

I Research Methodology

1. WHAT IS RESEARCH? Definition of Research, Reflection , Basic and applied research, Qualities of Researcher, Components of Research Problem, Various Steps in Scientific Research.
2. **LITERATURE COLLECTION:** Need of review of literature, review process and bibliography, Sources of Data: Primary Data, Secondary Data, Working bibliography, index cards and reference cards, literature citation.
3. **RESEARCH DESIGN:** Selection and formulation of research problem. Contents of the plan (protocol), Choice of research topic, Synopsis, Research Design & Plan, Significance of research design, Meaning & process of design. Introduction to Research & plan Research methodology. Writing the plan (protocol).
4. **SAMPLING DESIGN-** Census and sample survey, steps in sampling, characteristics of good sampling design, types of sample designs, how to select a sample random design, complex random sample. Arithmetical Mean, mode, Standard deviation, T- test.
5. **TECHNIQUES IN BOTANY:** Microscopy, micrometry, centrifugation, pH and pH meter, chromatography, electrophoresis, colorimetric and spectrophotometer methods, PCR, Gel-doc, Elisa, handling microorganisms in laboratory, laboratory safety and disposal of Bio hazards, chemical hazards, fire hazards ,electrical hazards, noise and radiation hazards.

II Cognate subject : Applied Botany

1. General account on morphology and economic importance of Algae, Bryophytes Pteridophytes and Gymnosperms. Angiosperm Taxonomy: Major systems of classification: Sexual systems and modern system of classification; Biodiversity profile in India and Karnataka; Hot spots; threat to Biodiversity; IUCN threat categories, Red Data Book; Conservation measures of Biodiversity.
2. **Environmental pollution and management:** Air, Water and Industrial pollution; Hazardous waste management: Hazardous substances and hazardous wastes and sources, composition, physical form, quantity and quality of hazardous wastes. Waste minimization (physical, chemical and biological disposal treatment technique); Remote sensing and GIS: Basic and fundamental concepts of remote sensing, fundamentals of satellite image interpretation. Biodegradation of pesticides. Environmental Impact Assessment.
3. **Post Harvest Technology:** Post harvest practices- processing, preservation transportation and marketing of agricultural crops(wheat , rice maize, millets, cotton, sunflower oil seeds soybean seeds, coconut) ; vegetables, fruits; medicinal plants; ornamental plants; Post harvest losses.
4. **Plant Physiology and Metabolism:** Recent developments in Photosynthesis, Respiration and Photorespiration - an overview; Signal transduction - receptors - phytochrome, ABA, G proteins and phosphate signaling cyclic nucleotides, Calcium, protein kinases. Senescence and programmed cell death.

5. **Cell and molecular biology:** Regulation of gene action in prokaryotes - transcriptional control mechanism negative and positive control, translational control, posttranslational control. Regulation of gene action in eukaryotes - kinds of regulations at different levels Re-combinant DNA and genetic engineering; isolation of nucleic acids, radioactive labeling of nucleic acids, restriction endonucleases, cloning vectors, vectors in molecular biology, DNA blotting, preparation of DNA complementary to RNA. Gene library.
6. **Plant Biotechnology:** Techniques of plant regeneration - Plant tissue culture, protoplast culture, somatic embryogenesis, anther and ovary culture and synthetic seeds: Different types of Secondary metabolites, production, factors, affecting yield, Biotransformation, different types with examples. Biosensor and biochips. Micro propagation - different stages of micropropagation, rooting and establishments in herbs & woody plants. Development of stress tolerant plants; Transgenics in crop improvement.
7. **Medicinal Plants and Phytochemistry:** Scope of medicinal plants, poisonous plants and plants of importance in pesticides and essential oil; Conservation of Endangered Medicinal and Aromatic plants with special reference to Karnataka; Intellectual property rights (patents, trade secrets, copyright, trademarks); IPR and plant genetic resources (PGR); GATT and TRIPs, patenting of biological material. Patenting transgenic organisms and isolated genes; patenting of genes and DNA sequence.
8. **Mycology:** Mutualistic symbiosis - Introduction and importance - Mycorrhizae kinds and biology of mycorrhizae; Lichens - mycobiont & phycobiont partners, morphological forms of lichens, reproduction, physiological relationships, Endosymbiosis ;endophytes and their taxonomy, endophytic mutualism, genetic variation in plant pathogen populations.
9. **Microbiology:** Microbiology of Air, Water and Food; Reproduction in microbes: methods of reproduction in bacteria, fungi, and viruses and in algae; Microbial genetics; structure of bacterial genome, mutations in microbes, bacterial recombination, bacterial plasmids and their application in genetic engineering; Microbial metabolism - Utilization of hexoses- EMP, PP, ED and PK pathways, and TCA cycle. Bacterial respiration and fermentation.
10. **Plant Pathology:** Plant disease diagnosis - techniques for the detection of plant pathogenic fungi, viruses, viroids, bacteria, and nematodes - conventional and modern methods of diagnosis including seed health testing methods; Signaling in plant disease resistance mechanisms, RNA as a signal, coordination of cell death responses and interplay of down stream signaling pathways.