

SYLLABUS
COURSE – BOOCT2.1
Plants in human welfare
(Full Marks – 75)

Course	Group	Details Contents Structure		Study hour
BOOCT 2.1	Plants in human welfare	Unit 1. Know your plants -I	1. Know your plants-Algae and Fungi	1
		Unit 2. Know your plants -II	2. Know your plants-Bryophyte and Pteridophyte	1
		Unit 3. Know your plants -III	3. Know your plants-Gymnosperms and Angiosperms	1
		Unit 4. Exploitation of microbes	4. Exploitation of microbes- Virus and Bacteria	1
		Unit 5. Mushrooms	5. Mushrooms – their uses and cultivation	1
		Unit 6. Environmental clean-up	6. Environmental clean-up by plants	1
		Unit 7. Stress in plants I	7. Stress in plants- Water	1
		Unit 8. Stress in plants II	8. Stress in plants- heat and cold	1
		Unit 9. Genetically modified crops I	9. Genetically modified crops- Introduction and steps	1
		Unit 10. Genetically modified crops II	10. Genetically modified crops- Examples	1
		Unit 11. Exploitation of plant resources	11. Exploitation of plant resources	1
		Unit 12. Conservation of plants I	12. Conservation of plants-Biodiversity and conservation type	1
		Unit 13. Conservation of plants II	13. Conservation of plants-IUCN categories, MAB, CITES and Hotspot	1
		Unit 14. Plants in forensic science I	14. Plants in forensic science-Introduction and Analysis of samples	1
		Unit 15. Plants in forensic science II	15. Plants in forensic science-Case histories	1
		Unit 16. IPR	16. Intellectual Property Rights	1

SYLLABUS
COURSE – BOHCT2.2
Plant Physiology and Biochemistry
(Full Marks – 75)

Course	Group	Details Contents Structure		Study hour
BOHCT 2.2	Plant Physiology and Biochemistry	Unit 1. Water and Plant Cells and water balance of Plants	1. Water and Plant Cells: Water in Plant life, structure and properties of water, water potential chemical properties of water, water potential of Plant Cells, major factors contributing cell water potential, cell wall and membrane properties. 2. Water balance of Plants: Water in the Soil, Water absorption by roots, Water transport through Xylem, Water movement from leaf to atmosphere, Soil-Plant-atmosphere continuum..	1
		Unit 2. Cell wall, transport and signal transduction	3. Cell wall structure, biogenesis; membrane transport processes; solute transport and photo assimilate translocation. 4. Signal transduction: Signal transduction in eukaryotes	1
		Unit 3. Sensory photobiology	5. Sensory photobiology: Light control of plant development; phytochrome: properties, phytochrome induced response, phytochrome signaling pathways, blue light responses.	1
		Unit 4 Plant hormones and growth regulators	6. Plant hormones and growth regulators: Chemistry, biosynthesis, physiological effects, and signal transduction pathways of auxins, gibberellins, cytokinin, ethylene, abscisic acid, brassinosteroids, polyamines, jasmonates	1
		Unit 5. Growth, developmental physiology, Senescence and programmed cell death	7. Growth and developmental physiology: Embryogenesis and differentiation of plant organs Seedgermination and seedling growth. 8. Senescence and programmed cell death: Types of senescence, metabolic changes associated with senescence and its regulation, influence of hormones.	1
		Unit 6. Control of flowering:	9. Control of flowering: Floral meristem and floral organ development, floral evocation.	1
		Unit 7. Stress physiology	10. Stress physiology: Response and adaptation to abiotic stress: water stress, temperature stress (heat and cold stress). Gene regulation and proteomics of stress tolerance, Development of transgenic plants to stress tolerance.	1
		Unit 8. Principle of biophysical chemistry and Nitrogen metabolism	11. Principle of biophysical chemistry: pH, buffer, reaction kinetics, thermodynamics, law of mass action, acid base reactions, bond energy, energy rich compounds, redox potential, free energy. 12. Nitrogen metabolism: Biological and non biological nitrogen fixation, nitrate and ammonium assimilation	1

