Syllabus for Plant Molecular Biology (SCPH25)

Note:

i. There will be one Question Paper which will have 100 questions.

ii. All questions will be compulsory.

iii. The Question Paper will have two Parts i.e. Part A and Part B

iv. Part A will have 50 questions based on Research Methodology

v. Part B will have 50 questions based on Subject-Specific Knowledge.

Unit-I **Unifying Concepts in Light and Hormone Signal Transduction in Plants**
Diversity of sensory receptors and their evolutionary significance; Two-component sensor-regulator system; Light- and hormone-regulated signaling.

Unit-II **Forefronts of Calcium Signal Transduction in Plants** -- Calcium as "Hub and Nodal point" in multiple signaling (biotic and abiotic stress); Development of calcium signaling networks with advanced tools and techniques.

Unit-III **Plant Development** -- Model systems; Developmental differences between animals and plants; early plant embryogenesis. Patterning and molecular mechanisms of differentiation.

Unit-IV **Gene Regulatory Networks Controlling Flower Development** -- ABCDE model of flower development; Floral initiation and meristem specification; Male and female reproductive development.

Unit–V **Bioinformatics** -- Biological Databases; Sequence alignment, phylogenetic analysis; Generation and analysis of whole genome data, Whole genome annotation taking examples of major plant genomes.

Unit-VI **Small RNA-mediated Gene Regulation** – Types of non-coding RNAs: Sequencing, detection and validation, Mechanism of action and biological roles; artificial microRNA (Amir) and siRNA technology.

Unit-VII **Plant Biotechnology and Production of Transgenic for Resistance to Varied Abiotic Stresses** -- Conventional plant breeding, molecular breeding and transgenic science; Tools and techniques for production of transgenic plants; Developing transgenic plants for resistance/tolerance to abiotic stresses.

Unit-VIII **Interaction of Plants with Viruses** -- Organization, functions and dynamics of viral genes; Viral promoters; RNA-interference and viral infections; Viral suppressors and their role in pathogenesis; Virus-induced gene silencing; Development of transgenic virus resistance in crops.

Unit-IX **Regulation of Fruit Ripening and Quality Addition and Role of Plants as Bioreactors** -- Role of ethylene; Genes manipulated for delayed ripening; Improvement of folate, lycopene and flavor compounds. Strategies for high-level expression, down-stream processing; Humanization of plant expressed products, few success stories.

Unit-X **Molecular Breeding and IPR-related Issues** -- Molecular markers; Marker-assisted breeding (MAB) and molecular-assisted selection (MAS); IPR-related issues, trade marks, copy rights, patents, geographical indicia.