

Course Code	Course Name	Credits
26BY004	PLANT ANATOMY, EMBRYOLOGY AND MICROTECHNIQUE	04

Course Objectives

- To understand the internal structure of plant tissues and organs.
- To distinguish normal and abnormal secondary growth in plants.
- To learn basic plant development and reproduction.
- To understand how gametophytes and seeds are formed in angiosperms.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Understand the anatomical features of stem, root, leaf and the reproductive structures in plants.
- Gain knowledge about the organization of plant tissues and their role and the processes in the development of embryogenesis in plants.
- Describe the anatomical organization of plant organs and explain the structure and function of different tissue systems.
- Explain key stages of plant embryology including microsporogenesis, megasporogenesis, fertilization, and embryo development.

Unit 1 - Plant tissues (12 Hrs.)

Classification, structure and functions of Meristematic, Permanent and Secretary Tissues. Shoots: theories on apical organisation (Apical cell theory, Histogen theory, Tunica-Corpus theory); Roots: Organization of root apex (Apical cell theory, Korpe-kappe theory); Tissue Systems-Epidermal System- Epidermis, Stomata and trichomes (uni- and multicellular, glandular and nonglandular). Fundamental Tissue System- Cortex, Endodermis, Pericycle and Pith. Types of Vascular bundles.

Unit 2 – Primary and secondary structure (12 Hrs.)

Primary structure of monocot and dicot Root, Stem and Leaf. Normal secondary thickening in dicot stem and root. Annual rings. Heartwood and sapwood. Anomalous secondary thickening in *Aristolochia*, *Boerhaavia*, and *Dracaena*.

Unit 3 – Embryology (12 Hrs.)

Structure and development of Anther, Microsporogenesis and Microgametogenesis. Structure of Pistil, Types of Ovules, Megagametogenesis and Female gametophyte Development (*Polygonum* Type).

Unit 4 – Pollination and fertilization (12 Hrs.)

Pollination and its types. Fertilization, Double fertilization, Post Fertilization Changes. Endosperm and embryo Development- Dicot (*Capsella*) and monocot (*Luzula*). Apomixis and Polyembryony.

Unit 5 – Microtechnique (12 Hrs.)

Introduction to microtechnique: Killing and fixing - purpose. Dehydration - purpose, agents used - ethyl alcohol. Sectioning: hand sections, serial section; Microtome - rotary, sledge (application only). Staining technique: Types of staining - single staining, double staining. Mounting and mounting media – purpose, mounting media - glycerine, DPX, Canada balsam; Maceration, smear and squash preparation.

Reference Books:

1. Eames AJ and Mc Daniels LH (1994) *An Introduction of Plant Anatomy*. Tata Mc. Graw Hill Company Limited.
2. Metcalf C R, Chalk L (1983) *Anatomy of the dicotyledons: Wood structure and conclusion of the general introduction*, Oxford University press
3. Fahn, A. (1974). *Plant Anatomy*. Pergmon Press, USA.
4. Pandey, S. N., & Chadha, A. (1996). *Plant Anatomy and Embryology*. New Delhi: Vikas Publishing House Pvt. Ltd.
5. Esau, K. (1977). *Anatomy of Seed Plants* (2nd ed.). New York: John Wiley & Sons.
6. Ragland, A. (2022). *Plant Anatomy and Microtechniques* (4th ed.). Nagercoil: Saras Publication.
7. Patki L R, B L Bhalchandra, I H Jeevaji, 1983. *An Introduction to microtechnique*. S Chand & Co.
8. Prasad M K, Krishna Prasad M, 1986. *Outlines of microtechnique*. Emkay Publishers, New Delhi