



VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

JNANASAGARA CAMPUS, BALLARI-583105

**Department of Studies in
Botany**

III Semester Syllabus

Bachelor of Science

With effect from 2021-22 and onwards

**Course Wise Content Details for B.Sc. Botany Programme
Semester-III
DSC-3 PLANT ANATOMY AND DEVELOPMENTAL BIOLOGY**

Course: Plant Anatomy and Developmental Biology	Course code: 21BSC3C3BOL
L-T-P per week: 4-0-0	No of credits: 04
Internal Assessment: 40 marks	Semester end Examination: 60 marks
Total contact hours: 56 hrs	

COURSE OUTCOMES:

On completion of this course, the students will be able to:

1. Observation of variations that exist in the internal structure of various parts of a plant and as well as among different plant groups in support of the evolutionary concept.
2. Skill development for the proper description of internal structure using botanical terms, their identification, and further classification.
3. Induction of the enthusiasm on the internal structure of locally available plants.
4. Understanding various levels of organization in a plant body with an outlook in the relationship between the structure and function through comparative studies.
5. Observation and classification of the floral variations from the premises of the college and house.
6. Understanding the various reproductive methods sub-stages in the life cycle of plants
7. Observation and classification of the embryological variations in angiosperms.
8. Enthusiasm to understand evolution based on the variations in reproduction among plants.

UNITS	COURSE CONTENT	Hrs
	ANATOMY	
Unit-1	<p>ANGIOSPERM ANATOMY, PLANT CELL STRUCTURE AND TISSUES</p> <p>Introduction, objective and scope of Plant Anatomy, Plant cell structure – nature of plant cell wall.</p> <p><i>Tissue and tissue systems</i> - meristematic tissue, permanent tissue and secretory cells.</p> <p>Classification of meristem: (apical, intercalary and lateral), primary and secondary meristem.</p> <p><i>Apical meristem:</i> Theories on organization of meristem (apical cell theory, Tunica-Corpus theory, histogen theory and Korper-Kappe theory), quiescent centre, Root cap.</p> <p>Evolution and concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory continuing meristematic residue, cytohistological zonation).</p>	12 hrs

Unit-2	<p>MORPHOGENESIS AND DIFFERENTIATION</p> <p>Morphogenesis in plants - Differentiation of root, stems and leaf. Types of vascular bundles and Vascular cambium, Origin, development, arrangement and diversity in size and shape of leaves.</p> <p>Structure of Dicot root: primary and secondary structures (Tridax/Sunflower), Structure of monocot root (Maize).</p> <p>Structure of Dicot stem: Primary and secondary structures (Tridax/Sunflower), Structure of Monocot stem (Maize), Nodal anatomy.</p> <p>Structure of Dicot leaf: primary structure (Tridax/Sunflower), primary structure of Monocot leaf (Maize), Stomatal types. Anomalous secondary growth: Bougainvillea, Boerhaavia (dicot stem) Dracaena (monocot stem)</p> <p>Applications in systematics, forensics and Pharmacognosy.</p>	12 hrs
DEVELOPMENTAL BIOLOGY		
Unit-3	<p>Morphogenesis and Differentiation</p> <p>Shoot Apical meristem (SAM): Origin, structure and function, Cytohistological zonation and Ultrastructure of meristems. Organogenesis: Differentiation of root, stem, leaf and axillary buds, bud dormancy</p> <p>Mechanism of leaf primordium initiation, development and Phyllotaxis (Diversity in size and shape of leaves)</p> <p>Structure and function of root apical meristem (RAM): Root cap, quiescent centre and origin of lateral roots.</p> <p>Transition from vegetative apex into reproductive apex</p>	12 hrs
REPRODUCTIVE BIOLOGY		
Unit-4	<p>Introduction, Scope and contributions of Indian embryologists: P. Maheswari, B G L Swamy, P.Maheshwari, M.S. Swaminathan and K.C. Mehta.</p> <p>Microsporangium: Development and structure of mature anther, Anther wall layers, Tapetum -types, structure and functions and sprogenous tissue.</p> <p>Microsporogenesis - Microspore mother cells, microspore tetrads, Pollinia.</p> <p>Microgametogenesis – Formation of vegetative and generative cells, structure of male gametophyte. Pollen embryosac (Nemec phenomenon).</p>	10 hrs
Unit-5	<p>Megasporangium – Structure of typical Angiosperm ovule.Types of ovule-Anatropous, Orthotropous, Amphitropous, Circinotropous. Megagametogenesis – Types of development of Female gametophyte/embryosac- monosporic- <i>Polygonum</i> type, bisporic – <i>Allium</i> type, tetrasporic - <i>Fritillaria</i> type. Structure of mature embryosac.</p> <p>Pollination and fertilization: Structural and functional aspects of pollen, stigma and style. Post pollination events; Current aspects of fertilization and Significance of double fertilization, Post fertilization changes.</p>	10 hrs

