M.Sc. Botany

Scheme and Syllabus

School of Distance Education
Andhra University, Visakhapatnam, Andhra Pradesh

S.No.	Paper	**M.Sc. Botany (Previous)**
1	Paper- I	Paper – I : Biology and Diversity of Algae, Viruses, Bacteria and Fungi
2	Paper – II	Paper – II : Biology and Diversity of Bryophytes, Pteridophytes and Gymnosperms
3	Paper –III	Paper – III : Plant Development, Plant Reproduction, Plant Cell, Tissue and Organ Culture
4	Paper – IV	Paper – IV : Taxonomy of Angiosperms, Plant Resource Utilization and Conservation
5	Paper – V	Cell Biology of Plants, Cytology, Genetics, Evolution and Plant Breeding

S.No.	Paper	**M.Sc. Botany (Final)**
1	Paper – VI	Paper - VI: Plant Ecology
2	Paper – VII	Paper -VII: Plant Physiology & Metabolism
3	Paper – VIII	Paper -VIII: Cytogenetics, Chromosome Mapping, Molecular Biology of Plants and Genetic Engineering of Plants and Microbes
4	Paper - IX	Elective : Applied Phycology
5	Paper - X	Elective : Plant Pathology
6	Paper - XI	Elective : Advanced Cytogenetics
7	Paper - XII	Elective : Plant Bio-Systematics

M.Sc. Botany
Two Year Programme Structure

The Programme Objectives (POs) of M.Sc. Botany are:

- To understand the scope and significance of the discipline
- To develop interest in Biological Research
- To develop a thrust to preserve the Natural Resources and Environment
- To make the students exposed to the diverse life forms
- To appreciate and apply ethical principles to biological science research and studies.
- To understand and identification of the flora within field enhances basics of plants application of botany in agriculture is through study of plant pathology.
- To understand the ultra-structure and function of cell membranes and cell communication.
- To learn molecular and physiological adaptations in plants in response to biotic and abiotic stress.
- To understand the classification plant taxonomy, plant ecology, plant anatomy and plant physiology

Previous year Subjects:

1. Biology and Diversity of Algae Viruses, Bacteria & Fungi
2. Biology and diversity of Bryophytes, Pteridophytes and Gymnosperms
3. Plant Development, Plant reproduction and plant tissue culture
4. Taxonomy of angiosperms, plant resources, utilization and conversation
5. Cell - biology of plants, Cytology, Genetics and Plant breeding

Previous year Practicals:

Practical-I :

Biology and Diversity of algae, fungi, bacteria and viruses, bryophytes, pteridophytes and gymnosperms

Practical-II :

Taxonomy of angiosperms, plant development, Plant reproduction, plant resources, utilization and conversation

Practical-III :

Tissue, culture, Cell biology of plants, Cytology, Genetics and Plant breeding

Viva-Voce & Assignment

Final year Subjects:

6. Plant Ecology
7. Plant Physiology and Metabolism
8. Cytogenetics, Chromsome mapping, Molecular Biology of plant and genetic Engineering
9. Elective - I (Plant Pathology)
10. Elective - II (Applied Phycology)

Final year Practicals:

Practical-IV

Plant Ecology, Plant Physiology Metabolism, Cytogenetics Chromosome mapping Molecular Biology of plants and genetic engineering.

Practical-V Elective – I (Plant Pathology)

Practical-VI Elective – II (Applied Phycology)

Viva - Voce & Assignment

Course Objectives of M.Sc. Botany Previous year – Paper 1

Biology and Diversity of Algae, Viruses, Bacteria & Fungi

- To educate the student about classification, overall Thallus organization, Reproduction, and Lifecycles in Algae, Viruses, Bacterial and Fungi.
- To educate the student about Economic importance of Algae and cultivation of important seaweeds, mass culture of microalgae
- To educate the student about uses in waste land reclamation, Bio-fouling and Bio-remediation through Algae.
- To educate the student about general character, Morphology, reproduction and Life history of Algae, Viruses, Bacterial and Fungi.
- To learn about detailed study about some algal forms belong to different classes of Micro-organisms
- This educate the student about prokaryotic and eukaryotic microorganism and their adaptations to different environmental conditions and their classification.
- To provide knowledge on history, origin and evolution, structure, chemistry, replication and transmission of plant viruses.
- To classify Fungi and phylogeny, thallus structure, nutrition and reproduction and their economic importance for the welfare of mankind.
- To learn about different types of bacteria and their classification
- To learn about morphology and chemistry and transmission of plant Viruses
- To learn about microbial ecology
- To learn about classification of fungi and general characteristics of different subdivisions
- To learn about ultrastructure of fungal cell, cell wall composition and different types of reproductions in fungi

Syllabus of M.Sc. Botany Previous year – Paper 1

ALGAE

Classification – Criteria employed in Classification.

Classification given by Fritsch and Bold and Whynne.

Range of thallus structsure, reproduction life histories of Chiarophyceae with special referencef to the genera, Chiamydomonas, Tetraspora, Volvox, Chlorella, Scenedesmus, Ulva, Enteromorpha, Cladophora, Fritschiella, Oedogonium, Spirogyra, Cosmarium Caulerpa, Chara.

Salient features of Prochlorophyta, Xanthophyta (Vaucheria), Bacillariophyta, (Cyclotella), Phaeophyta

(Ectocarpus, Dictyota, Padina, Laminaria, Sargassum), Rhodophyta (Gelidum, Gracilaria, Polysphonia) Cyanophyte (Nostoc, Lyngbya, Spirulina)

Economic importance of Algae. Single cell Protein.

Algal blooms and algal Biofertilizers

VIRUSES, BACTERI & FUNGI

- General account of Archebacteria, Eubacteria & Cyanobacteria. Ultrastructure. Nutrition. Reproduction and Economic importance of Bacteria

Mycoplasma like organisms & their role in carrying plant diseases.

Urastructure & Chemistry of viruses

Isolation & Purification of viruses

Replication & Transmission of viruses.

- Plant viral diseases & Animal (and human) viral diseases

Recent trends in Fungal classification.

