

DEPARTMENT OF BOTANY

Programme outcomes (POs)

The postgraduate (PG) course offered by the Department of Botany, Bodoland University, strictly adheres to the CBCS pattern. The goal of the course is to produce competent, skilled people who can employ and implement their gained knowledge in basic and applied ways that will profoundly influence the prevailing paradigm of botany, and other areas like industry, healthcare and the environment to provide sustainable development. The curricula will also boost the ability of critical thinking, development of scientific attitude, the handling of practical problems and generating solutions, the improvement of skills, the enhancement of communication skills, social interaction, environmental awareness, and the recognition of the ethical value system of society. Furthermore, the training provided to students will prepare them for jobs in the public and private sectors, as well as in research and industry.

Programme specific outcome (PSO's)

- Students will learn about cryptogamic and phanerogamic plants in Northeast India, including their diversity, life forms, reproduction, phylogeny, and economic value.
- Knowledge of recent trends in plant taxonomy, Cytology, Genetics and Plant Breeding, Plant Physiology and Biochemistry, Microbiology, Plant Ecology, Mycology and Plant Pathology.
- Describe the paleobotany, anatomy, morphology, systematics, genetics, molecular biology, physiology, and ecology of plants.
- The ecological and evolutionary characteristics of flora in their natural habitat.
- Developing skilled human resources in the field of Angiosperm Taxonomy and improving knowledge of the flora of north-east India.
- Discover the value of plant resources and how they can be used in traditional applications such as agriculture and health care. The industrial potential of plants, as well as other environmental concerns, are also highlighted

Course Outcomes

Name of the Course	Course Code	Course Outcome
		SEMESTER-I
Phycology, Mycology and Lichenology	BOT 101C	Course Outcome of BOT 101C (Phycology, Mycology and Lichenology) CO1. Learn about general characters, vegetative, reproductive structural features and classification of Algae. CO2. Comprehensive knowledge on thallus organization, phylogeny, evolutionary trends of the major groups of algae. The knowledge of economic potentialities, algal diversity of north east India, and conservation approaches. CO3. Understand the general affinities, ultrastructural composition, mode of reproduction of fungi. Also to know the classical and modern classification approaches of the fungi. CO4. The detail life cycle pattern on the major group of fungi (Mastigomycota, Zygomycota, Ascomycota, Deuteromycota, Basidiomycota). Acquired knowledge on applied mycology and interactions of fungi such as production of organic acids, antibiotics and as a biofertilizer etc. CO5. Understand the general characters, diversity pattern, classification, economic

		value of the Lichen.
Bryology, Pteridology & Paleobotany	BOT-102C	<p>Course Outcome of BOT 102C (Bryology, Pteridology & Paleobotany)</p> <p>CO1 The learner will be able to understand the comprehensive account on the origin, evolution, classification, interrelationship, biochemistry, ecology, life cycle pattern of the bryophytes.</p> <p>CO2 Enriched with diversity of bryophytes in northeast India, and their economic value.</p> <p>CO3. Knowledge on origin, interrelationship, evolution, classification, diversity and distribution pattern of the pteridophytes.</p> <p>CO4. Details morphological and reproductive life cycle pattern of the major groups of the pteridophytes.</p> <p>CO5. Understand the Geological Time Scale, fossilization process and characters of the major fossil groups.</p>
Gymnosperms, Angiosperm anatomy and Advanced morphology	BOT-103	<p>Course Outcome of BOT 103C (Gymnosperms, Angiosperm anatomy and Advanced morphology)</p> <p>CO1 The students will learn about the classification, salient features of fossil groups of Gymnosperms.</p> <p>CO2. The students will learn about the salient features and economic potentialities of living groups of Gymnosperms.</p> <p>CO3. Knowledge on plant cell wall, morphogenesis and organogenesis of plants anatomy.</p> <p>CO4. Understand the nodal anatomy, wood and floral anatomy, various components of stem and wood during its secondary growth etc.</p> <p>CO5. Origin and evolution of floral parts, understanding the mechanisms of co evolution of flower, types and evolution of placenta.</p>
Instrumentation and Laboratory Techniques	BOT 104C	<p>Course Outcome of BOT 104C (Instrumentation and Laboratory Techniques)</p> <p>CO1. Understanding of microscopy, microscopic techniques, spectroscopic techniques with working principles.</p> <p>CO2. Knowledge on herbarium techniques, microtomy and their standard operational procedure.</p> <p>CO3. Enriched with dissection, maceration techniques, histochemical and cytochemical techniques.</p> <p>CO4. The learner will be able to learn chromatographic techniques, concept of electrophoresis.</p> <p>CO5. Knowledge on immunological and radiolabelling technique.</p>
Practical -I	BOT105 (P)	<p>Course Outcome of BOT 105 (Practical -I)</p> <p>CO1. Practical knowledge on algae, fungi and lichens of north east India.</p> <p>CO2. Practical knowledge on Bryophytes, living and fossil members of Pteridophytes.</p> <p>CO3. Practical knowledge on Gymnosperms, angiosperms anatomy of selected flowering</p>

