

SCHEME OF TEACHING, EXAMINATION AND SYLLABUS AS PER

NEP 2020 for M. Sc. BOTANY

Choice Based Credit System (Semester Pattern) Effective from 2023-2024

Program Outcomes (POs)

- PO 1- Courses offered give students a general understanding of the fundamental principles of life that extend from the tiniest microbes to plants, animals, and human beings.
- PO 2- Students can describe the structure and function of cellular components and explain how they interact in a living cell. They can also describe how cells interact to develop tissues and organs, and how these contribute to a functional organism.
- PO 3-Students can demonstrate an understanding of the mechanisms driving evolution, and can describe similarities and differences of the major taxonomic groups.
- PO 4 -Students will become proficient in handling relevant scientific instruments and have an understanding of the principles of working.
- PO 5- Students can formally communicate the results of biological investigations using both oral and written communication skills.
- PO 6- Students also obtain the knowledge, skills, and motivation necessary to lifelong learning and problem solving attitude.
- PO 7- Specialized courses emphasizing teaching and research in various life science disciplines are also offered. Disciplines range from basic science to applied science

Program Specific Outcomes (PSOs) – M.Sc. Botany

- PSO 1- Capable of demonstrating comprehensive knowledge and understanding of one or more branches of Botany (discipline) in detail and ability to think critical and clearly about the plant world.
- PSO 2- Ability to analyse and critical thinking of the basic concepts of different morphological, anatomical, reproductive, cytological, physiological and molecular characters of the plants.
- PSO 3- After successful completion of the projects ability is developed to undertake supervised research, identification of research questions, critical analysis of the literatures and enhance research related skills in laboratory practices, which are tested in all forms of assessment.
- PSO 4 -Develop the problem solving capacity to identify and define the problem, generating alternative solutions, evaluating and selecting the best alternative, and implementing the selected solution.
- PSO 5 -Professional skills such as identification and classification of all forms of plant kingdom, Gardening, Farming and other related career competencies that often are not taught (or acquired) as part of the subject.
- PSO 6 - Acquired the knowledge of biotic and abiotic factors, critical thinking of economics, aesthetic and biological importance of preserving local resources and reducing or eliminating the harmful impacts of manmade alterations and could take a step towards the conservation of nature and environmental awareness.

- PSO 7. Ability to analyse the biological information by using different bio-informatics tools through ICT facilities and can compose the clear information through writing and other media on various digital platforms that can be assessed instantly.

M.Sc. Botany NEP 2020 Syllabus Semester I and II Affiliated Colleges

Objectives

Mandatory Paper 1 (MBO1T01): Microbiology, Algae and Fungi

- To explore the microbial diversity.
- To study the morphological and reproductive variations in viruses, prokaryotes, algae and fungi.
- To study the systems of classification and evolutionary trends in algae and fungi.
- To study the common plant diseases caused by bacteria, virus and fungi.

Outcomes

- The diversity among the microbes is revealed to the student in the class, laboratory and field.
- The student appreciates the variability among the algae and fungi and also acknowledges their economic importance.
- The student is able to trace the phylogenetic relationship among the algae and fungi.
- The student is conversed with the common diseases of plants and their control measures.

Mandatory Paper 2 (MBO1T02): *Bryophytes* and *Pteridophytes*

Objectives

- To explore the diversity of lower plants.

- To study the morphological, anatomical and reproductive variations within and among the groups of Bryophytes and Pteridophytes.
- To traverse the probable evolutionary paths in the lower plants.

Outcomes

- The student acknowledges the diversity among lower plants in the class.
- The student develops an insight to correlate the structural variations with the phylogenetic relationship among plants.
- The student understands the importance of lower plants in the ecosystem and the daily life.

Elective Paper 3 (MBO1T03): Palaeobotany and Gymnosperms

Objectives

- To explore the diversity of extinct flora and living Gymnosperms in the class.
- To study the morphological, anatomical and reproductive variations within and among the important groups of extinct plants and living Gymnosperms in the class.
- To understand the evolution of Gymnosperms from the lower plants and their subsequent diversification.

