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RAICHUR UNIVERSITY

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ADIKAVI SRI MAHARSHI VALMIKI UNIVERSITY, RAICHUR

Under Graduate Curriculum for Degree of Bachelor of Science (B.Sc.) in Botany

(III & IV Semester)

As per Revised NEP
With Effect from the Academic year from 2025-26 and onwards

B.Sc. Semester–III

Discipline Specific Course (DSC)

SEMESTER III

CORE COURSE: BOTANY PAPER -

Course Title: - PLANT ANATOMY AND EMBIOLOGY

Course Code: BSBOT 03

(Credits: Theory-4, Practicals-2)

THEORY

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC- 03	**Theory**	**04**	**04**	**64hrs.**	**3hrs.**	**20**	**80**	**100**

Course No	Title of the Course	No. Of Credit	Teaching Hours/Per Week	Formative Assessment	Summative Assessment	Total Marks
DSC-BOT-3.1 T	**PLANT ANATOMY AND** EMBRYOLOGY	04	04	20	80	100

Programme Name	B.Sc. in Botany	**Semester**	III
Course Title	**PLANT ANATOMY AND DEVELOPMENTAL BIOLOGY**		
Course Code	DSC-BOT-3.1 T	**No. Of Credits**	4
Contact Hours	4 hrs/Week	**Duration of SEA/Exam**	3 Hrs
Formative Assessment	20	**Summative Assessment Marks**	80

Course Outcomes (COs): At the end of the course students will able to:

CO1: Observation of variations that exist in internal structure of various parts of a plant and as well as among different plant groups in support for the evolutionary concept.

CO2: Skill development for the proper description of internal structure using botanical terms, their identification and further classification.

CO3: Induction of the enthusiasm on internal structure of locally available plants.

CO4: Understanding various levels of organization in a plant body with an outlook in the relationship between the structure and function through comparative studies.

CO5: Understanding the various reproductive methods sub-stages in the life cycle of plants.

CO6: Observation and classification of the embryological variations in angiosperms.

CO7: Enthusiasm to understand evolution based on the variations in reproduction among plants.

Unit	Titles	60hrs/sem
Unit I	**Angiosperm Anatomy, Plant Cell Structure and Tissues:** Introduction, objectives and scope of Plant Anatomy, Plant cell structure– nature of plant cell wall. Contribution of Indian anatomist ***Tissue and tissue systems*** – apical meristematic tissue. Theories on organization of meristem (apical cell theory, Tunica-Corpus theory, histogen theory and Korper-Kappe theory), quiescent centre. Permanent tissue (Parenchyma, Collenchyma, Sclerenchyma, and Complex tissues). ***Tissue system*** :Epidermal tissue, Ground tissue, Vascular tissue, Secretary tissue and Mechanical tissue system. Stomatal types.	16hrs
Unit II	**Primary Structures, Normal and Anomalous Secondary Growth** Types of vascular bundles and Vascular cambium, Origin, development. Primary Structures -Structure of Dicot root, and stem: (Tridax/Sunflower), - Monocot root, and Stem (Maize). Structure of Dicot and Monocot leaf (Tridax/Sunflower, Maize).	16hrs

	Normal secondary growth in dicot stem and root. Anomalous secondary growth: Aristolochia, Boerhaavia (dicot stem) Dracaena (monocot stem) Applications in systematics, forensics and Pharmacognosy.	
Unit III	**Embriology** Differentiation and cell polarity in acellular (*Dictyostelium*), Unicellular (*Equisetum spore*) and multi cellular system (root hair formation). Shoot Apical meristem: Origin, structure and function. Ultrastructure of meristem tissue. Organogenesis: Differentiation of root, stem, leaf and axillary buds, bud dormancy. Mechanism of leaf primordium initiation, development and Phyllotaxis. Transition from vegetative apex in to reproductive apex. Developmental patterns at flowering apex: ABC model specification of floral organs. Modification of gene action by growth hormones and cellular differences between floral organs. Senescence – a general account.	16hrs
Unit IV	**Reproductive Biology** Introduction, Scope and contributions of Indian embryologists: P. Maheshwari, BGL Swamy and M.S. Swaminathan. **Microsporangium**: Development and structure of mature anther, Anther wall layers, Tapetum -types, structure and functions. **Microsporogenesis** – Male Gametophyte: Microspore mother cells, microspore tetrads, Pollinia / pollinarium. **Microgametogenesis**–Formation of vegetative and generative cells, structure of male gametophyte. Pollen embryosac (Nemec phenomenon). **Megasporangium**– Structure of typical Angiosperm ovule. Types of ovules- Anatropous, Orthotropous, Amphitropous and Circinotropous. **Megasporogenesis** **Female Gametophyte** – Embryosac- monosporic- *Polygonum* type, bisporic– *Allium* type, tetrasporic - *Fritillaria* type. Structure of mature embryosac. **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. **Endosperm** – Types and its biological importance. Free nuclear (*Cocos nucifera*), cellular (*Cucumis),* helobial types. (Ruminate endosperm example Alisma.) **Embryogenesis**–Structure and composition of zygote, Dicot (*Capsellabursa-Pastoris)* and Monocot (*Najas)* embryo development. A general account of seed development.	16hrs

Recommended books:

1. Bhojwani and Bhatnagar- 'Introduction to Embryology of Angiosperms' – Oxford & IBH, Delhi
2. Bhojwani SantSaran, 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 – McGraw Hill, NewYork.
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.l., 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. NewYork: McGraw-Hill
12. Mauseth, J.D. 1988. PlantAnatomy, the Benjammin / Cummings Publisher, USA.
13. Nair P.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 –Atreatise- 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.

