Teaching Plan

F. Y. B. Sc. - Botany: 2023-24

Plant life and utilization II (BO 121)
(Semester – II; Paper – I)

Sr. No.	Month	Topics
1	**December**	**INTRODUCTION:** Introduction to plant diversity- Pteridophytes, Gymnosperms and Angiosperms with reference to vascular plants.
2	**January**	**PTERIDOPHYTES:** General characters, Outline classification according to Sporne (1976) up to classes with reasons. Life cycle of *Nephrolepis* w.r.t. Habit, habitat, distribution, morphology, anatomy of stem and leaf, Reproduction – vegetative and sexual. Utilization and economic importance of Pteridophytes. **Revision and Assignment**
3	**February**	**GYMNOSPERMS:** General characters, Outline classification according to Sporne (1977) up to classes with reasons. Life cycle of *Cycas* w.r.t. Habit, Habitat, Distribution, Morphology and Anatomy of Stem, leaf and reproductive organs- Male cone, Microsporophyll, microspores and megasporophyll, megaspore; structure of seed; Utilization and economic importance of gymnosperms. **Revision and Assignment**
4	**March**	**ANGIOSPERMS:** General characters, Outline of classification of Bentham and Hooker's system up to series, comparative account of monocotyledons and dicotyledons. Utilization and economic importance of Angiosperms: In food, fodder, fibers, horticulture and medicines. **Revision and Assignment** **Theory & Practical Internal and External Exam**

Dr K. M. Nitnaware

Teaching Plan

F. Y. B. Sc. - Botany: 2023-24

Principles of Plant Science (BO 122)

(Semester – II; Paper – II)

Sr. No	Month	Topics
1	**December**	**Plant Physiology and Cell Biology** **Introduction-** definition and scope of plant physiology. **Diffusion** – definition, factors affecting diffusion, importance of diffusion in plants, imbibition as a special type of diffusion.
2	**January**	**Osmosis** – definition, types of solutions (hypotonic, isotonic, hypertonic), endosmosis, exo-osmosis, osmotic pressure, turgor pressure, wall pressure, importance of osmosis in plants. **Plasmolysis** – definition, mechanism and significance. **Plant growth and growth regulators** – introduction, phases of growth, factors affecting growth, plant growth regulators – introduction, definition and their significance. **Revision and Assignment** **Structure of plant cell**, differences between prokaryotic and eukaryotic cell.
3	**February**	**Plant cell wall** – components of primary cell wall, structure and functions. **Ultrastructure and functions of chloroplast**. Cell cycle in plants – phases of cell cycle (G_1, M, G_2 and S), importance of cell cycle in plants, divisional stages of mitosis and meiosis. **Revision and Assignment** **Molecular Biology** **Introduction** and scope of molecular biology, central dogma of molecular biology. **Structure of DNA**- Structure of nitrogen bases, nucleoside, nucleotide, Chargaff's rule, C value paradox. **Watson Crick model of DNA** and its characteristic features, types of DNA (A, B and Z DNA).
4	**March**	**Structure and types of RNA.** **Packaging of DNA into chromosomes.** **DNA replication**- Types of replications (conservative, semi-conservative and dispersive), bacterial DNA replication (Initiation, elongation and termination), enzymes involved, leading and lagging strands, Okazaki fragments. **Theory & Practical Internal and External Exam**

Prof. P. D. Kad

Teaching Plan
S. Y. B. Sc. [Botany]: 2023-24
CBCS
BO: 241; Plant Anatomy and Embryology
(Semester IV, Paper I)

Sr. No	Month	Topics
1	**January**	**Plant anatomy** **Introduction –** Definition and scope of plant anatomy **Epidermal tissue system** Structure, types and function of epidermis, Structure, types and function of stomata, Epidermal outgrowths - glandular and non-glandular.,Motor cells **Mechanical tissue system** Principles involved in distribution of mechanical tissues with one example each – inflexibility, incompressibility, inextensibility and shearing stress Vascular tissue system - Structure and function of xylem, phloem and cambium Structure and function of cambium
2	**February**	**Normal secondary growth** Introduction Normal secondary Growth in Dicotyledonous stem Development of annual rings, periderm, bark, tyloses and lenticels. **Anomalous secondary growth** Introduction Causes, anomalous secondary growth, Anomalous secondary growth in: Dicot stem (*Bignonia*), Dicot root (*Raphanus*) and monocot stem (*Dracaena*) **Revision, Assignment**
3	**March**	**Plant Embryology** **7. Introduction** Definition and scope of plant embryology **8. Microsporangium and male gametophyte** Structure of tetrasporangiate anther, Types of tapetum, Sporogenous tissue, Microsporogenesis: process and its types, Types of microspore tetrad, Male gametophyte: structure and development of male gametophyte **9 Megasporangium and female gametophyte** Structure, Types of ovules, Types of megaspore tetrads, Female gametophyte: structure of typical embryo sac, Types of embryo sacs – monosporic, bisporic and tetrasporic
4	**April**	**10. Pollination and Fertilization:** Introduction and definition, Types of pollination, Germination of pollen grain, Entry of pollen tube- porogamy, mesogamy and chalazogamy, Double fertilization and its significance. **11. Endosperm and embryo** Endosperm: Types – nuclear, helobial and cellular. Structure of Dicotyledonous and Monocotyledonous embryo. **Revision, Assignment** **Theory and Practical Internal and External Exam**