Outcomes

- The student is sensitised about the paleoclimate, fossil flora and the process of fossilisation.
- Gymnosperms in the class.
- The student acknowledges the diversity among the the student develops an insight to correlate the structural variations in the extinct and extant plants with the phylogenetic relationships.

Research Methodology Paper 4 (MBO1T04)

Objectives

- To sensitize the student about research methodologies & their application.
- To update the student about the concepts of Foundations of Research, Problem Identification & Formulation, Research Design, Qualitative and Quantitative Research, Measurement, Sampling & data collection.

Outcomes

- The students are acquainted with the process of selection of a research problem and techniques and tools to be employed in completing research project writing.
- The students are capable of Analysis and Interpretation of Data and Paper
- The students are acquainted with the skills of qualitative and quantitative data analysis and presentation.
- The students will be abreast with the employability skills required for various academic research & industrial units.

Mandatory Lab 1 (MBOIL1): Microbiology, Algae, Fungi, Plant pathology, Bryophytes, Pteridophytes

Objectives

- To explore the diversity of microbes and lower plants in laboratory and field.
- To study the morphological and reproductive variations in Cyanobacteria, algae, fungi, bryophytes and pteridophytes.
- To study the common plant diseases caused by bacteria, virus and fungi.

Outcomes

- The diversity among the microbes and lower plants is revealed to the student in the laboratory and field.
- The student appreciates the variability among the microbes and lower plants and also acknowledges their economic importance.
- The student is conversed with the common diseases of plants and their control measures.
- Microbiology and Algae Classification and type study of the following Cyanobacteria and classes of algae *Cyanobacteria: Microcystis, Nostoc, Anabaena, Lyngbya, Spirulina, Gloeotrichia, Stigonema* *Prochlorophyta: Prochloron; Chlorophyta: Pandorina, Eudorina, Stigeoclonium, Ulva, Chlorella, Scenedesmus, Caulerpa, Valonia, Acetabularia; Pheophyta: Spacelaria, Padina, Turbinaria; Rhodophyta: Nemalion, Gelidium, Gracilaria, Corallina, Polysiphonia; Euglenophyta: Euglena, Phacus; Bacillariophyta: Cyclotella, Synedra, Cymbella, Navicula, Gomphonema.*

(One long and one short Botanical excursions are compulsory.)

Mandatory Lab 2 (MBO1L2): Palaeobotany, Gymnosperms, Cytology, Genetics, Cell biology and Research Methodology

Objectives

- To study the fossil specimens in laboratory and field.
- To study the morphological, anatomical and reproductive variations within and among the living Gymnosperms in laboratory and field.
- To gain hands-on experience in the fundamental techniques of cytology and genetics.
- To gain hands-on experience in basic techniques used in cell biology.

- To study the effect of stress in plants.

Outcomes

- The student is sensitised about the fossil flora.
- The student acknowledges the diversity among the Gymnosperms the laboratory and field.
- The student is equipped with techniques to prepare stains and study chromosomes and to analyse the data to decipher underlying genetical phenomenon.
- The student is equipped with the techniques to isolate and quantify DNA.
- The student is conversant with the technique to evaluate the effect of stress on plants.

Seminar 1 (1S1) Seminar 1

- Develop the communication skills, increase the leading ability and acquainted with the thorough knowledge of the topic.

Semester II

Mandatory Paper 5 (MBO2T01): Cytology and Genetics

Objectives

- To study the phenomenon of inheritance and principles of population genetics.
- To study the structure and organization of a typical and special chromosome.
- To study the chromosomal variations and their effect on the organisms.
- To study the nature, effect and applications of mutations in plants.

Outcomes

- The student interprets the observations in nature in the light of laws of genetics and/or underlying cytological aspects.
- The student employs the knowledge of Genetics and induced mutations for crop improvement.

