



**Darrang College
(Autonomous),
Tezpur-784001**

**Syllabus for
Postgraduate (CBCS)
Sub: Botany**

Approved by:

**Board of Studies meeting held on 25-06-2026 &
Academic Council vide Resolution no. DC/AC/3/2026/06 dated 29th June 2026**

**DEPARTMENT OF BOTANY
DARRANG COLLEGE, AUTONOMOUS
TEZPUR-784001**

**SYLLABUS FOR M.Sc. PROGRAMME (CBCS)
IN
BOTANY**

Effective from Academic Session 2025-2027

Paper Code	Name of the paper	Total Marks	Internal Assessment	Semester Exam	Teaching Hours/Week	Credits
First Semester						
BOT1016	Diversity I (Algae, Fungi, Bryophytes)	80	20	100	5	6
BOT1026	Diversity II (Pteridophytes, Gymnosperm and Angiosperm)	80	20	100	5	6
BOT1036	Ecology, Environment and Resource Management	80	20	100	5	6
BOT1044	Practical: Algae, Fungi, Bryophytes and Pteridophytes	80	20	100	9	4
BOT1054	Practical : Gymnosperm, Angiosperm, Ecology	80	20	100	9	4
Second Semester						
BOT2016	Cytogenetics , Plant Breeding & Evolution	80	20	100	5	6
BOT2026	Microbiology and Plant Pathology	80	20	100	5	6
BOT2036	Plant Physiology and Biochemistry	80	20	100	5	6
BOT2044	Practical Paper: Microbiology, Plant pathology and Cytogenetics	80	20	100	9	4
BOT2054	Practical: Plant Physiology Biochemistry	80	20	100	9	4
Third Semester						
BOT3016	Reproductive and Developmental Botany, Biostatistics	80	20	100	5	6
BOT3026	Molecular Biology, Plant Biotechnology & Bioinformatics	80	20	100	5	6
BOT3036	Research Methodology and Bioinstrumentation	80	20	100	5	6
BOT3044	Practical - Anatomy, Reproductive and Developmental Botany, Biostatistics	80	20	100	9	4
BOT3054	Practical-Molecular Biology, Plant Biotechnology & Bioinformatics	80	20	100	9	4
Fourth Semester						
BOT4015	Angiosperm Taxonomy Special Paper I	80	20	100	5	5
BOT4025	Angiosperm Taxonomy Special Paper II	80	20	100	5	5
BOT4035	Angiosperm Taxonomy Special Paper III	80	20	100	5	5

BOT4045	Angiosperm Taxonomy Special Paper Dissertation	80	20	100	9	5
BOT4054	Angiosperm Taxonomy Special Paper Practical	80	20	100	9	4
BOT4115	Plant Ecology Special Paper I	80	20	100	5	5
BOT4125	Plant Ecology Special Paper II	80	20	100	5	5
BOT4135	Plant Ecology Special Paper III	80	20	100	5	5
BOT4145	Plant Ecology Special Paper Dissertation	80	20	100	9	5
BOT4154	Plant Ecology Special Paper Practical	80	20	100	9	4
BOT4215	Mycology and Plant Pathology Special Paper I	80	20	100	5	5

BOT4225	Mycology and Plant Pathology Special Paper II	80	20	100	5	5
BOT4235	Mycology and Plant Pathology Special Paper III	80	20	100	5	5
BOT4245	Mycology and Plant Pathology Special Paper Dissertation	80	20	100	9	5
BOT4254	Mycology and Plant Pathology Special Paper Practical	80	20	100	9	4
BOT4265	Plant Physiology and Biochemistry Special Paper I	80	20	100	5	5
BOT4275	Plant Physiology and Biochemistry Special Paper II	80	20	100	5	5
BOT4285	Plant Physiology and Biochemistry Special Paper III	80	20	100	5	5
BOT4295	Plant Physiology and Biochemistry Special Paper Dissertation	80	20	100	9	5
BOT4304	Plant Physiology and Biochemistry Special Paper Practical	80	20	100	9	4

Programme specific outcome:

M. Sc. in Botany

Understand the diversity, life cycle pattern, phylogeny and economic values of Cryptogmic and Phanerogamic plants of the NE Region.

Analyse the biotic and abiotic interactions in different ecosystems. Understanding basic concepts and recent trends in Cytology, Genetics and Plant Breeding, Plant Physiology and Biochemistry, Microbiology, Plant Ecology, Mycology and Plant Pathology

Train up skill human resources in the field of Angiosperm Taxonomy.

Perform procedures as per laboratory standards in the above mentioned areas. Understand the application of plant resources in agriculture, health care, industry and other environmental issues.

FIRST SEMESTER

Allotment of Marks and Credits

Paper(s)	Course work	Internal Assessment	Total	Credit	Class/week
BOT 1016	80	20	100	6	5
BOT 1026	80	20	100	6	5
BOT 1036	80	20	100	6	5
BOT 1044	80	20	100	4	9
BOT 1054	80	20	100	4	9
Total	400	100	500	26	33
Examination Time:		Theory3 (Three Hours);		Practical...5 (Five Hours)	

BOT 1016 Diversity I (Algae, Fungi, Bryophytes)

Unit-I

Algae: Diversity and classification, recent trends in the classification, pigmentation, morphology and reproduction, phylogeny and interrelationships among different groups, patterns of life cycle and post fertilization stages in Chlorophyta, Xanthophyta, Phaeophyta and Rhodophyta, Ecological importance in different habitats, Algal indicators, Algal blooms, Eutrophication, Productivity in fresh water and marine environment, symbiotic association, Algal culture.

Unit-II

Fungi: Characteristics of fungi and cell structure, recent trends in classification and phylogeny, major groups and their interrelationships. Different mode of reproduction, parasexuality and degeneration of sex in fungi.

Unit-III

Fungi: Physiological and ecological specialization (coprophilous, cellulolytic, entomogenous and lignolytic); Mutualism: Mycorrhiza, Lichen; Parasites: common parasites of plants and humans, Saprophytes - decomposition of organic matter, Economic importance.

Unit-IV

Lichen: Classification and nomenclature, structure and reproduction, mechanism of phycobiont and mycobiont interaction, lichen as ecological indicator.

Unit-V

Virus: Types and nomenclature of viruses, replication of RNA and DNA viruses, virus-vector

relationships, tumor virus, viroids, prions and interferons.

Bacterial cell: Ultra structure, cell wall, different groups of bacteria, recent developments in classification.

Unit-VI

Bryophytes: Origin, evolution, classification, biochemistry, physiology and ecology; diversity and distribution in North East India, Economic importance. Morphological, anatomical and reproductive diversity, Morphogenesis, Evolution of gametophytes and sporophytes; Bryophytes as pollution indicator and monitoring.

