**COURSE OUTCOMES**

**Department of Bioscience- M.Sc. (Botany)**

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| **Sr. No** | **Class & Semester** | **Course & Course Code** | **COs** | **Course Outcomes** |
| **01** | **M.Sc.-1st Semester** | **Algae Fungi and Bryophyta (MBO9101T**) | CO1 | Comprehend the diversity of algae in various habitats (terrestrial, freshwater, and marine), thallus organization, cell ultrastructure, and reproduction (vegetative, asexual, and sexual). |
| CO2 |  Understand the classification of algae based on pigments, cell wall composition, reserved food material, and flagellation. |
| CO3 |  Describe the salient features of cyanophyta, chlorophyta, bacillariophyta, xanthophyta, pyrrophyta, phaeophyta, and rhodophyta. |
| CO4 |  Students will describe the general account of mastigomycotina, zygomycotina, ascomycotina, basidiomycotina, and deuteromycotina. |
| CO5 |  Comprehend the distribution, classification, morphology, structure, and reproduction of bryophytes, with special reference to Marchantiales, Jungermanniales, Anthocerotales, Sphagnales, Funariales, and Polytrichales. |
| **02** | **M.Sc.-1st Semester** | **Cell and Molecular Biology****(MBO9102T)** | CO1 | Explain the structure and function of cell organelles in eukaryotes and prokaryotes. |
| CO2 | Compare and contrast mitosis and meiosis, including their regulation and steps in the cell cycle |
| CO3 | Explain the mechanisms of DNA replication, including the replication apparatus and origins of replication. |
| CO4 | Students will be able to explain the mechanisms of DNA replication, including the replication apparatus and origins of replication. |
| CO5 | Students will be able to apply theoretical models to analyze and interpret data. |
| **03** | **M.Sc.-1st Semester** | **Principles of Plant Pathology & Microbiology****(MBO9103T)** | CO1 | Describe the history and scope of plant pathology and microbiology. |
| CO2 | Summarize the process of disease development, including pre-penetration, penetration, post-penetration, and colonization.  |
| CO3 | Utilize epidemiological factors in the development of plant disease management strategies.  |
| CO4 | Analyze the ultrastructure and lifecycle of bacteria, viruses (such as TMV and bacteriophage), and phytoplasma.  |
| CO5 | Investigate the economic importance and management strategies for various plant diseases, including fungal, bacterial, viral, nematode, and non-parasitic diseases.  |
| **04** | **M.Sc.-1st Semester** | **Applied Microbiology****(MBO9106)** | CO1 | Explain the structure and function of cell organelles in eukaryotes and prokaryotes. |
| CO2 | Compare and contrast mitosis and meiosis, including their regulation and steps in the cell cycle |
| CO3 | Explain the mechanisms of DNA replication, including the replication apparatus and origins of replication. |
| CO4 | Students will be able to explain the mechanisms of DNA replication, including the replication apparatus and origins of replication. |
| CO5 | Students will be able to apply theoretical models to analyze and interpret data. |
| **05** | **M.Sc.-2nd Semester** | **Research Methodology (MBO-9201T)** | CO1 | List and define the fundamental concepts of scientific methods, including induction, deduction, hypothesis, and theory. |
| CO2 | Describethe different methods of data collection and the use of secondary data. |
| CO3 | Utilize appropriate techniques for the preparation of research reports, including documentation, footnotes, and bibliography. |
| CO4 | Explain the concepts of correlation and the differences between simple and multiple correlations. |
| CO5 | Analyze time series data using trend measurement and moving averages to identify patterns and predict future trends. |
| **06** | **M.Sc.-2nd Semester** | **Pteridopiiyta, Gymnosperms & Paleobotany (MBO9202T)** | CO1 | Identify and define the different classifications of Pteridophytes. |
| CO2 | Describe the general account of fossil Pteridophytes and the classes Psilosida, Lycopsida, Sphenopsida, and Pteropsida. |
| CO3 | Summarize the morphology, anatomy, reproduction, classification, and life history of Lycopodium, Gleichenia, Isoetes, Ophioglossum, and Azolla. |
| CO4 | Demonstrate the economic applications of Pteridophytes in various industries. |
| CO5 | Analyse the evolutionary trends in Pteridophytes, focusing on the development of the stele and heterospory. |
| 07 | **M.Sc.-2nd Semester**  | **Plant Morphology and Developmental Anatomy****(MBO9203T)** | CO1 | Identify the unique features of plant development. |
| CO2 | Explain the differences between plant and animal development.  |
| CO3 | Demonstrate the control of cell division and cell-to-cell communication in shoots. |
| CO4 | Analyze the structural features of Kranz anatomy, leaf traces, leaf gaps, and transfer cells. |
| CO5 | Analyze root-microbe interactions and the morphology of seeds, including seed coat development in various families. |
| **08** | **M.Sc.-2nd Semester** | **Ethnobotany****(MBO9205T)** | CO1 | Define the fundamental concepts, scope, and objectives of ethnobotany. |
| CO2 | Describe the methods for documenting ethnobotanical knowledge. |
| CO3 | Use ethnobotanical knowledge to illustrate its role in rural development. |
| CO4 | Apply ethnobotanical knowledge to discuss the conservation of plant genetic sources. |
