

## POST GRADUATE PROGRAMME

1. At each of the Previous and Final Year Examination in a subject, a candidate must obtain for a pass (i) at least 36 % marks of the aggregate marks in all the papers prescribed at the examination, and (ii) atleast 36% marks in practical, wherever prescribed, at the examination; provided that if a candidate fails to secure 25% marks in each individual paper of theory at any of the examination and also in the Dissertation; wherever prescribed, he/she shall be deemed to have failed at the examination, notwithstanding his/her having obtained the minimum percentage of marks required in the aggregate for the examination. Division will be awarded at the end of the Final Examination of the combined marks obtained at the Previous and the Final Examinations taken together as noted below. No Division will be awarded at the Previous Examination.

First Division	: 60 Percent	} of the total aggregate marks of Previous and Final year taken together
Second Division	: 48 Percent	
Third Division	: 36 Percent	

**Note :** The candidate is required to pass separately in theory and practicals.

2. Dissertation may be offered by regular students only in lieu of one paper of Final Year Examination as prescribed in the syllabus of the subject concerned. Only such candidates will be permitted to offer dissertation who have secured atleast 50% marks in the aggregate at the previous examination.

**Note:** Dissertation shall be type-written and shall be submitted in triplicate, so as to reach the Controller of Examinations atleast two weeks before the commencement of Examination.

3. There shall be atleast eight theory in Post-Graduate Examination, 4 in Previous and 4 in Final year examinations of 100 marks each unless and otherwise prescribed. The non-credit papers wherever prescribed will remain as such. The marks of these non-credit papers will not be counted for division but passing in the same is compulsory.
4. Each theory paper will be of three hours duration.
5. Wherever practicals are prescribed the scheme will be included in the syllabus.
6. A candidate who has completed a regular course of study for one academic year and Passed M.A. / M.Sc./ M.Com. Previous Examination of the university shall be admitted to the Final Year Examination for the degree of Master of Arts / Master Of Science / Master of Commerce provided

that he / she has passed in atleast 50% of the papers at the previous examination by obtaining atleast 36% marks in each such paper.

- (a) For reckoning 50% of the papers at the previous examination, practical will be included and one practical will be counted as one paper.
  - (b) Where the number of papers prescribed at the previous examination is an odd number it shall be increased by one for the purpose of reckoning 50% of the paper.
  - (c) Where a candidate fails for want of securing minimum aggregate marks but secured 36% marks in atleast 50% of the papers, he/she will be exempted from re-appearing in those papers in which he/she has secured 36% marks.
  - (d) Where the candidate secures requisite minimum percentage in the aggregate of all the papers but fails for want of the requisite minimum percentage of marks prescribed for each individuals paper he/she shall be exempted from re-appearing in such paper (s) in which he / she has secured atleast 25% marks.
7. A candidate who has declared fail at the Final Year Examination for the degree of Master of Science / Arts, Commerce shall be exempted from re-appearing in a subsequent year in the following papers :

- (a) Where a candidate fails for want of securing the minimum percentage in the aggregate marks, he/she shall be exempted from re-appearing in such paper (s) Practical (s). Dissertation in which he/she has secured atleast 36% marks; provided he/she is passing in atleast 55% of the papers. (Here passing in each paper requires 36% marks).
- (b) Where a candidate secures the minimum requisite including dissertation wherever prescribed but fails for want of minimum percentage of marks prescribed for in each individual paper / dissertation, he / she shall be exempted from reappearing in such paper (s) dissertation in which he/she has secured atleast 25% marks provided he/she is passing in atleast 50% of the paper (here passing in each paper requires 25% marks)

## **M.Sc. (PREVIOUS) BOTANY**

### **PAPER –I BIOLOGY AND DIVERSITY OF MICROBES, ALGAE AND FUNGI**

#### **UNIT-I**

Algae in diversified habitats (terrestrial, freshwater and marine), thallus organisation, cell structure, reproduction, criterion for classification of algae, major systems of classification.