Dr. S. M. Jagtap

Teaching Plan
S.Y.B.Sc. Botany (CBCS): 2023 - 24
BO 242:Plant Biotechnology
(Semester IV, Paper II)

Sr. No.	Month	Topics
1	**January**	**Chapter 1 Introduction to Plant Biotechnology** History and definition, Scope and importance of plant biotechnology, Current status of biotechnology in India. **Chapter 2 Plant Tissue Culture** Concept of plant tissue culture and cellular totipotency; Basic techniques: Types of culture, Media preparation, sterilization, inoculation, incubation, hardening;Applications with reference to: Micropropagation, Somaclonal variation, Haploid production, Protoplast fusion & Somatic hybrids, Embryo rescue, Production of secondary metabolites; Commercial Plant Tissue culture laboratories in Maharashtra and India.
2	**February**	**Chapter 3 Single Cell Protein** (SCP) Concept and definition ; Importance of proteins in diet ; Production of SCP from *Spirulina* and Yeast; Importance & acceptability of SCP **Chapter 4 Plant Genetic Engineering** Introduction, concept ; Tools of genetic engineering (restriction enzymes, ligases, plasmid vectors); Gene cloning Technique; Applications of plant genetic engineering: insect pest resistance, abiotic stress tolerance, herbicide resistance **Revision, Assignment**
3	**March**	**Chapter 5 Genomics, Proteomics and Bioinformatics** Genomics- concept, types, methods used for whole genome sequencing; Proteomics-concept, types, methods used in proteome analysis; Bioinformatics-concept, database and its classification, data retrieval tools. **Chapter 6 Bioremediation** Introduction and concept; Microbial remediation; Phytoremediation
4	**April**	**Chapter 7 Biofuel technology** Definition, Concept and types of Renewable and nonrenewable energy sources Definition and concept of Biogas, Bioethanol, Biobutanol, Biodiesel & Biohydrogen **Revision, Assignment** **Theory and Practical Internal and External Exam**

Dr. K. M. Nitnaware

Teaching Plan
T. Y. B. Sc. – Botany CBCS Pattern: 2023-24

BO.362: Biochemistry

(Semester– VI; Paper – II)

Sr. No.	Month	Topic
1.	December	**Foundation of Biochemistry:** From molecules to the first cell (origin of acell), Miller and Urey experiment. Biomolecules of a cell, functional groups in biomolecules, conformations and onfigurations of biomolecules. **Water: The solvent of life:** Physical properties of water, structure of water molecule, polarity of water molecule, weak interactions in aqueous solutions.
2.	January	**Amino acids and proteins:** Structure, classification, properties and functions of amino acids. Structure (primary, secondary, tertiary and quaternary), properties and functions of proteins. Biological disorders of amino acid metabolism. Commercial applications. **Revision and Assignment** **Enzymes:** Definition, nature of enzymes and co-factors, classification and properties of enzymes, active site. Mechanism of enzyme action: free energy, activation energy, binding energy, transition state, lock and key hypothesis, induced fit theory. Factors affecting enzyme activity: pH, temperature, substrate concentration, enzyme concentration. Enzyme inhibition: Competitive, uncompetitive, non-competitive.Reversible and irreversible inhibition, feedback inhibition.
3.	February	**Carbohydrates:** Definition, classification of carbohydrates- Monosaccharides: aldoses and ketoses, configurations, linear to ring structure; Oligosaccharides: glycosidic bond, reducing and non-reducing sugars; Polysaccharides: homopolysaccharides, heteropolysaccharides, examples, their structures, locations and role. Properties and functions of carbohydrates. Commercial applications. **Revision and Assignment**
4.	March	**Lipids:** Definition, classification of lipids: simple, conjugate and derived lipids, properties and functions of lipids. Biological disorders of lipid metabolism. Commercial applications. **Vitamins:** Definition, classification of vitamins. source and functions of vitamins. **Revision and Assignment** **Previous Years' Question Paper Discussion** **Theory and Practical Internal and External Exam**

