

# MASTER OF SCIENCE IN BOTANY (MSc BOTANY)

## DURATION:2 YEARS

4 <sup>th</sup> Year							
Subject Code	Subject Title	IA Max. Marks	University Examinations		Total Marks	Min. Pass	Credits
			Max. Marks	Min. Pass			
MC401	LIFE SKILLS	20	80	35	100	35	4
MBO402	ALGAE, FUNGI, LICHENS, PLANT PATHOLOGY AND BRYOPHYTES	20	80	35	100	35	4
MBO403	PTERIDOPHYTES AND GYMNOSPERMS	20	80	35	100	35	4
MBO404	TAXONOMY OF ANGIOSPERMS AND ECONOMIC IMPORTANCE	20	80	35	100	35	4
MBO405	PLANT ANATOMY, EMBRYOLOGY AND MICROTECHNIQUE	20	80	35	100	35	4
MBO406	PRACTICAL PAPERS I AND II	20	80	35	100	35	4
MBO407	PRACTICAL PAPERS III AND IV	20	80	35	100	35	4
Total Credits							<b>28</b>
5 <sup>th</sup> Year							
Subject Code	Subject Title	IA Max. Marks	University Examinations		Total Marks	Min. Pass	Credits
			Max. Marks	Min. Pass			
MC501	LIFE SKILLS	20	80	35	100	35	4
MBO502	CELL BIOLOGY AND GENETICS	20	80	35	100	35	4
MBO503	MICROBIOLOGY AND BIOTECHNOLOGY	20	80	35	100	35	4
MBO504	PLANT PHYSIOLOGY AND BIOCHEMISTRY	20	80	35	100	35	4
MBO505	PLANT ECOLOGY AND PHYTOGEOGRAPHY	20	80	35	100	35	4
MBO506	PRACTICAL PAPERS V AND VI	20	80	35	100	35	4
MBO508	PRACTICAL VII AND VII	20	80	35	100	35	4
Total Credits							<b>28</b>

# **ALGAE, FUNGI, LICHENS, PLANT PATHOLOGY AND BRYOPHYTES**

## **UNIT – I**

Classification of algae (F.E. Fritsch). Range of cell structure – prokaryotic and Eukaryotic cell organization. Thallus organization in algae. Evolutionary trends seen in Chlorophyceae, Phaeophyceae and Rhodophyceae. Economic importance of algae.

## **UNIT – II**

Systematic position, distribution, thallus structure, cell structure, pigmentation, method of reproduction and life history of the following genera of algae.

*Scytonema, Hydrodictyon, Cladophora, Enteromorpha, Nitella, Cyclotella, Padina, Batrachospermum and Gracilaria..*

## **UNIT – III**

Classification of fungi(Alexopoulos) . Spore dispersal mechanism in fungi. Nutrition in fungi. Economic importance of fungi.

Detailed study of the occurrence, structure and reproduction of the following genera of fungi.

*Peranospora, Rhizopus, Yeast, Penicillium, Puccinia, Lycoperdon and Fusarium.*

A general account of lichens with special reference to their structure, nutrition, reproduction and economic importance.

## **UNIT – IV**

Stages in plant disease development, inoculum – predisposition – penetration – infection – invasion – growth, reproduction and dispersal of pathogen.

Host – pathogen interaction – physiological, chemical and bio – defence mechanism in host.

Plant disease control – prophylaction – protection – chemical, environmental manipulation – sanitation – biological control of disease.

Study of the following plant disease with reference to causes, symptoms, dissemination, control and preventive measures – Bacterial blight of Rice, wilt of cotton, Bunchy top of banana, Little leaf of Brinjal.

## **UNIT – V**

Thallus organization of gametophytes and range of structure and evolution of sporophytes in Bryophytes. Vegetative reproduction in Bryophytes. Origin of Bryophytes. Ecology of Bryophytes.

Structure and reproduction of the following genera of Bryophytes – *Reboulia*, *Porella*, *Anthoceros* and *Sphagnum*.

## **PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY**

## **UNIT I**

General features of Pteridophytes – Classification of Pteridophytes (Sporne, 1965) – Stellar evolution – Origin of Pteridophytes – Heterospory and seed habit – Apogamy and Apospory – Spore producing organs and evolution of sorus – Economic importance.

## **UNIT II**

Range in Morphology, Structure, Reproduction, Gametophyte and Embryogeny in Psilotum, Equisetum, Isoetes, Ophioglossum, Angiopteris, Osmunda, Pteris and Salvinia.

