

UNIVERSITY OF MADRAS
M.Sc. DEGREE PROGRAMME IN BOTANY
SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Course	PLANT PHYSIOLOGY						
Paper Number	CORE XII						
Category	Core	Year	II	Credits	5	Course Code	523C4A
		Semester	IV				
Instructional Hours per week	Lecture		Tutorial		Lab Practice	Total	
	4		1		-	5	
Pre-requisite	Basic knowledge on physiological processes in plants.						
Learning Objectives:							
C1	To acquire knowledge on the functional aspects of plants.						
C2	To know the energy production and its utilization in plants.						
C3	To understand the various steps involved in distribution of enzymes and protein synthesis for plant growth and the metabolism.						
C4	To understand how phytohormones are metabolised by plants to produce plant development.						
C5	To know the various responses of plants against stress and their mechanism of resistance.						
UNIT	CONTENTS						
I	Water Relation in plants: Properties of water, Diffusion, Osmosis and water potential, mechanism of water absorption. Translocation of water and solutes through cells, Mechanisms of loading and unloading of photo-assimilates. Transpiration and stomatal movement.						
II	Photosynthesis and respiration: Photosynthesis – Light harvesting complexes; mechanisms of electron transport; CO ₂ fixation – C ₃ , C ₄ and CAM pathways. Respiration and photorespiration: Glycolysis, Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; photorespiration and its significance.						
III	Mineral nutrition and nitrogen metabolism: Mineral nutrients – Role of Macro and Micro nutrients, Nitrogen metabolism: Nitrogen cycle, Biological Nitrogen fixation. Secondary metabolites – Biosynthesis of terpenes, flavonoids, phenols and alkaloids and their roles.						
IV	Plant hormones: Growth substances - Auxins, gibberellins, cytokinins, abscisic acid, ethylene, physiological effect and mechanism of action in agricultural and horticultural crops. Photoperiodism – Classification of plants and mechanism of flowering –Phytochrome and their action on flowering – Vernalization- Mechanism and its practical application, biological rhythms and movements. Seed dormancy and causes and Seed germination and their biochemical changes.						

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V	Plant senescence: Types and Mechanism of senescence- Abscission: Morphological and biochemical changes –Plant response to environmental stress: Biotic and Abiotic stress – Water, temperature, light and salinity- Adaptive mechanism to various stresses (avoidance, escape, tolerance)–stress responsive proteins	
Course outcomes: CO	On completion of this course, the students will be able to:	Programme outcomes
CO1	Relate understand properties and importance of water in biological system, nutrients and its translocation.	K1
CO2	Gain awareness about the various process involved in the energy production in plants and metabolic pathways.	K2
CO3	Expand knowledge about application of various mechanisms such as channel or transport proteins involved in nutrient uptake in plants.	K3
CO4	Compare the various growth regulators that influence plant growth.	K4
CO5	Discuss the senescence and plant response to environmental stress.	K5
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Recommended Text:

1. Gauch, H.G.1972. Inorganic Plant Nutrition. Hutchinson & Dowd. New York.
2. Govindji. 1982. Photosynthesis. AP. New York.
3. Jacob, W.P. 1979. Plant Hormones and Plant Development. Cambridge University Press. Cambridge
4. Khan, A.A. 1982. The Physiology and Biochemistry of Seed development, Dormancy and Germination. Elsevier. Amsterdam.
5. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont.
6. Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.
7. Sage, R and R.K. Monson (eds). 1999. The Biology of C4 Plants AP New York.
8. Postgate, J. 1987. Nitrogen Fixation. 2nd Edition Cassel, London.
9. Lincoln Taiz, Eduardo Zeiger, Ian Max Moller and Angus Murphy. 2015. Plant Physiology. 6th Ed., Sinauer Associates.
10. Stacey, G.R.H. Burris and Evans, H.J. 1992. Biological Nitrogen Fixation. Chapman and Hall, New York
11. Mann, J. 1987. Secondary Metabolism Clarendon Press, Oxford.
12. Jain, V.K. 2017. Plant Physiology, S.Chand & Company Ltd. New Delhi.
13. Lincoln, T, Eduardo, Z, Ian Max, M, and Angus, M. 2018. Fundamentals of Plant Physiology. Sinauer Associates Inc., US.
14. Pandey, N.S and Pandey, P. 2016. Textbook of Plant Physiology. Daya Publishing House,

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New Delhi.

15. Taiz, L. Zeiger, E., Moller, I.M and Murphy, A. 2015. Plant Physiology and Development 6th Edition. Sinauer Associates, Sunderland, CT.
16. Guowei Li Veronique Santoni ChristopheMaurel. 2014. Plant aquaporins: Roles in plant physiology. Biochimica et Biophysica Acta (BBA) - General Subjects Volume 1840, Issue 5, Pages 1574-1582.

Reference Books:

1. Bidwell, R.G.S. 1974. Plant Physiology, Macmillan Publisher, Boston.
2. Devlin, R.M. 1996. Plant Physiology, PWS publisher, Boston.
3. Jain, V.K. 2017. Fundamentals of Plant Physiology. Chand & Company Ltd., New Delhi.
4. Gontia. 2016. A textbook of Plant Physiology. Satish Serial publishing House, New Delhi.
5. Leopold, A.C, 1994. Plant Growth and Development, McGraw Hill, New York.
6. Lincoln Taiz et al., 2014. Plant Physiology and Development. Sinauer Associates Inc. Publishers, Sunderland, Massachusetts.
7. Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones (2nd Edition). SpringerVerlag, New York, USA.
8. Noggle, R.G and Fritz, G.J. 2010. Introductory Plant Physiology, PHI Learning Pvt Ltd, New Delhi.
9. Park S. Nobel. 2005. Physicochemical and Environmental Plant Physiology. Elsevier Academic Press, New York.
10. Panda, S.K, 2005. Advances in Stress Physiology of Plants. Scientific Publishers India, Jodhpur.
11. Salisbury, F.B and Cleon Ross, 2007. Plant Physiology, Wadsworth Publishing Company, Belmont.
12. Shinha. R.K. 2007. Modern Plant Physiology. Ane Books India, New Delhi.
13. William G. Hopkins, 1999. Introduction to Plant Physiology, John Wiley and sons, INC, New York.
14. Heldt, H.W. 2005. Plant Biochemistry, 3rd Edition. Elsevier Academic Press.
15. Hess, D. 2012. Plant Physiology: Molecular, Biochemical, and Physiological Fundamentals of Metabolism and development. Springer Science & Business Media, New York.

Web resources:

1. <https://www.sciencedirect.com/topics/agriculture-and0biological-sciences/plant-physiology>.
2. <https://learn.careers360.com/biology/plant-physiology-chapter/>
3. <https://www.biologydiscussion.com/plants/plant-physiology/top-6-processes-of-plant-physiology/24154>.
4. <https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf>
5. <https://basicbiology.net/plants/physiology>
6. <https://learn.careers360.com/biology/plant-physiology-chapter/4>
7. https://swayam.gov.in/nd2_cec20_bt01/preview
8. <https://www.nature.com/subjects/plant-physiology>

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Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	2	2	3	2
CO2	3	3	2	2	3	3	2	3	2	3
CO3	2	2	3	3	1	2	1	3	3	1
CO4	3	3	3	3	3	2	3	3	3	3
CO5	3	3	2	3	2	3	3	3	3	2

S-Strong (3) M-Medium (2) L-Low(1)