# DEPARTMENT OF BOTANY

B. Sc. Botany

Programme Outcomes:

## Knowledge outcomes:

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

PO1: Students will get the fundamental knowledge of the basic principles of major fields of Botany.

PO2: They can use their knowledge to solve the issues related to botany with the help of computer technology

PO3: Student will learn how to conserve the endemic and endangered plant species

## Skill outcomes:

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

PO4: They can have effective collaboration with team-oriented projects in the field of Plant sciences.

PO5: They can learn communication skills in a clear and concise manner both orally and in writing

PO6: explain Biodiversity, climate change and plant pathology.

PO7: They have scope in applied botany such as Biotechnology, Ecology, Genetics and Plant breeding techniques in plant sciences

PO8: apply knowledge of Medicinal and Economic botany in day to day life.

PO9: apply the knowledge to develop the sustainable and ecofriendly technology in Industrial Botany

## Generic outcomes:

Students will

PO10: They will develop their critical reasoning, judgment and communication skills.

PO11: Can study the recent developments in the field of Molecular and cell Biology, Biotechnology, Computational Botany and relevant fields of research and development.

PO12: Enhance the scientific temper among the students so that to develop a research culture and Implementation the policies to tackle the burning issues at global and local level.

## Programme Specific Outcomes

PSO1: Students will learn the techniques which are used in industrially important plant products.

PSO2: Students get conceptual knowledge of entrepreneurships in mushroom industry, Biofertilizers and Biopesticides production, plant tissue culture laboratories, Enzyme production, Fermentation, Single cell proteins etc.

PSO3: Students will understand the diversity of the plants and structural organization of plants like Dicot & Monocot.

PSO4: Understand plant structures in the context of ecological, physiological and biochemical functions of plants.

PSO5: Students will be well trained with various mechanisms of GMOs and molecular techniques.

## Course Outcomes
## F. Y. B.Sc. Botany
## CourseBO-111: PLANT LIFE AND UTILIZATION I

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

CO1: outline cryptogams and phanerogams.
CO2: Distinguish characters of cryptogams and Phanerogams.
CO3: Classify the plants in to cryptogams and Phanerogams.
CO4: Describe the Life cycle of plant forms of cryptogams.
CO5: Identify lichens and their economic value.
CO6: Discuss morphology of vegetative and reproductive parts of plants.

## Course BO-112: PLANT MORPHOLOGY AND ANATOMY

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

CO1: Define Plant anatomy & morphology.
CO2: Describe botanical concepts, including plant anatomy.
CO3: Differentiate with respect to tissue distinguishing.
CO4: Study reproductive structures in plant
CO5: Learn about the formation of fruits.

## Course: Practical Botany -I

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

CO1: Recognize the live forms of Cryptogamic and Phanerogamic plants.
CO2: Analyse and describe botanical concepts, including plant anatomy.
CO3: Illustrate the floral parts, fruits, leaves and their types.
CO4: Study the mushroom cultivation.
CO5: Categorize the plants into Monocot and Dicot on the basis of anatomical characters.

## Course BO-121: PLANT LIFE AND UTILIZATION-II

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

CO1: outline of vascular plants
CO2: utilization & economic importance of Vascular plants
CO3: Life cycle pattern in vascular plants.
CO4: Study reproductive structures in plant
CO5: Utilization and economic importance of Plant: In food, fodder, fibers, horticulture and medicines.

## Course Outcomes

**S. Y. B.Sc. Botany**

**BO 211: Taxonomy of Angiosperms and plant community**

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

Define plant taxonomy and taxonomic related terminologies.

CO1:

CO2: Explain different classification systems of angiosperms.

CO3: Use required data sources for classification of angiosperms.

CO4: Determine Botanical Nomenclature of angiosperm plants.

CO5: Recognize ecological plant groups with examples.

CO6: learn plant families with examples.

CO7: Apply proper herbarium methods - collecting, mounting, and keeping records.

CO8: Execute computer knowledge in plant taxonomy and digital herbarium.

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## BO212: Plant Physiology

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

CO1: learn about Plant water relations, Growth, Transpiration, Ascent of Sap, Plant growth regulators and Nitrogen metabolism.

CO2: Explain processes of mineral nutrition, absorption of water, ascent of sap, mechanisms of water loss from plants.

CO3: Perform processes of imbibition, Osmosis, Diffusion and Plasmolysis, measure growth by arc auxanometer.

CO4: Describe Plant growth regulators and their types.

CO5: Discuss nitrogen metabolism in plants

CO6: Learn mechanisms and application of photoperiodism

## BO 213:Plant Anatomy, Embryology and Palynology

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

CO1: Study Plant Anatomy, Embryology.

CO2: Describe various tissue systems in plants like epidermal, mechanical and vascular.

CO3: Interpret the Principles- incompressibility ,inextensibility,shearing stress etc in plants.

