



SRI VENKATESWARA UNIVERSITY, TIRUPATHI

4-Year UG Honours in B.Sc.BOTANY: Major in Consonance with Curriculum Frame work w.e.f AY 2025-26

II Semester

COURSES TRUCTURE

SEMESTER-II

Year	Semester	Course	Title	No.Hrs./ Week	No. of Credits
I	II	1	Diversity of Archegoniates	3	3
			Diversity of Archegoniates-Practical	2	1
		2	Anatomy and Embryology of Angiosperms	3	3
			Anatomy and Embryology of Angiosperms-Practical	2	1

Signatures of the Board of Studies members

Sl No.	Designation	Name	Signature
1	BOS Chairman	Dr Mohano Behera, Department of Botany, Govt. Degree College, Pakala	
2	Member	Dr L. Md. Bakshu, Department of Botany, Dr YSR Govt. Degree College, Veduru Kuppam	
3	Member	Dr M. Hemalatha, Department of Botany, SVCR Govt. Degree College, Palamaner	
4	Member	Dr A. Sasikala, Department of Botany, SVCR Govt. Degree College, Palamaner	
5	Member	Smt. S. Padmavathi, Department of Botany, Govt. Degree College, Puttur	
6	Member	Dr P. Sujana, Department of Botany, Govt. Degree College, Puttur	

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COURSE4:ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Theory

Credits:3

3 hrs/week

I. Learning Objectives: By the end of this course the learner has to:

1. Deliberate about various types of tissues in plants and their organization.
2. Explain anomalous secondary growth in plants and economic value of woods.
3. Debate on structure of anther and development of male gametophyte in plants.
4. Discuss the structure of ovules and process of fertilization.
5. Explain the embryo development and seed structure in monocots and dicots.

II. Course Outcomes: On completion of this course students will be able to:

1. Categorize various tissues and evaluate their role in plants.
2. Explain anomalous secondary growth in some plants and justify the value of timber plants.
3. Summarize the events in micro sporogenesis and development of male gametophyte.
4. Illustrate the events in mega sporogenesis and development of female gametophyte.
5. Propose the incidents in embryogenesis and structure of seeds in angiosperms.

III. Syllabus of Theory:

Unit-1: Tissues in plants

8 Hrs.

1. Meristematic tissues: Definition, classification, structure and functions.
2. Apical meristems: Generalized structure of shoot apex, theories on organization of Shoot Apical Meristem (SAM)-Apical cell theory, Tunica-Corpus theory and Histogen theory.
3. Permanent tissues (simple and complex); a brief account of plant secretory tissues/cells.

Unit-2: Anomalous growth in plants

10 Hrs.

1. Tissue systems—Epidermal, ground and vascular.
2. Anomalous secondary growth in root of *Beta vulgaris*; anomalous secondary growth in stems of *Boerhaavia* and *Dracaena*
3. Study of timbers of economic importance-Teak, Red-sanders and Rose wood; applications of anatomy forensics and pharmacognosy.



Unit-3: Anther and Pollen

10 Hrs.

1. Anther: Structure and functions of anther wall, micro-sporogenesis.
2. Pollen wall structure, NPC system; development of male gametophyte, MGU (male germ unit).
3. Pollen wall proteins; pollen viability storage and germination; abnormal features: Pseudomonads and polyads; Nemec phenomenon.
4. A brief account of palynology and its scope.

Unit-4: Ovules, fertilization and endosperm

10 Hrs.

1. Structure and types of ovules, mega sporogenesis; monosporic (*Polygonum*), bisporic(*Allium*) and tetrasporic (*Peperomia*) types of embryo sacs.
2. Pollination: types of self and cross pollination—contrivances; agents of pollination.
3. Double fertilization in angiosperms—process and consequences.
4. Perisperm; endosperm—types (free nuclear, cellular, helobial and ruminant) and biological importance.

Unit-5: Embryogeny and seeds

7 Hrs.

1. Embryo development in dicot (*Capsella bursa-pastoris*) and monocot (*Sagittaria sagittifolia*) plants.
2. Seed structure in monocot and dicot; importance of seed and seed dispersal mechanisms.
3. Polyembryony and apomixes: Introduction, classification, causes and applications.