+ Ultrastructure of Fungal cell & Thallus organization in Fungi

Nutrition of Fungi-Saprobic, Biotrophic & Symbiotic Reproduction in Fungi - Vegetative, Asexual & Sexual,Heterothallism, Heterokaryosis & Parasexuality. Phylogeny of Fungi

- General account of Mastigomycotina. Zygomycotina, Ascomycotina Basidiomycotina

Deuteromycotina, Fungi in industry, Medicine & as food.

Fungal diseases in plants & human & fungi as bio-control agents

Mycorrhiza

Course Objectives of M.Sc. Botany Previous year – Paper 2

Biology and diversity of Bryophytes, Pteridophytes and Gymnosperms

- To educates the student about classification, ecological and economic importance and conduction in bryophytes.
- To educates the student about general character, Morphology, reproduction and Lifehistory of Hepaticopsida, Anthocerotopsida and Bryopsida.
- Student can learn about general character of Bryophytes and Conduction in bryophyte.
- Student can learn about general characters, Morphology, reproduction and Life historyofsome species belong to Hepaticopsida, Anthocerotopsida and Bryopsida.
- To understand the classification and evolution of Pteridophytes and Gymnosperms with specialreference to Indian taxa.
- To get an insight in to the life histories of tracheophytes (Pteridophytes and Gymnosperms)
- To know the evolution of Bryophytes and Pteridophytes and Gymnosperms.
- To get knowledge about economic importance of Pteridophytes and Gymnosperms
- To get an understanding of the past history of the biosphere and evolution of Plants through fossils.
- To understand the phylogeny of Pteridophytes and Gymnosperms.
- To understand the stelar evolution and seed formation habit in pteridophytes.
- To gain knowledge about life cycles of gymnosperm plants.
- To explain about fossils and fossilization.
- The student will understand the evolutionary history of plant kingdom.

- To understand about geological time scale.

Syllabus of M.Sc. Botany Previous year – Paper 2

BYOPHYTES

Morphology, structure, reproduction and life history, distribution, classification, General account of Marchantiales, Jungermaniales, Antghoceratales, Sphagnlas, Funariales and Polytrichales. Economic and ecological importance.

PTERIDOPHYTES

Morphology, Anatomy and reproduction; classification; Egvolution of stele, Heterospory and origin of seed habitgg; General account of fo\ssil Pteriedophyta; introduction to Psilopsida, Lycopsida, Sphenopsida and Pteridopsida and the detailes study of the genera listed under the Practical work.

GYMNOSPERMS

Introduction: Gymnosperms, the vessel—less and fruitless seed plants varying in the structure of their sperms, Pollen grains, pollen germination and the complexity of their female gametophyte, Evolution of Gymnosperms.

Classification of Gymnosperms and their distribution in India.

Brief account of the families of Pterldospermales (Lyginopteridaceae, Medulosaceae, Caytoniaceae) Benettitales (Cyadeodiaceae), Perrtoxyiales (Pentoxylaceas) and Cordiatales (Cordaitaceae).

Structure and reproduction in Cycadales, Glnkgoales, Confierales, Ephedrales, Welwitschiales and Gnetales.

Course Objectives of M.Sc. Botany Previous year – Paper 3

Plant Development, Plant Reproduction and Plant tissue culture

- To study the plant tissue culture basic concepts and its applications
- To understand the preparation of culture medium, basic components, Phyto hormones and itseffects.
- To study the techniques and applications of cryopreservation and germplasm storage
- To study the methods of production of haploids, dihaploids, somatic embryos
- and artificial seeds.
- To understand the procedures of cell cultures, making protoplasts
- To study genetic transformationthrough protoplasts and its applications
- To learn about basic concepts and protocols of different types of tissue culture
- To learn about totipotency, morphogenesis and cell differentiation.
- Students learn about how to produce secondary metabolites in large
- To scale new varieties in crop improvement using protoplast and haploid cultures.
- To learn about applications of tissue culture in crop improvement
- To learn about conservation of natural bio diversity resources

Syllabus of M.Sc. Botany Previous year – Paper 3

1. Introduction : Plant development and its unique features.

2. SeedGerminationandseedlingGrowth : Metabolismofnucleic acids, proteinsandmobilization of food reserves; tropisms; hormonal control ofseedling growth; gene expression .

3. The Cell and Tissues:TheCell; the cytoskeleton and the ergastic substances; the cellwall, its chemical and grossstructure;simple and complex tissues; epidermis,stomata and trichomes; secretory cells and tissues.

4. Shoot Development : Organization of the shoot, apical meristem, (SAM); cytological and molecular analysis of SAM; control of cell division and cell communication; control of tissue differentiation.

5. Leaf Growth and Differentiation : Determination ; phyllotaxy; control of leaf form id differentiation of epidermis andmesophyll;structureoffoliage leaves;structureofmodified leaves.

6. Root Development : Organization of root apical meristem (RAM); cell fates and lineages; tissue differentiation; lateralroots;root hairs;root – microbe interactions.

7. Vascular Tissue Development : Development and structure of the primary xylem; primary phloem; secondary xylem;secondary phloem.

8. Cambium : Structure, celltypes anddevelopment of vascular cambium;cork cambium;structure of its derivatives; bark; anomaloussecondary growth in dicot andmonocotstems.

9. Introduction: Outlines of vegetative and sexual reproduction; flower and other reproductive organs.

10. Male Gemetophyte: Structure of anthers; microsporogenesis; role of tapetum; pollen development and gene expression;male sterility;sperm dimorphism; pollen germination, pollen tube growth and guidance; pollen storage; pollen allergy; pollen, embryo sac.

11. Female Gemetophyte: Ovule development imegasporogenesis; organization of embryo sac; ultrasturcture ofthe embryo sac cells; nutrition ofthe embryo sac.

12. Pollination, Pollen – PistilInteraction andFertilization :Floral characteristics; pollination mechanisms and vectors;structure of the pistil; pollen – stigma interaction; sporophytic and gametophytic self – incompatibility, (Cytological, biochemical andmolecular aspects); double fertilization.

13. Post – fertilization Events : Endospermdevelopment during early,maturation and desiccation stages; embryogenesis;storage proteins of endosperm and embryo; polyembryony; apomixis; parthenocarpy;seed development and fruit growth.

14. Latent life – Dormancy : Importance and types of dormancy; seed dormancy; overcoming seed dormancy; bud dormancy; Outlines of experimental embryology (Anther culture, ovary culture, ovule culture, endospermculture, embryo culture; in vitro fertilization).

