M. Sc. Botany

Programme Outcomes:

The master of science in Botany programme provides the students with knowledge, general competence, and analytical skills on an advanced level, needed in academics, industry, research, or public administration.

Knowledge outcomes

Students will

PO1: get substantial knowledge in Botany, basic knowledge in life sciences and understanding of the interconnectedness of different disciplines.

PO2: get some research experience within a specific field of botany, through project work.

PO3: get ability to apply knowledge of Botany to the real world issues.

PO4: be familiar with contemporary research within various fields of Botany.

PO5: use creativity, critical thinking, analysis and research skill to solve biodiversity and environmental issues.

Skill Outcomes

Students will

PO6: have the background and experience required to model, analyse and solve problems in biosciences.

PO7: be able to employ up-to-date and relevant knowledge and skills in several discipline.

PO8: communicate scientific information in a clear and concise manner with the help of dissertation and research articles.

PO9: analyse and present the research data using bioinformatics and biostatistics tools.

General Competence:

The students will

PO10: be able to understand the role of Botany in society and has the background to consider ethical problems

PO11: know the historical development of plant sciences, its possibilities and limitations, and know understand the value of lifelong learning.

PO12: get an ability to participate in debates, discussions in the society constructively.

Programme Specific Outcomes

After completing M.Sc. Botany Programme students will be able to:

PSO1: Demonstrate and Understanding of principles and theories of Botany. Theses includes: Biodiversity, Cryptogamic Botany, Plant Physiology and Biochemistry, Molecular biology and cell biology, Ecology;

PSO2: apply knowledge of Botany for entrepreneurship through nursery development, landscape gardening, herbal medicinal plant industry, mushroom cultivation.

PSO3: demonstrate ability to apply knowledge of the diversity of plants in the context of various disciplines of botany.

PSO4: take research work at the higher degree level in the field of Mycology and Plant pathology, Taxonomy, Plant Physiology, Pharmacognosy.

M.Sc. Part I (Semester I)

BO 1.1 Cryptogamic Botany I- Bryophytes and Pteridophytes

After successfully completing this course, students will be able to:

CO1: define Cryptogams, Algae, Fungi, Bryophytes and Pteridophytes.

CO2: discuss the distinguishing features, interrelationships, phylogeny and affinities of cryptogams.

CO3: categorize Algae, Fungi, Bryophytes and Pteridophytes.
CO4: describe morphology, anatomy, reproduction and life cycle of forms of bryophytes and Pteridophytes.
CO5: analyze the evolutionary trends of Pteridophytes, telome theory and stellar evolution.
CO6: justify life cycle of various forms of Bryophytes and Pteridophytes.
CO7: relate uses of Bryophytes, Pteridophytes and their role in environment.
CO8: illustrate ecology and physiology of bryophytes

BO 1.2 Biochemistry and Plant Physiology

After successfully completing this course, students will be able to:

CO1: define the importance of metabolites and their biosynthesis process.
CO2: explain the metabolism of plants and their application for mankind.
CO3: interpret the biochemical pathways in the plant.
CO4: discuss the physiology of plant and their various activities.
CO5: recall the basic principle of development of the plant.
CO6: use knowledge of the biomolecules from plant source.
CO7: illustrate Agri-Electronic equipments for plant physiological studies.
CO8: evaluate sensory photobiology.

BO 1.3 Genetics and Plant Breeding

After successfully completing this course, students will be able to:

CO1: recall mendelian and Non-mendelian inheritance
CO2: recognize various statistical test for solving various mendelian problems.
CO3: explain the concept of linkage and crossing over.
CO4: model gene mapping by Tetrad analysis and interrupted mating in Bacteria.
CO5: discuss the concept of qualitative and quantitative inheritance pattern.
CO6: describe concept of chromosomal aberrations.
CO7: explain microbial genetics.
CO8: categorize various crop improvement methods.

