Department of Botany, Osmania University
Ph.D (Botany) Course Work Syllabus (with effect from 2019)

Paper-I: Research Methodology in Botany

Unit-I

1. Research Problem – Its importance, aims and objectives, literature collection, Methodology (Experimental design / Field data collection). Data presentation and interpretation. Drawing conclusions.
2. Scientific paper writing – Manuscript preparation and presentation
3. Research Journals, Impact Factor and paper citation index
4. Statistical methods in Biology: Mean, Variance, Standard deviation, Standard error, Chisquare and 't'– test

U nit-II

5. Culture of Algae: Media and isolation of pure cultures
6. Culture and preservation of Fungi
7. Plant tissue culture methods. Genetic transformation methods (*Agrobacterium*-mediated and microprojectile / Biolistic methods).
8. Herbarium techniques

Unit-III

9. Plant Micro technique – Fixatives and staining (single and double). Fixation for histological and histochemical study. Microtomy.
10. Histochemical methods in Pharmacognosy and Forensic Botany. Organoleptic evaluation of market drugs.
11. Preparation of Cytological slides for study of Mitosis and Meiosis
12. Principles of Microscopy (Light microscope, phase contrast, Electron Microscope (SEM & TEM) and Fluorescence microscope).

Unit-IV

13. Methods of expressing concentration: Physical and chemical methods.
14. Soxhlet extraction, Column chromatography, TLC, High pressure liquid Chromatography (HPLC), Electrophoresis and ELISA.
15. Principles of Fluorescence, UV, Visible, NMR and Atomic Absorption Spectroscopy and Autoradiography.
16. Basic concepts of Recombinant DNA technology. Gene cloning, DNA fingerprinting technique, Polymerase Chain Reaction and Southern blotting.

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Paper-II: Current topics in Plant Science

Unit-I

1. Microbial Biotechnology
   - i) Bioremediation
   - ii) Biofertilizers (Cyanobacteria, Bacteria and Mycorrhizae)
   - iii) Phycotoxins and Mycotoxins
   - iv) Role of soil microbes in the degradation of pesticides and polycyclic aromatic hydrocarbons (PAHs)
2. Plant pathology–Principles of plant disease development, disease control (chemical, biological and integrated disease management) and role of biotechnology in plant disease control.
3. Molecular Plant Pathology – Host pathogen interactions; Recognition; Defense Elicitors, phytoalexins, Plant Immunization.

Unit-II:

4. Signal perception and transduction. Introduction, Receptors, G proteins, Phospholipid signaling, Cyclic nucleotides, Calcium calmodulin, protein kinases
5. Heavy metal stress: Availability, physiological basis for toxicity – water relation, photosynthesis, oxidative damage, membrane perturbations, tolerance mechanism – phytochelatins, phytoremediation – phytofiltration, phytoextraction, Phytostabilization, prospects and limitations
6. Isolation and characterization of certain enzymes (Rubisco, PEP Carboxylase, GS and GOGAT)
7. Regulation of photorespiration and its significance in crop, productivity
8. *In vitro* production of secondary metabolites. Significance of Hairy roots

Unit-III

9. The origin and early evolution of angiosperms, with reference to recent findings on fossil pollen, flowers and leaf remains.
10. Identification of Gymnosperms and Dicot wood based on anatomical characters of wood.
11. Concept of ICBN and salient features of Botanical nomenclature.
    - i). Typification ii). Rules of priority iii). Effective and valid publication
    - iv). Author's citations
12. Cultivation, harvest, drying, grading, packing, storage and marketing of medicinal plants
13. Pharmacognostic study of different types of plant drugs with special reference to Aromatic plants–Lemongrass and Palmarosa: Medicinal plants i) *Aloe vera* ii)Glory lily
14. Indigenous traditional drugs of India and their market Adulteration

Unit-IV

15. Conventional plant breeding, mutation breeding, QTL mapping and Marker assisted selection for crop improvement.
16. Modern methods & Principles of cultivation: Greenhouse and polyhouse. Hydroponics, Aeroponics and Aquaponics
17. Tissue culture of plants: Callus culture, plantlet regeneration, micro propagation, somaclonal variation and synthetic seeds.
18. Principles of genetic engineering and status of transgenic plants.
19. Molecular characterization of Elite medicinal plants and endangered plants and development of molecular markers (RAPD, SSR and AFLP).
20. Biodiversity-Types, hot spots, threats to Biodiversity and conservation.