- a. Salient features and general account of following classes :
  - i. Prochlorophyceae
  - ii. Chlorophyceae
  - iii. Charophyceae
  - iv. Xanthophyceae
  - v. Bacillariophyceae
  - vi. Chrysophyceae

#### **UNIT-II**

- vii. Phaeophyceae
  - viii. Rhodophyceae
- b. A brief account of Prasinophyceae, Glaucophyceae, Eustigmatophyceae, Haptophyceae
- c. Economic importance of algae

#### **UNIT-III**

Mycology : General characters of fungi; substrate relationship in fungi; cell ultrastructure; unicellular

and multicellular organization; cell wall composition; nutrition (saprobic, biotrophic and symbiotic) reproduction (vegetative, asexual, sexual); heterothallism; heterokaryosis; parasexuality; recent trends in classification. Phylogeny of fungi; general account of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina; Mycorrhizae and Lichens.

#### **UNIT-IV**

Microbiology : Fungi in industry, medicine and food; Archaeobacteria eubacteria and cyanobacteria : general account; ultrastructure, nutrition and reproduction; biology and economic importance; general account of Prions, Rickettsias, L-forms, Viroids etc. Viruses : Characteristics and ultrastructure of virions; isolation and purification of viruses; chemical nature, replication, transmission of viruses; economic importance.

Mycoplasma and Phytoplasma : General characteristics and role in causing plant diseases.

#### **UNIT-V**

Phytopathology : Scope and brief history of plant pathology, concept of disease and a general account of diseases caused by various plant pathogens. Important symptoms of plant diseases. Mechanism of host penetration and defense. A general account of physiological specialization, toxins and phytoalexins. Molecular basis of host-parasite interaction. Plant diseases management and fungi as biocontrol agents.

## M.Sc. (PREVIOUS) BOTANY

### PAPER-II

#### BIOLOGY AND DIVERSITY OF BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS

##### UNIT-I

General characters and classification :

Structure, reproduction, interrelationships of Bryophytes with special reference to:

1. Sphaerocarpales : *Sphaerocarpos*
2. Marchantiales : *Marchantia, Asterella*
3. Jungermanniales : *Pellia*
4. Calobryales : *Calobryum*
5. Anthocerotales : *Anthoceros* complex,  
*Notothylas*
6. Sphagnales : *Sphagnum*
7. Bryales : *Polytrichum*

##### UNIT-II

A systematic study of the distribution (present and past with special reference to India), structure, reproduction, evolution and inter-relationships of the Pteridophyta with special reference to :

1. Psilophytosida : Psilophytales - general account

2. Psilotopsida : Psilotales - general account
3. Lycopsida : Lepidodendrales-*Lepidodendron*; Isoetales-*Isoetes*; Selaginellales-*Selaginella*
4. Sphenopsida : Sphenophyllales - *Sphenophyllum*; Calamitales-*Calamites*
5. Pteropsida : Eusporangiateae:  
Ophioglossales-*Ophioglossum*;  
Marattiales-*Marattia*;  
Osmundales-*Osmunda*.

##### UNIT-III

- Pteridopsida : Leptosporangiate; Filicales - *Gleichenia, Cyathea*  
Marsileales - general account  
Salviniales - general account
6. Evolution of stelar system; cytology and the study of Prothallus in relation to taxonomy; soral evolution
  7. Fossils : Conditions necessary for fossilization, types of fossils and methods of their study; nomenclature

##### UNIT-IV

8. Present and past distribution of gymnosperms with special reference to India.

Classification; morphology, anatomy, life history, phylogeny and relationships of the main groups of gymnosperms with special reference to :

9. Cycadofilicales – General account.
10. Glossopteridales, Caytoniales, Nilssoniales – general account
11. Bennettitales – general account with reference to *Bennettites*
12. Cycadales and Pentoxylales – general account and phylogeny
13. Cordaitales – general account – *Cordaites*, Platyspermic seeds
14. Ginkgoales - *Ginkgo*

#### UNIT-V

15. Coniferales – A comparative account of the morphology, anatomy and life history; evolution of the female strobilus and phylogeny
16. Ephedrales – *Ephedra*
17. Welwitschiales – *Welwitschia*
18. Gnetales – *Gnetum*

## M.Sc. (PREVIOUS) BOTANY

### PAPER-III

### PLANT ECOLOGY, RESOURCE UTILIZATION, CONSERVATION & BIOSTATISTICS

#### UNIT-I

1. Definition, scope and history of plant ecology.
2. Ecological factors: Edaphic, Biotic and Climatic (Light, Temperature, Precipitation, Wind, Topography); Interaction of factors.
3. Population ecology : Definition, dispersion, fluctuation, age classes, sex, ratios; growth measurement; factors affecting population growth; r- and k- strategies; growth curves; population, density and frequency; over population and under population; population turnover.
4. Vegetation Organization : Structure, characteristics and classification of plant communities; methods of studying vegetation; gradient analysis, continuum concept; Life form and biological spectrum; Community coefficients, concept of ecological niche.

