

**SARDAR PATEL UNIVERSITY  
VALLABH VIDYANAGAR**



**Programme: MSC (CBCS)  
Syllabus with effective from: JUNE-2017**

**BOTANY  
Semester: II**

**PS02CBOT21**

**Biology and Diversity of Lower Plants (Algae, Bryophytes and Pteridophytes)**

**Unit I**

**Archebacteria and eubacteria:** General account; ultra structure, nutrition and reproduction biology and economic importance; cyanobacteria – salient features and biological importance.

**Unit II**

**Phycology:** Algae in diversified habits (terrestrial, freshwater, marine); thallus organization; cell ultra structure; reproduction (vegetative, asexual, sexual); criteria for classification of algae: pigments, reserve food, flagella;  
Classification, salient features of Protochlorophyta, Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta; algal blooms.

**Unit III**

**Bryophyta:** Morphology, structure, reproduction and life history; distribution; classification; general account of Marchantiales; Jungermaniales, Anthocerotales, Sphangales, Funariales and Polytrichales; economic and ecological importance.

**Unit IV**

**Pteridophyta :** Morphology, anatomy and reproduction; classification; evolution of stele; heterospory and origin of seed habit; general account of fossil pteridophyta; Introduction to Psilopsida, Lycopsidea, Sphenopsida and Pteropsida.

**Reference Books:**

- Kumar, H. D. Introductory Phycology. Affiliated East-West Press Ltd., New Delhi.
- Parihar, N. S. Bryophyta. Central Book Depot, Allahabad.
- Puri, P. Bryophytes. Atma Ram & Sons, Delhi.
- Round, F. E. The Biology of Algae. Cambridge University Press, Cambridge.
- Sporne, K. K. The Morphology of Pteridophytes. B. I. Publishing Pvt. Ltd., Bombay.
- Stewart, W. N. and Rathwell, G. W. Paleobotany and the Evolution of Plants. Cambridge University Press.

## **PS02CBOT22: Taxonomy and Diversity of Seed Plants**

### **Unit I**

#### **GYMNOSPERMS**

Introduction to 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. Structure and reproduction in Cycadales, Ginkgoales, Structure and reproduction in Coniferales, Ephedrales, Welwitschiales and Gnetales.

### **Unit II**

#### **ANGIOSPERMS**

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.

### **Unit III**

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

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

### **Unit IV**

Systems of angiosperm classification: phenetic versus phylogenetic systems; cladistics in taxonomy; relative merits and demerits of major systems of classification. Concepts of phytogeography: endemism, hotspots and hottest hotspots; plant explorations; invasions and introductions; local plant diversity and its socio-economic importance.

### **Reference Books:**

- Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms.
- Gurcharan Singh. Plant systematics: Theory and Practice
- Heywood (ed.) Modern Methods in Plant Taxonomy
- Jeffery, C. An Introduction to Plant Taxonomy
- Jones, S.B., Luchsinger, A.L. 1987. Plant Systematics
- Judd, W.S.; Campbell, C.S., Kellogg, E.A.; Stevens, P.F. 1999. Plant Systematics: A phylogenetic approach
- Lawrence, G.H.M. Vascular Plant Systematics
- Nordenstam, B., El Gazaly, G. and Kassas, M. 2000. Plant systematics for 21<sup>st</sup> century.
- Radford, A. 1986. Fundamentals of Plant Systematics
- Solbrig, O.T. 1970. Principles and Methods of Plant Biosystematics
- Sporne, K. Morphology of gymnosperms
- Stace, C. A. 1980. Plant Taxonomy and Biosystematics
- Stebins, G.L. Variation and Evolution in Plants.
- Turrill, W.B. Vistas in Botany vol. IV (Recent Researches in Plant Taxonomy)
- Woodland, D.W. Contemporary plant systematics.

## **PS02CBOT23: Mycology and Plant Pathology**

### **Unit I**

Introduction to Fungi: History and classification of Fungi (Alexopoulos, 1962, Ainsworth 1973, Kirk et.al. 2008). Fungi: General characteristics. Economic importance of fungi. Life cycle, morphology, structure and reproduction in Kingdom: Fungi, Kingdom: Chromista and kingdom:Protozoa.

### **Unit II**

Lichens: Morphology, reproduction and economic importance.

Techniques of mushroom cultivation: Schedule and systems of cultivation; composting; peak heating; spawn preparation and mushroom stains spawning and mycelia growth; supplementation; cultivation technique from casing to ruffling and recovery growth to harvesting; pests and diseases and its protection.

### **Unit III**

The disease triangle: Role of environment, host and pathogen in disease formation. Symptoms, life cycle and control of fungal diseases: Rusts, smuts, blast, red-rot, powdery mildew and tikka diseases. Symptoms, life cycle and control of bacterial and viral diseases: Leaf blight, canker, leaf spot, Mosaic, panama and leaf curl diseases.

### **Unit IV**

Control measures for plant diseases. Chemical control, biological control and integrated disease and pest management. Host- pathogen interactions, plant defense mechanisms. HR and SAR in plant defense. Molecular mechanisms and signaling pathways in plant defenses.

