University of Science & Technology Meghalaya

Department of BOTANY

BSC BOTANY

POs , PSOs, COs

SCHOOL OF BIOLOGICAL SCIENCE

B.Sc Programme Outcomes (PO):

PO1.**Knowledge and understanding of :**1. The range of plant diversity in terms of structure, function and environmental relationships. 2 The evaluation of plant diversity. 3. Plant classification and systematic position.4. The role of plants in the functioning of the global ecosystem.

PO2. Intellectual skills – able to: 1. Think logically and organize tasks into a structured form. 2. Assimilate knowledge and ideas based on wide reading and through the internet. 3. Transfer of appropriate knowledge and methods from one topic to another within the subject. 4. Understand the evolving state of knowledge in a rapidly developing field.

PO3. **Practical skills:** Students learn to carry out practical work, in the field and in the laboratory, with minimal risk. They gain introductory experience in applying each of the following skills and gain greater proficiency in a selection of them depending on their choice of optional modules. 1. Interpreting plant morphology and anatomy. 2. Plant identification. 3. Vegetation analysis techniques. 4. A range of physiochemical analyses of plant materials in the context of plant physiology and biochemistry. 5. Analyze data using appropriate statistical methods 6. Plant pathology to be added for sharing of field and lab data abtained. 6. Skills for developing nursery, develop and use organic farming

PO4. Scientific Knowledge: Apply the knowledge of basic science, life sciences and fundamental process of plants to study and analyze any plant form.

PO5. **Problem analysis:** Identify the taxonomic position of plants, formulate the research literature, and analyze non reported plants with substantiated conclusions using first principles and methods of nomenclature and classification in Botany.

PO6. Environment and sustainability: Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO7. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern instruments and equipments for Biochemical estimation, Plant cellular and physiological activities of plants with an understanding of the application and limitations.

PO8. The Botanist and society: Apply reasoning informed by the contextual knowledge to assess plant diversity, its importance for society, health, safety, legal and environmental issues and the consequent responsibilities relevant to the biodiversity conservation practice.

PO9. Ethics: Apply ethical principles and commit to environmental ethics and responsibilities and norms of the biodiversity conservation.

PO10.**Target for specialization:** Developing the ability to demonstrate proficiently in the experimental techniques and methods for analysis, appropriate for their area of specialization within biology.

PO11. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO12. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and

write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

B.Sc Programme Specific Outcomes (PSO):

PSO1. Understand the nature and basic concepts of Phycology, Mycology, Lichenology, and Taxonomy

PSO2. Understand the nature and basic concept of Instrumentation and Laboratory Techniques

PSO3. Understand the nature and basic concept of cytology, genetics, Molecular Biology, Microbiology, Plant physiology, Ecology and Phytogeography

PSO4. Understand the nature and basic concept, utility and methods of Biofertilizer, Nursery and Gardening, Pharacognosy, Horticultural Practices and Post Harvest Technology

PSO5. Understand the nature and basic concept of Anatomy, Palynology and Embryology, Stress biology, Economic Botany

PSO6. Understand the nature and basic concept of Applied Botany and Plant Breeding.

Course Outcome:

Semester-1

Course Code: BSB-101
Course Title: Phycology and Lichen(Theory)

Course outcome:
CO1. To get knowledge about different classes of algae, their habitat, habit, reproduction and life history

CO2. To learn about the proper documentation of algae of N.E. India

CO3. Understand the role of algae in the environment biotechnology and industry

CO4. Blue green algae are used as bio fertilizer. The student will learn how to identify and culture the algae and also their practical aspects.

CO5. To learn the basic knowledge of various classes of lichen, their habit, habitat, classification, reproduction and ecological significance

Course Code: BSB-102
Course Title: Archegoniate and Palaeobotany (Theory)

Course outcome:
CO1. To give the students some basic idea about the origin, evolution, classification of the group of Bryophyta, its comparative morphological, anatomical and reproductive differences within the group.

CO2. Deals with the basic understandings of the origin and evolution of pteridophytes.