## **UNIT III**

General characters, Distribution, Phylogeny, and Economic Importance of Gymnosperms – Classification of Gymnosperms (Sporne 1965) – Evolution of male and female gametophytes in Gymnosperms.

## **UNIT IV**

Morphology Anatomy, Reproduction and Phylogeny of Cycas, Cupressus, Ginkgo and Gnetum.

## **UNIT V**

Geological Time Scale – Types of Fossils – Methods of Fossilization – A study of the following fossils of Pteridophytes and Gymnosperms.

### **Pteridophytes**

A. Rhynia

### **Gymnosperms.**

A. Lagenostoma

B. Lepidodendron

B. Cordites

C. Calamites

C. Pentoxylon.

## **PRACTICALS**

01. Structural details of the vegetative and reproductive parts of the types included in unit II and unit IV of the theory syllabus.
02. Structural details of the fossils through fossil slides.

## **TAXONOMY OF ANGIOSPERMS AND ECONOMIC IMPORTANCE**

### **UNIT – I**

A detailed account of the classification of Linnaeus. Bentham and Hooker, Cronquist (Including Merits and demerits). Phylogeny of Angiosperms. National and International herbaria.

### **UNIT – II**

Modern trends in classification Taxometrics, Chemotaxonomy, Botanical Survey of India [BSI]. ICBN, Herbarium technique. Typification, Priority, Publication, Author Citation.

### **UNIT – III**

A detailed account of the following families and their economic importance.

Ranunculaceae

Magnoliaceae  
Capparidaceae  
Caryophyllaceae  
Meliaceae  
Sapindaceae

#### **UNIT – IV**

Asteraceae  
Sapotaceae  
Asclepiadaceae  
Solanaceae  
Bignoniaceae  
Verbenaceae

#### **UNIT – V**

Amaranthaceae  
Euphorbiaceae  
Casuarinaceae  
Typhaceae  
Poaceae  
Zingiberaceae

#### **PRACTICALS**

#### **Taxonomy**

Identification of specimens belonging to the families included in theory syllabus at family, generic and specific levels. Familiarity with the use of floras.

## **PLANT ANATOMY, EMBRYOLOGY AND MICROTECHNIQUE**

### **UNIT – I**

Cell wall – types, ultra structure of cell wall, pits, plasmodesmata, functions. Theories of organization of meristem in stem and root. Secondary cambium types – vascular cambium and phellogen – structure and functions. Cambial activity, wound healing and grafting. Nodal anatomy – types.

### **UNIT – II**

Simple tissues structure and their functions. Secondary xylem, secondary pholem – structure and functions. Ontogeny and phylogeny of vessels. Leaf structure – types – ontogeny of dorsiventral leaf. Secondary and anomalous secondary growth in dicot and monocot stems. wood types & structures.

### **UNIT – III**

Microsporogenesis and male gametophyte development. Megasporogenesis and female gametophyte development. Pollen–pistil interaction, sexual incompatibility.

## **UNIT – IV**

Structure and development of different types of Endosperms. Embryo development – Dicot (*Capsella bursa – pastoris*) monocot (*Luzula forsteri*) polyembryony, apomixes.

## **UNIT – V**

Microtechnique steps – Fixation & fixatives, dehydration clearing, infiltration, embedding & block making, microtome – Rotary, sledge & freezing, Section cutting, staining. Camera lucida – types principle, Micrometry. Phase contrast microscopy, Electron microscope (TEM & SEM) – principle & preparation techniques.

## **PRACTICALS**

Study of suitable examples to understand the anatomy of plants based on the theory syllabus.

Suitable examples to illustrate the features in the theory syllabus with the help of embryo mounting, pollen types, and whole mounts.

Knowledge of the function of rotary and sledge microtome. Measure and calculate the macerated elements by micrometry. Submission of 5 double stained permanent hand sections.



**PRACTICAL – I PAPERS I & II (ALGAE, FUNGI, LICHEN,  
PATHOLOGY, BRYOPHYTES, PTERIDOPHYTES AND  
GYMNOSPERMS)**

1. Make suitable micropreparation of A, B and C. Draw labelled sketches Identify giving seasons. Submit the slides for valuation
2. Make suitable micropreparation of D, E and F. Draw labelled sketches identify giving seasons. Submit the slides for valuation
3. Identify any two algae from the given algal mixture G. Draw diagrams only.
4. Name the genus and group of the given specimens. H, I, J and K.
5. Draw diagrams and notes of interest on. L, M, N and O.
6. Name the causal organism, disease symptoms and control measures of pathological specimen P.