Prof. P.D.Kad

Teaching Plan
T. Y. B. Sc. – Botany CBCS Pattern: 2023-24

BO.363: PLANT PATHOLOGY

(Semester– VI; Paper – III)

Sr. No.	Month	Topic
1.	December	**Fundamentals of plant pathology -** Introduction, Important terminology- Incitants, Host, Parasite, Pathogen, Inoculum, Penetration, Infection, Incubation, Disease, Disease development,Symptoms, Sign, Endophyte, Predisposition, Suscept, Resistance, Epidemic, Etiology. Economic importance of plant diseases, History of plant pathology, Introduction to Indian Agricultural Research Institute (IARI), International Crop Research Institute for Semi Arid Tropics (ICRISAT), Contribution of Anton DeBary and Prof. B.B.Mundkur.
2.	January	**Disease Development -** Concept of disease cycle, Inoculation, Prepenetration, Penetration, Infection, Dissemination. Epidemics- Forms, Decline,, Exponential model. Disease forecasting, Measurement of plant disease and yield loss. **Defence Mechanisms -** Concept and Definition, Types- Preexisting- Structural and chemical, Induced-Structural and Biochemical **Revision and Assignment** **Methods of Studying Plant Diseases -** Macroscopic study, Microscopic study, Koch"s postulates. Culture technique, Media Types and Preparation, Pure culture methods- streak plate, Pour plate, spread plate, Serial dilution. **Fungal Plant Diseases -** Introduction to fungi as plant pathogens. Study of Diseases- Club root of Crucifers, Downy mildew of Grapes, Head smut of Jowar, Leaf spot of Turmeric, Tikka disease of Groundnut with reference to causal organism, symptoms and signs, disease cycle and control measures **Revision and Assignment**
3.	February	**Bacterial Plant Diseases -** Introduction to bacteria as plant pathogens, Study of Diseases- Citrus Canker, Black arm of Cotton with reference to causal organism, symptoms and signs, control measures. **Mycoplasma Plant Diseases -** Introduction to Mycoplasma as plant pathogens, Study of Diseases- Grassy shoot disease of sugarcane, little leaf of brinjal with reference to symptoms and signs, control measures. **Nematodal Plant Diseases -** Introduction to Nematodes as plant pathogens. Study of Diseases- Root knot disease of vegetables, Ear cockle of Wheat with reference to causal organism, symptoms and signs, control measures**Viral Plant Diseases -** Introduction to Viruses as plant pathogens. Study of Diseases- Tobacco Mosaic Disease, Bunchy top of Banana with reference to causal organism, symptoms and signs, control measures.
4.	March	**Non-Parasitic Diseases -** The impact and abiotic causes- Temperature, Soil moisture and relative humidity, Poor oxygen, Poor light, Air pollutants, mineral deficiencies. Herbicide injury, Study of Tip burn of Paddy, Mango necrosis, Black Heart of Potato, Khaira disease of rice. **Principles of Plant Disease Control -** General account, Quarantine, Eradication, cultural control practices, biological control, Curative measures, Chemical control, Use of Effective Microorganism Solution (EMS), Microbial Pesticides, IPM **Revision and Assignment** **Previous Years' Question Paper Discussion** **Theory and Practical Internal and External Exam**

Prof. P. D. Kad

Teaching Plan
T. Y. B. Sc. – Botany CBCS Pattern: 2023-24

BO. 365 PLANT BIOTECHNOLOGY
(Semester– VI; Paper – V)

