UNIVERSITY OF MADRAS
B.Sc. DEGREE PROGRAMME IN PLANT BIOLOGY AND PLANT BIOTECHNOLOGY
SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Course	**PLANT ANATOMY, EMBRYOLOGY, PLANT PHYSIOLOGY AND BIOCHEMISTRY - PRACTICAL-VI**					
Category	Core	**Year**	III	**Credits**	4	Course Code **339C61**
		Semester	VI			

Instructional Hours perweek	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	-	1	5	6

Pre-requisite	Theoretical understanding of Plant Physiology and Plant Biochemistry as well as basic laboratory skills for the relevant core course.
Learning Objectives	
C1	To study the anatomy of the plant organs using various techniques.
C2	To study the embryology of the plant.
C3	To carryout experiments related with plant physiology.
C4	To tabulate and Interpret results of physiology experiments
C5	To perform biochemistry experiments.

Course outcomes: On completion of this course, the students will be able to: **CO**	**Programme Outcomes**
1. Elucidate the Basic principles involved in the plant physiology and biochemistry experiments.	K1
2. Classify The types of stomata and ovules.	K2
3. Compare the functions of various ergastic substances present in plant tissues.	K3
4. Perform free hand sectioning of plant materials and decipher the internal tissue organization.	K4
5. Estimate the biochemical components and determine the factors controlling photosynthesis and transpiration of plants.	K5

EXPERIMENTS

Anatomy

1. Study of simple and complex (Primary and Secondary) tissues by maceration.
2. Study the internal structure of primary (young) and secondary (old) stems. Internal structure of dicot and monocot stem. Internal structure of dicot and monocot root. Internal structure of dicot and monocot leaves.
3. Anomalous secondary growth in the stems of *Boerhaavia*, *Nycthanthes*and *Dracaena*.
4. T.S of dicot and monocot leaves.
5. Study of stomatal types.

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Embryology

1. T.S of (young and mature) anther (section from *Datura* or *Cassia* flower).
2. Observation of pollinia (slide only).
3. Types of ovules- Anatropous, Orthotropous, Circinotropous, Amphitropous, Campylotropous (Permanent slides).
4. Types of Endosperm - Nuclear, cellular and helobial.
5. Dissection and display of any two stages of embryo in *Tridax*

Plant Physiology and Plant Biochemistry

1. Determination of water potential by plasmolytic method.
2. Effect of chemicals on membrane permeability.
3. Effect of environmental factors on rate of transpiration by gravimetric method.
4. Separation of plant pigments by paper chromatography.
5. Study the rate of photosynthesis under different light intensities by using Willmott's bubble counter.
6. Study of rate of photosynthesis under different wavelengths (red & blue) of light.
7. Comparison of rate of respiration of different respiratory substrates.
8. Measurement of pH of expressed cell sap and different soils using pH meter.
9. Enzyme activity – catalase.
10. Biochemical test for carbohydrates, proteins and lipids

Demonstration – Experiments

1. Study the rate of transpiration by using Ganong's photometer
2. Demonstration of stomatal movement.
3. Induction of roots in leaves by auxins.

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 Texts	1. Sundara, R. S. 2000. Practical manual of plant anatomy and embryology. Anmol Publ. PVT LTD, New Delhi. 2. Panshin, A.J and C. de Zeeuw.1980.Textbook of wood technology. Structure, identification and uses of the commercial woods of the United States and Canada. Fourth Edition. New York: McGraw-Hill Book Company. 3. Sharma, H.P. 2009. Plant Embryology: Classical and Experimental, Bombay Popular Prakashan, ISBN-8173199698, 9788173199691. 4 Plummer,D.1988.AnintroductiontoPracticalBiochemistry,TataMcGraw–HillPublishing Company Ltd., New Delhi. 5 Palanivelu,P.2004.LaboratoryManualforanalyticalbiochemistryandseparationtechniques,SchoolofBiotechnology,MaduraiKamarajUniversity,Madurai. 6. Jayaraman.J.1981.Laboratory Manual in Biochemistry.Whiley Eastern Limited, New Delhi. 7. Bendre,A.M. and Ashok Kumar,2009.A textbook of practical Botany .Vol.I &II. Rastogi Publication. Meerut.9th Edition.
Reference Books	1. Sundara Rajan, S, 2003. Practical Manual of Plant Anatomy and Embryology 1st ed, Anmol Publications, ISBN-812610668. 2. Katherine Esau. 2006. Anatomy of Seed Plants. 2nd edition, John Wiley and Sons. 3. Allen, Sarah et al., 2016. Plant Anatomy Lab Manual, Fall. 4. Bala, M., Gupta, S., Gupta, N.K and Sangha, M.K. 2013. Practicals in plant physiology and biochemistry. Scientific Publishers (India). 5. Wilson,KandJ.Walker(Eds).1994.PrinciplesandTechniquesofPracticalBiochemistry(4th Edition)CambridgeUniversityPress,Cambridge. 6. Bendre,A.MandAshokKumar.2009. Atextbook of

	practical Botany.Vol.I&II. Rastogi Publication.Meerut.9th Edition. 7. Manju Bala,Sunita Gupta,Gupta,N.K.2012.Practicals in Plant Physiology and Biochemistry. Scientific Publisher.
Web resources	1. https://www.amazon.in/Practical-Anatomy-Adriance-1901-1973-Foster/dp/1341784509 2. https://books.google.co.in/books/about/Practical_Manual_Of_Plant_Anatomy_And_ Em.html?id=Cq1KPwAACAAJ&redir_esc=y 3. https://www.amazon.in/Practical-Physiology-Biochemistry-Sunita-Sangha/dp/9386102633 4. https://www.amazon.in/Practical-Biochemistry-Muriel-Wheldale-Onslow/dp/1107634318

Mapping with Programme Outcomes:

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

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