BOT 1026

Diversity II (Pteridophytes, Gymnosperm and Angiosperm)

Unit-I

Pteridophyta: Origin and evolution of Pteridophytes; Telome concept; stellar evolution; heterospory and origin of seed habit; classification of vascular cryptogams. Morphological, anatomical and reproductive diversity, soral evolution in ferns, gametophytic structure in eusporangiate and leptosprongiate forms and evolution of sex.

Unit-II

Palaeobotany: Geological time scale, fossilization process, classification and nomenclature of fossil plants, techniques in studying fossils, fossils vs. evolution. General account of major fossil groups - Psilophytales, Zosterophyllales, Sphenophyllales, Calamitales, Coenopteridales.

Unit-III

Gymnosperms: Classification and salient features of major taxa; characteristics, affinities and relationships of Ginkgoales, Coniferales, Taxales and Gnetales.

Unit-IV

Angiosperms: Historical background of Plant Taxonomy; Pre Darwinian, Post Darwinian and recent system of classifications (Takhtajan, Cronquist, APG); recent trends in Taxonomy; ICN- History, Principles and major rules of nomenclature, type concept, principles of priority and its limitation, effective and valid publication, author citation; plant collection and documentation; importance of botanical gardens and herbaria in taxonomic studies: important botanical gardens in India and abroad; Botanical Survey of India.

Unit-V

Phylogeny and affinities of Magnoliales, Ranunculales, Euphorbiales, Scrophuriales, Lamiales, Asterales, Orchidales, Zingiberales, Poales.

Unit-VI

Morphology: Origin and evolution of Angiosperms; Inflorescence and flowers; Co- evolution of flower and pollinators; Morphology of stamens and carpels; staminodia; nectaries; types of ovaries, morphology of inferior ovary; placenta and placentation.

BOT 1036

Plant Ecology, Environment and Resource Management

Unit –I

The Environment- physical and biotic; Definition, principle and scope of ecology, ecological factors. Concept of habitat and nicheresource partitioning; character displacement.

Unit -II

Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection). Ccommunity structure and attributes; levels of species diversity and its measurement; edges and ecotones. Methods of studying plant communities. Ecological succession- types; mechanisms; changes involved in succession; concept of climax. Ecosystem- types; structure; function; energy flow and mineral cycling (C, N, P & S).

Unit -III

Biodiversity – concept, components and types; importance of biodiversity conservation, Principles and practices, different approaches for biodiversity conservation-In-situ and ex-situ conservation.

Unit -IV

Environmental pollution- sources, types of pollutants of various industrial effluents such as pulp and paper mills, oil exploration and refinery, petrochemicals, iron and steel industries, domestic wastes, organic debris, agricultural wastes, pesticides. Effects of pesticides on soil components, residual toxicity and pollution. Global climate change: greenhouse effects, ozone layer depletion, acid rain.

Unit -V

Origin, evolution, botany, cultivation and uses of (i) Food & beverage (ii) fiber & oil (iii) medicinal and aromatic plants; important timber-yielding plants and NTFPs. Green revolution: Benefits and adverse consequences, innovations for meeting world food demands, GMO, INM, IPM.

Unit -VI

Dynamic phytogeography and its basic principles , theories and hypotheses, centre of origin of cultivated plants, plant migration, theory of tolerance, age and area hypothesis, concept of endemism, megacentres of endemism in India, endemic plants of India with special reference to N E India, phytogeographic regions of the world and India and their characteristic vegetations. Characteristic flora of N E India.

BOT 1044

Practical Paper : Algae, Fungi, Bryophytes and Pteridophytes

1. Study of range of thallus organization and reproductive structures of algae with the help of suitable representatives.
2. Gram staining, flagella staining, capsule staining and acid fast staining of bacteria.
3. Collection and study of symptoms of virus infected plants.
4. Study of morphological, anatomical and reproductive features of some fungi growing in Assam
5. Study of morphological and anatomical features of some lichens growing in Assam
6. Study of some important genera of Bryophytes available in NE India with respect to their morphology, anatomy and reproductive structures.
7. Study of some important fossil and living members of major groups of Pteridophytes.

BOT 1054

Practical Paper : Gymnosperms, Angiosperms, Plant Ecology and Resource Management

1. Determination of minimum size and number of quadrates necessary to study herbaceous communities
2. Determination of abundance, density, frequency, basal cover of plant communities by quadrat method.
3. Estimation of above ground and below ground biomass from unit area.
4. Effect of biotic disturbances on botanical composition.
5. Study of similarity between plant communities using index of similarity and dissimilarity.
6. Estimation of dissolved oxygen content in eutrophic and oligotrophic water samples.
7. Study on effects of effluents/contaminants on plant growth.
8. Morpho-anatomical adaptive features of hydrophytes and xerophytes.
9. Preparation of a map of India showing biogeographical zones.
10. To plot Biosphere Reserves/ Ramsar sites/ National Parks/Wildlife Sanctuaries located in different biogeographical zones of India in general and NE India in particular.
11. Study of morphological, anatomical and reproductive features of gymnosperms available in the region.
12. Study of Angiospermic plants with analytical drawings, botanical description and identification up to the rank of species
13. Study of special types of inflorescence, primitive and advance flowers, ovaries and fruits
14. Collection and preparation of herbarium specimens of common plants for familiarization of herbarium techniques.
15. Morphological and anatomical studies on economically important plants/ Part (s) of cotton, jute, tea, bay leaf, rauwolfia, tulsi.
16. Field study report.

SECOND SEMESTER

Allotment of Marks and Credits

Paper(s)	Course work	Internal Assessment	Total	Credit	Class/week
BOT 2016	80	20	100	6	5
BOT 2026	80	20	100	6	5
BOT 2036	80	20	100	6	5
BOT 2044	80	20	100	4	9
BOT 2054	80	20	100	4	9
Total	400	100	500	26	33
Examination Time:		Theory3 (Three Hours);		Practical...5 (Five Hours)	

BOT 2016

Cytogenetics, Plant Breeding and Evolution

Unit -I

Structural organization and function of intracellular organelles, cytoskeleton; structure of prokaryotic and eukaryotic chromosomes, centromeres and telomeres. specialized chromosomes, euchromatin and heterochromatin, cell division and cell cycle, regulation and control.

Unit-II

Genome organization, genome size and C-value paradox, DNA packaging, unique and repetitive DNA, linkage, recombination and crossing over, linkage mapping. sex-linked inheritance, cytoplasmic inheritance.

Unit-III

Transcriptional regulation in prokaryotes, operon system for lactose, tryptophan and arabinose metabolism; Molecular basis of mutation, spontaneous, reverse and suppressor mutations, transposable genetic elements.

