



M. C. E. Society's

Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune-1

(Autonomous) Affiliated to Savitribai Phule Pune University

NAAC accredited 'A' Grade

**S.Y.B.Sc. Botany
Semester III
(NEP – 2023 Pattern)**

Course Title	Fundamentals of Plant Physiology and Plant Genetics	
Course Code: 23SBBO31MN		No. of Credits: 02
Course Type: Minor (MN)		Total Teaching Hours: 30

Aims & Objectives of the Course

Sr. No.	Objectives
1.	The paper deals with general principles of Plant physiology and Genetics
2.	To understand Plant Physiology in daily life.
3.	Create potential among the students to become an entrepreneur by producing seedless fruits.
4.	To equip the students with skills of the advanced techniques of genetic engineered plants by producing new varieties of crops.
5.	To create foundation for further studies in Skill Development in Plant genetics.
6.	Application of physiological processes of the plant benefit for the of mankind.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Student understand various functioning of plants.
2.	Give the students exposure to understand effect of Phytohormones.
3.	Development of skills needed for future generation by using genetic character of Plants and inventing new ones.
4.	To understand basics of Plant physiology and Genetics.
5.	To become knowledge and Skill resource persons for 21 st century.

Syllabus

Unit No	Title with Contents	No. of Lectures
	Fundamentals of Plant Physiology	15
I	1.1. Introduction, Plant Physiology 1.2. Definition, Scope and Importance of Plant Physiology 1.3. Applications of Plant Physiology	02
II	2.1. Definition and Introduction to Mineral Nutrition, 2.2. Micronutrients, Macronutrients and their Functions. 2.3. Criteria for essentiality of Mineral element 2.4. Role of Microelements in Agriculture	03
III	3. Plant Water Relations 3.1. Diffusion- Definition, factors affecting diffusion, importance of diffusion in plants, imbibition as a special type of diffusion. 3.2. Osmosis – definition, types of solutions (hypotonic, isotonic, hypertonic), endosmosis, exo-osmosis, osmotic pressure, turgor pressure, wall pressure, importance of osmosis in plants, 3.3. Plasmolysis – definition, mechanism and significance, 3.4. Imbibition- definition, mechanism, significance	04
IV	4. Absorption of Water 4.1. Definition, Role of water in Plants 4.3. Mechanism of water absorption. 4.4. Factors affecting rate of water absorption	02
V	5. Transpiration 5.1. Definition, types of transpiration 5.2. Structure of stomata, Mechanism of opening and closing of stomata. 5.3. Factors affecting role of transpiration 5.4. Significance of transpiration	04
	Plant Genetics	15
VI	6.1. History of Genetics, concepts and Pre- Mendelian genetics 6.2. Inheritance of acquired characters 6.3. Concepts of Phenotype, Genotype in plants. 6.4. Heredity and variations. 6.5. Mendel experiments on Pea plants: Monohybrid cross, Dihybrid cross, Back cross and Test cross. Law of Independent Assortment.	05

VII	7.1. Definition, Introduction to Multiple Alleles 7.2. ABO blood groups and Rh factor in Human 7.3. Problems on Genetic.	04
VIII	8.1. Gene Interactions. 8.2. Incomplete inheritance and Co-dominance.	03
IX	9.1. Introduction to Sex Determination 9.2. Chromosome theory of Sex determination: XX- XY, XX-XO, ZZ-ZW, Genic balance theory of Bridges, Intersexes and Super sexes in <i>Drosophila</i> , Y chromosome in sex determination of <i>Melandrium</i> . 9.3. Environment and sex determination 9.4. Hormonal control of Sex determination	03

Suggested Readings	
1.	Plant Physiology, 4th Edn By S N Pandey, B K Sinha 2005.
2.	Plant Physiology 2nd Edition by Subhash Chandra Datta, 2021.
3.	Fundamentals. Of plant physiology by v. K. Jain 2022
4.	Fundamentals of Plant Genetics Life Sciences and Agriculture by Hashmi Mousmi S Harpal Singh & Joginder Singh, 2022
5.	Plant Physiology by Dr. Sayyed Iliyaz, 2020



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Semester III
(NEP –2023 Pattern)

Course Title	PRACTICALS BASED ON CELL BIOLOGY AND PLANT MORPHOLOGY	
Course Code: 23SBBO32MN		No. of Credits: 02
Course Type: Minor (MN)		Total Teaching Hours: 30

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To enrich the students to understand structure of Plant cell.
2.	To create awareness among the students about the applications of different plants in various industries.
3.	To create potential among students to become an entrepreneur.
4.	To equip the students with skills related to laboratory as well as field based studies.
5.	To develop foundation in molecular Biology for further studies in Botany.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will become aware about general Cell structures of Plant Cell.
2.	Students will become aware about DNA, RNA as hereditary units.
3.	Students will understand Difference between Mitosis and Meiosis.

