### Semester - VIII

# Course Title: Applied Pteridology and Gymnospermology

Assessment	
Maximum marks	100
Continuous Internal Assessment (CIA)	25
Mid Semester Exam (MSE)	25
End Semester Exam (ESE)	50
Passing Marks	50

**Course objectives:** The objective of the course is to give detailed knowledge of distribution, morphology, anatomy, cytology and reproductive biology of some important families of Pteridophytes and Gymnosperms. Students will also be acquainted with experimental studies in ferns and gymnosperms.

#### Theory

#### Unit 1 Pteridophytes

Diversity and distribution of Pteridophytes in India, their Phenology and habitat specificity and western Himalaya. Important concepts and their significance in plant evolution. Range of structure and reproduction in Lepidodendrales, Calamitales, Ophioglossales, Marattiales, Osmundales, Filicales and Salviniales.

#### Unit 2 Advances studies in Pteridophytes

Gametophyte as a model for biotechnological studies; methods of mass multiplication— *in vitro* gametophyte development, gametophyte explant culture, regeneration in clone , gametophytes; propagation of sporophytes *in-vitro* conditions, acclimatization and transplantation; traditional uses of ferns in pharmaceuticals— Secondary metabolites of ferns, types, composition and their therapeutically/medicinal role; fern conservation- ex situ storage of spore, gametophyte and sporophyte, *in-vitro* culture, and cryopreservation; genetic marker for fern diversity research; non-specific markers and microsatellites; *Ceratopteris richardii* as a model system of physiological control of sex expression.

### Unit 3 Gymnosperms

Diversity and distribution of living gymnosperms in India; range of structure and reproduction in Cordiatales, Coniferales, Taxales, Ginkgoales, Podocarpales and Welwitschiales.

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## Unit 4 Advanced studies in Gymnosperms

In vitro studies on gymnosperms using vegetative tissues, organs, microspores and male gametophytes and their significance in conservation and silviculture. Biotechnological approaches-somatic embryogenesis, genetic transformation, protoplast culture and micropropagation; phytochemistry of gymnosperms- secondary metabolites, medicinal value and drugs.

# Unit 5 Applied aspects of Pteridophytes and Gymnosperms

Role of ferns in environmental clean-up: removal of contaminants by ferns in soil and water; organic and inorganic contaminants. Environmental biotechnology: role in ecotoxicology and bioremediation in ferns. Ferns in horticulture- significance and different practices; role of climatic and other factors. Ecological role of gymnosperms on regional climate, soil, and vegetation; gymnosperms in horticulture- significance and different practices; role of climatic and other factors. Genetic marker for gymnosperms diversity; research non-specific markers and microsatellites.

### Practicals

Assessment	
Max: Mark	50
Continuous Internal Assessment (CIA)	25
End Samastas Exam (ESE)	25
End Semester Exam (ESE)	25
Passing Marks	

- 1. Study of external morphology of vegetative and reproductive structures of Ophioglossum, Dryopteris, Adiantum, Asplenium, Cheilanthes, Salvinia, Azolla etc.
- 2. Study of soral structure, spores' types, their viability and germination.
- 3. Field visits to local areas to study the pteridophyte diversity, habital specificity and economic importance.
- Study of secondary metabolites of ferns and their use in medicines.
- In vitro study of pteridophyte spores or plant to propagate the plant.

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- 6. Study of external and internal morphology of vegetative and reproductive structures of living gymnosperms (Gingko, Podocarpus, Taxodium, Araucaria).
- 7. Study of pollen grains of gymnosperms, their viability and attempt germination in
- 8. Field visits to study the diversity and habitat specificity of gymnosperms.
- Practical based on in vitro studies of gymnosperms.
- 10. Study of nutritional and medicinal value of gymnosperms.
- 11. Study of phytochemical analysis of gymnosperms.

# SUGGESTED READINGS:

### Pteridophyte

- 1. Gifford E. M, Foster A.S. (1989). Morphology and evolution of Vascular plants, (3rd Edn). W H. Freeman & Co.
- 2. Rashid A. (1976). An Introduction to Pteridophytes. Vikas Publishing House.
- 3. Sporne K.R. (1986). Morphology of Pteridophytes. Hutchinson University Library, London.
- 4. Surange K.R. (1966). Indian Fossil Pteridophytes. Council of Scientific and Industrial Research
- 5. Chandra S. &Srivastava M. (2003). Pteridology in the New Millennium. Khuwar Acad. Publishers
- 6. Stewart W.N. &Rothwell G.W. (2005). Palaeobotany and the Evolution of Plants, (2nd Edn.) Cambridge University Press.
- 7. Sharma O.P. (2006). Text book of Pteridophyta. Macmillan India Ltd., New Delhi,
- 8. The Morphology of Gymnosperms. K.R. Sporne. 1965. London. Hutchinson University Library; ed. H. Munro Fx. Hutchinson & Co. (Publishers).
- 9. John M. Coulter and Charles J. Chambriain, 2018, Morphology of Gymnosperms. CreateSpace Independent Publishing Platform.
- 10. S.P. Bhatnagar and Alok Moitra, 1996, Gymnosperms. New Age International.
- 11. C. Biswas and B.M. Johri. 1997. The Gymnosperms. Springer-Verlag Berlin Heidelberg.
- 12. H. Fernández (ed.). 2018, Current Advances in Fern Research, Springer International Publishing. Page 14 of 14



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