<p>Endosperm – Types and its biological importance. Free nuclear (<i>Cocos nucifera</i>) cellular (<i>Cucumis</i>), helobial types. Ruminant endosperm.</p> <p>Embryogenesis – Structure and composition of zygote, Dicot (<i>Capsella bursa-pastoris</i>) and Monocot (<i>Najas</i>) embryo development. A general account of seed development.</p>	
--	--

B.Sc. Hons Botany III Semester

Course: Plant Anatomy and Developmental Biology	Course code: 21BSC3C3BOP
L-T-P per week: 0-0-4	No of credits: 02
Internal Assessments: 25 marks	Semester end examination: 25 marks
Total contact hours: 52 hrs	

Practical No.	EXPERIMENTS
01	i) Study of the meristem (Permanent slides/ Photographs). ii) Study of Simple Tissues (Parenchyma, Collenchyma, and Sclerenchyma) and Complex Tissues (xylem and phloem).
02	Study of the primary structure of dicot root, stem, and leaf (Sunflower) and monocot root, stem, and leaf (Maize)
03	Study of Normal secondary growth structure in dicot stem and root (Sunflower) and Anomalous secondary growth: <i>Bougainvillea</i> , <i>Boerhaavia</i> (dicot stem) <i>Dracaena</i> (monocot stem)
04	Study of trichomes (any three types) and stomata (any three types) with the help of locally available plant materials
05	Permanent slides of Microsporogenesis and male gametophyte Mounting of Pollen grains of <i>Vinca rosea</i> and Hibiscus and Pollinia of Calotropis
06	Pollen germination (hanging drop method)/Pollen viability test.
07	Permanent slides of types of ovules, Megasporogenesis & embryo-sac development, and types of placentation: Axile, Marginal and Parietal types. Sectioning of the ovary, for the studied types of placentation
08	Mounting of the embryo: Chilli/Mustard, Mounting of endosperm: Cucumis/Croton
09	Study of histochemical localization of proteins/ carbohydrates
10 & 11	Mini project work in groups of 3-5 students, from the following list a) Study of pollen morphology of different flowers with respect to shape, color, aperture etc. b) Pollen germination of different pollen grains and calculates the percentage of germination. c) Calculating the percentage of germination of one particular type of pollen grain collected from different localities/ under different conditions. d) Study of placentation of different flowers.

e) Any other relevant study related to Anatomy / Embryology.
--

Text Books for Reference:

1. Bhojwani and Bhatnagar, Introduction to Embryology of Angiosperms –Oxford & IBH, Delhi
2. Bhojwani Sant Saran, 2014.Current Trends in the Embryology of Angiosperms, Woong-Young Soh, Springer Netherlands,
3. Coutler E. G. , 1969. Plant Anatomy – Part I Cells and Tissues – Edward Arnold, London.
4. Dickison, W.C. (2000). Integrative Plant Anatomy, Harcourt Academic Press, USA
5. Eames A. J. - Morphology of Angiosperms - Mc Graw Hill, New York.
6. Esau, K. 1990. Plant Anatomy, Wiley Eastern Pvt Ltd New Delhi
7. Evert, R.F. (2006) Esau's Plant Anatomy: Meristem, Cells, and Tissues of the Plant Body: Their Structure, Function and Development. John Wiley and Sons, Inc
8. Fahn, A.1992. Plant Anatomy, Pergamon Press, USA
9. Johri, B.M. I., 1984.Embryology of Angiosperms, Springer-Verlag, Netherlands.
10. Karp G., 1985. Cell Biology; Mc.Graw Hill Company
11. Maheshwari,P 1950. An introduction to the embryology of angiosperms. New York: McGraw-Hill
12. Mauseth, J.D. (1988). Plant Anatomy, the Benjammin/Cummings Publisher, USA.
13. Nair P .K .K - Pollen Morphology of Angiosperms - Scholar Publishing House, Lucknow
14. Pandey S.N. 1997, Plant Anatomy and Embryology .A. Chadha, Vikas Publication House Pvt Ltd;
15. Pandey, B. P., 1997. Plant Anatomy, S.Chand and Co. New Delhi
16. Raghavan, V., 2000. Developmental Biology of Flowering plants, Springer, Netherlands.
17. Saxena M. R. – Palynology – A treatise - Oxford & I. B .H., New Delhi.
18. Shivanna, K.R., 2003. Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt.Ltd. Delhi.
19. Vashishta .P.C .,1984. Plant Anatomy – Pradeep Publications – Jalandhar
20. Vashishta, P.C. 1997. Plant Anatomy, Pradeep Publications