

**DEPARTMENT OF BOTANY, ST. XAVIER'S COLLEGE (Autonomous), Mumbai.**  
**M. Sc. I Botany Syllabus (2016-2017)**

**Course: MS.BOT.1.01 PLANT DIVERSITY- IV (ALGAE AND FUNGI)**

**LEARNING OBJECTIVES**

The students will be able to understand-

- The morphology, structure and importance of the organisms.
- Classification and interrelationships between various groups and reasons behind the same.
- Applications of algae and fungi in different fields.

**Unit I: Algae:** Classification of Algae up to orders, according to the system proposed by G.M.Smith; diversification of habitat; general distribution, habitat distribution, thallus organization, origin and evolution, fossil algae. Study of the life cycle of following: *Scytonema*, *Volvox*, *Ulothrix*, *Gracillaria* and *Padina*.

**Unit II: Applied Phycology:** Algal collection and preservation, techniques of culturing Algae, concept of photo-bioreactor, Algae as biofuel, algae causing biological hazards.

**Unit III: Fungi:** Classification of fungi up to orders according to the system proposed by Alexopoulos. General account of spore bearing organs and their arrangements in various groups of fungi; spore release and dispersal. Study of following types: *Penicillium*, *Claviceps*, *Stemonitis*, *Trichoderma*.

**Unit IV: Lichens and Applied Mycology:** Role of lichens in biomonitoring. Thallus, morphology and reproduction in *Parmelia* and *Usnea*. Nutritive values of edible mushrooms, mushroom cultivation, poisonous mushrooms.

**Practicals MS.BOT.PR.1.01**

- 1) Study of the following type with reference to their systematic position, thallus and reproductive structures: *Scytonema*, *Lyngbya*, *Anabaena*, *Volvox*, *Scenedesmus*, *Ulothrix*, *Enteromorpha*, *Pithophora*, *Closterium*, *Nitella*, *Padina* and *Gracillaria*.
- 2) Study of the following type with reference to their systematic position, thallus and reproductive structure: *Penicillium*, *Stemonitis*, *Saprolegnia*, *Phytophthora*, *Xylaria*, *Peziza*, *Daedalea*, *Claviceps* and *Trichoderma*.
- 3) Estimation of biomass from suitable algal culture.
- 4) Study of growth curve of algae.
- 5) Study of *Parmelia* and *Usnea*.

**CIA-** multiple choice questions / assignments / presentation / field report / test.

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**Course: MS.BOT.1.02 PLANT DIVERSITY- V (GYMNOSPERMS AND ANGIOSPERMS)**

**LEARNING OBJECTIVES**

The students will be able to understand-

- Classification and interrelationships between order of gymnosperms.
- Various classification systems of angiosperms and the basis of their classification.
- Evolution and study of various taxonomic characters.
- The distinguishing characters of plants belonging to different families and the economic importance of these families.

**Unit I: Gymnosperms:** Classification of gymnosperms up to orders according to the system proposed by Coulter and C. J. Chamberlain. General characters, affinities and interrelationships of Cycadofilicales, Bennettitales, Cordaitales, Cycadales, Coniferales and Gnetales. Life cycle of *Araucaria*, *Cupresses*, *Podocarpus* and *Pinus*, form genera *Cordaitea*, *Glossopteris*.

**Unit II: Angiosperms-I :** Origin and evolution of angiosperms; Principles of taxonomy and phylogeny of angiosperms for assessment of relationships, delimitation of taxa and attribution of rank: a) criteria, b) guidelines, c) practical considerations, d) use of categories. Evolution, variation and speciation, biosystematics categories, biotypes and ecotypes, concept of characters: introduction, type, function, values of taxonomic characters – numerical taxonomy, chemotaxonomy, molecular systematic.

**Unit III: Angiosperms-II :** Evolution of classification systems, ancient, modern and current systems of classification (excluding the systems covered at UG level).

**Unit IV: Angiosperms III:** Study of following plant families, their morphological peculiarities and economic importance: Menispermaceae, Portulacaceae, Guttiferae, Passifloraceae, Rhamnaceae, Sapindaceae, Lythraceae, Chenopodiaceae, Cyperaceae, Polygonaceae,.

