

## SYLLABUS FOR SUBSIDIARY BOTANY (SBT)

### Paper I : Theory (100 marks)

#### Block-I : Virus, Bacteria, Algae, Fungi and Plant Pathology

- Unit 1.** *Virus* : General properties. Structure of TMV. Lytic and Lysogenic cycle.
- Unit 2.** *Bacteria* : Forms and structure in brief. Reproduction – binary fission, endospore. Brief idea of conjugation, transformation and transduction.
- Unit 3.** *Algae* : Introduction, classification by Lee (1999) up to division with examples. Salient features of Chlorophyceae, Cyanophyceae, Bacillariophyceae, Xanthophyceae, Phaeophyceae and Rhodophyceae.
- Unit 4.** *Algae* : Life history of *Oedogonium*. Economic importance of Algae (Food, Fodder, Agar-Agar, Algin, Carragenin, Diatomite, Biofertilizer etc.)
- Unit 5.** *Fungi* : Introduction, Classification of Fungi (Ainsworth, 1973) up to phylum with characters and examples.
- Unit 6.** *Fungi* : Life histories of *Rhizopus* and *Agaricus*. Economic importance of Fungi.
- Unit 7.** *Plant Pathology* : Terms and definitions : Disease concepts, pathogen, inoculum (primary and secondary), infection, incubation period, Koch's postulates, Symptoms:- Necrotic, hypoplastic and hyperplastic, disease resistance, chemical and biochemical control of plant diseases.
- Unit 8.** *Plant Pathology* : Symptoms, causal organism, disease cycle and control measures of Late blight of potato and Black stem rust of wheat.

#### Block-II : Bryophyta, Pteridophyta, Gymnosperm, Paleobotany and Anatomy

- Unit 9.** *Bryophyte* : Introduction, Classification (Proskauer, 1957) up to class with characters and examples of Hepaticopsida, Anthocerotopsida and Bryopsida.
- Unit 10.** *Bryophyte* : Life histories of *Riccia* and *Funaria*. Economic importance of Bryophytes.
- Unit 11.** *Pteridophyte* : Introduction. Classification (Spome, 1975) up to class with characters and examples of Psilopsida, Lycopsida, Sphenopsida and Filicopsida.
- Unit 12.** *Pteridophyte* : Life histories of *Lycopodium* and *Pteris*. Economic importance of Pteridophytes.
- Unit 13.** *Gymnosperm* : Introduction. Classification (Spome, 1965) up to class with characters and examples of Cycadopsida, Coniferopsida and Gnetopsida.

- Unit 14. **Gymnosperm** : Life histories of *Cycas* and *Gnetum*. Economic importance of Gymnosperms.
- Unit 15. **Paleobotany** : Introduction. Types of fossils. Fossilization process. Geological time scale.
- Unit 16. **Anatomy** : Tissue (meristem and permanent) structure, distribution and function.
- Unit 17. **Anatomy** : Vascular bundles – types, Stele – types, secondary growth – intra and extrastelar normal secondary growth in dicot stem and root.

### Paper II : Theory (100 marks)

#### Block - I : Morphology, Taxonomy, Ecology, Economic Botany and Plant Breeding

- Unit 1. **Morphology** : Inflorescence – types, Flower – types, parts, stamens, carpel, placentation types.
- Unit 2. **Morphology** : Pollination, contrivances. Fruits and seeds – types with examples.
- Unit 3. **Angiosperm taxonomy** : Definition. Artificial, natural and phylogenetic system of classification. Principles of ICBN (elementary idea). Herbarium preparation, preservation and maintenance.
- Unit 4. **Angiosperm taxonomy** : An outline of Bentham and Hooker's system of classification. Diagnostic features of Alismataceae, Poaceae, Palmae and Orchidaceae.
- Unit 5. **Angiosperm taxonomy** : Diagnostic features of Magnoliaceae, Cruciferae, Malvaceae, Leguminosae, Euphorbiaceae, Solanaceae, Lamiaceae, Cucurbitaceae and Compositae.
- Unit 6. **Plant Ecology** : Introduction. Plant succession- stages of succession (hydrosere).
- Unit 7. **Plant Ecology** : Ecological adaptations of hydrophytes, halophytes and xerophytes.
- Unit 8. **Economic Botany** : Study of the following economically important plants (scientific names, families, parts used and importance). Rice, wheat, mung, gram, ginger, tea, coffee, cinchona, rauwolfia, ipecac, vasaka, mustard, groundnut, cotton, jute, teak, sal and sugarcane.
- Unit 9. **Plant Breeding** : Definition, Mass and Pure line selection, Hybridization techniques, Heterosis.