Semester II

Mandatory Paper 6 (MBO2T02): Plant Physiology and Biochemistry

Objectives

- To get an in-depth view of the biological processes occurring in the plants and the factors affecting the plant life.
- To understand the nature and mechanism of enzyme action.
- To understand the structure and role of the major molecules in plant cells.

Outcomes

- The student realises the role and mechanism of physical and chemical factors affecting the plant life.
- The student learns about the diversity of the biological molecules.
- The student develops strategies to mitigate the adverse effect of environmental stresses
- On plants.

Semester II

Elective Paper 7 (MBO2T3): Cell biology

Objectives

- To study the ultrastructure and function of the cell envelope, organelles and cytoskeleton.
- To study the structure, replication and repair of DNA.
- To study the cellular responses of plants towards the stresses.

Outcomes

- The student is acquainted with the details of the structure and role of the cell organelles.
- The student is acquainted with the structure of DNA and the mechanisms involved in its replication and protecting its structure.
- The student is equipped with the effect of stress on plants.
- The student is able to devise the strategies to mitigate the adverse effect of the stress on the plants.

Semester II

Mandatory Lab 3 (MBO2L2): Plant physiology, Molecular biology, Plant biotechnology, Plant breeding

Objectives

- To impart student the skills to prepare solutions, buffers etc. to carry out a scientific investigation.
- To instil the skills in the student to set-up the experiment and collect the data.
- To give hands-on experience to the student in molecular techniques and to handle basic equipment and apparatuses in the laboratory.
- To equip the student to evaluate the data and interpret the results.

Outcomes

- The student learns to prepare buffers, solutions and carries-out the experiment.
- The student is trained in routinely used molecular techniques.
- The student learns to handle the equipment in the laboratory.
- The student is able to present the data and interpret the results.

Semester II

Mandatory Lab 4 (MBO2L3): Plant development & reproduction, Taxonomy, Ecology

Objectives

- To study the variation in structure of plant and its reproductive characters.
- To study the local flora by undertaking field tours.
- To learn the technique to describe and identify the plant.
- To undertake ecological investigations.

Outcomes

- The student studies the morphology, anatomy and embryology of the local plants.
- The student learns the biostatistical computations.
- The student is acquainted with the techniques and equipment to study the ecosystem and to describe & identify the plant.
- The student becomes familiar with the local flora and prepares the field report.

Semester III

Mandatory Paper 9 (MBO3T01): Plant Ecology and Conservation Biology

- CO1 - A Understanding the concept of various types of vegetational organization, analysis of communities and their functions.
- CO2 - Understanding the structure and function of ecosystem and ability analyse productivity of various ecosystems.
- CO3 - Developing skills in environmental impact assessment, critical thinking of sustainable development of ecosystems, environmental.
- CO4 - Use environmental resources with care and protect them from degradation.

Mandatory Paper 10 (MB3TO2): Angiosperms—II

- CO1 - Ability to read and analyse the different morphological characters for identification of plants at family level.
- CO2 - Capability to critically analyze the characters for distinguishing the angiosperm plant groups.
- CO3 - Study of ancestors of angiosperms and different IUCN categories of threat to bring awareness of their status in nature for conservation point of view.
- CO4 - Understanding and analyzing the concept of plant biodiversity, its role, stability and its importance; to identify hotspots of plants.

Core Elective 1 (MB3TO3) Paper 11 Elective 1: Molecular Biology and Plant Biotechnology – I

- CO1- Learning the mechanism of DNA replication, damage and repair at molecular level and factors responsible for damage.
- CO2 - Understanding the recent techniques and tools of recombinant DNA technology and molecular probing.
- CO3 -Learn to know the concept of polymerase chain reaction and rDNA techniques and its applications.
- CO4 - Ability to use and analyse the concept of proteomics, genomics and various bioinformatics tools.

Foundation Course – 1 (MB3TO4) Paper 12 Foundation 1: Aesthetic botany

- CO1 -Understanding the structure of male reproductive parts anther and its significance as experimental material.
- CO2 - Ability to read, understand and analyze different functional aspects of pollen fertility and sterility and factors which influence them.
- CO3 -Understanding the concept of megasporogenesis, types of embryo sac, and nutritional aspects for growth of embryo sac.
- CO4 - Learn to know the different types of pollination and pollen-pistil interactions, ability to overcome incompatibility problems in plants.