CO3. The students will have a understandings of classification of vascular cryptogams, morphological, anatomical and reproductive diversity of pteridophytes.

CO4. To give students some basic understandings of classification and salient features of major taxa of Gymnosperm,its characteristics, affinities and relationships among different taxa and finally the economic importance of Gymnosperms.

CO5. It was designed to give an understanding of fossilization process. General account, anatomy and reproduction of Psilophyta (*Rhynia*), Lepidodendrales (*Lepidodendron*) and Sphenophyllaes (*Sphenophyllum*), Cycadofilicales (*Lyginopteris*), Bennettitales(*Williamsonia*) and Cordaitales (*Cordaites*) .

Course code: BSB-103

Course Title: Phycology and Lichen(Practical)

Course outcome:

CO1. To give the students some basic idea about the morphological structure of different algal types by preparation of temporary slides

CO2. To give the students some basic idea about the reproductive structure of different algal types by preparation of temporary slides

CO3. To give the students some basic idea about the morphological and reproductive structure of different types of lichens.

CO4. Collection, study and preservation of algal and lichen specimen through field study

Course code: BSB-104

Course Title: Archegoniate and Palaeobotany(Practical)

CO1: To give the students some detail idea about specimens of various genera of Bryophyte by performing dissection, sectioning drawing, description and identification of the specimens

CO2: To give the students some detail idea about specimens of various genera of pteridophyte by performing dissection, sectioning drawing, description and identification of the specimens

CO3: To give the students some detail idea about specimens of various genera of gymnosperms by performing dissection, sectioning drawing, description and identification of the specimens

CO4: Preparation of permanent slides of various specimens of bryophytes, pteridophte and gymnosperms.

Semester-2

Course code: BSB-201

Course Title: Anatomy, Palynology and Embryology (Theory)

Course outcome:

CO1. Study of anatomy will help students to understand the structural adaptations of plants with respect to diverse environmental conditions. It also helps them to distinguish between monocots, dicots and gymnosperms. Such a study is linked to plant physiology. Hence, it helps in the improvement of food crops.

CO2. By studying plant tissues and cells they will learn how the plants constructed and how they work. These studies are very important because they lead to be a better understanding of how to take care for plants and fight plant diseases.

CO3. Study of embryology will help students to understand the growth and development of a species and it will help to know how it evolved and how various species are related. In various field of research work embryology will help to link various species on the phylogenetic tree of life. It also helps to understand other branches of biology like genetics, cytology, physiology, evolution, etc.

CO4. By studying palynology students will learn about Pollen morphology, Types of Pollen, pollen sterility, pollen pistil interaction and it's significance.

CO5. Forensic palynology is a branch where palynology is beneficial to criminal investigators in revealing the history of evidence based on pollen and spore traces. Palynology has several unique uses in the modern world. Thus study of palynology has a plethora of potential career opportunities.

Course code: BSB-202
Course Title: Instrumentation and laboratory techniques (Theory)

Course outcome:

CO1. To get the knowledge of different instrument used in the laboratory .

CO2. To know about the chromatography.

CO3. It will provide the knowledge of sterilization, fixative and staining technique and different concept of solution

CO4. Students can learn about the process of herbarium technique and future preservation of the species as many of the species are becoming rare day by day due to deforestation, over-collection of the lay people, building activities etc.

CO5. They can make different types of hebarium sheets particularly for medicinal plants locally available on their area, keeping them in safe, further they can deliver their lectures in schools and colleges and can teach them about the dry specimens keeping in the herbarium sheet to prevent any damage and also for their further need.

Course code: BSB-203
Course Title: Anatomy, embryology and palynology(Practical)

CO1. Study of anatomy will help students to understand the structural adaptations of plants with respect to diverse environmental conditions. In this paper students will learn about the anatomical study of stem and root (Dicots and Monocots) by making double stained temporary/permanent slides and also about the anomalous secondary growth of selected plant specimens.