Course	Group	Details Contents Structure		Study hour
BOHCT 2.2	Plant Physiology and Biochemistry	Unit 9. Enzyme	13. Enzyme: Enzyme kinetics, catalytic reactions and regulatory properties, inhibitions, iso-enzymes, allosterism, ribozyme and abzymes, vitamins as coenzymes.	1
		Unit 10 Chemistry of plant products: structure and properties	14. Chemistry of plant products: structure and properties of carbohydrates, lipids, amino acids, proteins, nucleic acids, secondary metabolites.	1
		Unit 11 Photosynthesis	15. Photosynthesis: Light reactions, organization of light absorbing system, mechanism of electron and proton transport, Carbon concentrating mechanisms	1
		Unit 12. Energy yielding metabolisms	16. Energy yielding metabolisms: Paths of energy synthesis through Glycolysis, Citric acid cycle, plant mitochondrial electron transport chain, alternative oxidase, PPP cycle, regulation of respiratory pathways, Lipid metabolism: fatty acid biosynthesis and oxidation..	1

SYLLABUS
COURSE – BOHCT 2.3
Embryology, Plant Breeding and Biometry
(Full Marks – 75)

Course	Group	Details Contents Structure		Study hour
BOHCT 2.3	Embryology	Unit 1. Plant development and Transition from vegetative to reproductive phase	1. Plant development: Concept, definition and unique features of development in plants. 2. Transition from vegetative to reproductive phase: morpho-histochemical changes in shoot apex floral meristem and floral organ development in <i>Arabidopsis</i> .	1
		Unit 2. Molecular genetics in Plant Development and male gametophyte development	3. Molecular genetics in Plant Development: Techniques of studying plant developmental pattern: Mutants and transgenics in plant development. 4. Gametogenesis fertilization and early development: i. Development of stamen, anther, sporogenous tissue, microspores, pollen and male germ unit. Molecular basis of male gametophyte development.	1
		Unit 3. female gametophyte development, Self incompatibility, Fertilization, embryo and endosperm development	5. Gametogenesis fertilization and early development: ii. Development of carpel, ovule, megaspore, female gametophyte and female germ unit. Molecular basis of female gametophyte development. iii. Genetic and molecular basis of self incompatibility. Fertilization, double fertilization, triple fusion, imprinting and endosperm development in gymnosperms and angiosperms, embryogenesis in gymnosperms and angiosperms, establishment of symmetry in plants, seed formation.	1
		Unit 4. apomixis, polyembryony	6. Developmental routes of apomixis, polyembryony and its molecular aspects.	1
	Plant Breeding & Biometry	Unit 1. Breeding methods	1. Breeding methods: Introduction and conservation of germplasm, mass selection, pure line selection, clonal selection, hybridization, selection after hybridization (bulk, pedigree, recurrent), heterosis & inbreeding depression.	1
		Unit 2. Mutation and polyploid breeding	2. An outline of mutation and polyploid breeding.	1
		Unit 3. Cytogenetics & breeding practices of crop plants	3. Cytogenetics & breeding practices of crop plants: rice, maize, potato	1
		Unit 4. Breeding methods for disease resistance and MAS	4. An outline of breeding methods for development of disease resistance 5. Molecular marker assisted breeding – an outline	1

Course	Group	Details Contents Structure		Study hour
BOHCT 2.3	Plant Breeding & Biometry	Unit 5. Population samples, Central tendency, SD and SE	6. Population samples, sampling methods. 7. Frequency distribution, histogram, normal curve, mean, median, mode, variance, standard deviation, standard error.	1
		Unit 6. Probability, t-test and ANOVA	8. Probability & test of significance (Student & paired t) χ^2 test (detection of segregation ratio & linkage, test of independence & heterogeneity), analysis of variance (F test) CD, genetic advance, heritability estimation	1
		Unit 7. Correlation & regression	9. Correlation & regression	1
		Unit 8. Design of experiments	10. Design of experiments: general principles of field trails, randomized blocks, latin square, split plot designs, layout of breeding experiment.	1

