



SEMESTER – 3

BRANCH	Subject Title	Subject Code
B.Sc. (Botany - Major)	Plant Anatomy and Embryology	BOM1-131

Course Learning Outcomes (CLO)

- Students will learn the internal structure of plants. It will enhance the basic understanding of organization of plant body by cells and tissues.
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- Students will understand the dynamic mechanism of plant pollination, fertilization and development.
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- They will have hands on training on section cutting, preparation of slides, study of pollen and ovules..

Content

Unit – I

Meristematic and permanent tissues

1.1 Types of meristems,

1.2 Organization of Root and shoot apex

1.3 Simple and complex tissues.

1.4 Special type of tissues.

1.5 Structure of dicot and monocot root, stem and leaf

Kranz anatomy.

1.6 Pits and plasmodesmata:

1.7 Wall ingrowths and transfer cells.

1.8 Hydathodes, cavities, lithocysts and laticifers.



Unit – II

Secondary Growth:

- 1.1 Vascular cambium-structure, function and seasonal activity.
- 1.2 Secondary growth in root and stem,
- 1.3 Wood (heartwood and sapwood).
- 1.4 Anomalous structures.
- 1.5 Adaptive and protective systems: Epidermis. cuticle, stomata;
- 1.6 General account of adaptations in xerophytes and hydrophytes.
- 1.7 Dendrochronology

Unit – III

Embryology:

- 1.1 History and Importance of embryology,
- 1.2 Structure of flower, anther and pollen,
- 1.3 Micro-sporogenesis and Mega-sporogenesis;
- 1.4 Structure and types of ovules;
- 1.5 Types of embryo sacs,
- 1.6 organization and ultra-structure of mature embryo



Unit - IV

Pollination and fertilization

- 1.1 Types of Anthers and pollen,
- 1.2 Pollination mechanisms and adaptations;
- 1.3 Pollen pistil interaction,
- 1.4 Double fertilization;
- 1.5 Post fertilization changes,
- 1.6 Seed structure appendages and dispersal mechanisms.
- 1.7 Palynology and Scope (a brief account)

Unit - V

Endosperm & embryo

- 1.1 Endosperm types, structure and functions;
- 1.2 Dicot and monocot embryos;
- 1.3 Embryo- endosperm relationship.
- 1.4 Nutrition of Embryo,
- 1.5 Unusual features in Embryo and Endosperm.
- 1.6 Apomixis and polyembryony., Definition, types and practical applications.
- 1.7 In-vitro fertilization



Practicals

1. Study of meristems through permanent slides and photographs.
2. Study of Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylem elements, Phloem (Permanent slides, photographs)
3. Study of Monocot stem: Maize (*Zea mays*): Dicot stem: sunflower (*Helianthus*); Secondary growth: *Helianthus*.
4. Study of Monocot root: Maize (*Zea mays*): Dicot stem: sunflower (*Helianthus*); Secondary growth: *Helianthus*
5. Study of Dicot and Monocot leaf
6. Study of anomalous structure in *Achyranthes*, *Boerhaavia*, *Nyctanthes* through section cutting.
7. Study of Xerophyte (*Nerium* leaf) and Hydrophyte (*Hydrilla* stem). Plants.
8. Study of anther (young and mature), tapetum (amoeboid and secretory) through Permanent slides/pictures
9. Study of female gametophyte *Polygonum* (monosporic) type of embryo sac development through permanent slides/photographs.
10. Study of mature egg apparatus through slides/photographs
11. Demonstration of different types of Pollination and seed dispersal.
12. Study of percentage germination of pollen grains in a given medium.
13. Demonstration of pollen germination,
14. Types of ovules in plants and placentation through temporary slides/photographs/permanent slide.



SEMESTER – 4

BRANCH	Subject Title	Subject Code
B.Sc. (Botany - Major)	Industrial Botany	BOM1-141

Course Learning outcomes (CLO)

- This course will provide knowledge on plants and their parts used in various industries.
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- Students will get an idea to establish plant based natural product industry.
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- This course will make the students self-reliant.

Content

Unit - I

Plants in Timber Industry:

1.1 Timber yielding trees of India and their products (Shisham, Sal, Teak, Deodar, Babool).

1.2 Bamboo and Cane Industry.

1.3 Kattha' Industry.

Unit - II

Leaf Based Industries-

1.1 Utility products of leaf (Palash, Banana).

1.2 Tea Industry (Production of various types of teas).

1.3 Leaf oil Industry (Mint, Camphor, Neem, Tulsi, Eucalyptus and Lemon grass).

1.4 Leaves used as spices (Kasoori Methi, Pudina, Curry pattà. Onion, Tejpatta)



Unit - 3

Flower based Industries-

- 1.1 Perfume products of Gulab, Jasmine, Henna,
- 1.2 Color industry (Food and Holi colors).
- 1.3 Raw material for Fermentation (Mahua).

Unit - 4

Fruits and Seeds based Industries-

- 1.1 Jams, Jellies, Juice, Sauce and Pickles.
- 1.2 Poha and Daal Industry.
- 1.3 Edible Oil Industry (Groundnut, Soybean)
- 1.4 Starch, Glucose, and Dextrose Industry.

Unit - 5

Other parts of plants based Industries-

- 1.1 Sugar and Jaggery Industries.
- 1.2 Jute and Agarbatti stick making industry.
- 1.3 Project proposal preparation for establishment of an industry.
- 1.4 Grants and funding provider organizations of India.



Practicals

- 1 Preparation of Holi color's from locally available flowers
2. Preparation of food colors from locally available flowers
3. Perfume extraction process by distillation method
4. Preparation and preservation techniques of jams, jellies and prickles.
5. Extraction and preservation of juices (lemon and orange etc.) 6. Preparation of different types of teas (Tulsi tea, lemon tea etc.)
7. Identification, collection and extraction of oil yielding leaves. 8. Identification, collection and specimen preparation of leafy spices.
9. Hands on training for preparation of "Douna and Pattal" using Palash and Banana leaves.
10. Visit to any plant based industry.
11. Herbarium preparation of different parts of plants used in various industries



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