CO2. Study of embryology will help students to understand the growth and development of a species and it will help to know how it evolved and how various species are related. In the laboratory students study the T.S. of young anther; T.S. of mature anther and L.S. of ovule and embryo of dicot and monocot.

CO3. By studying palynology students will learn about pollen morphology of *Hibiscus, Datura*, and pollinia of *Cryptostegia* and*Calotropis* by acetolytic method

CO4. By studying plant tissues and cells they will learn how the plants constructed and how they work. Students learn about tissues and cells by making temporary and permanent slides.

Course code: BSB-204
Course Title: Instrumentation and laboratory techniques(Practical)

CO1. Students will learn about how to make solutions of various strengths and how to make buffer solutions which is very essential for practical laboratory work.

CO2. Students will learn about how to make Reagents, Fixatives, stains and Indicators, which is very essential for practical laboratory work.

CO3. Students will learn about how to calibrate the pH meter and how to measure pH.

CO4. Students can learn about the process chromatographic separation of plant pigments

Semester-3

Course code: BSB-301
Course Title: Angiosperm Taxonomy (Theory)

Course outcome:

CO1. Understand the basic idea of flowering plants and their systematic position or classification.

CO2. Students may visit the forest area for collection of plants and identify with upto their knowledge learnt at the class

CO3. Students may know the uses of unknown plants used by the tribal people of the society with ethnobotanical uses.

CO4. Students may visit some research organisations like BSI, NBRI, FRI and can gather knowledge about the herbarium technique with up to date nomenclature of the plant

CO5. They can apply for Research fellowship for Ph. D and other higher Degree in Plant Taxonomy in Universities and Deem Universities for their future employment.

Course code: BSB-302
Course Title: Mycology and Plant Pathology (Theory)

Course outcome:

CO1. Understand history of Mycology, Fungal cell structure and classification, reproduction, growth and nutrition. Economic importance of fungi.

CO2. Morphology and reproduction of few important fugal genera.

CO3. **(0.1)**Understanding history of Plant pathology.

CO4. To get knowledge about Plant diseases caused by fungi and their control measures:

CO5. Plant disease: symptoms of Plant Diseases viral, fungal and bacterial.

Course code: BSB-303
Course Title: Cytology, Genetics and Plant Breeding (Theory)

Course outcome:

CO1. Genetics is a branch of biology that is used for the study of the mechanism of heredity and variation

CO2. Genetics, in fact provides the modern paradigm (a prototype) for whole of biology.

CO3. Cytogenetic tests are often used in the diagnoses of genetic diseases and in parental diagnostics.

CO4. To produce a health forecast by analysing database of genetic and cell biology information.

CO5. It is also important for the researchers or biologists in generating vaccines, medicines etc.

Course code: BSB-304
Course Title: Angiosperm Taxonomy and Mycology (Practical)

Course outcome:

CO1. Students will learn about vegetative structure of angiospermic plants of monocotyledons and dicotyledones.

CO2. Students will learn about reproductive structure of angiospermic plants of monocotyledons and dicotyledones.

CO3. Students will learn morphology and reproductive structures of different fungal species.

CO4. Students will learn about different angiospermic species in the field. They also learn about the collection , preservation, preparation of herbarium sheets and preparation of field report.

Course code: BSB-305
Course Title: Plant Pathology, Cytology and Genetics (Practical)

Course outcome:

CO1. Students will learn about various plant diseases from the infected plant parts. They will also learn about how to collect, identify the pathogens.

CO2. Students will learn about how to study different stages of mitotic divisions from onion root tip cells.

CO3. Students will learn about how to study different stages of meiotic divisions.

CO4. Students will learn about karyotype study in onion and garlic.

Course code: BSB-306 (SEC-I)
Course Title: Biofertilizer (Theory)

Course outcome:

CO1. To get the knowledge of different microorganism involve in improving soil health .

CO2. It will also give the knowledge of organic farming.

CO3. Students will learn different techniques to produce biofertilizer

CO4. Students will learn about the methods of isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.