15. Applications of Angiosperm Embryology (Agricultural, Horticultural and Taxonomic considerations).

16. Biotechnology : Basic concepts. Principles and Scope. PlantBiotechnology-Conventinal and non – conventional approach.

17. Plant Cell andTissue Culture : Introduction, history,scope, concept ofCellular differentiation, Totipotency.

18. Organogenesis and Adventive Embryogenesis, Fundamental aspects of Morphogenesis: Somatic embryogenesis and androgenesis – mechanisms,techniques and utility.

19. SomaticHybridization : Protoplastisolation,fusionandculture, hybridselection and regeneration, possibilities, achievements and limitations and protoplastresearch. 20. Applications ofPlantTissue Culture :Clonal propagation, artificialseed production of hybrids and somaclones, production ofsecondary metabolites, natural products. v 21. Cryopreservation and germplasm storage.

Course Objectives of M.Sc. Botany Previous year – Paper 4

Taxonomy of angiosperms, plant resources, utilization and conversation

- To the advanced concepts and principles of Taxonomy, evolutionary inference of Angiosperms.
- To understand Biodiversity of plant organisms
- To know important orders and families of flowering plants,
- To classify and the role of important characters
- To utilize and conservation of Plant resources
- To learn about the Angiosperms and their characteristics
- To understand Nomenclature and how is it governed by the ICBN
- To learn important morphological characters delineate flowering plants
- To learn different classification systems
- To learn Principles and applications of Molecular Taxonomy

Syllabus of M.Sc. Botany Previous year – Paper 4

Taxonomy of Angiosperms, Plant Resource Utilization and Conservation

Taxonomy of Angiosperms :

Origin of intrapopulation variation: Population and the environment; ecads and ecotypes; evolution and differentiation of species- various models.

The species concept: Taxonomic hierarchy, species, genus, family and other categories; principles used in assessing relationship delimitation of taxa and attribution of rank. Salient features of the international code of Botanical nomenclature.

Taxonomic evidence: Morphology, anatomy, palynology, embryology, cytology; phytochemistry, genome analysis and nuclic acid hybridization.

Taxonomic tools : Herbarium floras; historical, cytological, phytochemical, serological, biochemical and molecular techniques; computers and GIS.

Systems of angiosperm classification: Phenotic versus phylogenetic systems; Cladistics in taxonomy; relative merits and demerits of major systems of classification Takhtajan, Cronquist, Thorn; relevance of taxonomy to conservation, substainable utilization of bio-resources and ecosystem research.

Concepts of phytogeography : Endemism, hotspots and hottest hotspot; plant explorations; invasions and introductions; local plant diversity and its socio-economic importance.

Plant Resource Utilization and Conservation

Plant Biodiversity: Concept status in India, utilization and concerns. Sustainable Development:

Basic Concepts Origin of Agriculture World Centres of Primary diversity of domesticated Plants: The Indo- Burmese Centre, Plant introduction and secondary centres.

Origin, Evolution, Botany, Cultivation and uses of Food Crops : Wheat, Rice, Maize, Sugarcane.

Forage/ Fodder Crops : Sorghum, Barjra, Redgram. Fibere Cropes : Cotton, Coir Medicinal & Aromatic Corps: Catharanthus, Adhatoda, Withania, Andrographis Vetiveria, Cymbopogon. Vegetable Oil Yielding Corps: Groundnut Coconut, Sunflower, Castor. Important Fire-wood and timber yielding plants and non-wood.

Forest Product: Bamboos, Rattan, Casuarina Acacia, Eucalyptus, Curcuma, Bixa. Green Revolution: Benefits and adverse consequences. Innovations for meeting world food demands :

Plants Used as avenue trees: For shade, Pollution control and aesthetics. Principles of conservation, extinctions, Environmental Status of plants based on International union for conservation of nature.

Strategies for Conservation –in-situ Conservation: International efforts and Indian initiatives, Protected areas in India-Biospere reserves, Wetlands, mangroves and for conservation of wild biodiversity.

Strategies for conservation-ex situ conservation: Principles and practices, botanical gardens, field gene banks, seed banks, in vitro repositories, cryobanks; general account of the activities of Botanical Survey of India (BSI) National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific & Industrial Research (CSIR) and Department of Biotechnology (DBT) for conservation, non formal conservation efforts

Course Objectives of M.Sc. Botany Previous year – Paper 5

Cell - biology of Plants, Cytology, Genetics, Evolution and Plant breeding

- To learn about Crop improvement
- To understand about resistance against biotic and abiotic stress
- To learn about Plant breeding methods
- To understand ultra-structure and function of cell membranes and cell communication.
- To demonstrate hands on training of various tools andtechniques available in the field of recombinant DNA technology
- To give the knowledge of the Ultra structure, properties and functions. of the Plant cell and itsvarious organelles
- To explain the types and stages in Cell division.
- To stain and identify plant chromosomes
- To create awareness on the chromosomal structural and numerical aberrations
- To use cytological methods.
- Student will be taught about the origin and the development of
- To learn about the identification, distinction, ultra structure of the plant cell and its organelles.
- To know about the various parts of the cell, their functions and significance.
- To gain the knowledge about the types and stages of cell division cell cycle and theirsignificance.
- To Understand and identify the structural and numerical abnormalities of chromosomes in thecell.
- To know Mendelian and non-Mendelian inheritance,
- To explain quantitative and quantitative characters in genetics,
- To understand Molecular markers and their uses
- To distinguish crossing over, Linkage and Linkage mapping,
- To differentiate prokaryotic and eukaryotic genome structure, gene function and regulation,
- To learn about Inheritance of qualitative and quantitative traits
- To perform Mapping genes in bacteria
- To learn the structure and organization of different components of the eukaryotic genomes
- To learn Transposons types and their significance.
- To use linkage and recombination frequencies to map genes.

Syllabus of M.Sc. Botany Previous year – Paper 5

Cell Biology of Plants

1. The dynamic Cell : Structural organization of the plant cell, specialized plant cell types; chemical foundation, biochemical energetics.