Syllabus

Expt. No.	Title with Contents	No. of Practical
1.	Study of Cell Structure.	1 P
2.	Study of Plant Cell Organelles.	1 P
3.	Study of Mitosis in Onion Cells.	1 P
4.	Study of Meiosis in <i>Tradescantia</i> bud.	2 P
5.	Study of Inflorescence. a. Racemose: Raceme, Spike, Spadix, Catkin, Corymb, Umbel and Capitulum b. Cymose: Solitary cyme, Uniparous cyme: helicoid and scorpioid, Biparous cyme and Multiparous cyme. c. Special type: Verticillaster, Hypanthodium and Cyathium.	2 P
6.	Study of flower with respect to Calyx, Corolla and Perianths, Androecium and Gynoecium.	2 P
7.	Study of floristic key preparation with the help of 3-4 types of flower (1 from each class)	1 P
8.	Study of placentation with suitable example	1 P
9.	Study of fruits with suitable examples. a) Simple fruit: Dry: Achene, Cypsella and Legume; Fleshy: Berry and Drupe. b) Aggregate fruit: Etaerio of follicles and Etaerio of Berries. c) Multiple fruit: Syconus and Sorosis.	1 P
10.	Study of adaptation in Hydrophytes – <i>Eichhornia</i> .	1 P
11.	Study of adaptation in Xerophytes- <i>Alove vera</i> / <i>Casurina</i> .	1 P
12.	One day visit to study Ecological Adaptation in plants.	1 P



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**S.Y.B.Sc. Botany
Semester III
(NEP –2023 Pattern)**

Course Title	PRACTICAL BASED ON PLANT PROPAGATION, NURSERY MANAGEMENT AND GARDENING	
Course Code: 23SBBO31VS		No. of Credits: 02
Course Type: Vocational Skill Course (VSC)		Total Teaching Hours: 30

Course Objectives	
1.	To facilitate students for taking up and shaping a successful career in Botany.
2.	To make the students aware about the applications of different plants in various industries.
3.	To highlight the potential among the students to become an entrepreneur.
4.	To make the students aware about the conservation and sustainable use of Plants.

Course Outcome	
1.	Students will gain knowledge of gardening, cultivation, multiplication, raising of seedlings of garden plants.
2.	Lerner will get knowledge of new and modern techniques of plant propagation.
3.	To develop interest in nature and plant life.
4.	To highlight the potential to become an entrepreneur

Syllabus		
1	To study the methods of propagation with the help of suitable materials – tubers, bulbs, rhizomes, corms, suckers and runners.	2 P
2	To study the methods of artificial plant propagation by cutting, layering, budding and grafting	1 P
3	To study the seed propagation- preparation of portable trays, seed treatments, sowing and seedling production.	2 P
4	To study the Structure and types of Seed (Monocot and Dicot)	1 P
5	To study the causes of Seed dormancy	1 P
6	To study the Methods of breaking dormancy in tubers and vegetative buds.	1 P
7	To Study the viability of seeds by TTC method	1 P

8	Identification and description of annuals, herbaceous perennials, climbers, creepers, foliage and flowering shrubs, trees, palms, ferns, ornamental grasses; cacti and succulents.	1 P
9	Identify the nursery and gardening tool/equipment and write its uses.	1 P
10	Planning and designing of gardens, functional uses of plants in the landscape.	1 P
11	Preparation of land for lawn and planting to develop garden.	1 P
12	Project work : based on under supervision of lecturer – nursery/ornamental flowers/plants/lawn designing/landscape designing	1 P

Suggested Activities: Raising a nursery, managing it, studying and drawing various land scape designs, practicing layering methods, using shade nets to protect horticultural crops, practicing indoor gardening techniques, visiting florists and recording their methods of prolonging vase life of commercial cut flowers.

Suggested Readings

1.	Bose T.K., Mukherjee, D. (1972). <i>Gardening in India</i> . Oxford & IBH Publishing Co. New Delhi
2.	Musser E., Andres. (2005). <i>Fundamentals of Horticulture</i> . McGraw Hill Book Co. New Delhi
3.	Sandhu, M.K. (1989). <i>Plant Propagation</i> . Walle Eastern Ltd. Bangalore
4.	Agrawal, P.K. 1993, <i>Hand Book of Seed Technology</i> , Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.



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S.Y.B.Sc. Botany

Semester IV

(NEP – 2023 Pattern)

Course Title	PLANT ANATOMY AND EMBRYOLOGY	
Course Code: 23SBBO41MN		No. of Credits: 02
Course Type: Minor (MN)		Total Teaching Hours: 30

Aims & Objectives of the Course

Sr. No.	Objectives
1.	The course aims to educate student on concepts of plant Anatomy and Embryology.
2.	To understand about cell, tissue and its structure and functions.
3.	The course further deals with the role of xylem in conduction of water and minerals.
4.	To create foundation for further studies in Botany.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will gain the knowledge of epidermal tissue system.
2.	General embryo, types of embryo in plants.
3.	This course is meant to answer various stages of embryonic development in plants.
4.	Students will gain knowledge about secondary growth and abnormal secondary growth in plants.