#### UNIT-II

5. Ecosystem concept : Structure and function, flow of energy, biogeochemical cycles; Production and decomposition in nature; Ecological efficiencies, Methods of measuring primary productivity; turnover; Homeostasis.

6. Vegetation development : Causes and types of succession; Mechanism of ecological succession; Changes in ecosystem properties during succession.
7. Principles of limiting factor.
8. Plant indicators.

### UNIT-III

9. Major biomes of the world with special reference to desert and grassland.
10. Environmental pollution – A general account of air, water, soil and noise pollution; effects on plants and ecosystems.
11. Brief account of the following : afforestation, social forestry, agroforestry, windbreaks, environmental impact assessment, International Biological Programme; Man and Biosphere Programme (MAB), IUCN.

### UNIT-IV

12. Plant Biodiversity : Concept, status in India, utilization and concerns.
13. World centres of primary diversity of domesticated plants : The Indo-Burmese Centre; plant introductions and secondary centres.
14. Origin, evolution, Botany, cultivation and uses of (i) Food, forage and fodder crops, (ii) Fibre crops,

(iii) medicinal and aromatic plants and vegetable and oil-yielding crops.

15. Important fire-wood and timber yielding plants and non-wood forest products (NWFPs) such as bamboos, rattans, raw materials for paper making, gums, tannins, dyes, resins and fruits.
16. Ethnobotany : Introduction, History and development of ethnobotanical study; scope and potential applications; methods in ethnobotanical study.
17. Traditional Botanical knowledge and subsistence: Wild plant resources as (i) food (ii) fodder (iii) fibre and (iv) medicine with special reference to tribals of Rajasthan.
18. Applied Ethnobotany : Commercialization and conservation; applied ethnobotany in sustainable development; traditional botanical knowledge and intellectual property rights.

### UNIT-V

19. Strategies for conservation – *In situ* conservation: International and Indian initiatives; protected areas in India – sanctuaries, national parks, biosphere reserves, sacred groves.
20. Strategies for conservation – *Ex situ* conservation: Principles and practices, Principles and practices, botanical gardens, field gene bank, seed banks *in*

*in vitro* repositories, cryobanks, general account of the activities of Botanical Survey of India (BSI), National Bureau of Plant Genetic Resources (NBPGR), ICAR, CSIR and DBT for conservation.

21. Biometry : Aims and objects of statistics and applied to biological sciences – measures of central tendency, Mean, Median and Mode.
22. Measures of Dispersion : Range, mean deviation, standard deviation, standard error and student 't' test. Chi-square test and, goodness of fit. Simple Linear Regression; Analysis of variance.

## **M.Sc. (PREVIOUS) BOTANY**

### **PAPER-IV CELL BIOLOGY AND GENETICS**

#### **UNIT-I**

Structure of prokaryotic and eukaryotic cells, membrane structure and function, intracellular compartments, protein sorting (organelles). Biochemical energetics..

Structures and functions of cell wall, mitochondria, chloroplasts, Golgi apparatus, lysosomes, endoplasmic reticulum, ribosomes, and cytoskeleton .

#### **UNIT-II**

Chromatin organization, chromosome structure and packaging of DNA, Nucleolus and rRNA genes, Karyotype, banding patterns, lampbrush and B-chromosome

Nucleus, cell cycle, role of cyclins and cyclin-dependent kinases, C-value, Cot curve and its significance. Structure, chemical composition and type of nucleic acids, DNA replication in chromosomes and cell free system, enzymes of DNA replication.

#### **UNIT-III**

Structural and numerical alterations in chromosomes: duplication, deficiency, inversion, translocation heterozygotes, Haploids, aneuploids and euploids.