2. Cell Wall : Structure and functions; biogenesis, growth.

3. Plasma membrane : Structure models and functions, sites of ATP ases, receptors, ion carriers, channels and pumps.

4. Plasmodesmata : Structure, role in movement of molecules and macromolecules, comparison with gap junctions.

5. Chloroplast : Structure, genome organization, gene expression, RNA editing, nucleo – chloroplastic interactions.

6. Mitochondria : Structure, genome organization, biogenesis.

7. Plant vacuole : Tonoplast membrance ATP ases, transporters; as storage organelle.

8. Other cellular organelles : Structure and functions of microbodies, golgi apparatus, Lysosomes, endoplasmic reticulum.

Cytology

Chromosome structure and packaging of D.N.A. C value paradox, cot curves and their significance ™ Molecular organization of Centromere and telomere, nucleolus and ribosomal RNA genes ; Euchromatin & Heterochromatin. ™ Karyotype analysis; Banding patterns; specialized types of Chremosomes; Polytene, lampbrush, B. Chromosomes & sex chromosomes. ™ Origin, Occurrence, Production and meiosis of haploids, Origin and production of autopolyplids; Chromosome and Chromatid segregation; allopolyploids, types, genome constitution and analysis.

Genetics

Genetic analysis-Introduction • Recombination, Independent assortnent and Crossingover; molecular mechanism of recombination; role of Rec A and Rec B.C,D, enzymes, site specific recombination. • Genetics of mitochondria, and Chloroplasts; Cytoplasmic male sterility. • Fine structure of gene, cistrans test; fine structure, analysis of eukaryotes. • Regulation of gene expression in prokaryotes and eukaryotes. • Spontaneous and induced mutations, molecular basis of gene mutations; site directed mutagenesis DNA damage and repair-mechanisms; inherted human diseases and defects in DNA repair. • Transposable elements in prokaryotes and eukaryotes; mutations induced by transposans. • Initiation of Cancer at Cellular level; Proto oncogenes and oncogenes.

Evolution

Basic concepts of origin of life, theories of organic evolution Darwinism, Phyletic gradualism, punctuated equilibrium, Synthetic theory; Hardy – Weinberg equilibrium and signigicance, Natural selection – types pressure & adaptive radiation.

Plant Breeding

Origin of cultivated plants; Evolution of major crop plants – wheat & maize. Plant Introduction, Germplasm banks. Methods of breeding and selection of self, cross – pollinared and vegetatively propagated crops : Pureline selection, Mass selection, Hybridisation, Pedigree method, Back cross method, synthetic varieties; clonal selection and hybridization. Genetic basis of inbreeding depression and Heterosis

Course Objectives of M.Sc. Botany Previous year – Practical-I :

Biology and diversity of Algae, Fungi, Bacteria and Viruses, Bryophytes, Pteridophytes and Gymnosperms

- To examine of vegetative and reproductive morphology of Chlorophyceae members
- To examine of thallus structure and reproductive bodies of Xanthophyceae,
- To examine external and internal structure and reproductive organs of Rhodophyceae and Cyanophyceae members listed in the theory syllabus. Field work to get acquaintance with the Algae of coast in and around Visakhapatnam.
- To study Stemonitis, Saprolegnia, Mucor, Mochella, Aspergillus, Agaricus, Cyathus, Synchitirum, Helminthosporium.
- To identify symptomology of some diseased specimens - White rust, Powdery mildew, Green ear of Bajra, Wheat rust, Ground nut leaf-spot, Red rot of Sugarcane, Blast of rice, Citrus canker, Mosaic, Rust of linseed.
- To conduct Gram staining of Bacteria.
- To practice Sterilization methods.
- To prepare media & stains.

Syllabus for M.Sc. Botany Previous year – Practical-I :

- Chlamydomonas
- Chlorella
- Cladophora
- Oedogonium
- Caulerpa
- Vaucheria
- Ectocarpus
- Laminaria
- Gelidium
- Nostoc
- Microscopic observation of fungal slides
- Symptomology of some diseased plants
- Studies on leaves infected with fungal
- Sterilization methods
- Gram staining of bacteria
- Preparation of medium for the cultivation of bacteria
- Preparation of medium for cultivation of fungi
- Sterilization methods
- Gram staining of bacteria
- Preparation of medium for the cultivation of bacteria

Bryophytes

- Plagiochauma
- Marchant
- Pellia
- Parella
- Anthoceros
- Notothylas
- Andreaea
- Polytrichum

Pteridophytes

- Pilotum
- Lycopodium
- Selaginella
- Equisetums
- Ophioglossum

- Osmunda
- Adiamtum
- Marsilea
- Salvinia
- Azolla
- Fossil Slides

Gymnosperms

- Pteridospermales (- Cycadofilicales:
- Bennettitales (Cycadeoideales
- Pentoxylales
- Cycadales
- Cordaitales
- Ginkgoales
- Coniferales
- Coniferales
- Gnetales-1
- Gnetales -II

Course Objectives of M.Sc. Botany Previous year – Practical-II :

Taxonomy of Angiosperms, Plant development, Plant reproduction, Plant resources, utilization and Conversation

- To make the students aware of the kinds of tress and value in urban ecosystems and ecological services..
- To create awareness about protected area (biosphere reserve, national park, or a sanctuary) ii) A wetland iii) A mangrove iv) National Bureau of Plant Genetic Resources, New Delhi - 110012 or one of its field stations. v) Head Quarters of the Botanical Survey of India or one of its Regional circles vi) A CSIF, Laboratory doing research on plants and their utilization.
- To visit recognized botanical garden or a museum (such as those at the Forest Research Institute, Dehradun; National Botanical Research Institute, Lucknow; Tropical Botanical Garden and Research Institute, Trivandrum), which has rich collection of plant products.
- To deal with one major crop of crops.
- To prepare a brief illustrated narrative of the Field Survey and Scientific Visits.
- To assess the practical activities.

Syllabus for M.Sc. Botany Previous year – Practical-II :

Suggested laboratory exercises:

1. Description of a specimen from representative, locally available families.
2. Description of a species based on various specimens to study intraspecific variation : a collective exercise.
3. Description of various species of a genus: Location of key characters and preparation of keys to generic level.
4. Location of key characters and use of keys at family level.
5. Field trips within and around the campus; compilation of field notes and preparation of herbarium sheets of such plants, wild or cultivated as are abundant.
6. Training in using floras and herbaria for identification of specimens described in the class.
7. Demonstration of the utility of secondary metabolites in the taxonomy of some appropriate genera.
8. Comparison of different species of a genus and different genera of family to calculate similarity coefficients and preparations of dendrograms.