IV. Text Books:

1. Pandey, B.P. (2013) College Botany, Volumes-II&III, S.Chand Publishing, New Delhi
2. Bhattacharya, K., G. Hait & Ghosh, A.K., (2011) A Text Book of Botany, Volume-II, New Central Book Agency Pvt. Ltd., Kolkata

V. Reference Books:

1. Esau, K. (1971) Anatomy of Seed Plants. John Wiley and Son, USA.
2. Fahn, A. (1990) Plant Anatomy, Pergamon Press, Oxford.
3. Cutler, D.F., T. Botha & D. Wm. Stevenson (2008) Plant Anatomy: An Applied Approach, Wiley, USA



4. Paula Rudall(1987)Anatomy of Flowering Plants: An Introduction to Structure and Development. Cambridge University Press, London
5. Bhojwani, S.S.andS.P.Bhatnagar (2000) The Embryology of Angiosperms (4thEd.),Vikas Publishing House, Delhi.
6. Pandey,A.K.(2000)Introduction to Embryology of Angiosperms CBS Publishers& Distributors Pvt. Ltd., New Delhi
7. Maheswari, P.(1971)An Introduction to Embryology of Angiosperms. McGraw Hill Book Co., London.
8. Johri,B.M.(2011)Embryology of Angiosperms.Springer-Verlag,Berlin

VI. Suggested activities and evaluation methods:

Unit-1: Activity: Microscopic observations on different tissues in plants and recording characteristics.

Evaluation method: Judgement of the report/seminar on comparative and contrasting features of various tissues in plants.

Unit-2: Activity: Visits to timber depots and furniture shops and making a report on various woods.

Evaluation method: Assessment of report submitted with data, photographs and summary.

Unit-3: Activity: Study of pollen structure, germination and viability in some local plant species.

Evaluation method: Evaluating the report/seminar presentation with collected data.

Unit-4: Activity: Group discussion/quiz on endosperm types and functions. Evaluation method: Assessment of the best performing group.

Unit-5: Activity: Drawings of embryogeny in some angiosperms and making comparative report.

Evaluation method: Evaluating the best drawings and comparative report.



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II Semester

COURSE- 4: ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Practical

Credits:1

2 hrs/week

- I. Course Outcomes:** On successful completion of this practical course, student shall be able to:
1. Conduct dissections of various plant organs and study the internal structures by staining.
 2. Explain the embryological characteristics from sex organs to seeds in angiosperms.
 3. Demonstrate skills in studying anatomical and embryological features of angiosperms.

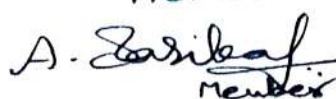
II. Laboratory/field exercises:

1. Observation of meristems in dicot and monocot plants.
2. Tissue organization in shoot apices using permanent slides.
3. Anomalous secondary growth in root of *Beta vulgaris*
4. Anomalous secondary growth in stems of *Boerhaavia* and *Dracaena*.
5. Study of anther and ovules using permanent slides/photographs.
6. Study of pollen germination and pollen viability.
7. Dissection and observation of embryo sac haustoria in *Santalum* or *Argemone*.
8. Structure of endosperm (nuclear and cellular) using permanent slides/photographs.
9. Dissection and observation of endosperm haustoria in *Crotalaria* or *Coccinia*.
10. Developmental stages of dicot and monocot embryos using permanent slides/photographs.


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II Semester

Course 4: Anatomy and Embryology of Angiosperms

Suggested Model Paper for Practical Examination

Max Time: 3 Hrs

Max. Marks: 50

1. Take the T.S. of the given material 'A' (**Anatomy**), prepare a temporary mount, and write comments on its identification. 15M
2. Write the procedure for the experiment 'B' (**Embryology**) and demonstrate the same. 10 M
3. Identify the following with specific reasons (Spotters) 5 X 3 = 15 M
 - C. Meristem / Shoot apices
 - D. Anther / Ovule
 - E. Endosperm
 - F. Haustoria
 - G. Embryo sac
4. Record 7 M
5. Viva-voce 3 M

Key;

- A. T.S of stem of *Boerhaavia* / *Dracaena*
- B. Study of pollen germination and pollen viability
- C: Meristem /Shoot apices
- D: Study of anther / ovules
- E: Structure of endosperm (nuclear / cellular)
- F: Embryo sac haustoria / Endosperm haustoria
- G: Study of Dicot Embryo Sac / Monocot Embryo sac


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Model question paper- Semester: II

Subject: BOTANY Major

Single major program wef: 2025- 26

COURSE4:ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Max. time: 3 hrs

Max. marks: 75

Section: A

**Answer any 5 of the following 10 questions. Each question carries 3 marks
(2 questions should be given from each unit) 5 QX 3 M = 15 M**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Section: B

Answer 5 of the following 10 questions following internal choice. Each question carries 12 marks (2 questions should be given from each unit) 5 QX 12 M = 60 M

Two questions (a,b) will be given from each unit in the syllabus, providing internal choice (a or b) within each unit. Students must answer a total of five questions, selecting one question from each unit.

11. Questions 11 & 12 from unit 1. One should be answered.
- 12.
13. Question 13 & 14 from unit 2. One should be answered
- 14.
15. Question 15 & 16 from unit 3. One should be answered
- 16.
17. Question 17 & 18 from unit 4. One should be answered
- 18.
19. Question 19 & 20 from unit 5. One should be answered
- 20.

Note: Questions should be framed to test the students' understanding, analytical, and creative skills. All questions must be set strictly within the prescribed syllabus framework.

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