



Savitribai Phule Pune University

(Formerly University of Pune)

Two Year Degree Program in Botany

(Faculty of Science & Technology)

Revised Syllabi for

M.Sc. (Botany) Part-I

(For Colleges Affiliated to Savitribai Phule Pune University)

Choice Based Credit System Syllabus

To be implemented from Academic Year 2019-2020

Title of the Course: M.Sc. Botany

Preamble :

M Sc Botany program is designed with an objective to encourage and support the growing demands and challenging trends in the educational scenario. Our training focuses on the all-round development of the students to face the competitive World.

OBJECTIVES OF THE M SC BOTANY PROGRAMME:

1. Understand the scope and significance of the discipline.
2. **Imbibe love and curiosity towards nature through the living plants.**
3. In order to make students open-minded and curious, we try our best to enhance and develop a scientific attitude.
4. We make the students fit for the society by enabling them to work hard.
5. **Make the students exposed to the diverse life forms.**
6. Make them skilled in practical work, experiments, laboratory equipment and to interpret correctly on biological materials and data.
7. Develop interest in Biological research.
8. Encourage the students to do research in related disciplines.
9. **Develop a thirst to preserve the natural resources and environment.**
10. Develop the ability for the application of acquired knowledge in various fields of life so as to make our country self-sufficient
11. Appreciate and apply ethical principles to biological science research and studies

PROGRAM SPECIFIC OUTCOMES (PSO) OF MSc BOTANY:

Plant science is now an amalgamation of basic and applied science. Plants besides being the unique capability of plants to trap solar energy and provide food to all cannot be replicated by any system. Conventional studies like plant identification are now being supplemented with molecular techniques like DNA Barcoding. The courses have been designed to benefit all Botany students to study various aspects of plant science including its practical applications. Keeping in mind that these students can take up teaching at different levels, research work in research institutes and or industry, doctoral work,

environment impact assessment, biodiversity studies, entrepreneurship, scientific writing relevant topics have been included in the curriculum.

PSO 1: Understanding the classification of plants from cryptogams to Spermatophyte. Identification of the flora within field enhances basics of plants. Study of biodiversity in relation to habitat will correlates with climate change, land and forest degradation. Application of Botany in agriculture is through study of plant pathology.

PSO 2: Understand the ultra structure and function of cell membranes, cell communications, signaling, genetics, anatomy, taxonomy, ecology and plant Physiology and biochemistry. To understand the multi functionality of plant cells in production of fine chemicals and their wide spread industrial applications.

PSO 3: Molecular and Physiological adaptations in plants in response to biotic and abiotic stress. Genes responsible for stress tolerance genetic engineering of plants.

2. Plant Genetic Resources

5L

Historical perspectives and need for PGR conservation; **Importance of plant genetic resources**; Gene pool: primary, secondary and tertiary; Centres of origin and global pattern of diversity; Basic genetic resources and transgenes. Principles, strategies and practices of exploration, collection, characterization, evaluation and cataloging of PGR; Plant quarantine and phytosanitary certification; Principles of *in vitro* and cryopreservation. Germplasm conservation- *in situ*, *ex situ*, Registration of plant genetic resources and importance of NBPGR.

3. Methods in plant breeding:

4 L

Introduction, Selection, Hybridization, Back Cross, Test Cross, modes of pollination- Self & cross pollination mechanism, Pure line theory, pure line selection and mass selection methods; Line breeding, pedigree, bulk, single seed descent and multiline method; Inter-varietal and wide/distant crosses, Principles of combination breeding and its application.

4. Asexual reproduction in crop plants-

Reproduction and apomixes. Types and Applications of Apomixis, Selection methods in asexually propagated crops, *In vitro* Double haploids, Triploids

3 L

Credit IV :**15 lectures****5. Mutation Breeding:**

6 L

Mutation Breeding and its history - Nature and classification of mutations: spontaneous and induced mutations, micro and macro mutations, - Detection of mutations in lower and higher organisms – paramutations.

Mutagenic agents: Physical mutagens, Chemical mutagens mechanism of action of mutagens. Dose determination and factors influencing chemical mutagenesis, - Treatment methods using physical and chemical mutagens, Mutagen effects in M1 generation: plant injury, lethality, sterility, chimeras *etc.*, - Observing mutagen effects in M2 generation - Estimation of mutagenic efficiency and effectiveness. *In vitro* mutagenesis – callus and pollen irradiation; Handling of segregating generations and selection procedures; Validation of mutants.