Semester-4

Course code: BSB-401
Course Title: Microbiology (Theory)

Course outcome:

CO1. To get knowledge about the Introduction and different scopes of study in various microbial field

CO2. To attain knowledge about the Germ theory of disease and koch's postulates. Control of microorganisms, Microbial nutrition, different culture media, isolation of microorganisms, pure culture concept, methods of preservation.

CO3. Basic knowledge about soil microbiology, air microbiology and water microbiology

CO4. Understand the basic concept of food microbiology, microbes responsible for spoilage and poisoning of food and precautions for preservation of food.

CO5. To get knowledge about utilization of microorganisms in dairy industries and ethanol production.

Course code: BSB-402
Course Title: Plant physiology (Theory)

Course outcome:

CO1. Understand the basic physiological relationship of Plant, water and soil and translocation of organic solutes

CO2. Understand the basic biochemical and physiological knowledge about the utility of different minerals present in the soil for the growth and development of plants and the deficiency symptoms of micro and macro nutrients to plants

CO3. Understand the basic knowledge about the Physiology and biochemistry of photosynthesis, chemosynthesis and respiration i.e., breakdown of sugar

CO4. Understand detail knowledge about the physiology of flowering, scenescens and abscission in plants and dormancy of seed

CO5. Basic knowledge about the physiological role of phytohormones in the growth and development of plants

CO6. Basic knowledge about the Biochemistry of enzymes

Course code: BSB-403
Course Title: Ecology and Phytogeography (Theory)

Course outcome:

CO1. To highlight the students with some basic understandings of plant ecology and ecosystem, food chain and its types, food webs, energy flow in an ecosystem. Understanding on habitat and niche, types of niche.

CO2. Deals with the understanding of plant population and community ecology, various attributes of population and community. The students will have an understanding on coexistence, intra-specific interactions, and interspecific interactions among various population, ecological succession and its significance

CO3. Deals with the understanding of phyto-geographical regions of India, detail idea about the floras of North-East India. Understanding on mechanism of migration and barrier of plant distribution and also about biodiversity hotspots and endemism, the unit also give the preliminary understanding on pollution its cause and remedies.

CO4. Deals with the understanding of biodiversity, its concept and status in India. It will give an understanding of loss of biodiversity, its causes and management and also various strategies involved in the conservation of biodiversity.

CO5. To give an understanding on protected area regime, acts and legislations.

Course code: BSB-404
Course Title: Microbiology and Water relations(Practical)

Course outcome:

CO1. To get knowledge about cleaning and sterilization of equipments and preparation of different media for microbial culture.

CO2. To attain knowledge about pure culture technique, isolation and enumeration of microbes from air, soil and water

CO3. Basic knowledge about how to study Gram positive and Gram negative bacteria.

CO4. Understand the how to determine osmotic potential of cell sap and how to determine stomatal index, stomatal frequency and estimate the transpiration rate of different types of leaves.

Course code: BSB-405
Course Title: Plant Physiology and Ecology (Practical)

Course outcome:

CO1. To get knowledge about how to determine Q10.

CO2. To attain knowledge about assay of effect of auxin in split pea test

CO3. To learn about extract and separate chloroplast pigments by paper chromatography

CO4. Understand the how to estimate quantitative and qualitative aspects of different ecological parameters

Course code: BSB-307(SEC II)
Course Title: Nursery and Gardening (Theory)

Course outcome:

CO1. It will provide the knowledge, how to open a nursery.

CO2. To know about the different method of gardening and land scaping.

CO3. To get the knowledge of cultivation, storage and marketing of various vegetable crops

CO4. To get knowledge about how to develop different types of garden and their management strategies.

Semester-5

Course code: BSB-501
Course Title: Pharmacognosy (Theory)

Course outcome:

CO1. To get knowledge about the history and scope of pharmacognosy, traditional and alternative systems of medicine

CO2. To get knowledge about Tridosha concept, Nutraceuticals &Cosmeuticals

CO3. Basic knowledge about Drug adulteration, Methods of drug evaluation.