Syllabus

Unit No.	Title with Contents	No. of Lectures
	Plant Anatomy	15
I	Introduction to Plant Anatomy 1.1 Definition 1.2 Scope and importance of plant anatomy	02
II	Epidermal Tissue System 2.1 Structure, functions and types of epidermis 2.2 Structure, types and functions of Stomata 2.3 Epidermal outgrowths- non-glandular and glandular 2.4 Motor cells	03
III	Mechanical tissue system 3.1 Principles involved in distribution of mechanical tissues with one example each a) Inflexibility, b) Incompressibility, c) Inextensibility and d) Shearing stress 3.2 Vascular tissue system: Structure and function of xylem, phloem and cambium	03
IV	Normal Secondary Growth 4.1 Introduction 4.2 Normal secondary growth in dicotyledonous stem 4.3 Development of annual rings, periderm, bark, tyloses and lenticel	03
V	Anomalous Secondary Growth 5.1 Introduction 5.2 Causes of anomalous secondary growth 5.3 Anomalous secondary growth in: a) Dicotyledonous stem (<i>Bignonia</i>), b) Dicotyledonous root (<i>Raphanus</i>), c) Monocotyledonous stem (<i>Dracaena</i>)	04
	Plant Embryology	15
VI	Introduction to Plant Embryology 6.1 Definition and scope of plant embryology	01
VII	Microsporangium and male gametophyte 7.1 Structure and functions of microsporangium. 7.2 Structure of T.S. of tetrasporangiate anther 7.3 Microsporogenesis : formation, structure of microspore tetrad and pollengrain, 7.4 Male gametophyte: structure and development of male gametophyte	04

VIII	Megasporangium and female gametophyte 8.1 Structure and functions of megasporangium. 8.2 Types of ovules 8.3 Megasporogenesis: formation and types of megaspore tetrads, megaspore. 8.4 Female gametophyte: structure of typical embryo sac 8.5 Types of embryo sacs – monosporic, bisporic and tetrasporic	04
IX	Pollination and Fertilization: 9.1 Introduction and definition of pollination and fertilization 9.2 Types of pollination 9.3 Germination of pollen grain 9.4 Entry of pollen tube- porogamy, mesogamy and chalazogamy. 9.5 Double fertilization and its significance.	04
X	Endosperm and Embryo 10.1 Endosperm: Types – nuclear, helobial and cellular. 10.2 Structure of Dicotyledonous and Monocotyledonous embryo.	02

Suggested Readings	
1.	Plant Anatomy, Chandurkar P J, Plant Anatomy Oxford and IBH publication Co. New Delhi 1971
2.	B P Pandey, Plant Anatomy. S Chand and Co. Ltd, New Delhi 1978
3.	Greulach V A and Adams J E Plant- An introduction to Modern Biology, Toppen Co. Ltd, Tokyo
4.	Eams and Mc Daniel, An Introduction to Plant Anatomy, McGraw –Hill Book Co. Ltd and Kogakusha Co, Tokyo, Japan
5.	Adriance S Foster Practical Plant Anatomy, D Van Nostrand Co. INC, New York
6.	Pandey S N and Ajanta Chadha, Plant Anatomy and Embryology, Vikas Publishing House, Pvt, Ltd, New Delhi
7.	Pijush Roy, Plant Anatomy. New Central Book Agency Ltd, Kolkata
8.	Maheshwari P, An introduction to Embryology of Angiosperm
9.	Bhojwani S S and Bhatnagar S P, An Embryology of Angiosperms



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**S.Y.B.Sc. Botany
Semester IV
(NEP 2023 Pattern)**

Course Title	PRACTICALS BASED ON PLANT ANATOMY AND EMBRYOLOGY	
Course Code: 23SBBO42MN		No. of Credits: 02
Course Type: Minor (MN)		Total Teaching Hours: 30

Course Objectives	
1.	Enable the students to understand basic of Cell Structure and types of Tissues in Plants.
2.	To Provide hands on training to Prepare temporary and permanent slides.
3.	Give the students exposure to the experiences of experts in plant Anatomy.
4.	To get knowledge on pollination and its significance.
5.	To know the development of anther and ovule.

Course Outcome	
1.	The training course will prepare student to analyse the anatomical structure of dicot and monocot plant.
2.	Equip the students with skills related to laboratory as well as field based studies
3.	Students will be able to understand the mechanism of pollination and fertilization.
4.	Students will be able to analyse the pollen viability in research aspect.

