

## **Syllabus for (Horticulture, Forestry, Seed Science, Rural Technology, Agronomy, Plant Breeding, Genetics) (PGQP33)**

**Basic Biology:** Spontaneous generation theory, prokaryotes vs eukaryotes, functional anatomy, structure and organization of bacteria, fungi and algae – economic importance, methods of sterilization, rhizosphere microorganisms and importance, plant-microbe interactions in soil, microbial transformation of nutrients in soil. Carbohydrates, lipids, proteins and amino acids – occurrence and classification, carbohydrate and lipid metabolism, glycolysis, TCA cycle, pentose phosphate pathway, ETC and oxidative phosphorylation, secondary metabolites – occurrence, classification, functions and applications.

**Ecology:** Physical environment; biotic environment; biotic and abiotic interactions. Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement. Characteristics of a population; population growth curves; population regulation; life history strategies; concept of metapopulation – demes and dispersal, interdemec extinctions, age structured populations. Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis. Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Types; mechanisms; changes involved in succession; concept of climax. Structure and function; energy flow and mineral cycling; primary production and decomposition; structure and function of some Indian ecosystems: terrestrial and aquatic. Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

**Plant Biology:** Photosynthesis: Light harvesting complexes; mechanisms of electron transport; photo protective mechanisms; CO<sub>2</sub> fixation-C<sub>3</sub>, C<sub>4</sub> and CAM pathways. Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photo respiratory pathway. Nitrate and ammonium assimilation; amino acid biosynthesis. Plant hormones: Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action. Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks. Solute transport and photo assimilate translocation: Uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photo assimilates. Secondary metabolites - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles. Responses of plants to biotic and abiotic stresses; mechanisms of resistance to biotic stress and tolerance to abiotic stress. Plant tissue culture and applications, molecular marker technology, transgenic technology – GMOs, transgenic plants for biotic and abiotic stress resistance and quality improvement, molecular pharming – production of vaccines, therapeutic proteins, industrial enzymes and bioplastics.

**Microscopic Techniques:** Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.

**Methods in Field biology:** Methods of estimating population density of animals and plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization-ground and remote sensing methods.

**Horticulture:** Scope and importance; global scenario of horticultural crops, classification of horticultural crops – nutritive value of horticultural crops, horticulture zones of India. Systematic botany – terminology, morphology description and classification of root, stem, leaf, inflorescence,

**Flower and fruits** – flowering mechanism – modes of pollination – asexual/ vegetative reproduction – floral biology – fertilization and fruit set, Principles involved in nomenclature.

**Landscaping and Gardening:** Importance and scope of gardening, gardens in India – concepts of landscape gardening – styles and types of gardens – Hindu, Mughal, English, Italian, Persian and Japanese gardens, ornamental landscaping in environmental protection.

**Food Technology:** Food processing industries/institutions/food scientists of importance in India, causes of food spoilage, methods of food preservation, post-harvest and storage of fresh fruits and vegetables, preparations of fruits and vegetables for processing, technology of foods of animal origin.