CO4. To get knowledge about occurrence, distribution cultivation, microscopic characters, constituents and uses of root rhizome drugs, stem, bark, leaf flower and fruit drugs.

CO5. Understand the various branches of Ethno-botany, Methodology, importance of Ethnobotany in research and conservation.

CO6. Basic knowledge about various ethnic Societies of North-East India and use of some plant by the tribes.

Course code: BSB-502
Course Title: Economic Botany (Theory)

Course outcome:

CO1. Students may know the plant kingdom and economic importance of the various categories of plants such as cereals, beverages, pulses, timber, fibers and sugar yielding plants.

CO2. Now a days Ethnobotany is very important part of economic botany. Hence students may gather knowledge about the traditional knowledge of the plants used by the primitive people of the society

CO3. To gather knowledge about the major spices, condiments, narcotics, mastigatories and funmitories, beverages.

CO4. To gather knowledge about the different types of ornamental plants. Plants used as avenue trees for shade, pollution control and esthetics.

CO5. To gather knowledge about the plants used in Sericulture.

Course code: DSE-I (BSB-503)

Course Title: Stress Biology (Theory)

Course outcome:

CO1. Understand the basic concept of stress physiology of plants

CO2. To learn about the physiological effect of various abiotic stress to plants such as **Water stress; Salinity stress, High light stress; Temperature stress**

CO3. To learn the physiological effect of various biotic stress

CO4. To understand the developmental and physiological mechanisms that protects plants against environmental stress. Adaptation in plant to various stress

CO5. Understand about reactive oxygen species: Production and scavenging mechanisms.

Course code: DSE-II (BSB-504)

Course Title: Plant Breeding (Theory)

Course outcome:

CO1. The study of plant breeding is necessary for changing the traits of plants in order to produce desired characteristics.

CO2. The knowledge of how to improve the quality of nutritional crop products for humans and animals can be initiated by plant breeding techniques.

CO3. Plant breeding technique can be used for producing disease resistant plants.

CO4. New plant varieties can be produced by plant breeding.

CO5. International development agencies believe that breeding new crops is important for ensuring food security by developing new varieties that are higher yielding.

Course code: BSB-505

Course Title: Pharmacognosy (Practical)

Course outcome:

CO1. To get knowledge about organographis studies of various medicinal plants

CO2. Detail study of selected medicinal and aromatic plants

CO3. Field study of different ethnomedicinal plants

CO4. Preparation of field report and herbarium

Course code: BSB-506

Course Title: Economic Botany (Practical)

Course outcome:

CO1. Detail study of selected common medicinal plants and their useful parts.

CO2. Detail study of major spices and their useful parts.

CO3. Field study of different economically important plants.

CO4. Preparation of field report and herbarium.

Course code: DSE-I (BSB-507)

Course Title: Stress Biology (Practical)

Course outcome:

CO1. Students will learn about how to estimate the antioxidant enzyme, peroxidase activity in seedlings **in the absence and presence of salt stress.**

CO2. Students will learn about how to estimate the Super oxide dismutase and proline activity in seedlings **in the absence and presence of salt stress.**

CO3. To learn the anatomical effect of various abiotic stress

CO4. To understand physiological effect of water stress on plants

Course code: DSE-II (BSB-508)

Course Title: Plant Breeding (Practical)

Course outcome:

CO1. Students will learn the techniques for emasculation.

CO2. The knowledge of how to identify plant for breeding.

CO3. Students will learn the techniques for hybridization of any plants

CO4. To learn techniques for development of New varieties by plant breeding techniques.

Semester-6

Course code: BSB 601

Course Title: Molecular Biology and Bioinformatics (Theory)

Course outcome:

CO1. Molecular biology is the basic science that has as its goal an explanation of life processes at the subcellular and molecular level.

CO2. Molecular biology deals with nucleic acids and proteins and how these molecules interact within the cell to promote proper growth, division, and development.

CO3. This course will emphasize on the molecular mechanisms of DNA replication, repair, protein synthesis, mutation etc.

