

M.Sc. Course in BOTANY (CBCS semester system)

SYLLABUS

COURSE – BOTCOR T205

Palaeobotany & Palynology

(Full Marks – 75)

Course	Group	Details Contents Structure		Study hour
BOTCOR T205	Palaeobotany	Unit 1. Preservation of Plants as Fossils	1. 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	2. Geologic Time: Geologic timescale, relative vs. numerical age, physical and biological principles for defining relative and numerical age.	1
		Unit 3. Early Life	3. 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 4. Colonization of Land by Plants	4. Colonization of Land by 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).	1
		Unit 5. Early Vascular Plants to Early Spore Producing Trees (Arborescent Pteridophytes & Progymnosperms)	5. 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 6. Early Vascular Plants to Early Spore Producing Trees (Gymnosperms)	6. Early spore producing trees to early seed producing trees (gymnosperms): From isospores to free sporing heterospores, origin of ovule, hydrasperman reproduction with fossil evidences.	1
		Unit 7. Origin and Evolution of Flowering Plants (Angiosperms)	7. 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
		Unit 8. Aspects and Appraisal of Palaeobotany	8. Aspects and Appraisal of Palaeobotany: Palaeobotanical study in exploring - mysteries in the living planet; origin, evolution, diversification and extinction of species; plant-animal interaction and co-evolution; plate movement, geological age and correlation of strata; palaeogeography, palaeoclimate; fossil fuel.	1

Course	Group	Details Contents Structure		Study hour
BOTCOR T205	Palynology	Unit 9. Spore-Pollen Morphology	1. Spore-pollen morphology: units, polarity, symmetry, shape, size, aperture; NPC system for numerical expression of apertural details; evolution of aperture types.	1
		Unit 10. Pollen Wall and Extraexinous Wall Materials	2. Pollen wall and extraexinous wall materials: Sporoderm stratification and sculptures; LO- analysis; sporopollenin; pollen wall development; Ubisch body; pollen connecting threads, perine, pollen-kit.	1
		Unit 11. Pollen Grains Adaptation	3. Pollen grains adaptation: Pollen grains adaptation in different habitats and pollination types; pollen wall adaptation and significance; Hermomegathic mechanism.	1
		Unit 12. Spore/Pollen Viability and Storage	4. Spore/Pollen Viability and Storage: Estimation; variations; responsible factors; short- and long-term storage; significance.	1
		Unit 13. Pollen Limitation and Plant Diversification	5. Pollen limitation and plant diversification: Definition; ecological and evolutionary relevance.	1
		Unit 14. Natural Spore/Pollen traps	6. Natural spore/pollen traps: Types, their implications in floristic & environment reconstruction.	1
		Unit 15. Branches of Palynology & Application	7. Branches of palynology & application: Branches of palynology; palynology in taxonomic & phylogenetic deductions; palynology in academic & applied aspects including melissopalynology, medical palynology, forensic palynology, entomopalynology & copropalynology.	1

COURSE – BOTCOR T206

Plant Physiology and Biochemistry

(Full Marks–75)

Course	Group	Details Contents Structure		Study hour
BOTCOR T206	Group A (Plant Growth & Biochemical Processes)	Water and Plant Cells And Water Balance of Plants:	Unit 1. Water in Plant life, chemical properties of water, water potential of Plant Cells, major factors contributing cell water potential, cell wall and membrane properties and Water in the Soil, Water absorption by roots, transport through Xylem, movement from leaf to atmosphere, Soil-Plant-atmosphere continuum.	1
		Cell wall and Early Growth in Plants:	Unit 2. Structure, biogenesis and growth. Embryogenesis and differentiation of plant organs, Seed germination and seedling growth.	1
		Photosynthesis	Unit 3. Light reactions, organization of light absorbing system, mechanism of electron and proton transport. Carbon concentrating mechanisms.	1
		Transport Processes:	Unit 4. Solute transport across membranes; Phloem translocation of photoassimilates.	1
		Stress physiology	Unit 5. Response and adaptation to abiotic stress: water stress, temperature stress (heat and cold stress) and Gene regulation and proteomics of stress tolerance; Development of transgenic plants to stress tolerance.	1
		Principle of biochemistry	Unit 6. pH, buffer, reaction kinetics, thermodynamics, law of mass action, acid base reactions, bond energy, energy rich compounds, redox potential, free energy.	1
		Enzyme	Unit 7. Enzyme kinetics, catalytic reactions and regulatory properties, inhibitions, isoenzymes, allosterism, ribozyme and abzymes, vitamins as coenzymes.	1