Practical course in divided into three units.

1) Laboratory work 2) Field survey and 3) Scientific Visits Laboratory Work :

1. Food Crops : Wheat, Rice, Maize and Sugarcane
2. Forage/Fodder Crops: Sorghum, Bajra, Gram
3. Plant fibres : a) Textile fibres : Cotton b) Cordage Fibres : Coir
4. Medicinal and aromatic plants : Catharanthus Adhatoda Zeylanica, Withania somnifera Andrographis paniculata, Vetiveria zizanoides, Cymbopogon sp
5. Vegetable Oils: Groundnut, coconut, Castor.
6. Gums, Resins, tannins, Dyes : Acacia, Cassia spp., Turmeric, Bixa. Field Survey : 7. Firewood and timber - vielding plants and NWFP's :

A) Prepare a short list of 10 most important sources of firewood and timber in your iv locality, Give their local names, scientific names and families to which they belong and mention their properties.

B) Prepare an inventory of the bamboos and rattans of your area giving their scientific and local names and their various uses with appropriate illustrations.

Course Objectives of M.Sc. Botany Previous year – Practical-III :

Tissue culture, Cell biology of plants, Cytology, Genetics and Plant breeding

- To learn about Plant breeding methods
- To understand ultra-structure and function of cell membranes and cell communication.
- To demonstrate hands on training of various tools andtechniques available in the field of recombinant DNA technology
- To give the knowledge of the Ultra structure, properties and functions. of the Plant cell and itsvarious organelles
- To stain and identify plant chromosomes
- To create awareness on the chromosomal structural and numerical aberrations
- To use cytological methods.
- To gain the knowledge about the types and stages of cell division cell cycle and theirsignificance.
- To explain quantitative and quantitative characters in genetics,
- To understand Molecular markers and their uses
- To distinguish crossing over, Linkage and Linkage mapping,
- To differentiate prokaryotic and eukaryotic genome structure, gene function and regulation,
- To perform Mapping genes in bacteria

Syllabus for M.Sc. Botany Previous year – Practical-III :

Genetics:
Assignments answers to lesson
Genetics: assignments lesson
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Cell Biology:
Mitosis
Meiosis
Cell biology techniques - 1 microscopy
Cell biology techniques - 2 fish & chemical methods
Cell biology techniques-3 electrophoresis
Cell biology techniques-4 cell organelle

Plant Breeding:
Plant breeding techniques-1 data collection on
Plant characters and analysis, mean, mode medians
Plant breeding techniques-2 analysis of quantitative traits
Plant breeding techniques-3 rice-oryza sativa
Plant breeding techniques-4 sorghum
Plant breeding techniques-6 bajra
Plant breeding techniques-8
Cajanus cajan linn. (red gram; pigeon pea)

Course Objectives of M.Sc. Botany Final year – Paper 6
Plant Ecology

- To study the geographical distribution, diversity and abundance of organisms.
- To study the biological productivity of nature and its relationship with mankind.
- To study the inter-relationship between organisms in population and communities.
- Temporal changes in the occurrence, abundance and activities of organisms.
- Conservation and management of natural resources and pollution
- Understanding populations in terms of diversity, habitat, niche and growth rates.
- To learn about ecosystems and populations.
- To learn about interactions in the community in terms of competition and predation
- To learn about succession and climax communities.
- To learn about biodiversity and its conservation.
- To explore ecological problems and understanding of the greenhouse effect, global warmingand climate change.

Syllabus for M.Sc. Botany Final year – Paper 6 :

Historical account of Ecology and definitions of Ecology. Development of Ecology in India, Ecosystem organisation: Structure and functions and concepts of Ecosystem, Management, Stability, Complexity, Dynamics, Homeostasis of Ecosystem. (Forest, Grassland, Freshwater Ecosystem) energy Ecological efficiencies, Energy Dynamics, Trophic Organisation, Energy flow pathways concepts of Biological Niche.
Ecology and its relevance to human welfare - Climate. Major biomes and vegetational patterns of the world. Major vegetational and soil types of India.

Vegetational Organization: Concepts of community and continuum. Methods of study of plant communities qualitative study of plants communities. Stratification Life forms, and Physiognomy, normal biological spectrum, Quantitative study of plant communities distribution pattern frequency, density canopy, cover basal area community coefficient. Inter specific association ordination.

Synthetic Characters of Plant Community.
Indices of species structure, Index of dominance indices of species structure: Association Index. Index of similarity, Index of diversity, Index of dominance. A general account of classification of communities

Population Ecology:
Basic concepts of population Ecology; population structure, characteristics of population, Population density, Natality, Mortality, Age distribution Biotic potential,Population growth and forms and curves. Population fluctuation, and population dispersal.
Litter falls, and decomposition (mechanism, substrate quality and climate factors). Global biogeochemical cycles of C, N, Pand S (mineral) cycles on teresterial and aquatic ecosystems.
The role of biodiversity in Ecosystem functions and stability, specialization and extinction IUCN categories of threat, distribution and global patterns teresterial bio-diversity.
Air, Water and Soil pollution, kinds, sources, quality parameters, effects on plants and Ecosystems.

Ecosystem Stability: Concept (resistance and reilliance) ecological perturbations (Material and anthropogenic) and their impact on plants and ecosystems.
Environmental impact assessment. Ecosystem restonation. Primary production and six methods for its estimation. Climate change: Greenhouse gasses (CO,, CH,, NO, CFCS sources trends and role) ozone layer and ozone hole, consequences of climate change (CO,, fertilization, global warning, sea level rise, UV radiation).
Definitions and composition of soil. Factors effecting soil formation, soil profile some important process in soil formation characteristic to the climate type (Laterization

podosolization, gleixation, mineralization and soil classification, soil water, soil solution. Soil organic matter or humus and soil organisms.

Course Objectives of M.Sc. Botany Final year – Paper 7

Plant Physiology and Metabolism

- To create awareness about the stomatal physiology.
- To understand the students the role of Phytohormones.
- To create awareness about the process of water transport in plants.
- To understand students about the nitrogen fixation.
- To create awareness about different types of stress.
- To learn about plant water relations.
- To learn about abiotic stress facing by plants.
- To learn about the plant regulators.
- To acquire the knowledge in Enzyme kinetics.
- To acquaint the knowledge about Biotic and Abiotic stress.