		<p>plant family.</p> <p>CO4. Practical knowledge on stains and staining techniques, paper chromatography and permanent slides preparation.</p>
Plant Propagation and Nursery Management	BOT 106(OE1)	<p>Course Outcome of BOT 106OE1 (Plant Propagation and Nursery Management)</p> <p>CO1. Knowledge on plant propagation techniques, factors affecting in seeds dormancy and micrografting.</p> <p>CO2. Knowledge on nursery management such as beds preparation, maintenance, nursery tools etc.</p>
Biofertilizer Technology	Optional BOT106 (OE2)	<p>Course Outcome of BOT 106E (Biofertilizer Technology)</p> <p>CO1 Knowledge on biofertilizer in agriculture and organic farming.</p> <p>CO2. Extensive knowledge on biofertilizer production technology.</p>
SEMESTER-II		
Plant Taxonomy & Economic Botany	BOT 201C	<p>Course Outcome of BOT 201C (Plant Taxonomy & Economic Botany)</p> <p>CO1. Understanding of historical approaches of plant taxonomy, knowledge on system of classification; evolution of early angiosperms.</p> <p>CO2. Knowledge on recent International Code on Nomenclature and major roles of plant nomenclature.</p> <p>CO3. Knowledge on plant collection and documentation, botanical garden, herbarium and BSI.</p> <p>CO4. Understand about the phylogeny of major orders of angiosperm.</p> <p>CO5. Learn about the centre of origin of cultivated plants and economic value of different categories of plants.</p>
Cytology, Genetics, Plant breeding & Evolution	BOT202C	<p>Course Outcome of BOT 202C (Cytology, Genetics, Plant breeding & Evolution)</p> <p>CO1. The students will be able to learn the basics of structural organization, components of cells, cell division and regulation.</p> <p>CO2. Understand the prokaryotic and eukaryotic chromosome and mechanism of gene regulation.</p> <p>CO3. The students will be able to learn Mendelian laws, gene interactions, sex chromosomes and genetic disorders.</p> <p>CO4. Knowledge on mutation, molecular basis of mutations and oncogenes.</p> <p>CO5. Students will understand the various processes in crop improvement program and familiarize with the various concepts of evolution.</p>
Plant Physiology and Biochemistry	BOT 203C	<p>Course Outcome of BOT 203C (Plant Physiology and Biochemistry)</p> <p>CO1. Know about the cell membrane structure, function and biomolecules.</p> <p>CO2. Comprehensive knowledge on enzymes, enzyme kinetics, enzyme regulation, mechanism of enzyme and protein synthesis</p>

		<p>and processing.</p> <p>CO3. Understanding about photosynthesis, Respiration, photorespiration and photorespiration pathways.</p> <p>CO4. Knowledge on plant hormones and sensory photobiology such as mechanisms of action of phytochromes, cryptochromes and phototropins.</p> <p>CO5. Acquired comprehensive knowledge of Solute transport concepts and photo-assimilate translocation.</p>
Ecology, Environment & Phytogeography	BOT 204C	<p>Course Outcome of BOT 204C (Ecology, Environment & Phytogeography)</p> <p>CO1 Understanding on concepts, types, structure, components of ecology and ecosystem and interrelationship of abiotic and biotic Environment.</p> <p>CO2 Knowledge on concept and characteristics of population, population growth curves, population interactions and communities nature, structure and methods of studying plant communities.</p> <p>CO3 Knowledge about the population and community, ecological succession, energy flow and mineral cycling in the environment and Ecological succession.</p> <p>CO4 Knowledge on environmental issues, pollution, green house effects and their solutions.</p> <p>CO5 Enriched with the concept of phytogeography centres of origin of cultivated plants, endemism, endemic flora and vegetation pattern of NE India.</p>
Biodiversity and Conservation	BOT 206E	<p>Course Outcome of BOT 206E (Biodiversity and Conservation)</p> <p>CO1 Knowledge on biodiversity & conservation strategies of RET plants and their environment.</p> <p>CO2 Concepts of strategies for conservation and RET Plants of Northeast India and their conservation initiatives.</p>
Plants and Society	Optional/ BOT 206E	<p>Plants and Society</p> <p>CO1 Understanding of ecosystem, community movements and laws.</p> <p>CO2 Knowledge on Entrepreneurship in Botany</p>
Practical-II	BOT205C(P)	<p>Course Outcome of BOT205C(Practical-II)</p> <p>CO1 Practical knowledge on Angiosperms and economic botany.</p> <p>CO2 Practical knowledge on Cytology, Genetics, Plant breeding & Evolution</p> <p>CO3 Practical knowledge on plant physiology and biochemistry</p> <p>CO4 Practical knowledge on ecology, environment and phytogeography</p>
		SEMESTER-III