Unit-IV

DNA damage and repair; in born errors of metabolism, metabolic pathways, overview of the metabolic basis of inherited diseases. `

Unit-V

Principle of plant breeding; distant hybridization, barrier to distance hybridization, techniques

for distant hybridization; back Cross methods of plant breeding; breeding for quantitative characters, handling of quantitative data, environmental effect on quantitative characters, estimation of heritability and genetic advance.

Unit-VI

Evolution, co evolution, Lamarckism, Darwinism, synthetic theory, Wiseman's theory, modern theory of evolution.

BOT 2026

Microbiology and Plant Pathology

Unit-I

Microbial diversity: 'Species' and 'Strain' concept in microbiology, ICN for virus, bacteria and other microbes, microbiome concept, ecological significance of microbes, microbiology of soil, air, water and milk.

Unit-II

Microbial techniques: sterilization techniques, population estimation (direct spore count, CFU, spectrophotometric method), pure culture and visualization techniques, culture preservation and maintenance, taxonomic and functional characterization of microbes.

Unit-III

Microbial genetics & Physiology: Mode of reproduction (vegetative, asexual & sexual), genetic recombination, mode of nutrition, growth conditions and nutritional requirements, different metabolic pathways (respiratory and photosynthetic).

Unit-IV

Plant Pathology: Principles of plant pathology, mechanism of pathogenesis, symptomatology and epidemiology, host defense mechanism, causal organism and etiology of certain important plant diseases occurred in NE India

Unit-V

Immunology: Innate and acquired immunity, antibodies, cells and tissues of the immune system, immune diseases, serological reactions and serodiagnostics, cancer biology,

Unit-VI

Applied microbiology: Application of microbes in the field of agriculture, fermented foods

and dairy products, industry and bio-waste management.

BOT 2036

Plant Physiology and Biochemistry

Unit-I

Membrane structure and function: Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes. Biomolecules: their structures and functions: Carbohydrate, lipids, proteins.

Unit-II

Enzymes: Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes; Protein synthesis and processing: Nitrate and ammonium assimilation; amino acid biosynthesis. Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, Post- translational modification of proteins.

Unit-III

Photosynthesis: Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO₂ fixation-C₃, C₄ and CAM pathways.

Respiration and photorespiration: Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway.

Unit-IV

Plant hormones: Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action.

Unit-V

Sensory photobiology: Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement.

Unit-VI

Solute transport and photo-assimilate translocation: uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; mechanisms of loading and unloading of photoassimilates.

BOT 2044

Practical Paper: Microbiology, Plant Pathology and Cytogenetics

1. Isolation and pure culture of microbes from soil, air and water
2. Identification and characterization of isolated pure cultures
3. Estimation of water quality
4. Identification and characterization of milk bacteria and nodule bacteria
5. Methylene blue reductase test for bacterial contamination of milk
6. Estimation of bacterial growth by spectrophotometric method and counting of cells
7. Effect of physical and chemical factors on growth of microbes
8. Study of plant pathogenic fungi from diseased specimens (symptoms, causal organism and their morphological & reproductive characters)
9. Spore measurement and camera lucida diagram
10. Chromosome analysis, study of chromosome behaviour in mitosis and meiosis, chromosome anomalies in plant cells.
11. Principle, techniques and procedure of emasculation.

BOT 2054

Practical Paper: Plant Physiology and Biochemistry

1. Preparation of normal, molar, molal and ppm solutions
2. Extraction of proteins from plant materials and estimation by Lowry's method using BSA standard curve.
3. Extraction of carbohydrates from plant materials and estimation of reducing and non reducing sugars.
4. Extraction of oil/fat from plant materials
5. Extraction of plant phenols and estimation of total phenols.
6. Extraction of chloroplast pigments and quantitative estimation; Determination of chlorophyll a/b ratio and total chlorophyll in C3, C4 and CAM plants.
7. Separation of amino acid mixture by thin layer / paper chromatography.

THIRD SEMESTER **Allotment of Marks and Credits**

Paper(s)	Course work	Internal Assessment	Total	Credit	Class/week
BOT 3016	80	20	100	6	5
BOT 3026	80	20	100	6	5
BOT 3036	80	20	100	6	5
BOT 3044	80	20	100	4	9
BOT 3054	80	20	100	4	9
Total	400	100	500	26	33
Examination Time:		Theory3 (Three Hours);		Practical...5 (Five Hours)	

BOT 3016

Reproductive and Developmental Botany, Biostatistics

Unit-I

Basic concepts of development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogen gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; genomic imprinting; mutants and transgenics in analysis of development.

Unit-II

Sporogenesis and Gametogenesis in plants; pollination, double fertilization, embryogenesis, development of endosperms, types of endosperms; polyembryony, seeds and seed development, seed dispersal; apomixis, apospory, parthenocapcy; comparative embryology

Unit-III

Morphogenesis and organogenesis in plants: Organization of shoot and root apices; shoot and root development; root-stem transition; leaf development and phyllotaxy; Transition to flowering and development of flower

Unit-IV

Periderm: Origin and activity, Rytidome, protective tissue in Monocotyedons, bark and cork; Cambium- Origin, function, behaviour (normal and abnormal).

Unit-V

Palynology: Pollen morphology, ultrastructure, pollen chemistry, viability, storage and adaptation; Applications of palynology: aeropalynology and pollen allergy, melissopalynology, forensic palynology, palaeopalynology and hydrocarbon exploration.

Unit-VI

Biostatistics: Measures of central tendencies; mean, mode, median, standard errors and standard deviations. Probability; normal, binomial and poisson distribution; Skewness and kurtosis. Degrees of freedom, Null hypothesis, T-test, Chi Square test, F-test; Analysis of variance (ANOVA): Variance and co-variance analyses, Correlation and methods of studying the correlation, Regression and methods of studying regression, Statistical software packages and their importance in data analysis.

BOT 3026

Molecular Biology, Plant Biotechnology & Bioinformatics

Unit-I:

Physical properties of DNA (UV absorption spectra, denaturation and renaturation), DNA topology, DNA - Protein Interactions, DNA replication, RNA synthesis and processing, small RNAs

Unit-II:

Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial chemotaxis and quorum sensing.

Unit-III:

Principles of genetic engineering, cloning vectors, enzymes involved in rDNA technology, transformations, IPR, legal and biosafety issues related to GMOs. DNA markers and its application in genetic diversity study, genome analysis, genetic mapping, molecular systematics and diagnosis.

Unit-IV:

Plant Tissue Culture: importance, requirements, culture medium, culture of plant tissues: root, meristem anther, pollen and protoplast culture; in vitro differentiation: organogenesis and somatic embryogenesis; role of tissue culture in crop improvements, Somatic hybridization: protoplast fusion, cybrids

Unit-V:

Molecular Basis of Plant Growth and Development: Molecular mechanisms of light perception, signal transduction and gene regulation; Biological clocks and their genetic and molecular determinants, Molecular genetics of floral development and floral organ differentiation. Hormone signal perception, transduction and regulation of gene expression during plant development.