Genetics of eukaryotes and prokaryotes organelles : Mapping the bacteriophage genome, phage pheno-

types, genetic recombination in phage; genetic transformation, conjugation and transduction in bacteria, genetics of mitochondria and cytoplasmic male sterility.

#### **UNIT-IV**

Restriction mapping-concept and techniques, multigene families and their evolution, physical mapping of genes in chromosomes. Techniques in cell biology : in situ hybridization, FISH, GISH, Light, confocal, electron microscopy. Genetic Code, transcription and translation : Operon Model, RNA polymerases, reverse transcriptase, RNA processing. Regulation of gene expression in pro- and eucaryotes, the control sequences (operator, promoter, terminator, attenuator, enhancer, cis-acting elements and trans-acting factors, tissue specific gene expression).

#### **UNIT-V**

Genetic recombination and genetic mapping : Recombinations, Role of Rec-A protein, independent assortment and crossing over, molecular mechanism of recombinations, chromosome mapping, linkage groups, genetic markers, somatic cell genetics.

Mutations : Spontaneous and induced mutations, physical and chemical mutagens, molecular basis of gene mutations, transposable elements in eukaryotes and prokaryotes, mutations induced by transposons, site-directed mutagenesis, DNA damages and repair mechanisms, inherited human diseases and defects. Initiation of cancer at cellular level.

## **M.Sc. (FINAL) BOTANY**

### **PAPER -V**

## **TAXONOMY OF ANGIOSPERMS, PLANT DEVELOPMENT AND REPRODUCTION**

#### **UNIT-I**

1. Taxonomic hierarchy - Species, genus, family and other categories; principles used in assessing relationships, delimitation of taxa and attribution of rank.
2. Principles of nomenclature.
3. Systems of angiosperm classification - Phenetic versus phylogenetic systems; cladistics in taxonomy, broad outline and relative merits and demerits of major systems of classification (Bentham and Hooker; Engler and Prantl; Hutchinson; Takhtajan; Thorne; Dahlgren).

#### **UNIT-II**

4. Taxonomic evidence - Role of morphology, anatomy, embryology, palynology, cytology, phytochemistry, genome analysis and nucleic acid hybridization in taxonomy.
5. Range of floral variation and trends of evolution in the Ranales, Centrospermales, Tubiflorales, Amentiferae and Helobiales.



6. Distribution, morphological characteristics, range of floral variation, trends of evolution and systematic position of the following families :

Combretaceae, Cactaceae, Compositae, Araceae, Lemnaceae, Poaceae, Orobanchaceae, Loranthaceae and Lentibulariaceae.

7. Phylogeny of angiosperms.

### UNIT-III

8. Unique features of plant development; differences between animal and plant development.
9. Shoot development- Organization of the shoot apical meristems (SAM), cytological and molecular analysis in SAM.
10. Root development - Organization of root apical meristem (RAM), vascular tissue differentiation; lateral roots; root hairs; root-microbe interaction.
11. Reproduction : Flower - its evolution; foliar stamens; open carpels; primitive living angiosperms; floral anatomy; inferior ovary; placentation and its evolution.

### UNIT-IV

12. Male gametophyte - Structure of anthers; microsporogenesis; role of tapetum; pollen germination, pollen tube growth and guidance.

13. Female gametophyte - Megasporogenesis, organization of the embryo sac, types of embryo sacs; synergid and antipodal haustoria.

14. Pollination, pollen-pistil interaction; fertilization, double fertilization, *in vitro* fertilization.

15. Endosperm - Types, ultrastructure, endosperm haustoria, their extension, persistence and function.

### UNIT-V

16. Embryo-Polarisation of Zygote, embryogenic types, organogenesis of mono and dicot embryos. Structure and function of suspensor, physiological and morphogenetical relationship of endosperm and embryo, embryo culture
17. Polyembryony - Types; genetic, somatic and pollen embryo.
18. Apomixis.
19. Embryo culture.

# **M.Sc. (FINAL) BOTANY**

## **PAPER-VI**

### **PLANT PHYSIOLOGY AND METABOLISM**

#### **UNIT-I**

Energy Flow : Principles of thermodynamics, free energy and chemical potential, redox reactions, structure and function of ATP, Types and mechanism of Phosphorylations.

