



University of Kerala

Discipline	BOTANY				
Course Code	UK3DSCBOT201				
Course Title	HISTOLOGY AND REPRODUCTIVE BOTANY				
Type of Course	DSC				
Semester	III				
Academic Level	200 - 299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	04	03 Hours	-	02 Hours	05 Hours
Pre-requisites	Basic understanding of plant biology at the higher secondary level.				
Course Summary	This course provides basic knowledge of plant internal architecture, cellular composition, and reproduction. This will also help them to understand how different plant tissue evolve and modify their structure and functions with respect to their environment.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	Introduction to tissues and tissue systems		07
	1	Introduction and scope of Plant Anatomy; Structure of Plant Cell and Cell wall, Cell wall organization – Primary and secondary wall, pits, plasmodesmata (Brief account).	
	2	Non-living inclusions of the cell -Reserve food (carbohydrates, proteins, fats,and oil) Secretory products (coloring matter,nectar), excretory products (nitrogenous and non-nitrogenous including resins, tannins, latex, essential oils, gums, and mineral crystals-cystolith, raphides.	
	3	Structure and functions of Meristematic tissues; Classification of meristems; Theories on Apical organization - Apical cell theory, Histoge theory, Tunica-Corpus theory, and Korper Kappe theory. Organization of shoot and root apex in dicots and monocots	
II	Permanent tissue system		06
	4	Permanent tissues – Definition, classification – simple, complex, and secretory tissues (glandular tissue, laticifers).	
	5	Tissue systems- Epidermal tissue system, Ground tissue system and vascular tissue systems. Different types of vascular arrangements-collateral, bicollateral, concentric, and radial.	
	6	Stomata – structure and functions, types- anomocytic, anisocytic, paracytic, diacytic, graminaceous.	
III	Primary and Secondary Structure		10
	7	Primary structure – Root, stem and leaf (Dicot & Monocot)	
	8	Cambium (structure and function),	

	9	Secondary Growth: Normal Secondary growth in stem and root. Periderm formation – phellum, phellogen and phelloderm; lenticels.	
	10	Wood anatomy: Hard wood, soft wood; Growth ring, Ring porous and diffuse-porous wood; Sapwood and heartwood, Tyloses.	
	11	Anomalous secondary growth – Bignonia, Boerhaavia, Dracaena	
	Reproductive Botany		
IV	12	Flower- as a reproductive organ, floral components, and their roles	07
	13	Microsporangium: Structure of anther, microsporogenesis, Male gametogenesis. Pollen structure-wall layers, aperture, NPC system of classification, pollen allergy (Only Brief account)	
	14	Megasporangium: types of ovules; Megasporogenesis – female gametophyte – structure of a typical embryo sac, types of embryo sacs, monosporic - Polygonum type, bisporic–Allium type and tetrasporic- Fritillaria type. Pollination- Types, agents of pollination, (Only Brief account)	
	15	Double fertilization; Endosperm: types – Cellular, Nuclear, and Helobial. Embryogeny- Structure of dicot and monocot embryo; seed formation. Polyembryony.	
	Comparative Plant Anatomy		
V	16	Evolutionary trends in plant anatomy - Nodal anatomy	15
	17	Anatomical adaptations of plants to different environments (Hydrophytes, Paracites, Xerophytes, Epiphytes)	
	18	Applications of anatomy in Plant systematics, Forensics, Pharmacognosy and Dendrochronology, Anatomic (Brief account)	

Practicals		
	<ol style="list-style-type: none"> 1. Non-living inclusions – Cystolith, Raphide, Sphaero- raphide (Druses). 2. Starch grains (Eccentric, Concentric, compound, Aleurone grains) 3. Simple permanent tissue- parenchyma, chlorenchyma, aerenchyma, collenchyma, sclerenchyma 4. Primary structure- Dicot stem- Centella/ Chromolaena 5. Monocot stem- Grass and Asparagus 6. Dicot root- Pea/ Limnanthemum, Monocot root- Colocasia or any other monocot root 7. Secondary structure – Stem (Normal type) – Vernonia. 8. Root (Normal type)- Carica papaya, Aerial root- Tinospora and Ficus 9. Epidermal structures- Stomata (Anomocytic, anisocytic, paracytic, diacytic) 10. Anomalous secondary thickening – Bignonia, Boerhaavia, Dracaena 11. Dissect a flower and document (photograph/illustration) 12. Identification of C.S of the anther. 13. Identification and documentation of anther dehiscence pattern in five locally available plants. 14. Dissection of dicot embryo, familiar with different types of ovules 	30

Suggested reading

1. Beck, C. B. (2010). An Introduction to Plant Structure and Development-Plant Anatomy for the Twenty-First Century. Cambridge University Press, ISBN: 9781139486361.