Unit-VI:

Introduction to bioinformatics, biological databases, data mining and retrieval, scope and application of bioinformatics, nucleic acid and protein sequence analysis, sequence alignment, local and global alignment, database search for homologous sequences-BLAST and FASTA, protein structure analysis, Ramachandran plot, computer-aided drug discovery.

BOT 3036**Research Methodology and Bioinstrumentation**

Unit- I:

Meaning and importance of research, Types of research, Research hypothesis, Writing of Dissertation, Reports, Research Articles, Research and Publication ethics, Plagiarism.

Unit- II:

Sample and sampling, techniques for collection of field samples (plant, soil and water); Dos and don'ts in fields; Lab safety measures, code of conduct in laboratory, handling of chemicals; First aid in field and lab, Experimental design.

Unit- III:

Reagents preparation, Concept of normal, molar and molal, parts per million (ppm), parts per billion (ppb); Buffer and Standard solution- concept and procedures for preparation, standard curve and its importance.

Unit- IV:

Microscopy: Types, Basics of staining and imaging techniques, Principles and applications of different microscopes (light, dark field, phase contrast, fluorescence, confocal, scanning and transmission electron microscopes), Chromosome banding, FISH; Microtomy and herbarium techniques; Macro and micro-morphological studies of plants.

Unit- V:

Spectrophotometry and Chromatography: Principles and applications of UV-VIS, Circular Dichroism, Optical Rotatory Dispersion; basic knowledge on Fluorescence spectrophotometer, Infrared spectroscopy, FTIR, NMR, ESR, AAS, TLC, GCMS, HPLC, LCMS.

Unit- VI:

PCR and Electrophoresis Techniques: Different types of PCR; Principles of electrophoresis, Agarose gel electrophoresis, SDS-PAGE, 2D gel electrophoresis; centrifugation techniques, differential and density gradient centrifugation, DNA sequencing methods, Radio-Isotope tracer techniques.

BOT 3044**Practical – Anatomy, Reproductive and Developmental Botany, Biostatistics**

1. Study of anomalous secondary growth of selective families of Angiosperms.
2. Study of developmental stages of leaf, stem and root.
3. Preparation of pollen grain slides by following different techniques.
4. Study of microsporogenesis, megasporogenesis, embryosacs and endosperms with the help of permanent slides.
5. Preparation of permanent slides by the process of microtome technique
6. To work out mean, mode, median, standard errors and standard deviation
7. Field study and Visit to different Research Institutions/Universities/Centers/ Botanical Garden/ Herbaria within India.

1. Protein isolation and gel electrophoresis
2. DNA isolation, quantification and electrophoresis
3. Restriction digestion and mapping
4. PCR reaction and gel electrophoresis
5. Regeneration of plantlets through tissue culture
6. Culture of Mushroom
7. Production of Synthetic Seeds
8. Sequence (protein/DNA) downloading from databases, alignment and homologous sequence search
9. Sequence BLAST, annotation and gene prediction with the help of bioinformatical tools.
10. Protein modeling and structure prediction

FOURTH SEMESTER

Optional –I:: Angiosperm Taxonomy (Special Paper)

Allotment of Marks and Credits

Paper(s)	Course work	Internal Assessment	Total	Credit	Class/week
BOT 4015	80	20	100	5	5
BOT 4025	80	20	100	5	5
BOT 4035	80	20	100	5	5
BOT 4045	80	20	100	5	9
BOT 4054	80	20	100	4	9
Total	400	100	500	24	33
Examination Time:	Theory3 (Three Hours);		Practical...5 (Five Hours)		

BOT 4015

Unit-I

Basics of Taxonomy: Concept, Aims and Principles, Alpha and Omega taxonomy; Concept of Phenetic, Phyletic, and Phylogenetic classification; Classificatory Systems: Pre- and Post Darwinian Classifications, Recent development of classificatory system in Angiosperms-APG System

Unit-II

Phenetic Methods: Taxometric: Principles, OTUs, coding of characters, Measuring Resemblances, Cluster analysis, Application of Taxometric

Phylogenetic Methods: Cladistic taxonomy, Character analysis, Cladogram construction and Analysis.

Unit-III

Taxonomic Structure: Concept of Taxa; Concept of Species, Genus, Family and Infra specific categories

Unit-IV

Material basis of Taxonomy: Concept of Character; Character Correlation, Weighing, Variations; Isolation and Speciation.

Unit-V

Botanical Nomenclature: History, Principles and Major rules, Typification, Effective and Valid Publication, Authors' citation, Principles of Priority and Limitations, synonym, basionym, nomina conservanda, rejection of names, illegitimate names, nomen nudum,

tautonym, later homonym.

BOT 4025

Unit-I

Sources of Taxonomic Characters: Morphology, Anatomy, Palynology, Embryology, Cytology, Phytochemistry, Serology., major areas.

Unit-II

Modern Approach to Taxonomy: Molecular Approach in taxonomy, Diagnostic tools, Polymerase Chain Reaction (PCR) analysis, applications of molecular markers in plant taxonomy; Biosystematics: Definition, importance and categories; Role of computers in taxonomic studies, commonly available softwares

Unit-III

Taxonomic Literature: Classical and recent literature of World in general and India in particular (World flora, Indian flora); Taxonomic journals, Icones, Check list, Illustrations

Unit- IV

Process of Identifications: Herbarium techniques: Methods of Collection, Identification and Documentation; Roles and importance of herbaria, Botanical Gardens and Museums in taxonomic studies, major Herbaria and Botanic Gardens in World and India.

Unit-V

Botanical exploration: Contributions made in earlier and recent periods. Presentation of Data : Flora, Manuals, Monograph, Revision; Preparation of a flora; Botanical keys, their construction and uses.

BOT 4035

Unit-I: Phytogeography:

Concept, Static and Dynamic Phytogeography, Phytochoria and botanical provinces of India; Major theories, Ranges, Migration and Barriers; Centres of Origin; Vicariance biogeography; Endemism; IUCN categories; Hotspots, India as a megadiversity country; plant introduction and acclimatization.

Unit-II: Flora of North East India:

Characteristics of flora of Northeast India; Endemic, Exotics and RET Plants of North East

India, their multiplication and conservation.

Unit-III: Botanical Survey of India:

History, Activities, Publications.

Unit-IV: Origin and Evolution:

Characteristic features of early Angiosperms; Origin of Angiosperms, Primitive and advanced angiosperms; Evolutionary trends in Angiosperms.

Unit-V: Phylogeny and Evolution of Angiospermic Taxa:

Magnoliales, Ranunculales, Euphorbiales, Scrophulariales, Lamiales, Asterales, Alismatales, Orchidales, Poales, Zingiberales.