Course	Group	Details Contents Structure	Studyhour	
BOTCOR T206	Group B (Plant Metabolism & Development)	Phytohormones and Growth Regulators in Plant Development:	<p>Unit 8. Chemistry, biosynthesis, physiological effects, and signal transduction pathways of auxins, gibberellins,</p> <p>Unit 9. Signal transduction pathways of cytokinin, ethylene, abscisic acid, brassinosteroids, polyamines, jasmonates.</p>	1
		Signal Transduction and Sensory Photobiology:	Unit 10. Signal transduction in higher plants and Light control of plant development; phytochrome: properties, phytochrome induced response, phytochrome signaling pathways, blue light responses.	1
		Control of Flowering:	Unit 11. Floral meristem and floral organ development, floral evocation.	1
		Senescence and Programmed Cell Death:	Unit 12. Types of senescence, metabolic changes associated with senescence. Senescence and its regulation, influence of hormones.	1
		Plant Products in Metabolism:	Unit 13. Structure and properties of carbohydrates, lipids, amino acids, proteins,	1
		Energy Yielding Metabolisms:	Unit 14. 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
		Nitrogen Metabolism:	Unit 15. Biological and non-biological nitrogen fixation, nitrate and ammonium assimilation.	1

COURSE – BOTCOR T207
Genetics, Cytogenetics, Plant Breeding and Biometry
(Full Marks – 75)

Course	Group	Details Contents Structure		Study hour
BOTCOR T207	Genetics & Cytogenetics	Unit 1. Mendelian Inheritance	1. Mendelian Inheritance: Meiosis; Chromosome theory of inheritance; Mendelian laws; Gene interactions.	1
		Unit 2. Non-Mendelian Inheritance	2. Non-Mendelian Inheritance: Organelle heredity; Infectious heredity; Maternal effects.	1
		Unit 3. Population Genetics	3. Population Genetics: Hardy-Weinberg principle; gene frequency in a population, genetic equilibrium, factors affecting gene frequency.	1
		Unit 4. Microbial Genetics	4. Microbial Genetics: Transformation, conjugation and transduction and their significance in gene mapping.	1
		Unit 5. Chromosome	5. Chromosome: Structure and nomenclature, centromere and telomere, chromosomal aberrations.	1
		Unit 6. Special Chromosomes	6. Special Chromosomes: Lampbrush, Polytene and B-chromosome.	1
		Unit 7. Sex Determination	7. Sex Determination: Sex determination in plants; dosage compensation; sex linked inheritance.	1
		Unit 8. Linkage and Crossing Over	8. Linkage and Crossing Over: Chiasma frequency and genetic map distance; Tetrad analysis; Centromere mapping with ordered tetrad.	1
		Unit 9. Transposable Elements	9. Transposable Elements: In bacteria (<i>IS</i> elements, composite transposons), maize (<i>Ac</i> and <i>Ds</i> elements), <i>Drosophila</i> (<i>P</i> -elements) and their genetic significance.	1
		Unit 10. Genetic Regulation	10. Genetic Regulation: Regulation of gene expression in prokaryotes and their viruses – <i>lac</i> , <i>trp</i> and <i>ara</i> operons of <i>E. coil</i> , Lambda lytic-lysogenic regulatory cascade; regulation of eukaryotic gene expression – brief account.	1