**Unit 10. Polyploid Breeding :** Euploidy types with examples, Aneuploidy – significance in plant breeding.

**Block-II : Plant Physiology, Plant tissue culture and Genetic engineering**

**Unit 11. Water relations :** Osmotic pressure, turgour pressure, water potential, mechanism of ion transport.

**Unit 12. Transpiration :** Types, stomatal opening and closing mechanism, guttation.

**Unit 13. Mineral nutrition :** Introduction, essential elements and their roles.

**Unit 14. Enzymes :** definition, types and properties.

**Unit 15. Photosynthesis :** light and dark reaction in  $C_3$  plants. Brief knowledge of  $C_4$  and CAM pathways.

**Unit 16. Respiration :** Glycolysis, TCA cycle, RQ.

**Unit 17. Nitrogen metabolism :** Biological nitrogen fixation (symbiotic and non symbiotic), ammonification, nitrification, reductive amination and transamination.

**Unit 18. Plant hormones :** Role of IAA, gibberellins, cytokinin, ABA and ethylene in plant growth and development. Photoperiodism and vernalization (elementary idea).

**Unit 19. Plant tissue culture :** Introduction, totipotency. Elementary idea of callus and suspension culture. Application of plant tissue culture in improvement of crop plants.

**Unit 20.** Recombinant DNA technology and transgenic plants.

**Paper III : Practical (100 marks)**

**Unit 1.** Work out microscopic preparation, drawing, description and identification of the following : *Nostoc*, *Oedogonium*, *Chara*, *Rhizopus*, *Penicillium* and *Agaricus*.

**Unit 2.** Work out microscopic preparation, drawing, description and identification of the following : *Riccia*, *Funaria*, *Lycopodium*, *Selaginella* and *Pteris*.

**Unit 3.** Dissection, drawing, description of angiospermic plants and floral parts, floral formula and floral diagram, identification from the following families : Solanaceae, Lamiaceae, Malvaceae, Cruciferae and Leguminasae.

**Unit 4.** Anatomical studies following double staining method of :  
i) Stem : Sunflower, Cucurbita and Maize.

- ii) Root : Gram, Orchid, Arum
- iii) Leaf : *Nerium*, Tube rose.

**Unit 5.** Plant physiology experiments :

- i) Demonstration of plasmolysis (Rhoeo leaf).
- ii) Measurement of leaf area (graphical method) and determination of transpiration rate per unit area by weighing method.
- iii) Preparation of solutions : normal, molar, molal.
- iv) Imbibitions of water by dry seeds.
- v) Evaluation of Oxygen during photosynthesis.
- vi) Evaluation of CO<sub>2</sub> during aerobic respiration.

**Unit 6.** Cytology : Squash preparation of Onion root tip cells (aceto-orcein staining). Study of mitotic stages.

**Unit 7.** Identification with reasons :

- i) Cryptogamic preparations as prescribed in the theoretical syllabus.
- ii) Plant pathological specimens as in the theoretical syllabus.
- iii) Gymnospermic specimens : macroscopic- microsporophyte and megasporophyte of *Cycas*, male and female cone of *Pinus*.
- iv) Morphological specimens of angiosperms as in the theoretical syllabus.
- v) Anatomical microscopic slides from theoretical syllabus.

**Suggested Reading :**

1. Studies in Botany (Vol. I) : Mitra J. N, Mitra D, Chaudhuri S. K (Moulik library).
2. Studies in Botany (Vol. II) : Mitra D, Guha J, Chaudhuri S. K (Moulik library)
3. দেবব্রত মিত্র, জীবেশ গুহ, সলিল চৌধুরী ও নরেন দত্ত : উদ্ভিদ বিজ্ঞান - ১ম/২য় খণ্ড (মৌলিক লাইব্রেরী)
4. নির্মল সমাজপতি ও নির্মল কুমার : উদ্ভিদ বিদ্যা (ভারতীয় বুক স্টল)