**PRACTICAL PAPER – II**

**COMPRISING THE THEORY**

**PAPERS III & IV (TAXONOMY, ANATOMY, EMBRYOLOGY AND  
MICROTECHNIQUE)**

1. Find the binomials of A, B and C
2. Refer specimens D, E and F to their respective families giving reasons at each level of hierarchy
3. Describe the given plant specimen G in botanical terms with diagram
4. Cut transverse section of H and I. Identify with suitable diagram and reasons. Submit the slide for valuation.
5. Dissect and mount any two stages of embryo from the given material J. Submit the slide for valuation.

6. Name the family, genus and species K and L.

7. Name the family, genus, species and economic importance of M, N and O.

8. Write a short notes on P and Q.

## **CELL BIOLOGY AND GENETICS**

### **UNIT - I**

General Organisation of Plant cell. Molecular Organisation of the cell membrane; cell permeability. Types of Plastids. Ultrastructure, function and biogenesis of chloroplast.

Structure and function of mitochondria. Ultrastructure and function of Endoplasmic reticulum, Ribosomes and Dictyosomes. Microbodies – Peroxisomes and Glyoxysomes.

### **UNIT - II**

Ultrastructure of Nucleus. Cell cycle and cell division – Mitosis and Meiosis. Morphology, ultrastructure and types of chromosomes.

Special types of chromosomes – Polytene chromosome, Lampbrush chromosome, B – chromosome and Isochromosomes. Identification of chromosomes – Banding technique.

### **UNIT - III**

Mendel's work – Monohybrid cross and law of segregation; Dihybrid cross and law of independent assortment. Interaction of genes – (Incomplete dominance; Co-dominance, Epistasis, Complementary genes, Duplicate genes). Quantitative inheritance, Multiple alleles, with reference to blood group in humans. Linkage and recombination – gene mapping.

### **UNIT- IV**

The genetic control of sex in plants : Sex chromosomes and sex – linked inheritance, extranuclear transmission of traits. Variation in chromosomes number; chromosomal aberrations.

Chemical nature of DNA and RNA. Replication of DNA.

### **UNIT - V**

Gene transcription, genetic code and translation. Genetic regulation in prokaryotes (The Lac operon model). Mutation types – Mutagenic agents; Significance of mutation.

Gene and genotype frequencies; The Hardy – Weinberg Law.

## **PRACTICALS**

1. Study of mitosis and meiosis - squash and smear techniques.
2. Demonstration of salivary gland chromosomes.
3. Examination of electron micrographs of cell organelles.
4. Genetic problems in mendelism, gene interactions and sex linkage.
5. Construction of chromosomes map.

## **MICROBIOLOGY AND BIOTECHNOLOGY**

### **MICROBIOLOGY**

#### **UNIT – I**

Scope of microbiology – sterilization techniques – culture media – Pure culture and Sub – culture. Microbial examination of water and air. Food spoilage and preservation – Pasteurization – Soil microbes – microorganisms associated with nitrogen cycle and organic matter decomposition.

#### **UNIT – II**

Sources and importance of primary metabolites (vitamins, organic acids, alcohols, amino acids), Sources and importance of secondary metabolites : toxins, antibiotics (Penicillin) – microbial proteins and SCP – mushroom cultivation and uses – microorganisms producing enzymes – methods of enzyme production and application – microbial pesticides and herbicides – microbial degradation of xenobiotics – microbial enzyme production and application.

### **BIOTECHNOLOGY :**

#### **UNIT – III**

Recombinant DNA technology : Enzymes (nucleases, polymerases, ligases, alkaline phosphatase, reverse transcriptase, S1 nucleases), brief study vectors (Plasmids, cosmids, phages and transposons). Gene cloning. Amplification of genes by PCR – Gene transfer using Ti plasmid of *Agrobacterium tumefaciens* – transgenic plants.

#### **UNIT – IV**

Plant cell and tissue culture : - culture media (MS medium, White's medium – Cell culture). Organogenesis – Somatic Embryogenesis – Micropropagation – Synthetic seeds – Uses of tissue culture.

#### **UNIT – V**

Protoplast culture and regeneration of plants – isolation of protoplast methods – protoplast viability testing – isolation of sub – protoplasts – protoplast fusion and somatic hybridization – uses of protoplast fusion – cybrids.

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#### **PRACTICALS**

1. Cleaning and sterilization of glasswares.
2. Preparation of culture media – agar slant, Agar plate.
3. Isolation of microbes by soil dilution technique
4. Gram staining of bacteria
5. MBRT of milk (Phosphatase test)
6. Study of biotechnologically important chemicals
7. Isolation of leaf protoplasts (mechanical method)
8. Extraction and estimation of leghaemoglobin in root nodules.