BO 1.4 Botanical Techniques

After successfully completing this course, students will be able to:

CO1: define principles of botanical techniques.
CO2: discuss the concept of microscopy, chromatography, electrophoresis, spectroscopy, centrifuge, immunology and molecular biology.
CO3: illustrate applications of different types of microscopes, chromatography, spectrophotometers, centrifuges, pH meter and oxygen electrode.
CO4: analyse tissue/cell by histochemical and cytochemical techniques.
CO5: demonstrate TLC, ELISA, PCR and SDS-PAGE techniques.
CO6: determine radioactive techniques used in biology.
CO7: justify Immunological techniques.
CO8: relate electrochemical techniques in plant sciences.

BO 1.5 Practical based on BO 1.1 and BO 1.4

After successfully completing this course, students will be able to:

CO1: recognize the morphology of Cryptogamic plants.
CO2: explain the external and internal characters of Bryophytes and Pteridophytes.
CO3: describe various principles behind the instruments.
CO4: know the working mechanism of instrument in experimental botany.
CO5: illustrate biological instruments.
CO6: compare the various methods for analysing or quantifying the biological source.
CO7: use flurochromes to visualize specific cell components.
CO8: compare cytochemical analysis used in botany.

BO 1.6 Practical based on BO 1.2 and BO 1.3

After successfully completing this course, students will be able to:

CO1: describe the various enzyme activities and their isolation and quantification method.
CO2: explain different methods for isolation and quantification of bio-molecules.
CO3: compare the pigment system and their isolation process.
CO4: select the fine techniques for preparation of various solution.
CO5: solve problem based practical for better understanding of genetic principles.
CO6: observe the different stages and their structural changes during cell division.
CO7: use chromatography techniques for isolation and estimation.
CO8: solve Problems of Mendelian inheritance and estimation of gene frequencies.

M.Sc. Part I (Semester II)

BO 2.1 Cryptogamic Botany II: Algae & Fungi

After successfully completing this course, students will be able to:

CO1: define cryptogamic plants.
CO2: classify algae and fungi according to their systems of classification.
CO3: recall the contribution of Indian phycologist and Mycologist.
CO4: explain the structure, reproduction and life cycle of Algae and Fungi.
CO5: describe the development based on reproductive structure.
CO6: diagram the life cycle of algal and fungal forms.
CO7: interpret uses and economics importance of algae and fungi.
CO8: evaluate mycorrhiza and lichens and their forms.

BO 2.2 Cell Biology and Evolution

After successfully completing this course, students will be able to:

CO1: describe the organization of cell and their structure.
CO2: explain the ultra-structure of various organelles of the plant cell.
CO3: know the biogenesis mechanism of the organelles.
CO4: analyse cellular talking and their by-products.
CO5: identify regulation mechanism of cellular activities.
CO6: report the phylogenetic affinities and evolution process in plants.
CO7: explain signal transduction in plants.
CO8: discuss the mechanism of evolution on genetic basis.

BO 2.3 Molecular Biology and Genetic Engineering

After successfully completing this course, students will be able to:

CO1: explain gene expression in plants and their activity for plant metabolism
CO2: describe the structure and properties of nucleic acid.
CO3: classify DNA replication in Prokaryotes and Eukaryotes.
CO4: explain DNA damage and Repair
CO5: interpret the process of transcription and translation.
CO6: identify various steps in Recombinant DNA technology
CO7: understand the role of enzymes and vectors in Recombinant DNA technology.
CO8: report applications of genetic engineering in plants.

BO 2.4 Plant Ecology and Phytogeography

After successfully completing this course, students will be able to:

CO1: classify different ecosystems and their importance.
CO2: relate the plant and environmental interaction.
CO3: describe the impact of climatic condition for the growth and development of the plant.
CO4: explain the energy transformation within environment.

CO5: discuss the basic process of evolution.
CO6: describe the distribution of plants and their adaptive capacity in different area.
CO7: classify biomes and components.
CO8: demonstrate Endemism and EIA.

