

Assessment	
Maximum marks	
Continuous Internal Assessment (CIA)	100
Mid Semester Exam (MSE)	25
End Semester Exam (ESE)	25
Passing Marks	50
	50

Course objectives

The course deals with details of plant developmental, sensory and stress physiology and secondary metabolism, signal transduction; programmed cell death and defense.

Theory

Unit 1: Developmental Physiology

Stages of fruit development and their regulation; biochemical and related events during fruit ripening in climacteric and non-climacteric fruits; physiology and biochemistry of fruit abscission; post-harvest changes; production of transgenic fruits; hormonal regulation of seed development; events associated with seed maturation- factors regulating seed dormancy; mechanisms of mobilization of food reserves during seed germination.

Unit 2: Sensory physiology and Secondary metabolism

Biochemical and biophysical mechanisms of thigmotropism- electric self-defence, taste, light; explosion, sleeping and rhythms; stimuli that trigger rapid movements- movements based on mechanical forces, mobility triggered by sense of touch, taste and electricity; motors driving movements in the living world, actin-myosin motors; photosensing- chemistry of excitability; neurotransmitters in plants; natural products (secondary metabolites)- their range and eco-physiological functions; overview of terpenoidal, alkaloidal, and phenolic metabolites and their biosynthesis.

Unit 3: Sensory Photobiology and Signal Transduction

Cryptochromes and phototropins- Structure, function and mechanisms of action; stomatal movement- scotomorphogenesis and photomorphogenesis; specific signalling mechanisms and their regulation- simple and hybrid type of two-component sensor-regulator system in

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bacteria and plants (examples of chemotaxis, osmosensing, ethylene and cytokinin signaling); quorum sensing; gasotransmitters.

Unit 4: Stress Physiology

Introduction to stress; plant responses to biotic and abiotic stresses; mechanisms of stress tolerance- drought, salinity, metal toxicity, freezing and heat stress; nitrosative and oxidative stress – effects and causes; reactive oxygen species metabolism; nitric oxide (NO) biosynthesis and metabolism; NO-mediated signalling; markers; antioxidant mechanisms.

Unit 5: Programmed cell death (PCD) and defense

Concept of PCD and its types in plants during vegetative and reproductive stages; developmental and stress-induced PCD; Plant, leaf and flower senescence and their characteristics; altered metabolism during senescence and its regulation; hormonal modulations; biochemical mechanisms of plants chemical war against other plants and animals; plant responses to herbivory; defense mechanisms; induced phytochemical responses.

Molecular Plant Physiology Lab

Assessment	
Max; Mark	50
Continuous Internal Assessment (CIA)	25
End Semester Exam (ESE)	25
Passing Marks	25

Practicals

1. To study the effect on different chemicals/phytohormone/stress on seed germination.
2. To study the effect of light on seed germination.
3. Demonstration of fruit ripening in climacteric and non-climacteric fruits.
4. Chlorophyll estimation of leaves (of different age) using spectrophotometric methods.
5. Demonstration of plant movements.
6. Extraction of metabolites from plant tissue and their qualitative analysis using TLC.
7. Demonstration of chemicals/phytohormone on stress alleviation.

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8. Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.
9. Demonstration of cell membrane damage during stress conditions.
10. To study ROS generation during development and stress conditions.
11. To study the effect of different concentrations of IAA on coleoptile elongation (IAA Bioassay).

SUGGESTED READINGS:

1. Ainsworth C (2006) Flowering and its Manipulation Annual Plant Reviews, Vol. 20 Blackwell Publishing, Oxford, U.K.
2. Davies P J. (2004) Plant Hormones: Biosynthesis, Signal Transduction, Action. 3rd Edition. Kluwer Academic Publisher, Dordrecht, The Netherlands.
3. Hopkins, G.W and Huner, N.P.A. (2008) Introduction to Plant Physiology. 4thEdn Wiley and Sons, Inc. New York, U.S.A.
4. Jordan BR. (2006) The Molecular Biology and Biotechnology of Flowering. 2nd Edition. CAB International, Oxfordshire, U.K.
5. Nelson D.L. and Cox, MM (2013). Lehninger-Principles of Biochemistry. Worth Publishers Inc. New York, U.S.A.
6. Salisbury FB and Ross CW (1992). Plant Physiology, 4thEdn. Wadsworth Publishing Co. California, U.S.A.
7. Taiz, I. and Zeiger E. (2006) Plant Physiology, 4th Edition, Sinauer Associates Inc. Publishers, Massachusetts, U.S.A.
8. Taiz, L. Zeiger, E. Moller IM and Murphy A (2015). Plant Physiology and Development, Sinauer Associates Inc. U.S.A. 6th edition.