Syllabus for M.Sc. Botany Final year – Paper 7 :

Plant Water Relations: Thermodynamic concepts of plant water relations, free energy and chemical potential, osmotic potential, water potential and its determination, active and passive absorption of water, stomatal physiology and mechanisms of stomatal opening and closing Soil-plant-atmosphere-continuum concept (SAC) and mechanism of water transport through xylem.

Mineral Nutrition : Passive and active uptake of ions, translocation of minerals in plants, essential elements, their functions and symptoms of mineral deficiency, importance of foliar nutrition and use of chelates in agriculture, root microbe interactions in facilitating nutrient uptake and mechanism of assimilate translocation.

The Flowering Process: Phytochrome structure, photochemical and biochemical properties and role in photomorphogenesis, photoperiodism and its significance, mechanisms of floral induction, role of vernalization, physiological and metabolic changes accompanying seed germination, causes and methods of breaking seed dormancy.

Plant Growth Regulators and Elicitors: Biosynthesis, physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteriods, polyamines, Jasmonic acid and salicylic acid, role in agrihorticulture and hormone receptors.

Stress Physiology: Plant responses to biotic and abiotic stress, mechanisms of biotic and abiotic stress tolerance, water deficit and drought resistance, salinity stress, metal toxicity, heat stress and oxidative stress

THEORY: (METABOLISM) Fundamentals of Enzymology: General aspects, allosteric mechanism, regulatory and Active sites, isozymes, kinetics of enzymatic catalysis, Michaelis-Menten Equation and its significance, Mechanism of enzyme action. Signal transduction: Receptors and G proteins, phospholipid signaling, role of cyclic nucleotides, calcium-calmodulin cascade, diversity in protein kinases and phosphatases, specific signaling mechanisms Eg. Two-component sensor-regulator system in bacteria and plants, sucrose sensing mechanism.

Photochemistry and Photosynthesis: General concepts and historical background, evolution of photosynthetic apparatus, Redox reactions, photosynthetic pigments and light harvesting complexes, photooxidation of water, mechanisms of electron and proton transport, structure, synthesis and function of ATP, carbon assimilation - the Calvin cycle, photorespiration and its significance, the C, cycle, the CAM pathway, biosynthesis of starch and sucrose, physiological and ecology considerations.

Respiration and lipid metabolism: Plant respiration, glycolysis, the TCA cycle, electron transport and ATP synthesis, pentose phosphate pathway, glyoxylate cycle, alternative oxidase system, structure and function of lipids, fatty acid bio synthesis, of membrane lipids, structural lipids and storage lipids and their catabolism.

Nitrogen fixation, nitrogen and sulphur metabolism: Biological nitrogen fixation, nodule formation and nod factors, biosynthesis of amino acids and proteins, mechanism of nitrate uptake and reduction, ammonium assimilation, sulphate uptake, transport and assimilation.

Course Objectives of M.Sc. Botany Final year – Paper 8

Cytogenetics, Chromsome mapping, Molecular Biology of Plant and Genetic Engineering

- To provide knowledge on Biomolecules and their utilization
- To gain the knowledge in protein synthesis and involvement of different types of nucleicacids during the process of protein synthesis
- This educates the student in DNA replication in both prokaryotes and Eukaryotes
- To gain the knowledge in gene regulation in both prokaryotes and Eukaryotes
- Student can learn about different types of Biomolecules and their mobility and functions
- Student can learn the central dogma molecular biology which includes transcription, translation, different types of DNA replication and number of enzymes involved.
- Student can learn about the gene regulation in both Prokaryotes and Eukaryotes.
- To provide a contextual and inquiry based learning of modern day advances in the field ofrecombinant DNA technology
- To understand methods of Gene transfer
- To know the different types of Vectors
- To produce transgenic plants.
- To have a concept on Bioinformatics
- Basic principles and modern age applications of recombinant DNA technology and proteomics.
- Learning molecular and technical skills along with applications of the instrumentation.
- Designing/conducting experiments and analyzing experimental data.
- Ethics of Recombinant DNA Technology and proteomics.

Syllabus for M.Sc. Botany Final year – Paper 8 :

Chromosome mapping, linkage groups, genetic markers, construction of molecular maps, correlation of genetic and physical maps, somatic cell genetics- an altenarative approach to gene mapping.

Mapping the bacteriophage genome; phage genotypes, genetic recombination in phage, genetic transformation, Conjugation and transduction in bacteria.

Origin, Occurrence, Production and effect of anueploidy on phenotype in plants, transmission of monosomics and trisomics and their use in Chromosome mapping of diplid and polyploid species.

Origin, Meiosis, Breeding behaviour and genetics of structural heterozygotes; Complex translocation heterozygotes; translocation tester sets; Robert sonian translocation; B-A translocations.

Transfer of whole genome, examples from wheat, Arachis and Brassica.

Transfer of individual Chromosomes and Chromosome segments; production, Characterization and utility of alien addition and substitution lines.

Restriction mapping-concept and techniques.

Multigene families and their evolution; in-situ hipridization-Concept & techniques.

Computer assisted Chromosome analysis; Chromosome microdissection and micro-cloning

Flow Cytometry and confocal microscopy in Karyotype analysis.

Genetic Engineering of Plants and Microbes:

Recombinant DNA technology: Gene; Cloning Principles and techniques; Cloning Vectors; Construction of Genomic & CDNA libraries; DNA synthesis and Sequencing (Sanger dideoxy method) Automated Sequencing); Polymerase chain reaction, DNA finger printing.

Genetic, Engineering of Plants: Aims, strategies for development of transgenics (with suitable examples) Agrobacterium - the natural genetic engineer. DNA and transposon mediated gene tagging, Chloroplast transformation and its utility, Intellectual property rights. possible Ecological risks and ethical issues.

Microbial genetic manipulation: Bacterial transformation: Selection of recombinants and transformants; Genetic improvement of industrial microbes and nitrogen fixers. fermentation technology.

Genomics & Proteomics. Molecular markers for introgression of useful traits, artificial Chromosomes, genome projects, bioinformatics functional genomics, microarrays, Protein profiling and its significance.