Syllabus

Expt. No.	Title with Contents	No. of Practical
1	To study the Microtomy and steps in microtomy.	2 P
2	To study epidermal tissue system – Unicellular multicellular; branched unbranched; non-glandular and glandular trichomes /hairs.	1 P
3	To study the structure of Dicotyledonous and Monocotyledonous stomata.	1 P
4	To study of mechanical tissues and their distribution in root, stem and leaves	1 P
5	To study the types of Vascular bundles.	1P
6	To study normal secondary growth in dicot stem – <i>Annona / Moringa</i> (Double stained temporary preparation).	1 P
7	To study anomalous secondary growth in <i>Bignonia</i> and <i>Dracaena</i> stem (Double stained temporary preparation).	2 P
8	To study the T.S. of Tetrasporangiate anther.	1 P
9	To study the types of ovules with the help of suitable example	1 P
10	To study the types of Pollen grains.	1 P
11	To study pollination types and seed dispersal mechanisms (Photographs and specimens).	1 P
12	To study methods of testing of pollen viability using (Terazolium chloride test).	1 P
13	To study the percentage of pollen germination.	1 P

Suggested Readings	
1	Roy, P. (2010). Plant Anatomy. New Central Book Agency, Kolkata.
2	Pandey, B.P. (2012). Plant Anatomy. S. Chand & Company Ltd., New Delh
3	Vasistha, P.C. (1968). Plant Anatomy. Pradeep Publication & Co., Chandigarh.
4	Pandey, S.N. (1997). Plant Anatomy and Embryology. Vikas Publishing House Pvt Ltd., New Delhi.
5	Gangulee, H.C., Das, K.S. and Datta, C. (1998). College Botany. Vol. I. New Central Book Agency, Kolkata

6	Singh, V. Pande, P.C. and Jain, D.K. (2008). A Text Book of Botany. Rastogi Publications, Meerut.
7	Singh, V., Pande, P.C. and Jain, D.K. (2012-13). Structure, Development and Reproduction in Angiosperms. Rastogi Publications, Meerut.
8	S S Bhojwani, S.S., Bhatnagar, S.P. and P. K. Dantu, P.K. (2015). The Embryology of Angiosperms. Vikas Publication House Pvt Ltd, New Delhi.



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S.Y.B.Sc Botany

(NEP – Autonomy 23 Pattern)

Course/ Paper Title	PRACTICALS BASED ON PLANT PROTECTION
Course Code	23SBBO41SE
Semester	IV
No. of Credits	2

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To skill the students to identify Plant diseases.
2.	To create awareness among the students about different types of Plant diseases.
3.	Create potential among students to become an entrepreneur.
4.	Equip the students with skills related to laboratory as well as field based Plant diseases studies.
5.	To diagnose various plant diseases of major crops of Maharashtra and finding their effective controls.
6.	Develop foundation for further studies in Botany.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will become aware about general plant.
2.	Students will become aware about bacterial, fungal and viral plant diseases.
3.	Students will understand plant pathogens and how to control them.

Sr. No.	Title of the Experiment	No. of Practicals
01	Study of laboratory equipments- Autoclave, Hot air oven, Inoculating chamber, laminar air flow, Air sampler, Incubator, Centrifuge	01 P
02	Preparation of culture media- PDA, Nutrient agar	01 P
03	Collection and identification of plant diseases.	01 P
04	Isolation of microorganisms.	01 P
05	Isolation and identification of seed-borne pathogens by blotter / agar plate method	01 P
06	Study of air-borne pathogens by exposed petri plates / air sampler	01 P
07	Isolation of fungal pathogens from diseased plant parts mango / Brinjal	01 P
08	Study of air-borne pathogens by exposed petri plates / air sampler	01 P
09	Study of symptoms and causal organisms of Stem rust of wheat	01 P
10	Study of symptoms and causal organisms of Late blight of potato and Downy mildew of grapes	01 P
11	Study of symptoms and causal organisms of Tikka disease of groundnut	01 P
12	Study of symptoms and causal organisms of Rust of Jowar and Grain smut of jowar	01 P
13	Study of symptoms and causal organisms of Green ear and ergot of bajra	01 P
14	Study of symptoms and causal organisms of Wilt of Tur and Whip smut of sugarcane	01 P
15	Botanical excursions to collect plant pathogens	01 P

Suggested Readings	
1	Plant Diseases and Food Security in the 21st Century, Peter ScottRichard, Strange Lise Korsten Maria Lodovica Gullino, 2021.
2	Detection and Diagnostics of Plant Pathogens, Maria Lodovica Gullino, Peter J. M. and Bonants – 2014.
3	Plant Pathology, 2Ed by Mehrotra, Mc Graw Hill India, 2013.
4	Diseases of crop plants in India Rangaswami, Prentice hall 2012.