BO 2.5 Practical based on BO 2.1 and BO 2.2

After successfully completing this course, students will be able to:

CO1: explain the basic morphological characters of some forms of algae and fungi for systematic treatment
CO2: choose identification clue for algae and fungi.
CO3: operate protocols for isolation of cell organelles.
CO4: explain the histo-chemical analysis of cells.
CO5: describe cell and its structure.
CO6: interpret the organelle structure.
CO7: compare different plant fossils with respect to evolution
CO8: determine Geological Time Scale

BO 2.6 Practical based on BO 2.3 and BO 2.4

After successfully completing this course, students will be able to:

CO1: perform different methods for isolation of DNA and its characterisation.
CO2: apply advanced experimental Botany at molecular level.
CO3: understand the minute principle during the bio-molecular study
CO4: describe the various eco-physiological properties of plant
CO5: classify different ecosystem, vegetation study and various biodiversity indices
CO6: implement the recent techniques in plant improvement.
CO7: determine physicochemical analysis of soil
CO8: compare of stomata index, chlorophyll contents and pollution fertility of the plants from polluted and non-polluted area

M.Sc. Part II (Semester III)

BO 3.1 Spermatophytic Botany

After successfully completing this course, students will be able to:

CO1: explain General Aspects and Fossil Gymnosperms.
CO2: describe morphology of Living Gymnosperms.
CO3: interpret various rules of Nomenclature and their use in classification.
CO4: apply taxonomic aspect of Angiosperm and their use for identification of plants on field.
CO5: describe plant systematics and its role in classification.
CO6: classify various systems of classification and their role to solve the taxonomy of ambiguous taxa.
CO7: recognize phytogeography and endemism in western Ghats.
CO8: evaluate affinities of pteridophytes and angiosperms.

BO 3.2 Developmental and Economic Botany

After successfully completing this course, students will be able to:

CO1: explain the basic process of development.
CO2: describe the properties and unique features of plant development.
CO3: discuss the embryological process of plant.
CO4: interpret the molecular events during the developmental pathway.
CO5: explain the signalling mechanism during developmental events.
CO6: recognize developmental pattern in various plants along with its evolutionary aspects.
CO7: determine process seed germination.
CO8: compare organ culture, anther, pollen and protoplast culture and its role in

understanding plant development.

BO 3.3 Industrial Botany I

After successfully completing this course, students will be able to:

CO1: relate algae and their industrial products.
CO2: interpret role of different plants in various industries.
CO3: develop the industrial processes among the students.
CO4: study and learning about biological control of various pests and diseases
CO5: execute theoretical knowledge for preparation of Biopesticides.
CO6: implement learning process of biofuel technology by using various raw material.
CO7: learn about Entrepreneurship and Management, and their application for establishment of Industry.
CO8: discuss about antibiotics industry.

BO 3.4 Advanced Biodiversity

After successfully completing this course, students will be able to:

CO1: classify various types of Biodiversity and their importance.
CO2: identify genetic diversity among plants based on various DNA markers.
CO3: illustrate species diversity, indices, richness abundance and its types viz. alpha, beta and gamma.
CO4: identify and explain various ecosystems of world.
CO5: analyze diversity at different taxonomic levels.
CO6: discuss diversity at taxonomic level with reference to species, habit, habitat, distribution and evolutionary success.
CO7: determine the assessment and monitoring of biodiversity.
CO8: illustrate loss of biodiversity.

BO 3.5 Practical based on BO 3.1., 3.2. &3.3.

After successfully completing this course, students will be able to:

CO1: apply the basic morphological characters for preparation of artificial keys of some families for systematic treatment, development and anatomical aspects of angiosperms and gymnosperms.
CO2: explain role of economic botany in society.
CO3: recognize various industrial products from algae and fungi.
CO4: prepare forest field visit notes and report of locally available medicinal, endemics and exotic plants.
CO5: perform various culture techniques of tissue culture.
CO6: compare between vegetative SA and reproductively induced SA.
CO7: determine fossil specimens of gymnosperm.
CO8: evaluate stages of embryo development in plants.

