University of Kerala

Discipline	**BOTANY**				
Course Code	**UK2DSCBOT102**				
Course Title	**ANATOMY OF FLOWERING PLANTS**				
Type of Course	**DSC**				
Semester	**II**				
Academic Level	**100 - 199**				
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 tissues at the higher secondary level				
Course Summary	The course provides a foundational understanding of plant structure, from the cellular level to the organizational complexity of tissues and organs, and also provides students with a comprehensive understanding about wood formation.				

Detailed Syllabus:

Module	Unit	Content	Hrs.
I		**Objectives and scope of plant anatomy**	**05**
	1	Definition, objectives, and scope of plant anatomy; Fundamental parts of flowering plant (Brief account only).	
	2	Basic study requirements: Stains (Saffranin), mounting media (Water, Glycerol), and compound microscope (Brief account only).	
	3	Cell wall organization – Gross structure- Primary and secondary wall, pits- plasmodesmata; Cell wall material (cellulose, cutin, lignin, suberin).	
	4	Non- living inclusions of the cell - Reserve food (carbohydrates, proteins), Secretory products (enzymes, nectar), Excretory products -nitrogenous (alkaloids) and non-nitrogenous including gum, resin, essential oils, latex, and mineral crystals-(Cystolith, Raphides).	
II		**Plant Tissues**	**08**
	5	Tissues - Meristems: Definition, Classification based on origin, position, plane of cell division, and functions.	
	6	Apical meristem- Theories on the apical organization of shoot apex- Apical cell theory, Histogen theory, Tunica - Corpus theory. Theories on the organization of root apex- Apical cell theory, Histogen theory, and Korper-Kappe theory	
	7	Permanent tissues – Definition, classification – simple, complex, and secretory tissues (schizogenous- lysigenous cavities, glandular hairs, nectary, laticifers).	
III		**Tissue Systems**	**5**

	8	Tissue systems- Definition & Types - Epidermal tissue system, Ground tissue system, and Vascular tissue system; Stomata – structure and functions, types (anomocytic, anisocytic, paracytic, diacytic, graminaceous); Different types of vascular arrangements (Conjoint, radial, open, closed, collateral, bicollateral, concentric (amphivasal & Amphicribral).	
IV	**Internal structure of plant body -I**		
	9	Primary structure – Root, stem and leaf (Dicot & Monocot)	
	10	Secondary growth – Dicot root and stem; vascular cambium (structure, types, and function); growth rings; dendrochronology. Wood - heart wood and sap wood; hardwood and softwood; ring-porous wood and diffuse-porous wood; tyloses; periderm formation; Bark and lenticels.	**12**
	11	Adaptive (anomalous) secondary growth in stem–*Boerhaavia, Bignonia,*	
V	**Internal structure of plant body -II**		
	12	Anatomy of petiole; Abscission layer.	
	13	Nodal anatomy (brief account only).	**15**
	14	Role of cambium in wound healing and grafting.	
	15	Adaptive Anatomy:– Hydrophytes ,Xerophytes, Epiphytes.	

Practicals		
	1. Observe and record: Non-living inclusions -Cystolith, Raphide; Starch grains - eccentric, concentric, compound; Aleurone grains. 2. Observe and record: Simple permanent tissues- parenchyma, chlorenchyma, aerenchyma, collenchyma, sclerenchyma. 3. Make micro preparation : 4. Study of stomata through peal method: types of stomata -anomocytic, anisocytic, paracytic, diacytic. *5.* primary structure: Root: monocot (*Colocasia),* dicot (Pea /*Limnanthemum*)*;* Stem: Dicot - *(Centella*), Monocot - Grass; Leaf- Dicot (Ixora); monocot (grass). *6.* secondary structure - Stem (Normal type) – *Vernonia,* Root – *Tinospora / Papaya* . *7.* Anomalous secondary thickening of Stem - *Boerhaavia, Bignonia.* 8. Adaptive anatomy: xerophytes (*Nerium*-leaf), hydrophytes (Hydrilla - stem), epiphytes (*Vanda* -velamen root).	**30**

Suggested reading

1. Bhattacharya H., Ghosh. 2017. A Textbook of Botany, Vol I – IV, NCBA, Kolkata
2. Dickison, W.C. 2000. Integrative Plant Anatomy. Harcourt Academic Press, USA.
3. Evert, R.F. 2006. Esau's Plant Anatomy: Meristems, Cells, and Tissues of the
4. Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc Fahn,
5. Mauseth, J.D. 1988. Plant Anatomy. The Benjammin/Cummings Publisher, USA.

Reference

1. Mitra, J.N. D. Mitra, D., S.K. Chowdhuri, S.K. 2017. Studies in Botany. Vol. 1 and 2, Moulik Library, Kolkata.
2. Pandey, B.P. 2001. Plant Anatomy, S. Chand Publishing, New Delhi.
3. Vasistha, P.C. 2000. Plant Anatomy, Pradeep Publications, Jalandha..

Web links

1. https://www.encyclopedia.com/social-sciences/applied-and-social-sciences-magazines/plant-anatomy.
2. 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	Understand the basic concepts, fundamentals, and scope of plant anatomy	U	PSO-2
CO-2	Develop a critical understanding of the concept of organization of shoot and root apex.	R, U	PSO-2,4
CO - 3	Develop skills for microscopic specimen preparation and examine the internal anatomy of plant systems and organs	U,An	PSO-2,4
CO - 4	Understand the composition, internal structure & architecture of plants	R, U, An,	PSO-4
CO - 5	Understand, analyse, and identify the modification of internal structure with respect to environmental adaptations	U, An	PSO-4,7

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

Name of the Course : Anatomy of Flowering plants:

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

CO No	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	1	2	U	F, C	L,T	
2	2	2,4	R, U	F, C	L,T	
3	3	2,4	U, An	F, C, P		P

4	4	4	R, U, An	C, P		P
5	5	4,7	U, An	C, P		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		✓	✓	✓