Course	Group	Details Contents Structure		Study hour
BOTCOR T207	Plant Breeding & Biometry	Unit 11. Breeding methods	11. 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 12. Population samples	12. Population samples, sampling methods.	1
		Unit 13. Frequency distribution	13. Frequency distribution: histogram, normal curve, mean, median, mode, variance, standard deviation, standard error.	1
		Unit 14. Probability & test of significance	14. Probability & test of significance: χ^2 test (detection of segregation ratio & linkage, test of independence); t-test (student & paired); analysis of variance (ANOVA).	1
		Unit 15. Correlation & regression	15. Correlation & regression	1

COURSE–BOTGEC T
Plants in Human Welfare
(Full Marks–50)

Course	Group	Details Contents Structure		Study hour
BOTGEC T	Plants in Human Welfare	Exploitation of Microorganisms and their Products:	Unit1. Health care products (antibiotics, interferons, vaccines, hormones, vitamins etc.); enzymes (amylase, protease); biofertilizers; food & dairy products.	1
			Unit2. Microbial production of organic acids (citric acid, acetic acid); amino acids (glutamic acid, lysine).	1
			Unit 3. Microbial production of alcoholic beverages (bear & wine); biofuels (ethanol, methane, biogas, biohydrogen).	1
			Unit 4. Microbes in biological warfare; microbial leaching (copper, uranium); role in biosorption, biotransformation of xenobiotics; microorganisms in the recovery of precious metals.	1
			Unit 5. Microbes in composting and biopesticide formulation; microbes in bioremediation & biopolymer production; microbes in single cell proteins & single cell oil, Microbial Enhanced Oil Recovery (MEOR).	1
		Fungi:	Unit 6. General & unique characters, nutrition, thallus structure, spores, basic idea of different groups; Mushrooms: basidiocarp, ascocarp.	1
			Unit 7. Macroscopic & microscopic features, Cultivation procedure of edible mushrooms; beneficial & harmful fungi.	1
		Algae:	Unit 8. Understanding algae as a plant group; Societal issues involving algae.	1
		Bryophyte, Pteridophyte & Gymnosperm:	Unit 9. Brief introduction of the plant groups and evolutionary importance, economy and livelihood of the modern-day people with the representative taxa of Bryophyte, Pteridophyte.	1
			Unit 10. Brief introduction of the plant groups and evolutionary importance, economy and livelihood of the modern-day people with the representative taxa of Gymnosperm.	1

	Plant and Medicine:	Unit 11. Introduction, source and medicinal uses of the following plant-derived pharmaceutical compounds - (artemisinin, aspirin, atropine, camptothecin, cannabidiol, ephedrine, digoxin, diosgenin, galanthamine,	1
		Unit 12. Introduction, source and medicinal uses of the following plant-derived pharmaceutical compounds - L-dopa, morphine, codeine, quinine, colchicine, vincristine, vinblastine, podophyllotoxin, taxol). Importance of phytopharmaceuticals.	1
		Unit 13. Classification of plant secondary metabolites; Exploration of secondary metabolites in therapeutics.	1
	Plant Tissue Culture:	Unit 14. Concept of cellular totipotency; culture media; organogenesis;	1
		Unit 15. Somatic embryogenesis; haploid plant production and micropropagation.	1
	Genetically Modified Crops:	Unit 16. Recombinant DNA technology and its use in crop improvement.	1
	Plants in Forensic Investigation:	Unit 17. Introduction; use of different branches of Botany (Palynology; Plant Anatomy including Dendrochronology in forensic investigation.	1
		Unit 18. Introduction; use of different branches of Botany Ecology; Limnology; Plant systematic & Taxonomy in forensic investigation.	1
		Unit 19. Introduction; use of different branches of Botany Molecular Biology; Plant Biotechnology; Bioinformatics etc in forensic investigation.	1
	Intellectual Property Rights (IPR):	Unit 20. Definition; Differentiating between Intellectual Property and Physical Property; Types of Intellectual Property Rights; Importance of IPR.	1