Molecular Biology of Plants:

Nucleus: Structure, Nuclear Pores, Nucleosome organization, A.B.Z forms DNA replication.

Transcription: Plant promoters and Transcription factors: splicing, m RNA transport, nucleolus, r RNA biosynthesis

Ribosome: Structure, Site of Protein Synthesis, mechanism of translation, initiation, elongation and termination, structure and role of tRNA.Protein sorting, targeting of Proteins to organelles.

Cell shape and Motility: The Cyto skeleton and role of microtubules and microfilaments, motor movements and implications in flagellar and other movements.

Cell Cycle: Control Mechanisms, role of cycling and cyclin dependent kinesis retinoblastoma and E2F Proteins.

Cytokinesis and cell plate formation.

Apoptosis: Mechanisms of programmed cell death.

Course Objectives of M.Sc. Botany Final year – Paper 9

Elective -1: Plant Pathology

- To provide knowledge on importance, Classification, symptoms and control of plant diseases.
- To gain the knowledge in Symptoms, etiology, epidemiology & control measures withreference to some Fungal, Bacterial and Viral diseases.
- This educates the student in know about different stages in Infection phenomena.
- To gain knowledge on Role of enzymes, toxins, Phytotoxins. Vivo toxins.
- Student can gain knowledge on importance, Classification, symptoms and control of plantdiseases
- Student gain knowledge on Symptoms, etiology, epidemiology & control measures withreference to some Fungal, Bacterial and Viral diseases
- Student gain knowledge on different stages in Infection phenomena, Role of enzymes,toxins, Phytotoxins and Vivo toxins

Syllabus for M.Sc. Botany Final year – Paper 9 :

Importance of plant diseases, classification of plant diseases, causes of plant diseases, symptoms of plant diseases. post-harvest diseases.

Dispersal of plant pathogens-Active and passive.

Infection phenomena-pre-penetration, penetration and post penetration. Factors affecting infection. Effect of environment on plant disease development-Temperature, humidity and light.

Role of toxins in plant diseases - pectic, macerating, cellulolytic, lignolytic, proteolytic, lypolytic enzymes & hemicellulases

Role of toxins in plant diseases-hostspecific & non- specific toxins patholoxins, vivo toxins & Phytotoxins.

Plant diseases management through host resistance:

a) Vertical, horizontal, Monogenic, polygenic, specific & general resistance. b) Development of resistant varieties.

Defence mechanisms in plants: pre-infectional defence mechanisms, post infectional defence mechanisms, phytoalexins

Control of plant diseases: a) Cultural practices: field & crop sanitation, crop rotation; b) Chemical control: systemic & non-systemic fungicides; c) Biological control.

Symptoms, etiology, epidemiology & control measures with reference to the following: Fungal diseases - Club rot of crucifers, Damping off of seedlings.

Leaf spot of turmeric, Ergot of Bajra, powdery mildew of cucurbits whip smut of sugarcane, Grain smut of sorghum, Bean rust, Coffee rust Blast disease of rice, wilt of cotton, Tikka disease of ground nut.

Bacterial disease - Citrus canker, Angular leaf spot of cotton, Bacterial leaf blight of rice, Brown rot of potatoes. Viral & phytoplasma diseases - Grassy shoot diseases of sugarcane, little leaf of brinjal, Rice tungro.

Course Objectives of M.Sc. Botany Final year – Paper 10
Elective - 2 :Applied Phycology

- To educates the student about classification, overall Thallus organization, Reproduction,and Lifecycles in Algae.
- To educates the student about Economic importance of Algae and cultivation of importantseaweeds, mass culture of microalgae and
- To educates the student about uses in waste land reclamation, Bio-fouling and Bio-remediation through Algae.
- Student can learn about Thallus organization, Reproduction, and Lifecycles in Algae.
- Student can learn about detailed study about some algal forms belong to different classes ofAlgae (Chlorophyceae, Protochlorophyta, Phaeophyta, Rhodophyta and Cycadophyta.
- Student can learn about cultivation of important seaweeds, mass culture of microalgae and their use in waste land reclamation, Bio-fouling and Bio-remediation.

Syllabus for M.Sc. Botany Final year – Paper 10 :

Algae in diversified habitants (terrestrial, freshwater, and marine)

Structure, reproduction, and life cycles of some algae like Ulva, Enteromorpha, Codium, Caulerpa, Ectocarpus, Padina, Sargassum, Porphyra, Gelidium, Echeuma, Hypnea, Gracilaria, Nosto0, Spirulina.

Composition and distribution of phytoplankton of Indian waters. Sampling techniques of phytoplankton, primary production.

Structure and reproduction of some important microalgae like, Chlorella, Scenedesmus, Tetraselmus, Dunaliella, Ceratium, Peridinium, Cyclotella and Skeletonena and their importance in aquaculture industry,
Algae as biofertilizers.

Economic uses of freshwater and marine algae and their products.

Mass culture and yield of microalgae (Chlorella, Scenedesmus, Spirulina)

Seaweed forming in India, with emphasis on the methods of seaweed cultivation of Sargassum, Porphyra, Gelidiella, Gracilaria.

Methods of extraction of Agar-agar and Algin.

Algae and water pollution; Algae as indicators of pollution.

Biofouling, Seawage disposal, Toxicity; was land reclamation.

Course Objectives of M.Sc. Botany Final year – Practical-IV

Plant Ecology, Plant Physiology Metabolism, Cytogenetics Chromosome mapping Molecular Biology of plants and genetic engineering.