BOT 4045

Dissertation

Dissertation =	50
Viva-Voce =	30
Internal Assessment =	20
Total =	100

BOT 4054

1. Floristic studies of locally available angiospermic plants in and around Greater Guwahati, their collections, describing with analytical drawing, botanical keys and identification up to the rank of species.
2. Practices on Nomenclatural problems
3. Plotting of various centers of BSI, Botanical Gardens and Herbaria in different regions of India.
4. Practices on identification of taxa /herbarium specimens.

Optional –III:: Plant Ecology (Special Paper)

Allotment of Marks and Credits

Paper(s)	Course work	Internal Assessment	Total	Credit	Class/week
BOT 4115	80	20	100	5	5
BOT 4125	80	20	100	5	5
BOT 4135	80	20	100	5	5
BOT 4145	80	20	100	5	9
BOT 4154	80	20	100	4	9
Total	400	100	500	24	33

Examination Time: Theory3 (Three Hours); Practical...5 (Five Hours)

BOT 4115

Unit –I

Development of ecology in India from ancient to recent times, evolutionary ecology, Interaction of ecological factors in the environment. Principles pertaining to limiting factors. Biogeochemical cycles.

Unit -II

Population concepts- characteristics, dynamics and control. mechanisms of population regulation, habitat specific demography, population viability analysis. Species interactions- types of interactions, interspecific competition, herbivory, carnivory, symbiosis, allelopathy, weed-crop interference. Concept of metapopulation – demes and dispersal, interdemec extinctions, age structured populations. Ecological amplitude of a species and adaptation - ecads, ecotypes, ecospecies.

Unit -III

Concepts of community and continuum; analysis of communities (analytical and synthetic characters); community coefficients; interspecific associations; ordination; concept of ecological niche, species diversity (α , β , γ) .

Unit -IV

Vegetation development, temporal changes (cyclic and non-cyclic); mechanism of ecological succession (relay floristics and initial floristic composition; facilitation, tolerance and inhibition models); changes in ecosystem properties during succession.

Unit -V

Principles and basic concepts of remote sensing; application of remote sensing in environmental studies: land use mapping, forest survey, habitat analysis, water management, drought monitoring and flood studies, wetland survey, rainfall estimation, pollution studies,

soil conservation, watershed management and vegetation mapping. Geographical Information System (GIS) - basic principles and techniques. Importance of Geographical Information System in environmental studies. Global Positioning System (GPS): basic principles, Applications in ecological studies.

BOT 4125

Unit -I

Ecosystem organization- structure and functions; Terrestrial and aquatic ecosystems, primary production (methods of measurement, global pattern, controlling factors); energy dynamics (trophic organization, energy flow pathways, ecological efficiencies); litter fall and decomposition (mechanism, controlling factors); ecosystem nutrient cycles and nutrient budgeting.

Unit -II

Ecosystem stability- Concept (resistance and resilience); ecological perturbations (natural and anthropogenic) and their impact on plants and ecosystems; ecology of plant invasion; Wetlands, its importance & benefits, causes of degradation and its consequences.

Unit –III

Introduction and elements of system ecology; ecosystem modeling, conceptual model, working model, auxiliary variable and foresters diagram. Basic concepts to statistical ecology, fundamental knowledge on pattern analysis, cluster analysis and ordination.

Unit –IV

Introduction to conservation ecology- principles, postulates and ethics , genetic variation and its loss, variation in natural populations, Species and habitat conservation- prioritizing species and habitat, protected area networks; major approaches to their management, Indian case studies on conservation/management strategy

Unit –V

Methods for biodiversity monitoring, megadiversity zones and hot spots ; biodiversity and ecosystem services- provisioning, regulating, supporting and cultural; threats to biodiversity: Causes of biodiversity loss, species extinction, vulnerability of species to extinction, IUCN threat categories, Red data book; keystone and flagship species. Biodiversity act and biodiversity action plan; IPRs, national and international programs for biodiversity conservation, wildlife values and eco-tourism, wildlife distribution in India, problem in wildlife protection, role of WWF, WCU, CITES, TRAFFIC.

BOT 4135

Unit -I

Scope of environmental management, basic concepts of sustainable development, advantages of environmental monitoring, deterioration of environmental quality with reference to anthropogenic impact; methods of assessment of environmental quality; Short term studies/surveys; Rapid assessment; Continuous short and long term monitoring; general guidelines for the preparation of environmental impact statement.

Unit –II

Effect of pollution on water quality, on phytoplankton productivity; bio-indicators of water pollution. biological treatment of wastewater. Biomonitoring of air pollution, active and passive monitoring; air pollution tolerance indices; control of air pollution by plants, green belt design. Plant indicators. Environmental problems of NE India with special reference to shifting cultivation, deforestation, opencast coal mining, oil exploration, encroachment, flood, erosion, landslides etc.;

Unit -III

Environmental Policies and Regulations. Evolution of International Environmental Policies. Environmental Movement in India. International Environmental Treaties and Conventions. Objectives and Provisions of Environmental Acts and Rules of India. IBP, MAB.

Unit -IV

Concepts of ecological restoration, aims and strategies; ecosystem reconstruction, major tools used in restoration, restoration of biological diversity- Acceleration of ecological succession, reintroduction of biota; restoration of degraded ecosystems- Forest, grassland and lake including contaminated soils, mine spoils etc.

Unit -V

Bioremediation, biotransformation, biodegradation and phytoremediation, In situ and Ex situ practices. Use of microbes (algae, bacteria and fungi) and plants to check biodegradation, biotransformation; waste water treatment using aquatic plants; root zone treatment. Ecological techniques for biowaste and e-waste management.

BOT 4145

Dissertation

Dissertation =	50
Viva-Voce =	30
Internal Assessment =	20
Total =	100

BOT 4154

1. Determination of light intensity, relative humidity, wind speed, maximum and minimum temperature at different times of the day.
2. Determination of amount of rainfall.
3. Mapping of vegetation.
4. Analysis of edaphic characters- soil profile, texture, soil moisture, water holding capacity, porosity, pH, organic matter content, quantitative estimation of N, P, K, Na, Ca and C:N.
5. Determination of carbonates, nitrates, chlorides, base deficiency by rapid soil test method.
6. Analysis of water quality- DO,COD,BOD, pH, hardness, alkalinity, conductivity, free CO₂, chloride, phosphate.
7. Estimation of litter contribution in different forest stands; estimation of litter decomposition rate by litter bag technique, soil respiration.
8. Determination of IVI; lifeform and biological spectrum; phenology; diversity indices in various plant communities.
9. Determination of gross and net primary productivity of aquatic ecosystem by light and dark method; estimation of phytoplankton biomass in terms of chlorophyll.
10. To study primary productivity for herbaceous community by Harvest method; Leaf Area Index.
11. To find out seed output and reproductive capacity of herbaceous plants.
12. To find out allelopathic effects of weeds on cultivated plants.
13. Morpho-anatomical variation of plant species as affected by environmental changes.
14. Ecological data collection for computer use.