Fundamentals of enzymology : General aspects, allosteric mechanism, regulatory and active sites, isoenzymes, kinetics of enzymatic catalysis, Michaelis-Menten equation and its significance.

Membrane transport and translocation of water and solutes : Plant-water relations, mechanism of water transport through xylem, root-microbe interactions in facilitating nutrient uptake, comparison of xylem and phloem transport, phloem loading and unloading, passive and active solute transport, membrane transport proteins.

#### **UNIT-II**

Signal transduction : Overview, receptors and G-proteins, phospholipid signaling, role of cyclic nucleotides, calcium-calmodulin cascade, diversity in protein kinases and phosphatases, specific signaling mechanisms, e.g., two-component sensor-regulator system in bacteria and plants, sucrose-sensing mechanism.

Photochemistry and photosynthesis : General concepts and historical background, evolution of photosynthetic apparatus, photosynthetic pigments and light harvesting complexes, photo-oxidation of water, mechanisms of electron and proton transport, carbon assimilation – the Calvin cycle, photorespiration and its significance, the C<sub>4</sub> cycle, the CAM pathway, physiological and ecological considerations, Carbohydrates – their classification, chemistry and metabolism.

#### **UNIT-III**

Respiration and lipid metabolism : Overview of plant respiration, glycolysis, the TCA cycle, electron transport and ATP synthesis, pentose phosphate pathway and other alternative pathways, glyoxylate cycle, alternative oxidase system, Structure and function of lipids, fatty acid biosynthesis, synthesis of membrane lipids, structural lipids, storage lipids, and their catabolism.

Nitrogen fixation, nitrogen and sulphur metabolism: Overview, biological nitrogen fixation, nodule formation and nod factors, mechanism of nitrate uptake and reduction, ammonium assimilation, sulfate uptake, transport and assimilation.

#### **UNIT-IV**

Sensory photobiology : History of discovery of phytochromes and cryptochromes and their photochemical and biochemical properties,

photophysiology of light induced responses, cellular localization, molecular mechanism of action of photomorphogenic receptors, signaling and gene expression.

Plant growth regulators and elicitors : Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroides, polyamines, jasmonic acid and salicylic acid, hormone receptors, signal transduction and gene expression.

#### **UNIT-V**

Plant Rhythms and biological clock, Secondary metabolites – Alkaloids and steroids

The flowering process : Photoperiodism and its significance, endogenous clock and its regulation, floral induction and development – genetic and molecular analysis, vernalization.

Stress physiology : Plant responses to biotic and abiotic stress, mechanisms of biotic and abiotic stress tolerance, HR and SAR, water deficit and drought resistance, salinity stress, metal toxicity, freezing and heat stress, oxidative stress.

## **M.Sc. (FINAL) BOTANY**

### **PAPER-VII PLANT BIOTECHNOLOGY AND GENETIC ENGINEERING**

#### **UNIT-I**

Recombinant DNA technology – gene cloning principles and techniques (plasmid, phage, cosmid, construction of genomics/ cDNA libraries, choice of vectors, DNA synthesis and sequencing PCR, PAGE, Northern and Southern blotting, RFLP, RAPD, AFLP based DNA finger printing. Integration and expression of foreign genes in pro- and eukaryotes. Improvement of industrial microbes and nitrogen fixers, fermentation techno-logy.

#### **UNIT-II**

Biotechnology : Basic concept, principles, plant tissue culture – history, concept of totipotency and cellular differentiation, fundamental aspects of morphogenesis, somatic embryogenesis, androgenesis, protoplast isolation, cultures, hybridization. Application of plant tissue culture in production of useful metabolites, plant pathology and conservation.

#### **UNIT-III**

Bacterial transformations, selection of recombinants and transformants. Techniques of molecular biology : Cell fractionation, isolation and purification of protein and nucleic acids, nucleic acid hybridization. Chloroplast and mitochondrial genome.

#### UNIT-IV

Genetic engineering of plants – Aims, strategies for development of transgenics with examples, *Agrobacterium*, the natural genetic engineering, t-DNA and transposon mediated gene tagging, chloroplast transformation and its utility, intellectual property rights, possible ecological risks and ethical concerns.