CO4: Explain the process of normal and abnormal secondary growth in plants.

CO5: Identify the process of pollination and fertilization.

CO6: Discuss the Structure and development process of male and female gametophyte CO7: The types of microspore, ovules, embryo, seed and endosperm.

## BO 213: Plant Biotechnology

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

CO1: Define the terminologies related to plant biotechnology.

CO2: Describe the fermentation process&enzyme technology.

CO3: Interpret the production of Single cell proteins.

CO4: Study the concept of phytoremediation.

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CO5: Study General method of gene isolation from the plants and their application.
CO6: Learn Methods of gene, transfer in plants.
CO7: StudyApplication of plant genetic engineering and Nano-biotechnology in crop improvement.

## BO 213:Practical Paper III

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

CO1: Classify &identify the plant families.
CO2: Study the pollen , pistil interaction
CO3: Draw the floral diagram of plants belonging to specific families.
CO4: Demonstrate physiological experiments, fermentation and fermentation products.
CO5: Demonstrate& perform pH, plasmolysis, osmosis,DPD
CO6: Describe internal structure of plant organs.
CO7: Describe the Transpiration process.
CO8: Micro/Megasporogenesis, pollination, fertilization, embryo & endosperm formation in plants

## T. Y. B. Sc. Botany

## BO 331: Cryptogamic Botany

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

CO1: to differentiate Higher and Lower cryptogams.
CO2: Identify the vegetative and reproductive structures in Cryptogams.
CO3: Describe thallus organization&Internal structure of cryptogams.
CO4: Diagram life cycle of various Cryptogams.
CO5: Classify the lower cryptogams &higher cryptogams
CO6: Importance and role of Cryptogams for human being.

## BO 332: Cell and Molecular Biology

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

CO1: Define terminologies related to cell and molecular biology.
CO2: Identify localization and describe all cell organelles.
CO3: Discuss the dynamics of plant cell structure and function.
CO4: Describe Replication, Transcription and Translation processes.
CO5: Explain gene action and regulation.

## BO 333: Genetics and Evolution

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

CO1: Define the terminologies of Genetics and evolution
CO2: Study of Mendelian Genetics
CO3: Discuss the Interactions of genes.
CO4: Explain the Concept, Characters and Examples of multiple alleles.
CO5: Describe the Euploidy, Aneuploidy and chromosomal aberrations.
CO6: Determine Linkage, Crossing over and quantitative inheritance.
CO7: study of evolution patterns.

## BO 334: Spermatophyta and Palaeobotany

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

CO1: Learn general characters of phanerogams
CO2: Define fossil and fossil groups.
CO3: study life cycle of*Pinus* and *Gnetum*.
CO4: Origin of Angiosperm and their theories.
CO5: Structure & types of various fossils.
CO6: to study different systems of classification.
CO7: Study of plant families as per Bentham and Hooker's system

## BO 335: Horticulture and Floriculture

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

CO1: Define branches and scope&economic importance of horticulture.
CO2: Explain Special Practices in Horticulture.
CO3: Describe methods of Plant Propagation.
CO4: Classify Vegetables, Fruits, Ornamental plants, Spices and Flowers.
CO5: Study fruits and Vegetables Production Technology.
CO6: Apply the techniques of making dry flowers and their preservation.

## BO 336 Computational Botany:

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

CO1: Study the statistics in relation to botany.
CO2: Define scope and limitations of biostatistics.

CO3: Discuss the plant growth indices.
CO4: Apply statistical terms and measures of central tendency of grouped and ungrouped data.
CO5: Apply computation of seed testing&biostatistics and test of significance for the data.
CO7: Classify data and methods of representation in biology.
CO8: Illustrate line, bar and pie diagram.

## BO 341Plant Physiology and Biochemistry

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

CO1: Define plant physiological concepts.
CO2: Explanation of the physiological processes like photosynthesis, respiration, translocation and stress physiology.
CO3: Study various physiological and metabolic pathways in plant.
CO4: Explain Description and classification of biomolecules.
CO7: Determine factors affecting enzyme activity.
CO8: Significance of various physiological & biochemical processes.

## BO 342Plant Ecology and Biodiversity

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

CO1: Define ecology, remote sensing, In situ /ex situ conservation.
CO2: Elaborate the characterization of biodiversity.
CO3: Explain environmental crisis& their impact assessment
CO4: Explain data analysis of remote sensing technique.
CO5: Illustrate social approach to biodiversity conservation

## BO 343Plant pathology

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

CO1: Define terminologies related plant diseases.
CO2: Discuss the plant and pathogen interactionthe economic importance of plant diseases. .
CO3: Host-parasite interaction & Plant signaling.
CO4: the plant diseases on the basis of pathogen.
CO5: control measures for plant diseases.
CO8: Apply molecular techniques to control the plant diseases.