<p>Microbiology & plant pathology</p>	<p>BOT 301C</p>	<p>Course Outcome of BOT301C(Microbiology & plant pathology) CO1The students will understand the fundamental aspects of microbiology, classification and microbial diversity. CO2Understand the microbial techniques, microbial metabolism, microbial genetic and immunology. CO3Comprehensive knowledge on soil microbiology, aeromicrobiology and water microbiology. CO4Understand the industrial and food microbiology with importance of microorganisms. CO5Knowledge on principles plant pathology and mechanism of pathogenesis and control of plant diseases.</p>
<p>Molecular biology & Plant Biotechnology</p>	<p>BOT 302C</p>	<p>Course Outcome of BOT 302C(Molecular biology & Plant Biotechnology) CO1 Detail knowledge on DNA damage and repair; recombination of DNA; RNA Synthesis and processing of RNA; Protein synthesis and processing. CO2 Knowledge on concept and mechanism of cell signaling; cellular communication. CO3Detail knowledge on comparative genomics and evolution; DNA fingerprinting, molecular marker, molecular systematic. CO4 Knowledge on genetic engineering; biotechnology for healthcare CO5 Knowledge on plant tissue culture</p>
<p>Reproductive & Developmental Biology</p>	<p>BOT 303C</p>	<p>Course Outcome of BOT 303C(Reproductive & Developmental Biology) CO1Knowledge on basic concept of developmental biology. CO2 Detail understanding of development of male and female gametophytes of plants; pollination biology, pollen pistil interaction. CO3 Knowledge on fertilization, development of embryo, endosperm, fruits development and dispersal; seeds types. CO4 Enriched with an overview of plant development; senescence, programmed cell death. CO5Knowledge on palynology and experimental embryology.</p>
<p>Biostatistics & Bioinformatics</p>	<p>BOT 304C</p>	<p>Course Outcome of BOT 304C(Biostatistics & Bioinformatics) CO1 Comprehensive knowledge on Biostatistics and their applications in biology. CO2 Knowledge on variance and co variance analysis; ANOVAs; regression analysis, hypothesis; application of statistics in biological research. CO3Knowledge on Bioinformatics, scope and application; biological databases. CO4Knowledge on online tools of bioinformatics; drug designing and drug discovery.</p>

Practical III	BOT 305C	Course Outcome of BOT 305C(Practical III) Practical knowledge on microbiology and plant pathology; Molecular biology and Biotechnology; Reproductive and developmental Biology; Biostatistics and Bioinformatics; Plant diversity, Pharmacognosy & Ethnobotany; IPR, Biosafety and Traditional knowledge.
Plant Diversity, Pharmacognosy & Ethnobotany	BOT 306 (DSE)	Course Outcome of BOT 306(Plant diversity, Pharmacognosy & Ethnobotany) CO1 Detail knowledge on concept, concerns and utilization of plant diversity; GMO and biosafety regulation. CO2 Knowledge on Pharmacognosy, techniques for quality control, standards techniques of collection and processing of crude drugs. CO3 Enriched with an ethno-botanical knowledge, nature, branches, importance, and methods of study.
IPR, Biosafety and Traditional Knowledge	Optional/ BOT 306 (DSE)	Course Outcome of BOT 306 (IPR, Biosafety and Traditional Knowledge) CO1 Concept on IPR, Patent law & patent application procedure. CO2 Knowledge on Biosafety issues, guidelines and regulations. CO3 Detail knowledge on traditional knowledge on bioresources of NE India.
		SEMESTER-IV
Angiosperm Taxonomy-I	BOT 401(AT1)	Course outcome of BOT 401(AT1) Angiosperm Taxonomy-I CO1. Understanding on basics of taxonomy, taxonomic structure, materials basis of taxonomy, Classification including APG CO2. Concept of Taxa and characters, plant nomenclature and taxonomic literatures.
Angiosperm Taxonomy-II	BOT402(AT2)	Course outcome of BOT402(AT2) Angiosperm Taxonomy-II CO1. Understanding on molecular systematic, sources of taxonomic characters CO2. Comprehensive knowledge on tools and material basis of taxonomy.
Angiosperm Taxonomy-III	BOT403(AT3)	Course outcome of BOT403(AT3) Angiosperm Taxonomy-III CO1. Understanding on phytogeography, endemism, BSI and flora of NE India CO2. Knowledge on phylogeny of major orders of angiosperms.
Angiosperm Taxonomy (Dissertation)	BOT 404 (ATD)	Course outcome of BOT 404 (ATD) Angiosperm Taxonomy (Dissertation) CO1. Knowledge on identification of flora CO2. Knowledge on solving taxonomic problems