#### **PLANT PHYSIOLOGY AND BIOCHEMISTRY**

#### **PLANT PHYSIOLOGY**

## **UNIT – I**

Mechanism of water absorption and ascent of sap. Transpiration – types and mechanism. Role and deficiency symptoms of micro and macro nutrients. Mechanism of mineral salt uptake and transport of solutes across membrane.

## **UNIT – II**

Photochemical reactions – Non – cyclic and cyclic electron transport - photophosphorylation. Calvin cycle. Hatch and Slack pathway. Photorespiration and Glycolate metabolism cycle.

## **UNIT – III**

Glycolysis (EMP) pathway. Krebs's (TCA) cycle. Electron transport system and oxidative phosphorylation. Pentose phosphate pathway.

Symbiotic & Asymbiotic nitrogen fixation. Ammonium assimilation (GDH, GS & GOGAT) pathway.

## **UNIT – IV**

Plant growth regulators – Physiological effects of auxins, gibberellins, cytokinins, abscissic acid and ethylene. Role of phytochrome. Photoperiodism and mechanism of flowering. Vernalization, Dormancy and Seed viability.

## **UNIT – V: BIOCHEMISTRY**

Classification and properties of carbohydrates. Classification of amino acids. Classification and structures of protein. Classification and mode of action of enzymes.

## **PRACTICES**

1. Measurement of membrane permeability as affected by chemicals
2. Separation of photosynthetic pigments by paper chromatography
3. Estimation of photosynthetic pigments (Arnon's method)
4. Measurement of transpiration by Ganong's potometer.
5. Estimation of total free amino acids (Moore and Stein's method)

Or

Estimation of protein (Lowry's method)

6. Seed viability – Tetrazolium test.

## **PLANT ECOLOGY AND PHYTOGEOGRAPHY**

### **UNIT – I**

Scope and importance of Ecology. The environment – climatic factors (Light, Temperature, rainfall, humidity and wind), Edaphic factors – Components of soil. Soil erosion and conservation. Biotic factors (human activity and forest fire).

### **UNIT – II**

Ecosystem – structure and function. Types of ecosystem (Grassland and Pond). Energy flow in ecosystem. Interaction between plants and animals. Plant succession – causes of succession, climax concept. Kinds of succession (Hydrosere, Xerosere).

### **UNIT – III**

Autecology and Synecology – Population ecology. Quantitative analysis of plant community structure (quadrat, transect and point methods). Habitat ecology (Fresh water, Marine and Estuary).

### **UNIT – IV**

Environmental pollution, air, water, soil and their control measures. Impact of pollution on vegetation. Conservation of natural resources – water resources and energy resources. Wild life management. Endangered species of plant and animals, Red Data Book.

### **UNIT – V**

Disaster management – floods, earthquake, and Tsunami – Age and area hypothesis – endemism. – Continuous and discontinuous distribution of vegetation. Phytogeographical regions of India. Remote sensing – principle, tools and application in forestry.

### **PRACTICALS**

1. Estimation of Soil moisture
2. Determination of pH of Soil and water samples.
3. Simple quadrat method of studying vegetation
4. Line transect method of studying vegetation
5. Measuring the transparency level of an aquatic system using secchi disc.
6. Spotting of phytogeographical regions of India.



### **PRACTICAL PAPER III**

#### **PAPERS V & VI (CELL BIOLOGY, GENETICS, MICROBIOLOGY & BIOTECHNOLOGY)**

1. Make a squash preparation of A.

Display any two stages of cell division.

Draw diagrams. Submit the slides for valuation.

2. Prepare a smear of B.

Display any two stages of cell division.

Draw diagrams and submit the slides for valuation.

3. Solve the genetic problems C and D.

Construct a chromosome map from the given data.

4. Determine whether the given sample F is contaminated with bacteria or not. Leave the sample for valuation.

5. Isolate the protoplasm of the given material G by mechanical method.

6. Write notes of interest on H, I and J.

### **PRACTICAL PAPER – IV**

#### **PAPERS VII & VIII (PLANT PHYSIOLOGY, BIOCHEMISTRY, ECOLOGY AND PHYTOGEOGRAPHY)**

1. Set up the experiment A assigned to you. Record your observation and interpret the results. Leave the set up for valuation
2. Set up the experiment B assigned to you. Record your observation and interpret the results. Leave the set up for valuation
3. Construct a meter quadrat C. Analyze the Vegetation. Record your data. Interpret the results.
4. Determine the pH of the given soil / water sample D.
5. Write critical notes on E, F, G, H, I, J