SYLLABUS
COURSE – BOHCT2.4
Palaeobotany, Palynology and Anatomy
(Full Marks – 75)

Course	Group	Details Contents Structure		Study hour
BOHCT2.4	Palaeobotany	Unit 1. Introduction and Presevation of plants as fossils	1. Introduction: Definition and application. 2. Preservation of plants as fossils: Definition; taphonomy; environment for fossilization; modes of preservation; types; major rock types, rock cycle and rocks containing Fossils; systematics, reconstruction and nomenclature.	1
		Unit 2. Geologic Time and Early life	3. Geologic Time: Geologic timescale, relative vs. numerical age, physical and biological principles for defining relative and numerical age. 4. Early Life: The origin of earth, earliest environment, theories on origin of life, evidences for the origin of life - prokaryotes, evolution of eukaryotes and fossil records, diversified life - algae and fungi.	1
		Unit 3. Terrestrialization of plants and Early vascular plants to early spore producing trees	5. Terrestrialization of plants: Geologic time, environment, vegetative and reproductive adaptations to land dwelling, fossil evidences - transitional plants with land adaptive features, early non vascular land plants (bryophytes), early vascular land plants (pteridophytes). 6. Early vascular plants to early spore producing trees (arborescent pteridophytes & progymnosperms): Geologic time, environment, advancement in plant adaptive features for land dwelling with fossil evidences.	1
		Unit 4. Early spore producing trees to early seed producing trees and Origin and evolution of flowering plants	7. Early spore producing trees to early seed producing trees (gymnosperms): From isospores to free sporing heterospores, origin of ovule, hydrasperman reproduction with fossil evidences. 8. Origin and evolution of flowering plants (angiosperms): Geologic time, evolutionary trends -angiosperm derived characteristics, fossil evidences for early flowering plants, place of origin, radiation, phylogeny.	1
	Palynology	Unit 1. Spore-pollen morphology	1. Spore-pollen morphology: units, polarity, symmetry, shape, size, aperture; NPC system for numerical expression of apertural details; harmomegathic mechanism; evolution of aperture types.	1
		Unit 2. Sporoderm and Pollen Wall:	2. Sporoderm: stratification & sculptures; LO- analysis; pollen wall evolution. 3. Pollen Wall: Development; Ubisch body; sporopollenin; adaptive significance of pollen wall architecture.	1
		Unit 3. Extraaxinous wall materials and Natural spore/pollen traps	4. Extraaxinous wall materials: pollen connecting threads, perine, pollen-kit. 5. Natural spore/pollen traps: types, their implications in floristic & environment reconstruction	1
		Unit 4. Branches of Palynology & their Application	4. Branches of Palynology & their Application: Branches of palynology; palynology in taxonomic & phylogenetic deductions; palynology in academic & applied aspects including melissopalynology, medical palynology, forensic palynology, entomopalynology & copropalynology..	1

Course	Group	Details Contents Structure		Study hour
BOHCT2.4	Plant Anatomy	Unit 1. Meristems and differentiation	1. Meristems and differentiation: meristems and growth of the plant, differentiation of primary and secondary plant body: epidermis: stomatal ontogeny, cuticle and epidermal appendages; secretory structure	1
		Unit 2. Phylogeny and evolution of vascular and mechanical tissue elements	2. Phylogeny and evolution of vascular and mechanical tissue elements: origin and development of sclereids and fibres, phylogeny of xylem and phloem elements, wood anatomy: vascular cambium and its seasonal activity	1
		Unit 3. Anatomical variations with ecology	3. Anatomical variations with ecology: leaf and root anatomy in ecological perspectives; hydraulic architecture of plant	1
		Unit 4. Anatomy in applied science	6. Anatomy in applied science: anatomy and pollution, anatomy in forensic science, archaeology and climatology.	1