#### UNIT-V

Genetic and physical mapping of genes, artificial chromosomes, genome projects, functional genomics, proteomics, microarrays, protein profiling and its significance. Basics of protein engineering and design, enzyme technology, immunotechnology and bioprocess technology. Bioinformatics, computer application in Biotechnology.

## M.Sc. (FINAL) BOTANY

### PAPER-VIII A BIOLOGY OF BRYOPHYTES

#### UNIT-I

1. Introduction, characteristics and classification.
2. Evolution of gametophyte and sporophyte of bryophytes
3. Reproduction :
  - a. asexual
  - b. sexual

#### UNIT-II

4. A comparative study of the various orders of :
  - a. Hepaticopsida
  - b. Anthocerotopsida
  - c. Bryopsida
5. Regeneration studies
6. Ecology

#### UNIT-III

7. Bryophytic flora of Rajasthan
8. Contribution of Indian Bryologists :
  - a. SR Kashyap
  - b. SK Pande

c. Ram Udar

d. PN Mehra

9. Cytology and cytogenetics.

10. Spore morphology, germination and interrelationships in mosses

#### **UNIT-IV**

11. Morphogenetic studies with special reference to:

- a. Protonema and mechanism of bud formation
- b. Physiology of rhizoid formation

12. Physiology of reproduction

#### **UNIT-V**

13. Origin of Bryophytes

14. Economic importance

15. Microtechniques in bryological studies

## **M.Sc. (FINAL) BOTANY**

### **PAPER-VIII B**

### **ADVANCED ECOLOGY**

#### **UNIT-I**

1. Scope of grassland ecology; grassland climate, Basis of grassland classification, phytogeography of grasslands, major grassland types, grasslands in India with special reference to Rajasthan.
2. Grassland as an ecosystem; Dynamics of grassland ecosystem, nutrition of grasslands, Grass-legume association; Ecology of fire in grasslands; Grasses and grasslands in relation to soil conservation; management of grasslands.

#### **UNIT-II**

3. Inter-relationships between physico-chemical properties and biota of lentic freshwater ecosystems. Diel cycles and their significance.
4. Organic matter production in freshwater ecosystems; ecological pyramids; eutrophication, its causes and consequences.

#### **UNIT-III**

7. Environmental pollution – types, effects on plants, biomonitoring, control, green house effect, bio-indicators.
8. Environmental impacts of mining and industrialization.

#### UNIT-IV

9. Management and utilization of inland freshwater resources; management of forest resources.
9. Survey and classification of natural resources; conservation; Development without destruction; management of resources.
10. Biomass as a source of energy, non-conventional sources of energy.
11. Biological diversity; Biosphere reserves; threatened plants of India.

#### UNIT-V

12. Waste management – types, transportation, disposal, reuse and recyclings; Environmental Biotechnology.
  13. Wastelands – Description, classification, reclamation.
  14. Environmental education; remote sensing.
- \*\* Forest ecosystem : Major forest types of the world and of India; forest environment, food chains, energetics, and and biogeochemical cycles operating in forests.

## M.Sc. (FINAL) BOTANY

### PAPER-VIII C

### ADVANCED TAXONOMY OF ANGIOSPERMS

#### UNIT-I

1. Classical vis-à-vis experimental taxonomy, scope and significance of experimental taxonomy, principles and procedures of biosystematics, experimental taxonomic categories, Deme terminology.
2. Concept of species, origin and evolution of species, speciation in vegetatively reproducing plants, speciation in relation to breeding systems.
3. Concept of character, adaptive significance of major taxonomic characters and morphological trends in angiosperms, a general account of numerical taxonomy.

#### UNIT-II

4. Population concept, variation within population, causes of variation in populations; polymorphism and gene flow within population.
5. Population and the environment : phenotypic plasticity and range of tolerance, ecotypes, transplant experiments.
6. Hybridization : recognition of hybrids, isolation mechanisms, hybrid swarms and introgression, taxonomic treatment of hybrids.

### UNIT-III

7. Aquatic angiosperms of India.
8. Endangered taxa and their conservation with special reference to India, Hot spots; Biosystematics and conservation.
9. Evolution and migration of flora, taxonomy of cultivated plants; Plant explorations, invasions and introductions; local plant diversity and its socio-economic importance; ethnobotanical research in relation to taxonomy.