**Practicals MS.BOT.PR.1.02**

- 1) Gymnosperms: Study of following types- *Cordaitea* (Fossils), *Araucaria*, *Cupresses*, *Podocarpus*, *Pinus*.
- 2) Angiosperms: A study of the following plant families their morphological peculiarities and economic importance: Menispermaceae, Portulacaceae, Guttiferae, Passifloraceae, Rhamnaceae, Sapindaceae, Lythraceae, Chenopodiaceae, Cyperaceae, Polygonaceae,.
- 3) Identification of genus and species with the help of flora volumes (In addition to the above mentioned families, all families studied in undergraduate classes are included)
- 4) Field excursion.

**CIA-** multiple choice questions / assignments / presentation / field report / test.

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**M. Sc. I Botany Syllabus (2016-2017)**

**Course: MS.BOT.1.03 PLANT PHYSIOLOGY AND BIOCHEMISTRY- IV**

**LEARNING OBJECTIVES**

The students will be able to understand

- The mechanism of enzyme actions, kinetics and inhibition.
- Structure and organization of photosynthetic apparatus and mechanism of electron transport and synthesis of ATP.
- Repair and regulatory mechanism governing the photosynthetic machinery and various pathways.
- Assimilation of nutrients in plants.

**Unit I: Enzymes :** Mode of action, Kinetics-  $K_m$  and  $V_{max}$ , Lineweaver-Burk Plot, Inhibition, immobilization of enzymes, allosteric enzymes.

**Unit II: Photosynthesis-I :** Chloroplast structure, organization of photosynthetic apparatus, light absorbing pigments, organization of light antenna systems, mechanism of electron transport, proton transport and ATP synthesis in chloroplast.

**Unit III: Photosynthesis-II:** Repair and regulation of photosynthetic machinery, role of carotenoids, regulation of C<sub>3</sub>, C<sub>4</sub> and CAM pathways.

**Unit IV: Assimilation of Nutrients in Plants:** Phosphorus, Sulphur, cations and molecular oxygen assimilation in plants.

**Practicals MS.BOT.PR.1.03**

Major experiments

- 1) Enzyme kinetics: Determination of  $K_m$  and  $V_{max}$  of the enzyme amylase.
- 2) Solvent extraction of chlorophyll a/b, xanthophylls and study of absorption pattern.
- 3) Study of Hill Reaction.
- 4) Extraction and estimation of GOT and GPT from suitable plant material.

Minor experiments

- 1) A study of the enzyme polyphenol oxidase from potato peels.
- 2) Study of ratio of chl.a and chl.b in C<sub>3</sub> and C<sub>4</sub> plants.
- 5) Quantitative study of diurnal fluctuation in titratable acid number (TAN) in CAM plant.
- 6) Immobilization of yeast cells and study of Invertase activity.

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**M. Sc. I Botany Syllabus (2016-2017)**

**Course: MS.BOT.1.04 MOLECULAR BIOLOGY**

**LEARNING OBJECTIVES**

The students will be able to understand-

- The genetic regulation in cells of living organism.
- How the higher plant organism change over time and what are the molecular mechanisms underlying these changes.
- Identify the basic methods and approaches used in molecular biology.
- Explain the role played by the molecular components of the genetic machinery.

**Unit I: Gene Regulation I:** Control of gene expression in eukaryotes: Chromatin remodelling, Transcriptional control, mRNA processing control, mRNA translocation control, mRNA degradation control, Protein degradation control.

**Unit II: Gene Regulation II:** Genetic control of development in plants: Cell differentiation, function of gene regulation, Genes regulated by developmental program, environmental cues, Homeobox and homeobox proteins.

**Unit III: Biotechnology :** Recombinant DNA Technology: Vectors in gene cloning: PUC 19, phage, cosmid, BAC and YAC vectors, High and low copy number plasmids and its regulation, Restriction enzymes, Types of restriction enzymes, Process of gene cloning (*Agrobacterium*).

**Unit IV: Application of recombinant DNA technology:** application of recombinant DNA technology for production of herbicide resistant plants, insect resistant plants, improving seed storage proteins, golden rice.

**Practicals MS.BOT.PR.1.04**

- 1) Isolation of plasmid.
- 2) Quantification of DNA.
- 3) Agarose gel electrophoresis separation for plasmid DNA.
- 4) Restriction enzyme digestion and separation of fragments.
- 5) Transformation of *E.coli* cell by plasmid DNA.
- 6)  $\beta$ -galactoside expression and assay.

**CIA-** multiple choice questions / assignments / presentation / field report / test.

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