Optional –V: Mycology and Plant Pathology (Special Paper)

Allotment of Marks and Credits

Paper(s)	Course work	Internal Assessment	Total	Credit	Class/week
BOT 4215	80	20	100	5	5
BOT 4225	80	20	100	5	5
BOT 4235	80	20	100	5	5
BOT 4245	80	20	100	5	9
BOT 4254	80	20	100	4	9
Total	400	100	500	24	33
Examination Time:		Theory3 (Three Hours);		Practical...5 (Five Hours)	

BOT-4215

Unit-I

History and development of mycology, ultra structure of fungal cell, Different groups of fungi, ; systematics and phylogenetic relationship among different groups of fungi; modern trends in identification and classification of fungi.

Unit-II

Fungal reproduction: different mode of reproduction in fungi, different reproductive structures, parasexuality, degeneration of sex, heterothallism. Spore dispersal mechanism in fungi.

Unit-III

Fungal physiology, growth, nutrition, development and metabolism in fungi, nutritional specialization in parasitic fungi.

Unit-IV

Ecology of fungi, distribution of fungi, role of fungi in biogeochemical cycling, fungi of terrestrial and aquatic environments, fungi of extreme environments.

Unit-V

Fungal biotechnology: Genetically modified fungi, fungi as biocontrol agent, Edible and poisonous mushrooms, cultivation of mushrooms, industrially important fungi as a source of antibiotics, organic acids, enzymes and proteins, IPR.

BOT-4225

Unit- I

The concept of diseases in plants, history of plant pathology, role of fungi and other organisms as causes of plant diseases, losses caused by plant diseases, Symptoms of plant diseases caused by fungi, bacteria and viruses.

Unit-II

Diagnosis of plant diseases, Koch's postulate and germ theory of diseases, pathogenesis and host range, stages of development and disease cycle, dissemination of plant pathogens.

UNIT-III

Epidemiology and disease forecasting, Effects of environmental factors on epidemiology; Control of plant diseases, chemical and biological disease control, integrated disease management (IDM), physiological changes due to disease in plants (photosynthesis, movement of water, respiration, permeability of cell membrane, growth and transcription and translation).

Unit-IV

Genetics of plant diseases, genes and disease, mechanism of variability, types of plant resistance to pathogens, Genetics of Virulence in pathogens and resistance in host, Enzymes, toxins and growth regulators in plant disease development.

Unit-V

Symptomatology, disease cycle, control measures and management of some important plant diseases of Assam caused by fungi, bacteria, virus and nematode.

BOT-4235

Unit I

Defense mechanisms in plants, structural and chemical defenses, defense through lack of essential factors, induced structural and biochemical defenses, plant immunization- systemic acquired resistance, Induced resistance, plantibodies.

Unit II

Biotechnology and plant diseases – resistant gene identification and insertion in suitable host for crop improvement, strategies for development of disease resistance in plants; GMO (bt-

cotton, bt- brinjal, bt-chickpea); Use of immunological techniques in plant pathology.

Unit-III

Aerobiology and Plant diseases: Air microflora, air sampling techniques, factors affecting the distribution of air microflora, air-borne plant diseases, aero-allergens

Unit-IV

Soil borne diseases: Soil as an environment for plant pathogens, nature and importance of rhizosphere and rhizoplane, root exudates, and soil and root borne pathogens, Associative and antagonistic effects; Suppressive soils, biological control- concepts and potentialities for managing soil borne pathogens.

Unit-V

Morphology and anatomy of infected seeds; transmission of pathogens from seed to plants, Seed-borne diseases and pathogens, Toxins affecting seed quality and its impact on human and animal health, management of seed-borne diseases, seed health testing and methods for detecting seed microorganisms, Quarantine and seed certification.

BOT-4245

Dissertation

Dissertation =	50
Viva-Voce =	30
Internal Assessment =	20
Total =	100

BOT-4254

1. Study of vegetative and reproductive structure of different fungal specimens
2. Study of disease symptoms and causal organisms
3. Isolation and identification of pathogen from diseased plant materials
4. In vitro inhibition of plant pathogens by different plant extracts
5. Estimation of spore population and root colonization of mycorrhiza
6. Extraction of cellulase/pectinase/xylanase from diseased plants

7. Proving of Koch's postulate at least one disease
8. Study of the effect of fungicides and plant extracts on the germination and growth of plant pathogenic fungi
9. Isolation and enumeration of microbes from soil samples
10. Study of effect of physical and chemical factors on the growth of plant pathogens.

Optional –VI: Plant Physiology and Biochemistry (Special Paper)

Allotment of Marks and Credits

Paper(s)	Course work	Internal Assessment	Total	Credit	Class/week
BOT 4265	80	20	100	5	5
BOT 4275	80	20	100	5	5
BOT 4285	80	20	100	5	5
BOT 4295	80	20	100	5	9
BOT 4304	80	20	100	4	9
Total	400	100	500	24	33
Examination Time:		Theory3 (Three Hours);		Practical...5 (Five Hours)	

BOT 4265

Unit-I

Membrane transport and translocation of water and solutes: Membrane transport of proteins. Root microbe interactions in facilitating nutrient uptake.

Unit-II

Nitrogen and sulphur metabolism: Regulation of nitrogen fixation, products of nitrogen fixation and their transport, mechanism of nitrate uptake and reduction, transamination, nitrogen metabolism in relation to photosynthesis and respiration, Sulphate uptake, transport, reduction and assimilation.

Unit-III

The flowering process: Photoperiodism and its significance, endogenous clock and its regulation, floral induction and development- genetic and molecular analysis, role of vernalization.

Unit-IV

Post-harvest physiology: Ripening of fruit and its regulation, post-harvest management. Metabolism of leafy vegetables during storage.

Unit-V

Stress physiology: Plant responses to water deficit, salinity, metal ion stress, freezing and heat stress, effect of elevated CO₂ concentration on plant metabolism, Oxidative stress -

Generation of reactive oxygen species, Effect of ROS on metabolism, ROX detoxification mechanisms in plants. Biotic stress - effect of fungal infection on plant metabolism; transgenic approach to overcome the abiotic stress in plants.

Unit-VI

Signal transduction: Overviews, receptors and G- proteins, phospholipids signaling, role of cyclic nucleotides, Calcium-Calmodulin cascade, protein kinases and phosphatases, specific signaling mechanisms. e.g., two component sensor – regulator system in bacteria and plants.

BOT 4275

Unit-I

Respiration and lipid metabolism: Overview of plant respiration, anaerobic respiration, modern concept of electron transport and ATP synthesis; glycolysis in plants and its regulation; regulation of pentose phosphate pathway and TCA Cycle; inhibitor of respiration, glyoxylate cycle, synthesis of membrane lipids, structural lipids and storage lipids and their catabolism, gluconeogenesis.