### UNIT-IV

10. Taxonomic tools- Herbarium, flora, histological, cytological, phytochemical, serological, biochemical and molecular techniques; Computer and GIS.
11. Role of the following disciplines in modern taxonomy :
  - i. Morphology
  - ii. Anatomy
  - iii. Embryology
  - iv. Phytochemistry
  - v. Cytology
  - vi. Palynology
  - vii. Genome analysis
  - viii. Nucleic acid hybridization

### UNIT-V

12. Taxonomic and morphological characteristics of the following :

*Paeonia, Exocarpus, Trapa, Sphenoclea, Nyctanthes, Funaria, Calycanthus, Polygala, Aristolochia, Casuarina, Passiflora, Centella, Dischidia, Ultricularia, Tillandsia, Butomus, Butomopsis, Alisma.*

## **M.Sc. (FINAL) BOTANY**

### **PAPER-VIII D ADVANCED PLANT PATHOLOGY**

#### **UNIT-I**

Diseases and their causes : Scope and history of plant pathology with special reference to contribution by Indian Phytopathologists. Concept of disease, animate and non-animate causes of plant diseases, introduction to disease causing pathogens and symptoms caused by them. Plant parasitic nematodes and their classification. Morphology, anatomy and life-cycles of some important phytophagous nematodes like *Meloidogyne*, *Heterodera*, *Anguina* and *Rotylenchulus*. Insects and mites induced plant galls : their types and classification and structure.

#### **UNIT-II**

Disease Development and Diagnosis : Mechanism of penetration, transmission and host defense invoked by different phytopathogens. Factors affecting infections. Toxins and phytoalexins and their significance in disease development and defense. Virulence inoculum potential and pre-disposition factors for disease development and epiphytotic. Modern tools of plant disease diagnosis and surveillance. Role of monoclonal antibodies and serology in plant disease diagnosis. Integrated approaches to plant disease management (Preventive, Curative and biological methods). Seed and soil borne

microbes and their role in plant diseases. Control of soil borne fungi by antibiosis.

#### **UNIT-III**

Study of deranged metabolism of host under pathogenesis with special reference to phenolics, carbohydrates, enzymes, plant growth regulators and other metabolites. Application of plant tissue culture techniques in plant pathology with special reference to culture of biotrophic fungi, elimination of viruses, screening of germplasm and development of disease resistant lines. Genetic regulation of defense in plants. Susceptibility and resistance phenomena. Physiological specialization of parasitic fungi. Molecular basis of host-parasite interaction with special reference to crown-gall pathogen.

#### **UNIT-IV**

Study of symptoms, etiology, perpetuation and control measures of following plant diseases caused by fungi : Wheat-Rust, Blight, Powdery Mildew; Bajra-Green-ear, Ergot, Smut; Maize-Blight, Downy Mildew, Smut ; Jowar-Smut; Rice-Blast Groundnut-Tikka; Sorghum-White Blisters; Gram-Blight, Rust; Sugarcane-Red-Rot.

#### **UNIT-V**

Study of symptoms, etiology, perpetuation and control measures of following plant diseases caused by viruses, phytoplasma, bacteria, nematodes, insects



and mites : Tobacco-Tobacco Mosaic Virus; Chillies-Leaf-curl; Tomato-Leaf-curl; Papaya-Vein-clearing and leaf curl; Citrus-Canker; Sesame-Phyllody; Root knot-Vegetable crops; Cyst Nematode of wheat, Molya disease of wheat, Tundu disease of wheat; plant galls of *Pongamia*, *Cordia*, *Ficus*, *Zizyphus* and *Prosopis*.

## **M.Sc. (FINAL) BOTANY**

### **PAPER-VIII E ALGAL BIOTECHNOLOGY**

#### **UNIT-I**

1. Classification of Oceanic environments, biological importance of Sea, food from Sea , knowledge of Indian Ocean and adjacent Seas.
2. Phytoplankton - (freshwater and marine) seasonal succession, factors affecting distribution and succession.
3. Sea-weed resources -aquaculture of macrophytes methods of cultivation, harvesting manufacture of algin, agar, carrageenan from sea-weeds and other minerals.

