

DISCIPLINE SPECIFIC CORE COURSE –12 :

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Plant Physiology (BS-DSC-403)	4	2		2	Class XII pass with Biology and chemistry,	None

Learning Objectives

The Learning Objectives of this course are as follows:

- Gives the students an insight into the structure-function integration in plants.
- To appreciate the complex interactions of the plant with the environmental and edaphic factors that forms a major portion of plant physiology
- To provide students with comprehensive exposure to the subject of plant physiology.
- Aims to familiarize the students with the role of various functional processes of plants in their growth and development;
- To understand transport mechanisms and translocation in the phloem,
- Appreciate the commercial applications of plant physiology.

Learning outcomes

By the end of the course, the student will be able to:

- Comprehend the fundamental concepts of plant physiology
- Understand the physiological mechanisms of plant growth, function, and development.
- Understand the integration of soil, atmosphere, and plant in carrying out the life processes by plants.
- Understand the complex regulation of phenomena of growth and flowering.
- Be able to use the knowledge gained to help crop growers, fruit farmers, floriculturists and others in the related area.

SYLLABUS OF DSC-12

Theory

Credits: 2

Total Hours: 30

Unit 1: Water relations

No. of hours: 9

Water potential and its components (solute potential, pressure potential, gravimetric potential and matric potential); inter cellular water transport (diffusion, mass flow and osmosis), short- distance transport (water absorption by roots), aquaporins, pathway of water movement (apoplast and symplast), water and ion uptake from soil into roots, root pressure, guttation, ascent of sap, cohesion-tension theory; Transpiration and its significance, factors affecting transpiration, anti- transpirants; Mechanism of stomatal movement (starch-sugar hypothesis, proton transport theory).

Unit 2: Plant Nutrition: uptake and distribution

No. of hours: 10

Essential elements (macronutrients and micronutrients, criteria of essentiality, roles and deficiency symptoms), methods of study and use of nutrient solutions (ash analysis, hydroponics and aeroponics), Soil cation exchange capacity, transport of ions across cell membrane-passive transport and active transport, experimental evidence in support of phloem as the site of sugar translocation, Source-sink relationship, pressure flow model, phloem loading and unloading.

Unit 3: Regulation of plant growth

No. of hours: 5

Discovery, basic structure, bioassays, physiological roles and commercial applications of auxins, gibberellins, cytokinins, abscisic acid and ethylene, general mechanism of mode of action of hormones. Brassinosteroids and Jasmonic acid (brief)

Unit 4. Physiology of Flowering

No. of hours: 6

Photoperiodism: SDPs, LDPs, DNP, photoinductive cycle (perception of photoperiodic signal), physiology of flowering (florigen concept), phytochrome (discovery, structure and responses on photomorphogenesis) vernalization, seed dormancy and germination (causes and methods to overcome dormancy).

2.1 Practical

Credit:2

Total Hours: 60

1. To determine the osmotic potential of plant cell sap by incipient plasmolytic method.
2. To determine the water potential by weight method.
3. To study the effect of two environmental factors on transpiration of an excised twig.
4. To calculate stomatal index and stomatal frequency of two surfaces of leaves of a mesophyte and a xerophyte.
5. To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and a xerophyte (any one surface)
6. To demonstrate suction due to transpiration
7. To demonstrate the role of auxins in rooting of the cuttings
8. To study the phenomenon of Bolting
9. To study the role of Ethylene in fruit ripening
10. To study the effect of pH on anthocyanin pigments

Essential readings:

1. Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology. John Wiley and Sons.U.S.A. 4th edition.
2. Kochhar, S.L. and Gujral, S.K. (2011). Comprehensive Practical Plant Physiology, Macmillan India Ltd, New Delhi.
3. Noggle, G.R. and Fritz,G.J. (1986).Introduction to Plant Physiology, 2nd Ed. PrenticeHall of India Ltd., New Delhi.
4. Salisbury, F.B. and Ross, C.W. (2005). Plant Physiology, Thomson Wadsworth, 4th edition.
5. Taiz, L., Zeiger, E. Moller, I.M. and Murphy, A. (2015). Plant Physiology and Development, Sinauer Associates Inc. U.S.A 6th edition.

Suggested readings:

1. Bhatla, S.C. and Lal M.A. (2018). Plant Physiology, Development and Metabolism, Springer Nature, 1st edition.
2. Nobel, P.S. (2009). Physicochemical and Environmental Plant Physiology, Academic Press, 4th edition.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.