

**JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2018 BATCH AND THEREAFTER**

Programme: B.Sc.

Semester: IV

BOTANY PAPER IV

GYMNOSPERMS, EMBRYOLOGY OF ANGIOSPERMS AND INVITRO MORPHOGENESIS

Course Code: 18IVBO4

No. of Hours: 60

COURSE OBJECTIVES:

- Systematic study of gymnosperms and angiosperm embryology.
- Understand the morphological and reproductive character of spermatophytic plants.
- Understand economic importance of gymnosperms and angiosperms.

LEARNING OUTCOMES:

- Classify and compare Gymnosperms based on their morphology, anatomy, reproduction and life cycles.
- Justify evolutionary trends in tracheophytes to adapt for land habitat.
- Explain the process of fossilization and compare the characteristics of extinct and extant plants.

UNIT I :Gymnosperms

10 HRS

General Characters classification (Sporne).

Distribution, structure and reproduction of *Pinus and Gnetum* (developmental stages not required). Brief account of fossil gymnosperm –*Ptilophyllum* Economic importance of Gymnosperms

UNIT II Embryology of Angiosperms (Units II -IV)

13 HRS

A brief account on Embryology, Contributions of P. Maheshwari, B.G.L Swamy (a brief account).

Microsporangium : Development of anther, Microsporogenesis , structure of a mature anther and anthesis.

Male gametophyte: Development of male gametophyte, role of Tapetum during pollen development, concept of male germ unit (MGU). NEMEC Phenomenon Palynology and its branches (A brief account of Mellitopalynology, aeropalynology, copropalynolgy ,

paleopalynology and Forensic Palynology),

Pollen morphology : NPC System (a brief account of size, shapes, apertures and pollen wall architecture) and applications of palynology.

UNIT III Embryology of Angiosperms (Units II -IV)

13 HRS

Ovules: types (orthotropous, anatropous, hemianatropous, campylotropous, amphitropous and Circinotropous). Structural details of an Anatropous ovule (LS).

Megasporogenesis and Megagametogenesis, Study of types of embryo sacs - Monosporic (Polygonum type Bisporic (Allium type) & Tetrasporic (Adoxa type) Ultra structure of embryo sac, concept of female germ unit,.

Accessory ovular structure- Aril, integumentary tapetum, caruncle, hypostase and obturator

Double fertilization: Types of stigma and style, pollen-pistil interaction, entry of pollen tube into the stigma, style, ovule and female gametophyte, Syngamy and triple fusion. Preferential fertilization and polyspermy post fertilization changes in the embryo sac and Ovule.

Significance of Double fertilization.

UNIT IV Endosperm Embryology of Angiosperms (Units II -IV)

11 HRS

Types (Nuclear, Cellular, Helobial), endosperm haustoria (Barleria and Cucumis), Ruminant endosperm (Areca nut) - a brief account.

Embryo: Classification (as per P. Maheshwari), development of dicot embryo in *Capsella bursa pastoris* (Crucifer type) and monocot embryo (Najasnaja). Definitions: Apomixis and polyembryony and parthenocarpy. A brief account on seed development – Albuminous, exalbuminous and perisperm.

UNIT V *In vitro* morphogenesis

13 HRS

Definition of Morphogenesis, differentiation, dedifferentiation, redifferentiation. Concepts of totipotency, explants, Nutrient media (MS Medium and G5) aseptic culture, callus, and embryoids.

A brief account on Protoplast, Cell, tissue and Organ culture: ovary, anther, endosperm and embryo culture.

Practical applications of Plant tissue culture and Somatic Hybridization.

A brief concept of syn seeds and their applications.

REFERENCES

1. Bhatnagar, S.P. and Moitre, A. Gymnosperms. New Age Publications, New Delhi
2. Bhojawani, S.S. & Bhatnagar, S. P. (1979). The Emryology of Angiosperms, Vikas Pub, New Delhi.
3. Coulter, J. M. & Chamberline, C. J.(1978). Morphology of Gymnosperms. Central Book Depot. Allahabad.
4. Johri, B.M. (1984). Embryology of Angiosperms. Springer-verlag, Berlin.
5. Maheshwari, P. (1950). An Introduction to Embryology of Angiosperms. Tata McGraw Hill, New York.
6. Shukla, A.K. (1999). Biology of Pollen. Atlas books & Periodicals.
7. Sporne, K.R. (1974). The Morphology of Gymnosperms, Hutchinson & Co. London.
8. Sundarajan, S.(1997) College Botany Vol. II. Himalaya Publication.
9. Vashista, P. C. (1990). Gymnosperms. 5th ed., S Chand & Co. Ltd., New Delhi.
10. K.V. Krishnamurthy/series editor: Anantanarayanan Raman, (2015) Growth and Development in plants (21st century biology and agriculture: textbook series), scientific publisher.
11. M. K. Razdan , (2003) Introduction to Plant Tissue Culture, Science Publishers.

BOTANY PRACTICAL – IV

1. Study of gymnosperm materials included in the theory.
2. Study of microsporogenesis and male gametophyte.
3. Pollen embryology-Grass, Hibiscus, Tridax, Mimosa and Pollinia of Calotropis.
4. Germination of pollen grain-Eg. Vinca by Hanging drop method.
5. Types of ovules, types of placentation's,
6. Mounting of endosperm of *Cucumis* .
7. Mounting of embryo of Tridax/
8. Test and Repetition

Activity For IV Semester: Visit to Tissue culture lab./ study of pollen flora of college campus/ collection of pollen by air samples/ study of honey samples