#### **UNIT-II**

4. Marine pollution - its causes and effect, Pollution control.
5. Historical perspectives of use of algae for human needs.
6. Algae as a source of food and feed; single cell protein; as biofertilizers; industrial uses of algae.

#### **UNIT-III**

7. Mass cultivation of microalgae as source of protein and as feed.

8. Positive and negative roles of algae in agriculture and fisheries.
9. Algae in closed systems; symbiotic algae; algae in medicine, parasitic algae, phycopathology.

#### UNIT-IV

10. Role of algae in environmental health; sewage treatment; treating industrial effluents; in soil reclamation.
11. Aquatic pollution: causes and consequence; algae as indicators in assessing water quality and pollution; saprobien index.
12. Problems of eutrophication : algal blooms; toxic algae, control of nuisance algae.

#### UNIT-V

13. Algal cultures and their utility : Sources of algal cultures, algal culture collection of the world.
14. Recombinant DNA technology in algae, cloning of algal genomes and genetic engineering with reference to Algae.

## M.Sc. (FINAL) BOTANY

### PAPER-VIII F APPLIED PLANT TISSUE CULTURE

#### UNIT-I

Laboratory organization, water purification systems (including demineralization and reverse osmosis), methods of sterilization (including ozonization, air purification), growth of callus and cell cultures, asynchronous and synchronous cultures, regeneration, methods of micropropagation and their use in forestry, horticulture, agriculture and floriculture. Somatic embryogenesis and synthetic seeds, cryo-preservation and germplasm storage. Micropropagation technology at commercial level.

#### UNIT-II

Haploids – production of homozygous lines and uses. Methods of direct and *Agrobacterium* mediated gene transfer, electroporation, microinjection, particle-gun technology. Transgenic plants. Strategies for crop improvement with special mention of herbicides, virus and insect resistant plants. Protoplast isolation and culture. Somaclonal and Gametoclonal variations.

#### UNIT-III

Role of plant tissue culture in plant pathology – meristem tip culture for virus free plants, culture of obligate parasites. Screening of germplasm and selection of disease resistant lines.

Selection procedure in cell culture; for environmental stress and herbicide resistance.

Methods of cell immobilization, Ri-plasmid and hairy root cultures, process of elicitation and bio-conservation of bio-molecules.

#### **UNIT-IV**

Approaches and factors affecting the production of secondary metabolites. Principle classes of secondary metabolites. Production of pharmaceutically important drugs – alkaloids, anti tumour agents, saponins and sterols, food aditives and insecticides.

#### **UNIT-V**

Bioreactors; types of bioreactors- stirred tank, air-lift, membrane type process and operation. Bioreactor for production of biomass (secondary metabolites and for micropropagation), mass-scale for commercialization. Plant tissue culture industry in India.

## **M.Sc. (FINAL) BOTANY**

### **PAPER-VIII G COMPUTER APPLICATION**

#### **UNIT - I**

1. Introduction to Micro computers : definition, history, types.
2. Organization of Computers : input devices, processing units, memory, output devices, other parts.
3. Disc-Operating System (DOS).
4. Programme, data-processing concepts, representation of numbers and characters.
5. Programming Language, Machine language, Assembly language. Basics of Programming in BASIC with special reference to biological applications.
6. Windows 2000 : (Window based programmes).
7. MS-Office : working with MS-word(preparation of manuscript), Power point and Excel.
8. Coral draw : Basics (working with text, effects and affects, photo-paint, etc.)
9. Preparation of biological figures with Computers (Powerpoint, Smart draw, Coral draw.)

10. Statistics and Graphics with Computer (MS-Excel).
11. Chemical structures, reactions and formulae with computer, 3-D structure with Computer (software chem., Office)).
12. Utilities of Computer : Internet, E-mail. Scanning with scanner, conversion of files in different formats (JPEG, Bitmap, PDD, HTML etc.). Printers and printing.

### **PRACTICALS**

13. All the theory classes should be conducted with the aid of Personal Computers based on contents of theory paper.

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**Mohanlal Sukhadia University  
Udaipur (Raj.)**

**Syllabus**

**Scheme of Examination and Courses of Study**

**FACULTY OF SCIENCE**



**M. Sc. BOTANY**

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Final Examination : 2005-2006

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