UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN BOTANY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Course	**PLANT ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS**						
Paper Number	**CORE V**						
Category	Core	**Year**	I	**Credits**	4	**Course Code**	423C2B
		Semester	II				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	3	1	-	4

Pre-requisite	To acquire knowledge on the anatomical structure and reproductive phase of angiosperms.
Learning Objectives:	
C1	Learn the importance of plant anatomy in plant production systems.
C2	Classify meristems and identify their structures, functions and roles in monocot and dicot plants growth and secondary growth of woody plants.
C3	Understand the recent advances in palynology.
C4	Trace the development of male and female gametophyte.
C5	Understand the development of embryo.

UNIT	**CONTENTS**
I	**ANATOMY:** Classification of tissues. Theories of organization of shoot, root and floral meristems. Cambium – Vascular cambium and cork cambium - origin, development and types. Xylem; secondary elements, components, structure. Tyloses, heart wood and sap wood, Growth rings - reaction wood and wood seasoning. Maceration technique. Patterns of secondary wall thickening. Phloem - secondary elements, components and structures.
II	**PERIDERM:** Structure, organization and activity of phellogen. Polyderm and Rhytiderm – wound periderm. Normal secondary thickening in Dicots; Anomalous secondary growth in Dicots (Aristolochiaceae, Nyctaginaceae) and arborescent Monocots. Primary thickening in palms; Structure and types of Stomata; Leaf abscission; Major nodal types; Kranz anatomy and its significance.
III	**MICROSPORANGIUM AND MALE GAMETOPHYTE:** Microsporangium and male gametophyte structure and development of anther and physiology of tapetum. Palynology: morphology and ultrastructure of pollen wall, pollen kitt, pollen analysis, pollen storage, pollen sterility, pollen loads, pollen calenders and pollen physiology. Importance and recent advances in palynological studies.

IV	**MEGASPORANGIUM AND FEMALE GAMETOPHYTE:** Structure and development of Megasporangium; Types of ovules. Megasporogenesis: Female gametophyte: Fertilization: Double fertilization and triple fusion. Endosperm: Development of endosperm, types. Endosperm haustoria and its functions.
V	**DEVELOPMENT OF EMBRYO AND POLYEMBRYONY:** Embryogeny: Development of monocot (Grass) and dicot (Crucifer) embryos. Causes of Polyembryony, classification, induction and practical application. Apomixis and its significance. Role of growth substances in seed and fruit development. Parthenocarpy and its importance.

Course outcomes: CO	**On completion of this course, the students will be able to:**	**Programme outcomes**
CO1	Learn the structures, functions and roles of apical *vs* lateral meristems in monocot and dicot plant growth.	K1& K2
CO2	Study the function and organization of woody stems derived from secondary growth in dicot and monocot plants.	K1& K4
CO3	Apply their idea on sectioning and dissection of plants to demonstrate various stages of plant development.	K2
CO4	Understand the various concepts of plant development and reproduction.	K3
CO5	Profitably manipulate the process of reproduction in plants with a professional and entrepreneurial mindset.	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. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms (6th revised and enlarged edition). Vikas Publishing House, New Delhi.
2. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi.
3. Sharma, P.C. 2017. Text Book of Plant Anatomy. Arjun Publishing House, New Delhi.

4. Pandey.S.N and Ajanta Chandha. 2006. Plant Anatomy and Embryology. Vikas Publishinf House Pvt. Ltd, New Delhi.
5. Narayanaswamy, S. 1994. Plant Cell and Tissue Culture. Tata McGraw Hill Ltd. New Delhi.

Reference Books:

1. Krishnamurthy, K.V. 1988. Methods in Plant Histochemistry. S. Viswanathan & Co., Madras.
2. Swamy, B.G.L and Krishnamurthy. K.V 1990. From flower to fruits, Tata – McGraw Hill publishing Co Ltd, New Delhi.
3. Pullaiah, T., Lakshiminarayana, K and Hanumantha Rao, B. 2006. Text book of Embryology of Angiosperms. Regency Publications, New Delhi.
4. Bierhorst, D.W. 1971. Morphology of Vascular Plants. Macmillan publishers, New York.
5. Crang, R., Lyons-Sobaski, S and Wise, R. 2018. Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants. Springer International Publishing.
1. Cutler, D. F., Botha, T and Stevenson, D.W. 2008. Plant Anatomy: An Applied Approach. Blackwell Publishing, Malden, USA.
2. Eames, A.J and Mac Daniels, L.H. 2013. Introduction to Plant Anatomy, 3rd Edition. McGraw-Hill Inc., US.

Web resources:

1. https://www.ipni.org/
2. http://www.theplantlist.org/
3. https://faculty.etsu.edu/liuc/plant_anatomy_sites.htm
4. http://aryacollegeludhiana.in/E_BOOK/Botany/plant_anatomy.pdf
5. https://www.uou.ac.in/sites/default/files/slm/BSCBO-202.pdf
6. http://greenlab.cirad.fr/GLUVED/html/P1_Prelim/Bota/Bota_typo_014.html
7. https://www.askiitians.com/

Mapping with Programme Outcomes:

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

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