Unit-II

Photochemistry and photosynthesis: Evolution of photosynthetic apparatus, photo-oxidation of water, mechanism of electron and proton transport, Regulation of PCR Cycle and C4 Pathway, RUBISCO and PEP Case, C3–C4 intermediates, ecological significance and modification of CAM.

Unit-III

Carbohydrate metabolism: Regulation of starch and sucrose biosynthesis, Synthesis and degradation of cellulose; A brief idea of pectin biosynthesis and enzymes involved in pectin degradation.

Unit-IV

Organic acid metabolism: Metabolism and roles of oxalic acid, ascorbic acid and malic acid.

Unit-V

Secondary metabolites: Shikimate Pathway and its role in biosynthesis of Secondary Metabolites. Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.

Unit-VI

Phosphorus nutrition – Forms of phosphorus in soil. Phosphorus uptake, factors controlling 'P' uptake, 'P' fractions in plants. Role of Pyrophosphate in plant metabolism.

BOT 4285

Unit-I

Growth and morphogenesis: photomorphogenesis: phytochromes and cryptochromes and their photochemical and biochemical properties; phytochrome biosynthesis, cellular localization, roles, mechanism of action of photomorphogenetic receptors.

Unit-II

Plant developments: Biochemical changes during development of seeds; phototropism, geotropism and nastic movements.

Unit-III

Senescence and PCD- Biochemical changes during senescence of leaves and petals and regulation of senescence. Programmed Cell Death.

Unit-IV

Enzyme kinetics: Km value, enzyme inhibition, factors responsible for enzyme interaction, abzyme and ribozyme

Unit-V

A brief idea about role of tissue culture, and mutants in physiological studies.

Unit-VI

Plant Growth Regulators – A brief idea about discovery, role and possible mechanism of action of Triacetonol, Brassins, Salicylic acid, Jasmonates and Polyamines. A brief idea about role of plant growth retardants- CCC, Maleic hydrazide, Trizoles and TIBA.

BOT 4295
Dissertation

Dissertation =	50
Viva-Voce =	30
Internal Assessment =	20
Total =	100

BOT 4304

1. Estimation of starch, Ascorbic acid, Polyphenols, Cellulose.
2. Study of Oxalic acid accumulation in leaf tissue.
3. Hormonal regulation of leaf and petal senescence.
4. Study of changes in starch / protein content during seed development.
5. To study the effect of different PGRs on seedling growth
6. Sugar and amino acids analysis of phloem sap with paper chromatography.
7. Estimation of nitrate in different plant parts.
8. Study of lipid accumulation during development of oil seeds.
9. Study of effect of PEG induced water stress on seed germination
10. Measurement of RWC and Osmotic potential
11. Study of protein/ amino acid profile in plants under stress.
12. Study of effect of fungal infection on peroxidase activity.
13. Study of free radicals scavenging enzymes, Catalase and super oxide dismutase.
14. Study of free proline accumulation in plants under stress.
15. Study of seed germination under stress condition.

Course outcome:**Programme : M. Sc. in Botany****Course: BOT 1016 Diversity I – Algae, Fungi, Bryophytes**

- CO1. Knowledge on classification of different groups of algae and their distribution, understanding their phylogeny, life cycles, ecological roles and industrial applications.
- CO2. Comprehensive knowledge on fungal classification, phylogeny, physiological and ecological roles and their utilization as resource.
- CO3. Understand about the classification and nomenclature of viruses and bacteria and their reproductive mechanism.
- CO4. Understand the origin, evolution, classification of bryophytes and their biochemistry, physiology, ecology, diversity and distributional pattern in NE states and roles in the environment.

Course: BOT 1026 Diversity II – Pteridophytes, Gymnosperms and Angiosperm

- CO1. Comprehensive account on the origin, evolution, life cycle patterns pteridophytes
- CO2. Knowledge on fossil pteridophytes and gymnosperms and process of fossilization
- CO3. Understand about the classification, salient features and relationships of major taxa of living gymnosperms
- CO4. Knowledge on angiosperm taxonomy, recent International Codes on Nomenclatures, roles of botanical gardens and herbarium and BSI
- CO5. Understand about the phylogeny of major orders of angiosperm
- CO6. Knowledge on origin and evolution of floral parts, understanding the mechanism of co-evolution of flower and pollinator

Course: BOT 1036 Ecology, Environment and Resource Management

- CO1. Knowledge on various components of environment and their interaction, comprehensive knowledge about the niche concept, resource utilization and character displacement
- CO2 Knowledge about the population and community, ecological succession, energy flow and mineral cycling in the environment
- CO3. Knowledge on biodiversity & conservation strategies of RET plants and their environment.
- CO4. Knowledge on environmental issues, pollution and their solutions.
- CO5. Knowledge about the origin and evolution of economically important plants, GMO, IPR, INM, IPM.
- CO6. Enriched with the concept of phytogeography, centre of origin of cultivated plants, endemism, endemic flora and vegetation pattern of NE India

Course: BOT 1044 Algae, Fungi, Bryophytes and Pteridophytes (Practical)

- CO1. Practical knowledge on algae, fungi, bryophytes, pteridophytes and lichen of NE region

Course: BOT 1054 Gymnosperm, Angiosperm, Ecology (Practical)

- CO1. Practical knowledge on Gymnosperm and Angiosperm of NE region, Knowledge on population and community analysis.

Course: BOT 2016 Cytogenetic, Plant Breeding and Evolution

- CO1. Knowledge on cellular structures and organization; genome organization; prokaryotic and eukaryotic gene expression; DNA damage and repair.
- CO2. Knowledge on principles of plant breeding and evolution

Course: BOT 2026 Microbiology and Plant Pathology

- CO1. Knowledge on microbial diversity, techniques, microbial genetics and physiology
- CO2. Knowledge on principles plant pathology and mechanism of pathogenesis, immunology and applied microbiology.

Course: BOT 2036 Plant Physiology and Biochemistry

- CO1. Knowledge on structure and function of membranes and biomolecules,
- CO2. Knowledge on kinetics, regulation and mechanism of enzyme catalysis, protein synthesis and processing.
- CO3. Knowledge on mechanism of photosynthesis, respiration and photorespiration CO4. Knowledge on biosynthesis, storage, breakdown, transport, physiological effects and mechanism of action of plant hormones

CO5. Knowledge on sensory photobiology; transpirations solutes transport and photoassimilate translocation

Course: BOT 2044 Microbiology, Plant Pathology and Cytogenetics (Practical)

CO1. Practical knowledge on isolation, identification of microbes from different habitats and preparation of pure culture.

CO2. Practical Knowledge on plant pathogenic fungi.