## BO 344Medicinal and Economic Botany

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

CO1: Define concept and scope of Pharmacognosy and economic botany.
CO2: Discuss Ayurvedic principles and Ayurvedic formulation
CO3Explain concept of Ayurvedic Pharmacy.
CO4: to detect drug adulteration, methods of extraction and evaluation.
CO5: Discuss the process of cultivation, collection and processing of herbal drugs.
CO6: medicinally important drugs.
CO7: Study of Ethanobotany& ethnic societies of India.

## BO 345Plant Biotechnology

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

CO1: Define biotechnology, plant tissue culture, bioinformatics, genomics and proteomics.
CO2: Describe Plant Tissue Culture techniques.
CO3: Explain the concept and technique of Germplasm and Cryopreservation.
CO4: Describe the concept of Transgenic Plants as Bioreactors.
CO5: Explain applications of Genomics, Proteomics, Transgenic plants, Bioinformatics, Germplasm and cryopreservation.

CO6: Application of biotechnological techniques for human welfare.

## BO 346Plant Breeding and Seed Technology

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

CO1: Define plant breeding, hybridization, Seeds, germination percentage.
CO2: Describe conventional techniques, methods and practices of breeding in plants.
CO3: Discuss the mechanisms of seed certification ,Seed sampling, storage and packaging.
CO4: Explain the seed Testing and Seed marketing.
CO6: Effect of mutagen on seed germination.

## BO 347 Practical Paper I

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

CO1: Studylower & higher cryptogams with respect to systematic position thallusstructure and reproduction with suitable examples.
CO2: Perform cytological techniques (like mitosis and meiosis) as well as plantphysiology practical, plant tissue culture.
CO3: Study Maceration technique and study of plant tissues.
CO4: isolate DNA, RNA from plant cell.
CO5: Compare bio-fertilizers and study of their application.
CO6: Differentiate between transgenic and non-transgenic plants.

## BO 348 Practical Paper II

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

CO1: Identify the fossil forms with help of slides and specimens.
CO2: Describe the flowering plants in botanical terms&plant families.
CO3: Draw the floral diagram of plants belonging to specific families.
CO4: Determine the genotypes and phenotypes with help of example.
CO5: study polytene chromosome.
CO6: Illustrate gymnosperms *Gnetum* and *Pinus*.

## BO.349Practical III

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

CO1: Study of garden tools and implements- Sprayer, Duster, Pruning knife,Sprinkler,Micro-irrigation system
CO2: Methods of harvesting of cut flowers and their preservation methods
CO3: Representation of data by various graphical methods
CO4: Analysis of vegetation data obtained from list count quadrat method for Frequency,density, abundance, relative dominance and importance
CO5: Study of Koch's Postulates&Culture technique - Streak plate methods, Pour plate methods, Spread plate and Serial dilution method for preparation of pure culture
CO6: Study of Fungal Diseases.
CO7: Demonstration of Plant extraction methods -Cold and Soxhlet extraction and TLC
CO8: Study and preparation of ayurvedic formulations&Qualitative analysis

# 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

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

PO3: get ability to apply knowledge of Botany to day-to-day life.

PO4: use creativity, critical thinking, analysis and research skill to solve biodiversityand environmental issues.

## Skill Outcomes

Students will

PO1: have the background and experience required to model, analyse and solve problems in botany.

PO2: be able to employ up-to-date and relevant knowledge and skills in several discipline.

PO3: communicate scientific information in a clear and concise manner with the help of dissertation and research articles.

## General Competence:

The students will

PO1: be able to understand the role of Botany in society.

PO2: know the historical development of plant sciencesand know understand the value of lifelong learning.

PO3: 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.

PSO2: demonstrate ability to apply knowledge of the diversity of plants in the context of various disciplines of botany.

PSO3: apply knowledge of Botany for entrepreneurship through nursery development, landscape gardening, herbal medicinal plant industry, mushroom cultivation.

PSO4: take research work at the higher degree level in the field of Botany.

**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..

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.

## 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&the biochemical pathways in the plant. .
CO3: discuss the physiology of plant and their various activities.
CO4: recall the basic principle of development of the plant.
CO5: use knowledge of the biomolecules from plant source.

## BO 1.3 Genetics and Plant Breeding

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

CO1: Revise 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 cytochemicalTLC, ELISA, PCR and SDS-PAGE techniquestechniques.
CO5: determine radioactive techniques used in botany.
CO6: 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: know the working mechanism of instrument in experimental botany.
CO4: compare the various methods for analysing or quantifying the biological source.
CO5: use flurochromes to visualize specific cell components&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: solve problem based practical for better understanding of genetic principles.

CO5: observe the different stages and their structural changes during cell division.

CO6: use chromatography techniques for isolation and estimation.

CO7: solve Problems of Mendelian inheritance and estimation of gene frequencies.