CO4. Developments in molecular biology have opened new areas of study and provided powerful techniques that are revolutionizing the pharmaceutical, health, and agricultural industries.

CO5. The knowledge of bioinformatics involves in analysis of plant and human genome, identification of targets for drug discovery, the study of structural and functional relationships and molecular evolution.

Course code: BSB 602

Course Title: Applied Botany (Theory)

Course outcome:

CO1. To get basic knowledge on plant breeding

CO2. To get basic knowledge on mushroom cultivation

CO3. Understanding application of Biotechnology in conservation of plant generic resources

CO4. Importance of tissue culture and it's application

CO5. Understanding the role of plant growth regulators in Agriculture and Horticulture and mode of applications of plant growth regulators.

Course code: DSE-III (BSB-603)

Course Title: Plant Resourse Utilization (Theory)

Course outcome:

CO1. By studying "Plant resource 13tilization" students will learn about different dimensions of plant identification as a resource for self- sustenance, their domestication, commercialization based on the need and induction of modification using modern techniques.

CO2. They will learn about the utilization of wild plants as it is more limited and how to improve it for the new need and imperatives of mankind.

CO3. Study of medicinal plants would help them in research and development of newer organic drugs that would help to minimize adverse effect that are usually evident in synthetic and semi-synthetically processed drugs. Thereby proving to be a boon to medical science.

CO4. They will learn about the different conservation processes like in-situ and ex-situ conservation of plants that are going to be extinct very soon due to biotic, abiotic and anthropogenic causes.

CO5. Study of plant resource 14tilization will enhance their specific knowledge and technological skills in converting the rich bio-resource into economic wealth.

CO6. Students can discover wild tea germplasm using genetic markers for developing better variety of tea with better quality, productivity and resistance to pests and stress conditions. India is major tea producer and Assam produces 13% tea in the world, hence of extreme economic importance.

Course code: DSE IV (BSB-604)

Course Title: Horticultural Practices and Post Harvest Technology (Theory)

Course outcome:

CO1. It will give the knowledge , how to identify the different important plants.

CO2. To know about the production of different fruit and vegetable crops.

CO3. To know about the different horticultural technique of weed control and irrigation.

CO4. To know about the different method of propagation.

CO5. To get the knowledge of post harvest technology of fruits and vegetables.

Course code: BSB 605

Course Title: Molecular Biology (Practical)

Course outcome:

CO1. Students will get knowledge about determination of protein content from the sample

CO2. Students will learn about separation and identification of amino acids by paper chromatography method

CO3. Developments in molecular biology have opened new areas of study and provided powerful techniques that are revolutionizing the pharmaceutical, health, and agricultural industries.

Course code: BSB 606

Course Title: Applied Botany (Practical)

Course outcome:

CO1. Students will learn hand on technique on tissue culture techniques

CO2. Students will learn hand on technique on mushroom cultivation

CO3. Understand the role of auxin on germination and growth of crops.

Course code: DSE III BSB-607

Course Title: Plant Resourse Utilization (Practical)

Course outcome:

CO1. Students will learn hand on technique on extraction of essential oil from lemon grass and Holy basil

CO2. Students will learn hand on technique on collection and preparation of Henna powder, Amala and Ginger

CO3. Students will learn hand on technique on collection and preparation of Aloe gel.

CO4. Students will learn on various plant resources and products

Course code: DSE IV BSB-608

Course Title: Horticultural Practices and Post Harvest Technology (Practical)

Course outcome:

CO1. Students will learn propagation technique of horticultural crops.

CO2. Students will learn hand on technique on nursery bed preparation and seed sowing

CO3. Students will learn different horticultural technique of weed control and irrigation

CO4. Students will learn hand on technique on jam and jelly production

Course code: BSB-609
HVP 760

Course title: Fundamentals of Human values and Professional ethics
Non credit mandatory course

CO1. To critically understand ethical issues as they pertain to professional and personal identity.
CO2. To learn to consider oneself and the world around from these basic ethical positions.
CO3. To develop sharpened analytic powers and capacities for oral and written expression.