

Course Code	Course Name	Credits
26BY510	PTERIDOPHYTES, GYMNOSPERMS AND PALEOBOTANY	04

### Course Objectives

- Develop a comprehensive understanding of the diversity, origin and classification of Pteridophytes and Gymnosperms, including systems proposed by Reimer and Sporne.
- Analyze the morphology, anatomy, reproductive biology and evolutionary adaptations of major plant groups, including key processes such as stelar evolution, heterospory and seed habit origin.
- Interpret evolutionary relationships and phylogenetic trends among extinct and extant plant groups, including fossil gymnosperms and early vascular plants.
- Understand the principles of Paleobotany, including fossilization processes, geological time scale and the role of fossils in reconstructing plant evolution and paleoclimate.

### Learning Outcomes

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

- Classify and differentiate major groups of Pteridophytes and Gymnosperms based on morphological, anatomical and reproductive features.
- Explain key evolutionary concepts such as apogamy, apospory, heterospory and the origin of seed habit and relate them to plant adaptation and evolution.
- Critically evaluate the structure, development and evolutionary significance of reproductive structures such as sori, cones and gametophytes.
- Analyze fossil evidence to interpret plant evolution, geological timelines and applications in stratigraphy, coal formation and paleoclimate studies.

### Unit 1 – Introduction to Pteridophytes (12 Hrs.)

General features and origin of Pteridophytes. Classification of Pteridophytes (Reimer, 1954). Stelar evolution in pteridophytes, Apogamy and apospory; Heterospory and origin of seed habit. Structure, Development and evolution of sorus in filicales. Economic importance of Pteridophytes.

### Unit 2 – Morphology, Reproduction and Evolutionary Trends in Pteridophytes (12 Hrs.)

Range of morphology, structure, reproduction and evolution of gametophytes and sporophytes of the following orders: Rhyniales, Psilotales, Lycopodiales, Selaginellales, Isoetales and Equisetales, Ophioglossales, Marrattiales, Osmundales and Salviniiales.

### Unit 3 – Introduction to Gymnosperms (12 Hrs.)

The general characteristic features of Gymnosperms. Origin of Gymnosperms. Classification of Gymnosperms (Sporne, 1965). General structure and interrelationships of Pteridospermales, Bennetitiales, Pentoxylales and Cordaitales.

### Unit 4 – Morphology, Reproduction and Evolutionary Trends in Gymnosperms (12 Hrs.)

Gymnosperms: A general account on the distribution, morphology, reproduction and phylogeny of Cycadales, Coniferales, Ginkgoales, Ephedrales, Welwitschiales and Gnetales. Economic importance of Gymnosperms.

### Unit 5 – Paleobotany (12 Hrs.)

Concepts of Paleobotany, A general account on Geological Time Scale and plant evolution. Fossil types: Compressions, incrustation, casts, molds, petrifications, coalballs and compactions. Age determination and methods of study of fossils. Paloclimates and fossil plants. Applications in stratigraphy and coal formation, Paleopalynology.

### Reference Books:

1. Parihar, N. S.. (1985). The biology and morphology of pteridophytes. Allahabad, India: Central Book Depot.
2. Rashid, A.. (1986). An introduction to pteridophyta. New Delhi, India: Vani Educational Books.
3. Sharma, O. P.. (1990). Textbook of pteridophyta. India: Macmillan India Ltd.
4. Sporne, Kenneth R.. (1974). The morphology of gymnosperms. New Delhi, India: B.I. Publications.
5. Vashishta, P. C., et al. (2006). Botany for degree students: Gymnosperms. New Delhi, India: S. Chand & Co. Ltd.
6. Foster, A. S., & Gifford, Ernest M.. (1965). Morphology and evolution of vascular plants. San Francisco, CA: W.H. Freeman & Co.
7. Seward, A. C.. (1931). Plant life through the ages. London, UK: Cambridge University Press.
8. Shukla, A. C., & Mishra, S. P.. (1982). Essentials of paleobotany (2nd ed.). New Delhi, India: Vikas Publishing House Pvt. Ltd.