

Course Code	Course Name	Credits
26BY506	ADVANCED ANATOMY, EMBRYOLOGY AND DEVELOPMENTAL BIOLOGY	04

Course Objectives

- Explain the scope and significance of plant anatomy and development.
- Analyze secondary growth, cambial activity, wood formation and structural adaptations.
- Evaluate reproductive development in plants and special reproductive strategies.
- Assess the molecular and developmental mechanisms regulating plant growth, differentiation and flowering.

Learning Outcomes

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

- Describe plant tissues, meristem organization and primary growth and interpret the development of leaves, roots and vascular systems.
- Explain secondary growth processes, analyze cambial function and wood development and identify structural variations and secretory mechanisms in plants.
- Illustrate the development of male and female gametophytes and evaluate reproductive adaptations.
- Interpret developmental concepts and analyze the role of hormones and genetic networks in flowering and embryo development.

Unit 1 - Fundamentals of Plant Anatomy and Tissue Systems (12 Hrs.)

Scope and significance of plant anatomy, Meristematic tissues, Theories of apical meristems, Permanent tissues, Types of simple, complex and secretory tissues, Structure and function of epidermal tissue system, Types of stomata and trichomes, Ground or fundamental tissue system, Elements of vascular bundles, Types of vascular bundles.

Unit 2 - Organ Anatomy, Secondary Growth and Cambial Activity (12 Hrs.)

Anatomy of monocotyledonous and dicotyledonous stems, General account of leaf anatomy, Secondary growth in dicotyledonous stem and root, Anomalous secondary growth in dicot stem and roots, Anatomical features of floral parts, Nodal evolution, Leaf trace lacunae, Role and structure of the vascular cambium, Plant hormones and cambial activity.

Unit 3 - Reproductive Biology (12 Hrs.)

Development of female and male gametophyte, Pollination and fertilization, Self-incompatibility systems in flowering plants, Advantages and biological significance of incompatibility, Method to overcome incompatibility.

Unit 4 - Embryology, Seed Development and Special Reproductive (12 Hrs.)

Embryogenesis from zygote to seed in monocot and dicot, Embryo development and maturation, Patterning in plants, Endosperm structural, functional and evolutionary significance, Types of endosperm, Haustorial behavior of endosperm, Polyembryony, Apomixis and Parthenocarpy-types, causes and uses.

Unit 5 - Developmental Biology (12 Hrs.)

Terminologies used in developmental botany, Differentiation, De-differentiation, Cell fate and potency, Commitment, Determination, Induction, Competence, Specification and strategies of specification, Polarity, Developmental control genes in a model plant (*Arabidopsis*), Change from vegetative growth to reproductive growth, Floral quartet model, Targets of the floral organ identity genes, Genetic network of flowering control, Genes essential for embryo formation.

Reference Books:

1. Beck, C. B. (2005). An introduction to plant structure and development: Plant anatomy for the twenty-first century. Cambridge University Press.
2. Eames, A. J., & McDaniels, L. H. (1994). An introduction to plant anatomy. Tata McGraw-Hill.
3. Fahn, A. (1997). Plant anatomy. Aditya Publishers.
4. Pandey, S. N., & Chadha, A. (2023). Plant anatomy and embryology. Vikas Publishing.
5. Pua, E. C., & Davey, M. R. (Eds.). (2009). Plant developmental biology: Biotechnological perspectives (Vol. 1). Springer.
6. Smith, G. M. (2010). Developmental biology. Sinauer Associates.
7. Twyman, R. M. (2001). Instant notes in developmental biology. Taylor & Francis.