BO 3.6 Practical based on Paper BO. 3.50

After successfully completing this course, students will be able to:

CO1: explain the methods of vegetation study, its software, diversity indices, study and conservation of endangered plants through micro propagation.
CO2: describe methods of above ground and below ground biomass.
CO3: prepare shoot canopy profile.
CO4: estimate algal and fungal species diversity of water and soil samples.
CO5: explain quadrat and belt methods.
CO6: interpret about vegetation through study of satellite image and aerial photographs.
CO7: identify and describe various phytogeographical regions of India.
CO8: relate chromosomes, chromosome banding and Karyotype analysis.

M.Sc. Part II (Semester IV)

BO 4.1 Computational Botany

After successfully completing this course, students will be able to:

CO1: interpret statistical analysis of the biological data.
CO2: recall basic principles behind the experimental design
CO3: explain testing of hypothesis.
CO4: prepare the experimental planning for laboratory work.
CO5: avail the conclusion w.r.t. biological data.
CO6: apply the computer based software for concluding the information gathered from biological source.
CO7: determine phylogenetic relationships using DNA and protein sequences.
CO8: analyze nucleotide sequence by molecular tools in proteins.

BO 4.2 Plant Organism Interaction

After successfully completing this course, students will be able to:

CO1: mutualistic relationship of organisms for biodiversity conservation.
CO2: describe allelopathic, parasitic, epiphytic and carnivorous plants and their interaction.
CO3: relate mimicry and evolution of insects for pollination mechanism.
CO4: explain seed dispersal mechanism.
CO5: Identify symbiotic association between insect, fungi, algae, bacteria and plants.
CO6: relate algae-coral/ fungal-insect.
CO7: determine seed dispersal mechanisms in plant sciences.
CO8: evaluate co-evolution of pollinators and plants.

BO 4.3 Industrial Botany II

After successfully completing this course, students will be able to:

CO1: interpret applications of various medicinal plants mentioned in Atharva Veda.
CO2: develop various techniques of landscape gardening and industrial aspects of forest botany.
CO3: implement propagation techniques of various ornamental floricultural crops.
CO4: describe post-harvest technology of tropical and sub-tropical fruits.
CO5: interpret preservation techniques for preparation of Jam and Jelly.
CO6: prepare bankable techno commercial reports of micro-propagated plants.
CO7: determine Maturity and harvesting indices.
CO8: compare principles of conventional methods of preservation.

BO 4.4. Plant Pathology

After successfully completing this course, students will be able to:

CO1: identify different plant diseases on the basis of their symptoms.
CO2: classify different plant diseases and its impact on human affairs.
CO3: recognize pathogenicity of biotrophic and necrotrophic pathogens.
CO4: describe role of environmental factors in developing diseases and defence mechanism in plants.
CO5: explain ideas of post-harvest diseases of fruits, vegetables and seeds.
CO6: discuss disease management and role of biotechnology in plant pathology,
CO7: relate environmental factors and disease development.
CO8: determine disease control using biological and chemical activators of resistance.

BO 4.5 Practical based on BO 4.1, 4.2, 4.3 & 4.50

After successfully completing this course, students will be able to:

CO1: analyse biological data by statistical methods.
CO2: execute bioinformatics tools for retrieving data, pairwise and multiple sequence alignment

CO3: identify mutualistic relationship between organisms.
CO4: extract essential oils and bioactive compounds from plants.
CO5: execute micropropagation technique for propagation of plants.
CO6: solve the pathological issues of commercial crops.
CO7: determine Karl-Pearson's coefficient of correlation from the given grouped and ungrouped data.
CO8: justify micropropagation of banana, sugarcane and *Lilium.*

BO 4.6 Project based on special paper

After successfully completing this course, students will be able to:

CO1: develop the research aptitude.
CO2: evaluate the basic needs for research.
CO3: execute research ideas and solve issues related with it.
CO4: criticise the experimental data.
CO5: design and construct research data for creative writing.
CO6: defend while presenting their research work.
CO7: persue further Research work.
CO8: develop investigation skills for new innovations beneficial to society.