Practical Core 9 & 10 (MB3P1) Practical 5: Plant Ecology and Conservation biology and Angiosperm – II

- CO1- Develop the ability to perform ecological experiments and build up the skill of solving biostatistical problems systematically.

- CO2 - Ability to learn and apply the knowledge of conservation methods.
- CO3 - Capability to identify and classify plants properly by regular field visits.
- CO4 - Develop the ability to use floras and herbarium for plant identification

Practical Core Elective – 1 (MB3P2): Practical 6 Elective: Molecular Biology and Plant Biotechnology – I

- CO1 - Ability to develop skills by perform the techniques of molecular biology experiments.
- CO2 - Ability to use the different bioinformatics tools for analysing the molecular biological data.
- CO3 - Developing skills to perform the techniques of rDNA technology.
- CO4 - Ability to develop plants in the laboratory by plant tissue culture techniques and commercial applications for micropropagation

Seminar 3 (MB3S1) Seminar 3

- Ability to improve language and subject communication skills effectively.

Semester IV

Mandatory paper 13 (MB4TO1): Cell and Molecular Biology – II

- CO1- Ability to understand the concepts of transcription and translation in prokaryotes and eukaryotes at molecular level.

- CO2- Understanding and analyzing the different concepts of genes and regulation of gene expression.
- CO3 - Ability to know the genome organization, genetic recombination and mapping in various organisms.
- CO4 - Understanding the concept of signal transduction and different techniques in cell biology.

Mandatory Paper 14 (MB4T02): Plant Biotechnology and Plant Breeding

- CO1- Ability to analyse the concept of recombinant DNA technology and genetic engineering of plants.
- CO2- Understand the concept of genomics and proteomics.
- CO3- Learn to know the different aspects of Plant tissue culture techniques and transgenic production.
- CO4- Ability to analyse the different aspects of bioinformatics and methods of plant breeding.

Core Elective 2 (MB4T03) Paper 15 Elective 2: Molecular Biology and Plant Biotechnology – II

- CO1- Learn to know the production and applications of transgenic.
- CO2- Understanding transgenics and application transformation and molecular farming.
- CO3-Learn to know the advanced aspects and techniques of Plant tissue culture in details.
- CO4- Ability to analyse the concept of DNA fingerprinting, marker assisted breeding and cleaner biotechnology and its applications.

Foundation Course – 2 (MB4T04) Paper 16 Foundations 2: Applied Botany

- CO1 - Learn new things which help in social change and other life-affirming endeavours.
- CO2 - Ability to transfer such skills in other domains of one's life and work.
- CO3. Ability to retain and build on critical reading skills.
- CO4. Develop some entirely new skills in plant science that will help in some way to enhance life style.

Pract. Core 11, 12 & Elective 2 (MB4P1) Practical 7: Cell and Molecular Biology – II, Plant Biotechnology and Plant breeding

- CO1- Learn to develop skills in molecular biology experiments for protein and DNA isolation, separation, purification and applications.
- CO2- Ability to perform in vitro Transcription, Translation and Conjugation.
- CO3- Ability to study immunological techniques for diagnosis and disease identification. CO4- Ability to learn the techniques of chromatography for analysis of bio-molecules.

Project (4 PROJ 1) Practical 8: Project

- CO1 - Capable of self-paced and self-directed learning aimed at improving practical knowledge and research skills and problem solving ability.
- CO2- Ability of intensive search, investigation, and critical analysis, usually in response to a specific research question or

hypothesis.

- CO3 -Research literature survey and other research tasks are expected to develop a degree of creativity, originality to students are encouraged.
- CO4- Enhance skills in research and analysis, which are tested in all forms of assessment.

Seminar 4 (4S1) Seminar 4

- Ability to speak and present data clearly in standard academic language form.