### **References:**

- Alexopoulos, C. J., Mims, C. W. and Blackwel, M., Introductory Mycology, John Wiley & Sons Inc.
- Mandahar, C. L. Introduction to Plant Viruses. Chand & Co. Ltd., Delhi.
- Mehrotra, R. S. and Aneja, R. S. An Introduction to Mycology. New Age Intermediate Press.
- Rangaswamy, G. and Mahadevan, A. 1999. Diseases of Crop Plants in India. Prentice Hall of India Pvt. Ltd., New Delhi.
- Singh R S. Plant diseases. 6<sup>th</sup> edition. Oxford and IBH, New Delhi
- Singh R.S. Principles of plant pathology. 3<sup>rd</sup> edition. Oxford and IBH, New Delhi
- H C Dube: An introduction to Fungi. (Fourth edition) Scientific publishers (India)

**PS02CBOT24: Lab I Practicals based on PS02CBOT21 and PS02CBOT22**

**PS02CBOT25: Lab II Practicals based on PS02CBOT23 and PS02EBOT2X**

## **PS02EBOT21: Microtechniques**

### **Unit I**

Light microscopy

Properties of lenses, Optical corrections, Properties and types of objectives, Oculars and Illumination.

Light microscopes: Bright field, dark field, fluorescence, phase contrast, polarizing, differential interference contrast.

Micrometry and photomicrography

### **Unit II**

Basic components of electron microscopes. Thermionic and field emission guns. Types of electron microscopes: TEM, SEM, STEM, ESEM and HVEM

### **Unit III**

Maceration, squash and clearing techniques. Sample preparation for light microscopy. Classification of fixatives, formulas', (Plant and animal samples).

Sample preparation for light microscopy: Fixation, dehydration and infiltration procedures.

Embedding media for light microscopy. Stains and staining procedures- negative and positive staining procedures. Microtomes: Rotary, sliding, cryostat. Histochemical localization of metabolites for light microscopy: Starch, proteins, lipids, total carbohydrates, lignins, polyphenols, nucleic acid, histones, cutin, suberin and waxes. Localization of enzymes: Peroxidase, acid phosphatase and succinic dehydrogenase.

### **Unit IV**

Freeze etching and freeze fracturing.

Sample preparation for Electron microscope: Fixatives, double fixation, dehydration and infiltration procedures, embedding media for electron microscopy. Fixation and embedding of particulate samples like bacteria, virus etc. ultra-microtome and freezing ultramicrotome-semi thin sectioning, ultrathin sectioning, grids, formavar coating, Staining for electron microscopy.

Ultrastructural cytochemistry: Tannin, protein, cell wall polysaccharide, lignin and membrane.

Enzymes: Peroxidase and phosphatase.

Immunocytochemistry.

### **References:**

- Microscopy and Microtechnique: R Marimuthu MJP Publisher, Chennai
- The study of plant structure: Principles and selected methods- T. P. O' Brien and M E McCully.
- Plant Microtechnique- Johansen, DA, McGraw Hill Book Co., New York.
- Botanical Microtechnique and Cytochemistry; Graeme P. Berlyn and Jerome P Micksche.

## **PS02EBOT22: Bioinformatics**

### **Unit -I**

Introduction to Bioinformatics:

Overview, Internet and bioinformatics, Applications

Databases: Databases in Bioinformatics, various biological databases, Protein and Nucleotide sequence Data bases. Protein sequence, structure and Classification databases, pathway databases

Sequence analysis: Pairwise alignment, local and global alignment, Scoring matrices, multiple sequence alignment, tools for sequence alignment, programming algorithms

### **Unit-II**

Gene prediction: Gene structure in Prokaryotes and Eukaryotes, Gene prediction methods: Neural Networks, Pattern Discrimination methods, Signal sites Predictions, Evaluation of Gene Prediction methods.

Transcriptomics: Complete transcript cataloguing and gene discovery- sequencing based approach, Microarray based technologies and data analysis

RNA secondary structure prediction

Introduction to Chemi-informatics

### **Unit III**

Protein Computational Biology: Structural classification of proteins, Protein structure analysis, structure alignment and comparison, Secondary and tertiary structure prediction and evaluation, prediction of specialized structures, Active site prediction, Protein folding, Protein modeling and drug design

Tools in Bioinformatics: Protparam, Translate, Bioedit, findmod, Coils, TMHMM, Rasmol, Deepview, matlab, and other NCBI and ExPASy tools

### **Unit IV**

Genomics: structural and functional Genomics, Comparative Genomics.

Proteomics: Types of proteomics, tools for proteomics- separation and isolation of proteins, acquisition of protein structure information, databases and applications

Phylogenetic analysis: molecular basis of evolution, Phylogenetic trees & different methods for phylogenetic inference

### **References:**

- Bioinformatics: A Beginners Guide, Clavarie and Notredame
- Bioinformatics: David Mount
- Bioinformatics: Rastogi
- Introduction to Bioinformatics: Arthur M. Lesk
- Bioinformatics: Principles and applications, Ghosh and Mallick
- Bioinformatics: Genes, Proteins and Computer, C A Orengo
- Protein Structure Prediction: Methods and Protocols, Webster, David (Southern Cross Molecular Ltd., Bath, UK)