CO3. Practical Knowledge on chromosome behavior

Course: BOT 2054 Plant Physiology and Biochemistry (Practical)

CO1. Practical knowledge on extraction and estimation of proteins, carbohydrate, phenolics and chloroplast pigments.

CO2. Practical knowledge on TLC and paper chromatography

Course: BOT 3016 Reproductive and Developmental Botany, Biostatistics

CO1. Knowledge on embryology and anatomy of plants.

CO2. Knowledge on concept of palynology and microtechniques and their application CO3. Knowledge on Biostatistics and their applications in biology

Course: BOT 3026 Molecular Biology, Plant Biotechnology & Bioinformatics

CO1. Detail knowledge on replication, repair and recombination of DNA; Synthesis and processing of RNA, small RNAs.

CO2. Knowledge on concept and mechanism of cell signaling.

CO3. Knowledge on genetic engineering, biosafety issues; plant tissue culture and bioinformatics

Course: BOT 3036 Research Methodology and Bioinstrumentation

CO1. Basic knowledge on research principles and procedures applicable in plant science.

CO2. Knowledge on research methodology helpful for cracking PhD and other competitive examination.

CO3. Knowledge on different instruments applicable for research works in plant science.

Course: BOT 3044 Anatomy and Reproductive and Developmental Botany, Biostatistics (Practical)

CO1. Practical knowledge on secondary growth in plants, sporogenesis and gametogenesis.

CO2. Practical knowledge on morphogenesis, organogenesis and anatomy of plants.

CO3. Practical knowledge on concept of palynology and microtechniques and their application CO4. Practical knowledge on Biostatistics and their applications in biology.

Course: BOT 3054 Molecular Biology, Plant Biotechnology & Bioinformatics (Practical)

CO1. Hands on knowledge on isolation of proteins and DNA, PCR and tissue culture CO2. Practical knowledge bioinformatics, nucleotide search, BLAST, sequence alignment, protein modeling and structure prediction

Course: BOT 4015 Angiosperm Taxonomy-I

CO1. Knowledge on basics of taxonomy, Classification including APG
CO2. Concept of Taxa and characters, nomenclature and taxonomic literatures

Course: BOT 4025 Angiosperm Taxonomy-II

CO1. Knowledge on molecular systematic, sources of taxonomic characters CO2. Tools and material basis of taxonomy

Course: BOT 4035 Angiosperm Taxonomy-III

CO1. Knowledge on phytogeography, endemism, BSI and flora of NE India CO2. Knowledge on phylogeny of major orders of angiosperms

Course: BOT 4045 Angiosperm Taxonomy (Dissertation)

CO1. Knowledge on solving taxonomic problems of Assam

Course: BOT 4054 Angiosperm Taxonomy (Practical)

CO1. Practical knowledge on locally available taxa and their identification CO2. Practices on solving nomenclatural problems, herbarium specimens

Course: BOT 4115: Plant Ecology-I

CO1. Knowledge on ecological literatures, concept of population and community, metapopulations, ecological niche, ecads, ecotypes and ecospecies CO2. Population regulation and community analysis

CO2. Species interaction and diversity (alpha,beta and gamma), remote sensing, GIS, GPS and their applications

Course: BOT 4125: Plant Ecology-II

CO1. Knowledge on ecosystems organization, modelling, stability, resistance and resilience, nutrient analysis and budgeting, succession

CO2. Knowledge on conservation ecology and biodiversity management.

Course: BOT 4135: Plant Ecology-III

CO1. Knowledge on environmental issues and management, sustainable development and EIA

CO2. Restoration ecology, concept of bioremediation, phytoremediation, waste management and waste water treatment

Course: BOT 4145 Plant Ecology (Dissertation)

CO1. Knowledge on solving the problems of crude oil degraded ecosystem of Assam

CO2. Analysis on biotic and abiotic interaction in different ecosystem of Assam CO3. Vegetation analysis through standard ecological protocols.

Course BOT 4154 Plant Ecology (Practical)

CO1. Knowledge on phytosociology of plants and biomass estimation. CO2. Litter assessment and understanding of nutrient dynamics CO3. Estimate water and soil quality of different ecosystems

CO4. Assessment of biodiversity

Course BOT 4215 Mycology and Plant Pathology-I

- CO1. Knowledge on mycological literature, ultra structure, systematic and phylogeny of fungi
- CO2. Knowledge on fungal reproduction and physiology, mode of nutrition, fungal ecology
- CO3. Knowledge on fungal and their application

Course BOT 4225 Mycology and Plant Pathology-II

- CO1. Knowledge on plant disease, symptoms of fungal, bacterial and viral diseases,
- CO2. Knowledge on Koch postulates and disease cycle, IDM, physiological changes due to disease
- CO3. Knowledge on genetics of plant disease, virulence, application of enzymes, toxins, plant growth regulators in disease management.

Course BOT 4235 Mycology and Plant Pathology-III

- CO1. Knowledge on different defense mechanism of plants against disease, air, soil and seed born diseases
- CO2. Biological controls of disease, quarantine and seed certification

Course BOT 4245 Mycology and Plant Pathology (dissertation)

- CO1. Knowledge on solving the problems of plant diseases of selected crop plants of Assam

Course BOT 4254 Mycology and Plant Pathology (Practical)

- CO1. Practices on isolation of fungal pathogens from diseased plants, soil microbes
- CO2. Practices on in vitro inhibition study of plant pathogens

Course: BOT 4265: Plant Physiology and Biochemistry-I

- CO1. Membrane transport of proteins, root-microbe interaction in nutrient uptake, nitrogen and sulphur metabolism
- CO2. Photoperiodism, vernalization, post harvest physiology, stress physiology and signal transduction

Course: BOT 4275: Plant Physiology and Biochemistry-II

- CO1. Respiration and lipid metabolism, photochemistry and photosynthesis
- CO2. Metabolism of carbohydrates and organic acids, secondary metabolites and phosphorus nutrition

Course: BOT 4285: Plant Physiology and Biochemistry-III

CO1. Growth and morphogenesis, plant development, senescence and programmed cell death
CO2. Enzyme kinetics, role of tissue culture and mutants in physiological studies, plant growth regulators

Course: BOT 4295: Plant Physiology and Biochemistry (Dissertation)

CO1. Preparation of dissertation on stress physiology and biochemical analysis

Course: BOT 4304: Plant Physiology and Biochemistry (Practical)

CO1. Practical knowledge on estimation of selected biomolecules and hormonal regulation in senescence

CO2. Protein and amino acid profiles in stressed plants

Credits: Total: 24/ Paper

1 Theory period of one hour per day over a semester

1 Tutorial period of one hour per day over a semester

1 Practical period of three hours per day over a semester

Course work 80; Internal Assessment 20; Credit 6 (Theory)/ 4 (Practical)/5 (Dissertation)