of mushroom culture technology, Knowledge on edible and poisonous

mushrooms, medicinal values of mushrooms and types of edible mushrooms
CO2. Understanding the cultivation techniques of mushrooms and factors associated with their cultivations, Knowledge on low-cost technology for mushroom production
CO3. Knowledge on storage and nutraceutical values of mushrooms, Understanding on food preparations and marketing of mushrooms