- To understand different types of nucleicacids during the process of protein synthesis
- To educates the student in DNA replication in both prokaryotes and Eukaryotes
- To gain the knowledge in gene regulation in both prokaryotes and Eukaryotes
- Student can learn about the gene regulation in both Prokaryotes and Eukaryotes.
- To understand methods of Gene transfer
- To know the different types of Vectors
- To study transgenic plants.
- To learn Basic principles and modern age applications of recombinant DNA technology and proteomics.
- Learning molecular and technical skills along with applications of the instrumentation.
- Designing/conducting experiments and analyzing experimental data.
- To understand the Ethics of Recombinant DNA Technology and proteomics

Syllabus for M.Sc. Botany Final year – Practical-IV

No.	Experiment
1.	Effect of temperature on cell wall permeability
2.	Demonstration of osmosis
3.	Determination of the water potential
4.	Determination of osmotic potential
5.	Determination of stomatal frequency and stomatal index
6.	Demonstration of stomatal movements
7.	Demonstration of transpiration rate
8.	Demonstration of root pressure
9.	Extraction and separation of photosynthetic pigments-paper charomatographic method
10.	Separation of chloroplast pigments into four groups
11.	Estimation of chlorophyll pigments
12.	Demonstration of hill reaction
13.	Evolution of oxygen during photosynthesis
14.	Rate of photosynthesis in different concentrations of bicarbonate
15.	Rate of photosynthesis: hydrilla experiment using different colour filters
16.	Hydrolysis of starch
17.	Estimation of starch in plant tissue by gravimetric method
18.	Estimation of free acids (titratable acidity)
19.	Demonstration of the activity of the enzyme polyphenol oxidase
20.	Demonstration of the activity of the enzyme amylase
21.	Determination of the activity of the enzyme catalase
22.	Estimation of aerobic respiration
23.	Measurement of rate of anaerobic respiration
24.	Estimation of reducing sugars
25.	Preparation and study of Karyotypes
26.	Construction of Idiograms
27.	Construction of Genetic and Chromosome Map-1 Linkage analysis
28.	Construction of Genetic and Chromosome Map-II Three-point test cross
29.	Construction of Genetic and Chromosome Map-III Tetrad analysis
30.	Construction of Genetic and Chromosome Map-IV Prokaryotes
31.	Construction of Genetic and Chromosome Map - V Molecular Markers
32.	Construction of Genetic and Chromosome Map - VI Trisomic analysis
33.	Spotters covering chromosomal interchange heterozygotes and trisomics
34.	Spotters covering RFLP, RAPD and in situ Hybridization
35.	Spotters covering Ultrastructure of Nucleus, Ribosomes, Cytoskeleton, Nucleic acids and Apoptosis

36. Isolation of plant DNA and its spectrophotometric quantification
37. Growth characteristics of E-Coli using plating and turbidometric methods
38. Isolation of plasmid DNA and its spectrophotometric quantification
39. Restriction digestion of plasmid DNA and separation of fragments by agarose gel electrophoresis
40. DNA amplification by Polymerase Chain Reaction
41. GFP cloning.
42. Testing for GUS expression.

Course Objectives of M.Sc. Botany Final year – Practical-V
Plant Pathology

- To gain the knowledge in symptoms, etiology, epidemiology & control measures withreference to some Fungal, Bacterial and Viral diseases.
- To study different stages in Infection phenomena.
- To understand Role of enzymes, toxins, Phytotoxins. Vivo toxins.
- To observe the symptoms and control of plantdiseases
- To apply control measures with reference to some Fungal, Bacterial and Viral diseases
- To study bacterial disease - Citrus canker, Angular leaf spot of cotton, Bacterial leaf blight of rice, Brown rot of potatoes. Viral & phytoplasma diseases - Grassy shoot diseases of sugarcane, little leaf of brinjal, Rice tungro.
- Study of symptoms, microscopic examination of diseased parts and identification of the pathogens involved in different plant diseases included in the theory part of syllabus.
- Acquaintance with general techniques used in routine phytopathological and microbiological work.
- Isolation and Identification of plant pathogens.

Syllabus for M.Sc. Botany Final year – Practical-V

1. Symptomatology of some plant diseases caused by fungi
2. Symptomatology of some diseases caused by bacteria
3. Symptomatology of viral and phytoplasmal diseases
4. Microscopic observation of pathogenic fungal slides
5. Studies on leaves infected with fungal pathogens
6. Studies on external symptoms and internal structures with reference to leaf spot of turmeric
7. Studies on external symptoms and internal structures with reference to Powdery mildew of cucurbits
8. Studies on external symptoms and internal structures with reference to Grain Smut of Sorghum
9. Studies on external symptoms and internal structures with reference to Whip smut of Sugarcane
10. Studies on external symptoms and internal structures with reference to Rust of Beans
11. Studies on external symptoms and internal structures with reference to Rust of Coffee
12. Studies on external symptoms and internal structures with reference to Tlikka disease of groundnut
13. Studies on external symptoms and internal structures with reference to Blast disease of rice
14. Isolation of pathogenic fungi from leaf spots
15. Isolation of microorganisms from phylloplane
16. Isolation of microorganisms from Rhizosphere
17. Evaluation of fungicidal activity
18. Measurement of microorganisms

Course Objectives of M.Sc. Botany Final year – Practical-VI

Applied Phycology

- To know overall Thallus organization, Reproduction, and Lifecycles in Algae.
- To value the Economic importance of Algae and cultivation of important seaweeds, mass culture of microalgae and
- To study about some algal forms belong to different classes of Algae (Chlorophyceae, Protochlorophyta, Phaeophyta, Rhodophyta and Cycadophyta.)
- To cultivate important seaweeds, mass culture of microalgae and their use in waste land reclamation, Bio-fouling and Bio-remediation.

Syllabus for M.Sc. Botany Final year – Practical-IV

1. Describe the morphological and anatomical characters for the identification of Enteromorpha
2. Describe the morphological and anatomical characters for the identification of Ulva
3. Describe the morphological and anatomical characters for the identification of Codium
4. Describe the morphological and anatomical characters of the rhizome for the identification of Caulerpa Describe the morphological characters for the identification of Ectocarpus
5. Describe the morphological and anatomical characters for the identification of Padina
6. Describe the morphological and anatomical characters for the identification of Sargassum
7. Describe the morphological and anatomical characters for the identification of Porphyra
8. Describe the morphological and anatomical characters for the identification of Gelidium
9. Describe the morphological and anatomical characters for the identification of Hypnea
10. Describe the morphological and anatomical characters for the identification of Gracilaria
11. Describe the morphological and anatomical characters for the identification of Eucheuma
12. Describe the characters for the identification of Nostoc and Spirulina
13. Describe the characters for the identification of Chlorella and Scenedesmus
14. Describe the characters for the identification of Dunaliella and Tetraselmis
15. Describe the Morphological characters for the identification of Ceratium and Peridinium
16. Describe the Morphological characters for the identification of Cyclotella and Skeletonema
17. How do you estimate the primary production
18. How do you extract agar-agar from agarophytes
19. How do you Extract alginic acid or alginates from alginophytes