Angiosperm Taxonomy (Practical)	BOT 405(ATP)	Course Outcome of BOT 405(ATP) Angiosperm Taxonomy (Practical) CO1. Knowledge on locally available taxa and their identification CO2. Practices on solving plant nomenclatural problems, herbarium specimens.
Microbiology –I	BOT 401 (M1)	Course Outcome of BOT 401 (M1) Microbiology –I CO1. General microbiology knowledge focusing on cell structure and diversity of microbes, incorporating microbial physiology and genetics.
Microbiology -II	BOT 402 (M2)	Course Outcome of BOT 402 (M2) Microbiology –II COI. This course teaches about the genetic recombination of microbes, as well as their potential benefits and threats to humans. Main focused on Immunology and medical microbiology, particularly the study of human diseases caused by viruses, bacteria, fungi, and protozoa, are given greater emphasis.
Microbiology -III	BOT 403 (M3)	Course Outcome of BOT 403 (M3) Microbiology –III CO1: The focal theme of this paper is the role of microbes in ecology, especially in soil, agriculture, and food industries, which will impart knowledge about how to learn how they are significant for sustainable development.
Microbiology (DISSERTATION)	BOT 404 (MD)	Course Outcome of BOT 404 (MD) Microbiology (DISSERTATION) CO1: This course will help students improve their understanding of cultural media preparation, microbial culture, isolation, characterization, and application.
Microbiology (PRACTICAL)	BOT 405 (MP)	Course Outcome of BOT 405 (MP) Microbiology (PRACTICAL) CO 1. Learn the fundamentals of live plant pathogenic microbe including tools and techniques before conducting research using cutting-edge techniques.
Mycology and Plant Pathology I	BOT 401 (MPP1)	Course Outcome of BOT 401 (MPP1) Microbiology and Plant Pathology-I CO1: Exploration of plant disease caused by fungi, as well as detailed study of their ecology, physiology, and reproduction
Mycology and Plant Pathology-II	BOT 402 (MPP2)	Course Outcome of BOT 402 (MPP2) Microbiology and Plant Pathology-II CO1: Exploring the concept of plant diseases, Epidemiological studies, disease forecasting, and a detailed study of their ecology, physiology, and reproduction some important plant diseases of Assam with a focus on Enzymes, toxins, and growth regulators.

Mycology and Plant Pathology-III	BOT 403 (MPP3)	Course Outcome of BOT 403(MPP3) Microbiology and Plant Pathology-III CO-I This course is designed to teach students about plant defense mechanisms, resistant gene identification, soil-borne diseases, and seed-borne pathogens.
Mycology and Plant Pathology (DISSERTATION)	BOT 404 (MPPD)	Course Outcome of BOT 404 (MPPD) COI: This course will assist students in learning cutting-edge research techniques by conducting some practice-based research in project mode for the compilation of dissertation reports in the Plant pathological area.
Mycology and Plant Pathology (Practical)	BOT 405 (MPPP)	Course Outcome of BOT 405 (MPPP) COI: This course will teach students the tools and techniques of plant pathological study for future research.
Plant Ecology-I	BOT 401 (PE1)	Course Outcome of BOT 401 (PE1) Plant Ecology-I CO1.Knowledge on evolutionary ecology, population ecology, 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
Plant Ecology-II	BOT 402 (PE2)	Course Outcome of BOT 402 (PE2) Plant Ecology-II CO1. Understanding of ecosystems organization, ecological modelling, stability, resistance and resilience. CO2. Knowledge on conservation ecology and biodiversity management.
Plant Ecology-III	BOT 403 (PE3)	Course Outcome of BOT 403 (PE3) Plant Ecology-III CO1. Understanding of environmental issues and management and sustainable development. CO2. Restoration ecology, concept of bioremediation, phytoremediation, waste management and waste water treatment
Plant Ecology (Dissertation)	BOT 404 (PED)	Course Outcome of BOT 404 (PED) Plant Ecology (Dissertation) CO1. Analysis on biotic and abiotic interaction in different ecosystem of Assam CO2. Vegetation analysis through standard ecological protocols.
Plant Ecology (Practical)	BOT 405 (PEP)	Course Outcome of BOT 405 (PEP) Plant Ecology (Practical) CO1. Assessment of biodiversity and ecological impacts. CO2. Estimate water and soil quality of different ecosystems