FormativeAssessment forTheory	
AssessmentOccasion/type	**Marks**
Internal Assessment Test 1	05
Internal Assessment Test 2	05
Assignment	10
Total	**20Marks**
Formative Assessment as per guidelines.	

B.Sc.Semester–III

Discipline Specific Course (DSC)

Course Title: PLANT ANATOMY AND EMBRYOLOGY

Course Code: BSBOT 03

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Durationof Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC-3	**Practical**	**02**	**04**	**64 hrs.**	**3hrs.**	**10**	**40**	**50**

Course No	Title of the Course	No. Of Credit	Teaching Hours/Per Week	Formative Assessment	Summative Assessment	Total Marks
DSC-BOT-3.2 P	**PLANT ANATOMY AND ~~DEVELOPMENTAL BIOLOGY~~** EMBRYOLOGY	02	04	10	40	50

Practical

List of the Experiments, each will have 4rs/Week (Minimum12 experiments)

1: Study of meristem (Permanent slides/ Photographs).

2. Study of Simple Tissues (Parenchyma, Collenchyma and Sclerenchyma) and Complex Tissues (Xylem and Phloem).

3: Maceration technique to study elements of xylem fibres, Study of primary structure of dicot root, stem and leaf (Sunflower) and monocot root, stem and leaf (Maize).

4: Study of Normal secondary growth structure in dicot stem and root (Sunflower) and Anomalous secondary growth: *Aristolochia, Boerhaavia* (dicot stem) *Dracaena* (monocot stem).

5: Study of trichomes (any three types) and stomata (any three types) with the help of locally available plant materials.

6: Permanent slides of Microsporogenesis and male gametophyte.

7.Mounting of Pollen grains of Grass and Hibiscus and Pollinia of *Calotropis*.

8: Preparation of Brewbaker and Kwack Media

9. Pollen germination (hanging drop method) and Effect of Boron and Calcium on pollen germination.

10: Permanent slides/photographs of types of ovules, Megasporogenesis & embryosac development.

11. Placentation: Axile, Marginal and Parietal types.

12: Mounting-of -embryo:Tridax and Chilli, Mounting of endosperm: Cucumis/Crotalaria

Formative Assessment for Theory	
Assessment Occasion/Type	**Marks**
Session Test	10
Seminar/Group Discussion	5
Assignment/Field work/Minor project	5
Total	**20**

Formative Assessment for Practical	
Assessment Occasion/Type	**Marks**
Session Test	6
Practical Record	2
Assignment/Tour Report/Field Studies	2
Total	**10**

SEMESTER III

CORECOURSE: BOTANY PAPER-

DSC-BOT-3.1: PLANT ANATOMY AND EMBRYOLOGY

THEORY

Time: 3 Hours Max.Marks:80

Q.I. Answer all of the following questions 10x2=20Marks

1
2
3
4
5
6
7
8
9
10

Q.II. Write critical note on any **SIX** of the following 6x05=30Marks

11
12
13
14
15
16
17
18

Q. III. Answer any **THREE** of the following 3x10=30Marks

19
a.
b.

20
a.
b.

21
a.
b.

22
a
b

Scheme of Practical Examination (Distribution of Marks): 40 Marks for semester end Examination

SEMESTER III

CORE COURSE: BOTANY PRACTICAL-

DSC-BOT-3.2 P: PLANT ANATOMY AND EMBRYOLOGY

Time: 03Hours Max. Marks: 40

Q No. 1. Identify and describe the anatomical features of given material A	05Marks
Q No. 2. Conduct the pollen germination test for given material B and calculate the percentage of pollen germination	05Marks
Q NO. 3. Mount or expose from the given material C _____	05Marks
Q NO. 4. Mount embryo /endosperm from given specimen D	05Marks
Q NO. 5. Identify with reasons with given slide/specimen/photograph E, F, G and H	10 Marks
Viva voce	05 Marks
Practical Record/ submission	05 Marks

Note: The same scheme may be used for IA (Formative assessment) Examination.

General instruction to examiners:

1. Give specimen for anomalous secondary growth–A
2. Give flower buds for pollen germination –B
3. Give specimen for tylosis, epidermal out growths, simple tissues, complex tissues–C
4. Give specimen for embryo /endosperm mounting–D
5. Spotting 2 slides /specimen from anatomy and 2 slides /specimen developmental biology– E, F, G and H.
6. Viva voce based on theory
7. Practical Record.

SEMESTER SCHEME OF EVALUATION

Q1 A- Identification	1Mark
Slide Preparation	2Marks
Labelled diagram	2Marks
Reasons	3Marks
Q2-B Mounting	2 Marks
Labeled diagram	2Marks
Q3-C Mounting	4 Marks
Labelled diagram	1 Marks
Q4 D- Identification	1Mark
Slide preparation	2Marks
Sketch and Label	2Marks
Q5 E,F,G – Identification	1Mark
Reasons	1.5 Mark