

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

1. Explain the general characters, classification and significance of Bryophytes.
2. Discuss the morphological, anatomical and reproductive characters of Pteridophytes.
3. Acquire knowledge of evolutionary trends in Pteridophytes and their value.
4. Brief the morphological, anatomical and reproductive characters of Gymnosperms.
5. Summarize the evolutionary trends in Gymnosperms.

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

1. Compare and contrast the morphological, anatomical and reproductive features of some Bryophytes.
2. Illustrate the morphological, anatomical and reproductive characteristics of some Pteridophytes.
3. Infer the evolution of vasculature, heterospory, and seed habit in Pteridophytes.
4. Compare and contrast the morphological, anatomical and reproductive features of some Gymnosperms.
5. evaluate the evolutionary trends in Gymnosperms.

III. Syllabus of Theory:

Unit-1: Biology of Bryophytes 9 Hrs.

1. General characteristics of Bryophytes; Rothmaler (1951) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life cycle of (a) Hepaticopsida: **Marchantia** (b) Anthocerotopsida: **Anthoceros** (c) Bryopsida: **Funaria**
3. General account on the evolution of sporophytes in Bryophyta.

Unit-2: Biology of Pteridophytes 10 Hrs.

1. General characteristics of Pteridophyta: Smith (1955) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of: (a) Lycopsidea: **Lycopodium** (b) Sphenopsida: **Equisetum** and (c) Filicopsida: **Marsilea**

Unit-3: Evolutionary trends in Pteridophytes 8 Hrs.

1. Geological time scale: a brief account of **Rhynia**
2. Stellar evolution in Pteridophytes; heterospory and seed habit.
3. Ecological and economic importance of Pteridophytes.

Unit-4: Biology of Gymnosperms 10 Hrs.

1. General characteristics of Gymnosperms: Sporne (1965) classification.
2. Occurrence, morphology, anatomy, reproduction (developmental details are not needed) and life history of: (a) Cycadopsida: **Cycas** (b) Ginkgoopsida: **Ginkgo** and (b) Gnetopsida: **Gnetum**

Unit-5: Evolutionary trends in Gymnosperms 8 Hrs.

1. A brief account on fossilization processes and types of fossils.
2. A over view of **Cycadeoidea** and **Pentoxylon**
3. A summary of evolutionary trends in Gymnosperms.
4. Ecological and economic importance of Gymnosperms.

IV. Text Books:

1. Acharya, B.C., (2019) Archegoniates, Kalyani Publishers, New Delhi
2. Bhattacharya, K., G. Hait&Ghosh, A. K., (2011) A Text Book of Botany, Volumell, New Central Book Agency Pvt. Ltd., Kolkata
3. Hait,G., K.Bhattacharya & A.K.Ghosh (2011) A Text Book of Botany, Volume-I, New Central Book Agency Pvt. Ltd., Kolkata
4. Pandey, B.P. (2013) College Botany, Volumes-I&II, S. Chand Publishing, New Delhi

V. Reference Books:

1. Shaw, A.J. & B. Goffinet (2000) Bryophyte Biology. Cambridge University Press, New York
2. Smith, G.M. (1971) Cryptogamic Botany Vol. II., Tata McGraw Hill, New Delhi
3. Sharma, O.P. (2012) Pteridophyta. Tata McGraw-Hill, New Delhi
4. Sporne, K.R. (1971) The Morphology of Gymnosperms. Hutchinsons Co. Ltd., London
5. Coulter, J.M. & C.J. Chamberlain (1910) Morphology of Gymnosperms, The University of Chicago Press, Chicago, Illinois
6. Bhatnagar, S.P. & Alok Moitra (1996) Gymnosperms. New Age International, New Delhi

VI. Suggested activities and evaluation methods:

Unit-1: Activity: Collection and identification of Bryophytes from their locality. **Evaluation method:** Assessing the collections made by the student and assigning a grade.

Unit-2: Activity: Making temporary slides/models/drawings of Pteridophytes in the syllabus. **Evaluation method:** Assessment of the temporary slides/model/drawing.

Unit-3: Activity: Group discussion/Quiz/JAM on evolutionary trends in Pteridophytes. **Evaluation method:** Assessing the abilities of a group/ an individual based on the performance.

Unit-4: Activity: Study of wood elements in locally available Gymnosperms and making temporary slides. **Evaluation method:** Validation of prepared slides submitted by the learner.

Unit-5: Activity: Assignment/seminar on evolutionary trends in Gymnosperms-making comparative account. **Evaluation method:** Evaluating the quality of assignment written with apt examples/quality of presentation using a rubric.

Practical Credits: 1

2 hrs/week

I. Course Outcomes: On successful completion of this practical course, the student shall be able to:

1. distinguish the Pteridophytes and Gymnosperms based on their morphological, anatomical and reproductive structures.
2. make systematic classification of plant species using vegetative and floral characters.
3. identify angiosperm plant species and make herbarium specimens.

II Laboratory/field exercises:

1. Study/ microscopic observation of vegetative, sectional/anatomical, and reproductive structures of the following using temporary or permanent slides/specimen/ mounts: A. Bryophyta: **Marchantia**, **Anthoceros** and **Funaria** B. Pteridophyta: **Rhynia**, **Lycopodium**, **Equisetum**, and **Marselia** C. Gymnosperms: **Cycadeoidea**, **Pentoxylon**, **Cycas**, **Ginkgo** and **Gnetum**
2. Field trip to a Botanic garden or local floristic area/forest.