

DEPARTMENT OF BOTANY

Unit- I:

Fritch's system of classification of algae. General account of reproduction in algae. Brief account of Algal biofertilizers, algal blooms, fossil algae and toxic algae.

General characters and life history of the following

- a) Chlorophyta- *Eudorina Pediastrum, Hydrodictyon, Ulva, Stigeoclonium, Closterium, Cosmarium.*
- b) Cyanophyta- *Lyngbya, Microcystis.*
- c) Xanthophyta- *Botrydium.*
- d) Phaeophyta- *Laminaria.*
- e) Rhodophyta- *Porphyra, Gracillaria.*
- f) Bacillariophyta- *Cyclotella, Synedra*

Recent trends in the classification of fungi, General account of reproduction in fungi. Fungi in industry – Production of alcohol, organic acids and antibiotics.

Fungi in Agriculture and Forestry – Fungi as plant parasite (wilts, leaf spot, root rots, smuts and rusts)

Fungi as biofertilizers. Fungi as food, human and animal parasites.

Comparative study of the following sub-divisions.

Myxomycotina – *Stemonitis*

Mastigomycotina – *Peronospora*

Zygomycotina – *Pilobolus*

Ascomycotina – *Chaetomium, Morchella*

Basidiomycotina- *Melampsora, Polyporus*

Deuteromycotina – *Phoma*

Bacteria – General account, ultra structure, nutrition, reproduction in bacteria and Economic importance.

Viruses – characteristics and ultra structure of virions, isolation and purification of virion, chemical properties of plant viruses. Transmission of viruses.

Mycoplasma – General account, systematic position and Economic Importance of the mycoplasma.

Unit- II:

A general account of the structure, reproduction, life history classification, distribution of Archegoniatae and economic importance of Bryophyta with reference to

- a) Marchantiales, b) Jungarmaniales, c) Anthocerotales d) Sphagnales e) Funariales f) Polytrichales.
- Structure and evolution of gametophytes and sporophytes in Bryophyta.

Stelar evolution in Pteridophytes, Telome concept and its application. Heterospory and origin of seed habit. A general account of vegetation, morphology, reproduction and evolutionary trends in a) Psilotales b) Lycopodiales c) Selaginellales d) Isoetales e) Equisetales f) Filicales.

Principles of Paleobotany and importance of fossil plants in the classification of vascular plants. Origin and evolution of primitive and advanced vascular plants with suitable examples from a) Rhyniales b) Zosterophyllales c) Asteroxylales d) Psillophytales and e) Sphenophyllales.

A general account of Lepidodendrales, Calamitales and Sphenophyllales .

Unit- III:

Classification, distribution and Economic Importance of Gymnosperms.

A general account of gymnosperms with reference to their vegetative, morphology and anatomy of the following taxa.

- a) Cycadales – *Zamia*
- b) Ginkgoales- *Ginkgo*
- c) Coniferales- *Podocarpus, Araucaria*
- d) Taxales- *Taxus*
- e) Gnetales- *Ephedra*

Embryogeny and development of male and female gametophytes in gymnosperms,
General account of Pteridospermales, Cordiatales.

A brief account of experimental embryology, Apomixis, Apospory and parthenocarpy. Fertilization and incompatibility mechanism.

Recent views on organization of shoot apical meristem and organization of root apex. Significance of Quiescent centre. Structural composition of Epidermal cells, Stomata and Trichomes. Structure of phloem and differentiation of phloem elements. Ultra structure of sieve elements and companion cells.
Salient features of the wood of *Tectona grandis* and *Shorea robusta*.
Aeropalynology, Mellitopalynology and application of palynology in forensic science.

Unit- IV:

Critical account of systems of classification of Cronquist Takhtajan and Hutchinson. Concept of ICBN.
A comparative study of the following pairs of families and their treatment in recent systems.

- a) Magnoliaceae and Winteraceae
- b) Malvaceae and Sterculaceae
- c) Amaranthaceae and Chenopodiaceae
- d) Cyperaceae and Poaceae.

Flora of A.P.

Morphology, Active principles and Medicinal value of the following.

- a) *Andrographis paniculata*
- b) *Phyllanthus emblica*
- c) *Gymnema sylvestre*
- d) *Asparagus racemosus*.

Unit - V:

Role of biodiversity in ecosystem functions and stability, IUCN categories of threat, hot spots and inventory. Allopatric and sympatric speciation. Basic concepts of sustainable development. Principles of *In situ* and *Ex situ* conservation. General account of the activities of BSI, NBPGR, ICAR, CSIR and DBT for conservation and non formal conservation efforts.