Sr. No.	Month	Topic
1	**December**	**Biotechnology:** Introduction, Traditional and modern Biotechnology. Impact of Biotechnology on Health care, Agriculture, and Environment **Plant Tissue Culture:** Concepts of Cell theory & Cellular totipotency, Landmarks in plant tissue culture. Pluripotency, Differentiation, dedifferentiation, redifferentiation, Hormones used in PTC, 'Explant' for plant tissue culture and Response of explants in vitro– callus formation, organogenesis (direct and indirect) and embryogenesis (direct and indirect)**.** Micro propagation of Banana (in detail from Selection of explant to hardening and marketing)
2	**January**	**Techniques of Genetic Engineering and Methods of gene transfer in Plants-** Introduction to Molecular tools: Definition and role of Nucleases, Polymerases, Ligases, Polynucleotide kinases, Alkaline Phosphatases. Types of vectors- Definition and characters (2-4) of Plasmids, Phages, Cosmids, BAC, YAC, Plant viruses, Animal viruses. Methods of gene transfer in Plants – Direct gene transfer – Definition and concept of Electroporation, Microinjection, and Gene gun Indirect gene transfer- Agrobacterium mediated gene transfer method, Tiplasmid: structure and functions, T-DNA Gene amplification technique -Polymerase chain reaction DNA finger printing **Cryopreservation and Germplasm Conservation** Definition and concept, techniques of cryopreservation, cold storage, long term and short term storage, applications. **Revision and Assignment**
3	**February**	**Germplasm Conservation:** Preservation of Cell, tissue, organ, whole organism. Concept of Gene Bank, DNA Bank, Seed Bank, Pollen Bank etc. **Biotechnology and Society** Biotechnology- Benefits, GM foods and its safety, Recombinant foods and religious beliefs, Recombinant therapeutic product for human health care. Patenting of biotechnological inventions and Intellectual property rights.
4	**March**	**Microbial Biotechnology:** Biochemistry of fermentation, Microorganism used in fermentation, fermentable substrate, Ethanol fermentation methods, Distilleries producing alcohols. Commercial production: Alcoholic beverages, organic acids, citric acids. Advantages of fermentation. **Transgenic Plants as Bioreactors:** Metabolic engineering of starch, cyclodextrins, fructans, Bioplastics, Genetically engineered plants as protein factories, Production of therapeutic proteins from plants. **Nano-biotechnology** Definition and concept, Applications of nanotechnology in agriculture (fertilizers and pesticides). **Revision, Assignment** **Previous Years' Question Paper Discussion** **Theory and Practical Internal and External Exam**

Dr. K. M. Nitnaware

Teaching Plan

T. Y. B. Sc. – Botany CBCS Pattern: 2023-24

BO366: PLANT BREEDING AND SEED TECHNOLOGY

(Semester– VI; Paper VI)

Sr. No.	Month	Topic
1	December	**Introduction:** Definition, Scope and objectives and History of Plant breeding in India **Techniques and practices of plant breeding** **A. Plant Introduction** Definition, Types (Primary and Secondary), Procedure, Merits and Demerits Important Achievements **B. Selection methods** Concept, Types of selections –mass selection, pure line selection and clonal selection. Advantage and disadvantages of selection, Achievements of selection breeding **C. Hybridization** Definition, Concept and Objectives, Precaution to be taken during hybridization Types: Intervarietal and Distant, General procedure of hybridization Methods of hybridization: Pdigree and bulk, Hybrid vigour and heterosis **Advanced techniques in Plant breeding** **A. Mutation breeding** Definition and concept, Mutagens (Physical and Chemical) Mutants, Types of mutation (Spontaneous and Induced), Application of mutation breeding, Limitations of mutation breeding **B. Tissue Culture** Definition and concept, Totipotency, Application of tissue, embryo and another culture in seed Production **Revision and Assignment**
2	January	**Introduction to Seed Technology** Seed as a basic input in agriculture, Classes of seed- 1. Nucleus, 2. Breeder, 3. Foundation, 4. Certified, Role of seed technology **Seed legislation** Introduction, Seed legislation in India (Seed Act) **Seed Production** Introduction, National Seed Corporation (NSC) and its objectives, State Seed Corporation (SSC) and its objectives, General procedure for Seed Production Location and Season, Land requirement, Importance of soil and water testing Cultural practices, Isolation distance, Plant protection, Weed Control Rouging, Harvesting, Threshing, Seed Processing **Seed Certification** Definition, Objectives and Concept, Phases of Seed Certification General procedure of seed certification, Field inspection, Duties of seed inspector **Seed Testing**A. **Physical Purity Analysis** Definition of purity components, Physical Purity Work Board, Procedure

3	**February**	B. **Moisture Testing** Concept, Air oven method, Digital Moisture Meter C. **Germination testing** Definition and objectives, Procedure and methods for germination testing (Paper, Sand and Soil), Seedling evaluation (Normal Seedlings, Abnormal Seedlings, Multigerm Seed Units and Non-germinated Seeds) **,Seed Pathology and Entomology** Definition. Seed Borne pathogens, Fungi, Bacteria, Viruses Influence of seed borne pathogens on seed production, Common insect pest and its impact on seed production **Seed Storage** Definition and Concept, Seed treatment, Management of seed storage structures Sanitization, Dehumidification, Fumigation **Revision, Assignment** **Previous Years' Question Paper Discussion** **Theory and Practical Internal and External Exam**

Dr. S. M. Jagtap