<p>Advance Plant Physiology and Biochemistry-I</p>	<p>BOT 401(PPB1)</p>	<p>Course Outcome of BOT 401(PPB1) Course Outcome of BOT 401(PPB1) Advance Plant Physiology and Biochemistry-I CO1 Knowledge on uptake mechanism of water from soil and transportation of water and minerals to different parts of the plant and the role of microbes in facilitating nutrient uptake. CO2 Knowledge on metabolism of nitrogen and sulphur in plants. CO3 Metabolism of Phosphorus CO4 Knowledge on genetic and molecular mechanism of flowering CO5 Knowledge about post-harvest physiological changes, management and role of tissue culture in physiological studies CO6 Knowledge on various types of stresses encountered by plants and how plants overcome these stresses CO7 Knowledge on mechanism of how signals are transduced in plants and bacteria</p>
<p>Advance Plant Physiology and Biochemistry-II</p>	<p>BOT 402 (PPB2)</p>	<p>Course Outcome of BOT 402 (PPB2) CO1 Knowledge on different pathways related to respiration, its regulations, inhibitors and lipid metabolism CO2 Knowledge on photosynthetic pathways CO3 Knowledge on biosynthesis and degradation of starch, sucrose, cellulose and pectin CO4 Knowledge on metabolism of organic acids such as oxalic, ascorbic and malic acid CO5 Knowledge on biosynthetic pathways of secondary metabolites and their role</p>
<p>Advance Plant Physiology and Biochemistry-III</p>	<p>BOT 403 (PPB3)</p>	<p>Course Outcome of BOT 403 (PPB3) CO1: Knowledge on development of different organs and photomorphogenetic receptors and their mechanism of actions CO2: Knowledge on biochemical changes during development of seeds, fruit ripening and its regulation and movements in plants CO3: Knowledge on Phenomena such as senescence, Program cell death and their regulation CO4: Knowledge on enzyme kinetics CO5: Role of tissue culture in physiological studies CO6: Knowledge on Plant Growth Regulators, their biosynthesis, mechanism of action and retardants</p>
<p>Advance Plant Physiology and Biochemistry (Dissertation)</p>	<p>BOT 404 (PPBD)</p>	<p>Course Outcome of BOT 404 (PPBD) Advance Plant Physiology and Biochemistry (Dissertation) CO1: Introduction of students to research article, plan a project, carry out field work as well as laboratory work and write a thesis on the project</p>
<p>Advance Plant Physiology and Biochemistry (Practical)</p>	<p>BOT 405 (PPBP)</p>	<p>Course Outcome of BOT 405 (PPBP) CO1: Knowledge on various practicals related to theory</p>

Cytology, Genetics and Plant Breeding-I	BOT 401(CGB1)	Cytology, Genetics and Plant Breeding-I CO1:Understanding on cell function, chromosome structure and organization CO2: Knowledge on Genome organization in viruses, prokaryotes and eukaryotes, concept of epigenetic, molecular basis of gene mutation, genetic distances and phylogenetic analysis.
Cytology, Genetics and Plant Breeding-II	BOT 402(CGB2)	Cytology, Genetics and Plant Breeding-II CO1: Knowledge on RNAs processing and molecules. CO2: Understanding of techniques on molecular genetics, comparative genome and protein analysis CO3. Understanding of genetic engineering and public concerns
Cytology, Genetics and Plant Breeding-III	BOT 403(CGB3)	Cytology, Genetics and Plant Breeding-III CO1. Knowledge on Principles of plant breeding, quantitative and evolutionary genetics, chromosome variation in higher plants CO2. Knowledge on plant transformation and genetic engineering, cell, tissue and organ culture
Cytology, Genetics and Plant Breeding(Dissertation)	BOT 404(CGB1D)	Dissertation CO1. Works on cytology, genetics and marker based study.
Cytology, Genetics and Plant Breeding(Practical)	BOT405(CGB 1P)	Cytology, Genetics and Plant Breeding (Practical) CO1. Practices on preparation of smears from pollen mother cells and root tips, karyotypes and ideograms