Principles, concepts and levels of ecology. Homeostasis and self regulation. Diversity dominances and similarity indices of plant communities. Ecosystem organization- Structure and functions. Primary production, energy dynamics. Litter fall and decomposition.

Global biogeochemical cycles of C, N₂, P and S. Mineral cycles in terrestrial and aquatic ecosystems. Climate of the World and India. Koppen and Thornthwaite's climatic classification. Good's principals. Endemism.

Climate change, Green house gases. Ozone layer, Consequences of climate change. Sources of soil and water pollution.

Unit- VI:

Water relations- SPAC concept, stomatal regulation of transpiration.

Photosynthesis- properties of light and absorption of light by photosynthetic pigments, composition and characterization of photosystem I and II,

Photophosphorylation, pathway of carbon differences between C₃ and C₄ photosynthesis. CAM pathway and its regulation, photorespiration and biosynthesis of glycolate and regulation of photorespiration.

General role of Auxins, Gibberellins, Cytokinins. Ethylene and Abscisic acid.

Physiology of flowering and biochemistry of seed dormancy and germination.

Water stress-Mechanism of drought tolerance, flooding stress- flooding injury, Hormonal imbalance and Tolerance of low temperature and frost injury on plant productivity. Chilling and freezing effects on carbondioxide exchange. Heat stress, Metal stress and mode of action of allelochemicals on plant physiological processes.

Carbon-di-oxide metabolism in C_3 and C_4 plants. Rubisco- structure and assembly of enzyme, Kranz leaf anatomy, C_3 pathway and biochemical scheme for C_4 pathway and its regulation. Source- Sink relationship and starch sucrose metabolism and assimilate partitioning.

Molecular biology of photosynthesis in higher plants and regulation of gene expression during chloroplast development.

Naturally occurring growth substances-polyamines, Brassinosteroids, Phenolics and Methyl jasmonates. Physiological and biochemical changes during senescence and hormonal control of senescence. Hormonal regulation of root, shoot and leaf development. Fruit set development and ripening. Physiological and molecular mechanisms of disease resistance in plants- Elicitors, phytoalexins and hypersensitive reaction.

Unit- VII:

Principles of Thermodynamics-First and Second law of thermodynamics. Enzymes classification, nomenclature, properties, kinetics and Michaelis-Menten equation. Mechanism and regulation of enzyme action.

Classification, structure and functions of Carbohydrates, lipids, aminoacids, and proteins.

Respiration-Glycolysis, Electron transport and oxidative phoshporylation. Hexose monophosphate shunt and its significance.

Brief study of regulation of gene expression in prokaryotes and eukaryotes. Brief account of gene mutations and chromosomal aberrations, DNA damage and repair. Gene interaction, linkage and chromosome mapping in eukaryotes. Overview of cell cycle and apoptosis

Biochemistry and genetics of Nitrogen fixation- Molecular mechanism of nitrogen fixation, regulation of nif genes and components and regulation of nitrogenase. Genetic engineering , biotechnology and agricultural applications of Nitrogen fixation.

Unit- VIII:

Basic principles of light, electron, phase- contrast and fluorescence microscopy. Brief account of DNA replication and transcription. Overview of recombinant DNA technology. Basic concepts of restriction mapping, gene cloning, genomic libraries, polymerase chain reaction, RFLP and DNA fingerprinting. Basic concepts of gene sequencing, microarrays, functional genomics and proteomics.

Agrobacterium and microprojectile gun mediated methods of gene transfer to plants. Genetic transformation of chloroplast and current status of transgenic plants.

Unit- IX:

Plant tissue culture techniques, Morphogenesis and embryogenesis, Meristem culture, multiple shoot production and micropropagation. Isolation, fusion, culture of protoplast. Cryopreservation and germplasm storage. Anther and pollen culture and hairy root cultures. Invitro production of secondary metabolites from medicinal and aromatic plants and industrial applications. Gene cloning, restriction mapping, Preparation of genomic or cDNA libraries and selection of transformed cells by immuno- detection of proteins and nucleic acids hybridization.

Brief study of vectors used in gene cloning, Ti and Ri plasmids. Southern, Northern and Western blotting.

Unit- X:

Basic concepts of Bioinformatics. Introduction to computers, use of word and PowerPoint in the preparation and presentation of documents. Use of internet and World Wide Web in research.

Mean, Variance, standard deviation and standard error. Chi-square and students "t" test. Concept of probability. Addition and multiplication rule.