

Paper 2a BRYOLOGY, PTERIDOLOGY AND GYMNOSPERMOLOGY

M. Sc. va (Candidates admitted from the academic year 2021-2022)

Course Code 212BO1M02

Total Hours 75

Credits 4

CORE THEORY

Learning Objective	The students will have an overview and understanding of the structure and interrelationship within and between various forms of cryptogams. Students learn the evolutionary trends in non vascular plants. The students will develop an understanding of diversity, distinctive characteristics and significance of gymnosperms.
--------------------	--

CO No.	Course Outcome	PSO Addressed	CL
	Upon the completion of this course, students will be able to		
CO - 1	Learn the characteristic features and classification of Bryophytes; evaluate the evolutionary role and ecological significance of Bryophytes.	PSO-1	U
CO - 2	Acquire knowledge on various living forms of Bryophytes.	PSO-1	Ap
CO - 3	Acquainted with the characteristic features of Pteridophytes, its distribution, threats, conservation, evolutionary importance and various extinct pteridophytes.	PSO-1	U
CO - 4	Learn various living forms of primitive vascular land plants.	PSO-1	An
CO - 5	Describe the characters, classification, Morphology, anatomy and reproductive features of selected extinct and extant Gymnosperms.	PSO-1	An

UNIT I BRYOLOGY HOURS 12

General account of habit, habitat, ecology and distribution of Bryophytes
 Characteristics of Bryophytes as true plants. Classification of Bryophytes - Goffinet and Shaw (2009). Distinguishing features of Marchantiophyta, Anthocerotophyta and Bryophyta. Adaptations for land habits. Fossil Bryophytes. Phylogeny of Bryophytes. Culture of Bryophytes. Economic importance.

UNIT II HOURS 13

Range of vegetative and reproductive structures, modes of reproduction in Liverworts (Haplomitriopsida – Calobryales- *Calobryum*; Marchantiopsida – Sphaerocarpaceae- *Sphaerocarpos*; Marchantiales- *Marchantia*; Jungermanniopsida – Porellales- *Porella*; Jungermanniales- *Jungermannia*) hornworts (Anthocerotales - *Anthoceros*, Notothyladales- *Notothylas*); and Mosses (Takakiales- *Takakia*, Sphagnales- *Sphagnum*, Polytrichales - *Polytrichum* - and Bryales- *Bryum*).

UNIT III PTERIDOLOGY HOURS 13

Features of Seedless Vascular Plants: Organisation of sporophyte, stele, microphylls and megaphylls, homosporous, heterosporous, gametophytes and embryos. Classification of fossil and living Pteridophytes [Smith. et al. 2008.]. Origin and evolution of early vascular plants; Telome Theory.

Significance of extinct Divisions: Rhyniophyta (*Rhynia*, *Cooksonia*); Zosterophyllophyta (*Zosterophyllum*); Trimerophyta (*Trimerophyton*). Selected fossil Lycopods, (*Asteroxylon*, *Lepidodendron*), Equisetophytes (*Sphenophyllum*, *Calamites*) and Ferns (Coenopteridales).

UNIT IV **HOURS 12**
 Survey of structure and reproduction in living pteridophytes. Psilotales (*Psilotum*); Lycopodiales (*Lycopodium*); Selaginellales (*Selaginella*); Isoetales (*Isoetes*); Equisetales (*Equisetum*); Ophioglossales (*Ophioglossum*), Gleicheniales (*Gleichenia*), Marsileales (*Marsilea*).

UNIT V **GYMNOSPERMOLOGY** **HOURS 25**
 Characteristics of gymnosperms. Classification of gymnosperms (Christenhusz's classification – 2011) and their interrelationships. Distribution of Gymnosperms. Groups of fossil gymnosperms: progymnosperms (*Archaeopteris*), pteridosperms (*Lyginopteris*), Glossopterids (*Glossopteris*), Cycadeoids (*Williamsonia*, *Pentoxylon*). Distribution, Reproduction and Interrelationships of Cycadophyta (*Cycas*), Coniferophyta (*Pinus*, *Araucaria* and *Taxus*), Ginkgophyta (*Ginkgo*) and Gnetophyta (*Gnetum*, *Ephedra* and *Welwitschia*). Economic importance of Gymnosperms. Indian Contributions to Gymnosperms.