| CO5 | Analyze the role of ethnobotany in conservation and sustainable development. |
| **09** | **M.Sc.-3rd Semester** | **Biosystematics of Angiosperms****(MBO-301)** | CO 1 | Identify the principles, rules, and recommendations of the International Code of Botanical Nomenclature. |
| CO2 | Discuss the preparation, maintenance, and utility of herbaria. |
| CO3 | Utilize taxonomic literature to identify and classify plant species. |
| CO4 | Analyse taxonomic evidences from morphology, anatomy, palynology, embryology, cytology, phytochemistry, and genome analysis. |
| CO5 | Investigate the phylogeny of angiosperms, including ancestors, time and place of origin, and relationships among major groups.  |
| **10** | **M.Sc.-3rd Semester** | **Molecular Biology****(MBO-302)** | CO1 | Identify the components of the genome, gene, and different types of genetic material (DNA & RNA) in bacteria, viruses, and eukaryotes.  |
| CO2 | Explain the evidence supporting DNA and RNA as genetic material in various organisms. |
| CO3 | Describe the process of DNA supercoiling, and the structure of coding and non-coding DNA & RNA. |
| CO4 | Implement techniques such as PCR (semi-quantitative and quantitative) and Reverse Transcription-PCR in gene expression analysis. |
| CO5 | Analyse the effects of DNA damage on the genetic material and the efficiency of different repair mechanisms (base excision, recombination repair systems, and SOS repair).  |
| **11** | **M.Sc.-3rd Semester** | **Plant Physiology & Metabolism****(MBO-303)** | CO1 | Describe the properties of water, solutions, and chemical potential.  |
| CO2 | Describe the properties of water, solutions, and chemical potential.  |
| CO3 | Use knowledge of nitrogen metabolism to explain amino acid synthesis in plants. |
| CO4 | Illustrate the regulation of enzyme activity using the Michaelis-Menten equation. |
| CO5 | Evaluate the role of different growth regulators in various stages of plant development. |
| **12** | **M.Sc.-3rd Semester** | **Genomics & Proteomics****(MBO-304)** | CO1 | Students will recall key concepts of genome and genomics, including the structure and organization of prokaryotic and eukaryotic genomes, and the Human Genome Project. |
| CO2 | Students will explain the differences between various genome sequencing strategies and technologies for high throughput sequencing. |
| CO3 | Students will describe the basic principles of structural and functional proteomics, and tools and techniques used in proteome analysis. |
| CO4 | Students will apply knowledge of genome and gene databases to retrieve and analyze genomic data from various plant genome projects. |
| CO5 |  Students will utilize methods for sequence alignment and gene annotation to interpret genomic sequences. |
| **13** | **M.Sc.-4th Semester** | **Plant Reproductive Biology****(MBO-401)** | CO1 | Identify the structures and functions of the female gametophyte, including ovule development and megasporogenesis. |
| CO2 | Discuss the interactions between pollen and pistil during pollination and fertilization, and the processes of self-incompatibility. |
| CO3 |  Apply the concepts of pollen-pistil interactions to understand mechanisms of hybrid seed production and in vitro fertilization techniques. |
| CO4 |  Illustrate the process of double fertilization and the stages of endosperm and embryo development. |
| CO5 | Examine the dynamics of fruit growth and the molecular biology of fruit maturation. |
| **14** | **M.Sc.-4th Semester** | **Plant Tissue Culture & Genetic Transformation****(MBO-402)** | CO1 | Name the hormones auxin and cytokinin and their role in plant development. |
| CO2 |  Explain the historical development and significance of tissue culture techniques. |
| CO3 | Illustrate the concepts of differentiation, dedifferentiation, and redifferentiation using examples. |
| CO4 |  Describe the process of aseptic manipulation and preparation of explants. |
| CO5 | Investigate the factors affecting the growth and subculture of cell suspensions. |
| **15** | **M.Sc.-4th Semester** | **Plant Ecology****(MBO-403)** | CO1 | Define basic concepts: Students will be able to recall fundamental concepts of ecology, including evolutionary ecology and ecological models. |
| CO2 | Explain vegetation organization: Students will understand and explain the concepts of community, species diversity, habitat, and ecological niches. |
| CO3 | Describe temporal changes: Students will describe the mechanisms and models of ecological succession and the changes in ecosystem properties during succession. |
| CO4 | Analyze ecosystems: Students will apply knowledge to analyze the components of ecosystems, such as producers, consumers, and decomposers, and understand energy flow models. |
| CO5 | Assess biomes and biodiversity: Students will assess the impact of climate change on biomes and evaluate biodiversity assessment methods and conservation practices. |
| **16** | **M.Sc.-4th Semester** | **Methods in Plant Sciences****(MBO-404)** | CO1 |  Explain the process of plant extraction and isolation of cell organelles. |
| CO2 | Identify the principles of ultraviolet and visible spectroscopy |
| CO3 | Apply spectroscopy techniques to quantify DNA and RNA. |
| CO4 | Analyze the data obtained from immunofluorescence microscopy. |
| CO5 | Apply NMR and ESR spectroscopy to determine molecular structures |