2. Bonham, D. (2018). Plant Anatomy. Larsen & Keller education, ISBN: 9781635496468
3. Crang, R., Lyons-Sobaski, S., & Wise, R. (2018). Plant Anatomy A Concept-Based Approach to the Structure of Seed Plants. Springer International Publishing, ISBN: 9783319773155.
4. Cutler, D. F., Botha, T., & Stevenson, D.W. (2009). Plant Anatomy: An Applied Approach, Wiley, ISBN: 9781444300468.
5. Esau, K. (2006). Anatomy of seed plants, 2nd Edition, Wiley India Pvt. Limited, ISBN: 9788126508204
6. Evert, R.F., Eichhorn, S.E. (2006). Esau's Plant Anatomy Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function, and Development, Wiley, ISBN: 9780470047378
7. Foster, A. S. (2015). Practical plant anatomy. Creative Media Partners, LLC, ISBN: 9781341784507
8. Jain, A.P., & J. K. Maheshwari J. K. (2001). Recent researches in plant anatomy and morphology, Scientific Publishers, ISBN: 9788172332693.
9. . Bhattacharya K., Majumdar M. R & Bhattacharya S. G. 2017. A text book of Palynology. New Central Book Agency (P) Ltd.
10. Johri B. M., Srivastava P. S. 2015. Reproductive Biology of Plants Springer - Verlag Berlin and Heidelberg GmbH & Co.
11. Ramawat K. G. Mérillon J. M and Shivanna K. R. 2014. Reproductive Biology of Plants. CRC Press.
12. Johri, B. M. 1984. Embryology of Angiosperms. Springer Verlag. Berlin.
13. Pandey, S. N. & Chadha, A. 2000. Embryology. Vikas Publishing House Pvt. Ltd. New Delhi.
14. Maheswari, P. 1980. Recent Advances in the Embryology of Angiosperms.

Web links

1. <https://www.encyclopedia.com/social-sciences/applied-and-social-sciences-magazines/plantanatomy>
2. <https://agriculturistmusa.com/plant-embryology/>
3. [http://www.ppup.ac.in/download/econtent/pdf/JNL%20College%20\(%20Pallavi%20for%20Botany%20B.Sc%20Part%20II\)%20Topic-Plant%20embryology%20part%201.pdf](http://www.ppup.ac.in/download/econtent/pdf/JNL%20College%20(%20Pallavi%20for%20Botany%20B.Sc%20Part%20II)%20Topic-Plant%20embryology%20part%201.pdf)
4. [https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_Biology_\(Kimball\)/16%3A_The_Anatomy_and_Physiology_of_Plants](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_Biology_(Kimball)/16%3A_The_Anatomy_and_Physiology_of_Plants)

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Students can understand the complexities of cell wall organization, microscopic and sub-microscopic	U	PSO-1,2

	structures		
CO-2	Students can distinguish various anatomical features of monocots and dicots (stem and root) with respect to permanent tissues and tissue systems	R, U	PSO-1,2
CO-3	Differentiate stelar patterns in the stem and root of vascular plants with normal and anomalous secondary growth	An	PSO-1,2
CO-4	Students should comprehend the processes involved in plant embryonic development, including fertilization, embryogenesis, and seed development.	C, E	PSO-2
CO-5	Students should be able to compare the embryonic development of different plant taxa	C	PSO-1,2
CO-6	Students should be able to apply their understanding of plant anatomy and embryology to address real-world problems in agriculture, horticulture, plant breeding, and conservation biology.	Ap	PSO-6,7

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Histology and Reproductive Botany

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	1	1,2	U	F, C	L, T	
2	2	1,2	R, U	F,C	L,T	P
3	3	1,2	An	F,C	L,T	P
4	4	2	C, E	F,C	L,T	P
5	5	1,2	C	p	L,T	
6	6	6,7	Ap	M	T	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓
CO 6			✓	