TEXT BOOKS

- BIERHORST, D.W. 1971. Morphology of Vascular Plants. Macmillan Publishing Company. New York.
- BOLD, H.C., C.J. ALEXOPOULOS, T. DELEVORYAS. 1987. Morphology of Plants and Fungi. Harper & Row, Publishers. New York.
- CHOPRA, R.N., AND P.K. KUMAR. 1988. Biology of Bryophytes. John Wiley. New York.
- CHOPRA, R.S. 1975. Taxonomy of Indian Mosses. CSIR. New Delhi.
- GOFFINET, B. AND A. J. SHAW. 2009. Bryophyte Biology, 2nd edition. Cambridge University Press, Cambridge.
- MEYEN, S.V. 1987. Fundamentals of Palaeobotany. Chapman and Hall. London.
- PANDEY, S.N., P.S. TRIVEDI, AND S.P. MISRA. 1992. A Text Book of Botany. Vol. I & II. 2nd Edition. Vikas Publishing House. New Delhi.
- SPORNE, K. R. 1974. The Morphology of Gymnosperms. B. I. Publications. New Delhi.
- SPORNE, K. R. 1976. The Morphology of Pteridophytes. B.I. Publications. New Delhi.
- SMITH, A.J.E. 1982. Bryophyte Ecology. Chapman and Hall. London.
- VENKATACHALA, B.S., M. SHUKLA AND M. SHARMA. 1992. Plant Fossils - A Link with the Past. Pub. & Information Directorate. New Delhi.

SUGGESTED READING

- BANKS, H.P. 1970. Evolution and Plants of the Past. Wadsworth Publishing Co., Inc., Belmont. California.
- CHRISTENHUSZ, M. J. REVEAL, J.L, FARJON.A, GARDNER, M.F, MILL, R.R., CHASE, M.W., 2011. A new classification and linear sequence of extant gymnosperms. Phytotaxa 19: 55-70.
- CONRAD, H.S., AND P.L. REDFEARN, Jr. 1979. How to Know the Mosses and Liverworts Academic Press. New York.
- DELEVORYAS, T. 1962. Morphology and Evolution of Fossil Plants. Holt, Rinehart and Winston. New York.

- KUBITZKI, K., K.U. KRAMER AND P.S. GREEN (Eds.). 1990. The Families and Genera of Vascular Plants - I: Pteridophytes and Gymnosperms. Springer - Verlag. Berlin.
- MOORE, R., W.D. CLARK, K.R. STERN, AND D. VODOPICH. 1995. Botany: Plant Diversity. Wm. C. Brown Publishers. Dubuque. IA.
- RAVEN, P.H., R.F. EVERT, AND S.E. EICHHORN. 1992. Biology of Plants. Fifth Edition. Worth Publishers. New York.
- SMITH, A. R., PRYER, K.M., SCHUETTPELZ, E., KORALL, P., SCHNEIDER, H., AND WOLF, P. G. 2008. Fern Classification *In* - Biology and Evolution of Ferns and Lycophytes, (eds.) T.A. Ranker and C.H. Haufler. Cambridge University Press.

REFERENCES

- BECK, C.B. 1988. Origin and Evolution of Gymnosperms. Columbia University Press. New York.
- GANGULEE, H.C. 1985. Handbook of Indian Mosses. Amerind Pub. Co., New Delhi.
- GENSEL, P.G., AND H.N. ANDREWS. 1984. Plant Life in the Devonian. Praeger Publishers. New York.
- GRAHAM, L.E. 1993. Origin of Land Plants. John Wiley & Sons, Inc. New York.
- GIFFORD, E.M. AND E.S. FOSTER. 1989. Morphology and Evolution of Vascular Plants. Third Edition. W.H. Freeman and Company. New York.
- JOHRI, B.M. 1994. Botany in India - History and Progress Vol - I, Oxford & IBH Pub. Co. Pvt. Ltd. New Delhi.
- JONES, D.L. 1993. Cycads of the World - Ancient Plants in Today's Landscape. Smithsonian Institution Press. Washington. D.C.
- KAUFMAN, P.B., T.F. CARLSON, P. DAYANANDAN, M.L. EVANS, J.B. FISHER, C. PARKS, AND J. WELLS. 1989. Plants: Their Biology and Importance. Harper & Row, Publishers. Inc., New York.
- KASHYAP, S.R. 1929. Liverworts of Western Himalayas. Part I and Part II (1932). University of Punjab, Lahore.
- MANICKAM, V.S. AND V. IRUDAYARAJ. 1992. Pteridophyte Flora of the Western Ghats, South India. B.I. Publications. New Delhi.
- MAUSETH, J.D. 1991. Botany - An Introduction to Plant Biology. Saunders College Pub., Philadelphia.
- STEWART. W. N. 1983. Paleobotany and the Evolution of Plants. Cambridge University Press, California.
- WATSON, E.V. 1971. The Structure and Life of Bryophytes. Hutchinson and Co., (Publishers) Ltd. London.

ONLINE RESOURCES

- <https://www.conifers.org/zz/gymnosperms.php>
- <https://www.cycadlist.org/>