6. Mutation breeding for various traits (disease resistance, insect resistance, quality improvement, etc) in different crops- Procedures for micromutations (oligogenic)

breeding/polygenic mutations. Use of mutagens in genomics, allele mining, TILLING 4 L

7. Seed development in Gymnosperms 2 L

Credit 1.5 III Angiosperms

23 Lectures

1. Characteristic features of angiosperms, Angiosperm as a dominant group 2 L
2. Importance and need for classification, hierarchical classification. Criteria used for classification; phases of **plant classification**. Overview on pre- and post-Darwinian systems of classification. 3 L
3. Phylogenetic systems of classification as per Cronquist (1981). 1 L
4. APG IV system of classification. 1 L
5. Phylogeny of Angiosperms: homology and analogy, parallelism and convergence, monophyly, paraphyly, polyphyly and clades, Phylogenetic tree and cladogram, Origin and evolution of angiosperms. 3 L
6. Study of plant families with respect to general characters, morphology, economic importance and affinities following Bentham and Hooker and APG system of classification
Amborellaceae, Nymphaeaceae, Hydatellaceae, Magnoliaceae, Araceae, Arecaceae, Papaveraceae, Amaranthaceae, Leguminosae, Malvaceae, Satalaceae, Acanthaceae, Asteraceae 13 L

References-

1. Balfour Austin (2016). Plant Taxonomy. Syrawood Publishing House
2. Chapman, J.L. and Reiss, M.J. (1998). Ecology: Principles and applications. Cambridge, University Press.
3. Chopra G.L. (1984). Angiosperms: Systematics and Life-Cycle., Pradeep Publications
4. Cooke, Theodore (1903-8). The Flora of the Presidency of the Bombay Vol. I, II, III (Repr. ed), Botanical Survey of India.
5. Cronquist, A. (1968). The Evolution and Classification of Flowering Plants. Thomas Nel and Sons Ltd. London.
6. Datta S.C. (1988). Systematic Botany. New Age Publ.
7. Davis P.H and V.H Heywood (1963). Principles of Angiosperm Taxonomy. Oliver and Boyd, London.
8. Heywood V.H. (1967). Plant Taxonomy, Hodder & Stoughton Educational, London.
9. Judd Walter S., Campbell, C. S., Kellogg, E. A., Stevens, P.F. and M. J. Donoghue. (2008). Plant Systematics- A Phylogenetic Approach. Sinauer Associates, INC, Publishers.Sunderland, Massachusetts, USA.
10. Kormondy Edward (1995). Concepts of Ecology, Pearson Publ.
11. Lawrence G.H.M. (1955). An Introduction to Plant Taxonomy. McMillan, New York.
12. Lawrence, G.H.M. (1951). Taxonomy of Vascular Plants. McMillan, New York.
13. Michael P. (1984). Ecological Methods for field and Laboratory investigations TMH Co. ltd. Bombay.
14. Mondol A.K. (2016) Advanced Plant Taxonomy, New Central Book Agency (NCBA)
15. Naik V.N. (1988) Taxonomy of Angiosperms. Oxford and IBH
16. Odum E.P., (2004). Fundamentals of Ecology, Publ. Cengage Learning, Australia
17. Pande B.P. (1997). Taxonomy of Angiosperms. S. Chand.
18. Pande B.P. (2001) Taxonomy of Angiosperms. S. Chand.
19. Radford A.E. 1986. Fundamentals of Plant Systematics, Harper and Row N Y.

(2 Credits- 30 Lectures)**Credit-I (Cr 1): Floriculture****15 Lectures**

1. Floriculture : Concept, definition, Scope and Importance of floriculture, global scenario of flowers, scope of floriculture in India 2L
2. Pre-requisites of commercial floriculture: soil and climate requirements, field preparation, systems of planting, water and nutrient management, weed management, rationing, training and pruning, pinching and disbudding, special horticultural practices, use of growth regulators, physiological disorders and remedies 3L
3. Harvesting and processing of flowers: harvesting indices, harvesting techniques, postharvest handling and grading, pre cooling, packing and storage, value addition, concrete and essential oil extraction, transportation and marketing, export potential, agri-export zones 5L
4. Commercial production of flowers: varietal wealth and diversity, climate, soil preparation, aftercare and manuring, pruning and training, harvesting, yield, important pests and diseases, control measures, harvesting, grading, packing and marketing , storage and transport, export potential of cut flowers: Chrysanthemum, Gerbera, Tuberose, Anthurium; Loose flowers- Scented Rose and Jasmine 5L

Credit II (Cr 1): Nursery Management**15 Lectures**

1. Introduction 1 L
2. Nursery Site: Types of Nurseries, Water, Location, Topography, Size of Nursery, Soil 2 L
3. Preparation of the Site: Clearing of surface, Removal of Top Soil, Erosion Control and Wind Damage, Surface Dressing, Shape, Fencing. 2 L
4. Design and Layout of Nursery: Administration Area, Operations Area, Production Areas, Germination Section, Transplanting Area. 2 L
5. Producing Plants from Seed: Seed Handling, Seed Procurement and Storage, Seed Dormancy and Pre-Treatment, Germination Process, Time of Sowing, Method of Sowing, Care of Seed Bed and Direct Sown Container, Transplanting the Young Seedlings, Light and Shade, Transplanting Natural Regeneration Seedlings, Tending the Seedlings, Watering, Germination Beds and Transplants, Weed Control. 4 L
6. Producing Plants Vegetatively: Cuttings, Air Layering, Grafting and Budding, Cleft or V Grafting, Shield or Inverted T-budding. 2 L
7. Growing Media: Growing Media for Propagation and Germination Beds, Growing Media for Transplant Beds, Growing Media for Container Seedlings, Organic Material, Compost, Mixing the Growing Media, Media Compaction in Pots, Mulching. 2 L

References:

1. Arora JS. 2006. Introductory Ornamental horticulture. Kalyani.
2. Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ.