

LESSON PLAN
SUBJECT: BOTANY (Theory)
SEMESTER- 5, PAPER: BOTN5011 – Botany: MORPHOLOGY AND ANATOMY

Unit	TOPIC	Teacher
MORPHOLOGY		
Unit 1	Introduction to root and stem, and their modifications.	Dr. Sayani Biswas
Unit 2: Leaves	Types; phyllotaxy; venation; leaf shape, apex, margin and tip; modifications of leaves.	Dr. Sayani Biswas
Unit 3: Inflorescence	Concept of inflorescence and syn-florescence; types; evolution.	Dr. Sayani Biswas
Unit 4: Flower	The flower as a modified shoot; merosity and symmetry of flowers; modification of different floral parts; calyx, corolla, androecium and gynoecium types (adhesion and cohesion and their evolutionary significance); aestivation; placentation and its evolution; floral formulae and floral diagram in different major clades of angiosperms.	Dr. Sayani Biswas
Unit 5: Fruit and Seeds	Fruit and seed diversity and their dispersal mechanisms.	Dr. Sayani Biswas
ANATOMY		
Unit 1: Introduction to diversity of plant forms	Historical perspective, methods/tools and techniques (fixation, sectioning, macerations); terms for describing plant cells; basic plant growth-meristems and cell differentiation; Primary and Secondary plant body (introduce terms); Classification of tissues; Simple and complex tissues, Vascular system.	Mr. Subir Samanta
Unit 2: Tissue organisation in stem, root and leaf	Organization of shoot apex -Apical cell theory, Tunica Corpus theory, Cyto-Histological Zonation Theory; Types of vascular bundles; Structure of dicot and monocot stem; Shoot Chimeras (concept only). Organisation of root apex - Apical cell theory, Korper- Kappe theory; Structure of dicot and monocot root. Dermal tissue system, cuticles and special epidermal cells - cuticle; epicuticular waxes, appendages; stomata types, structure of dicot and monocot leaf.	Mr. Subir Samanta
Unit 3: Vascular Cambium	Structure (axially and radially oriented elements); function and seasonal activity of cambium; Secondary growth in stem, cambial variants in anomalous secondary thickening stem.	Mr. Subir Samanta
Unit 4: Wood and Periderm	Basic structure of secondary wood; types of rays and axial parenchyma; sapwood and heartwood; ring and diffuse porous wood; early and late wood, tyloses; wall ingrowths and transfer cells; ergastic substances; development and composition of periderm; rhytidome and lenticels.	Mr. Subir Samanta
Unit 5: Adaptive and Defensive Systems	Anatomical adaptation of halophytes, xerophytes and hydrophytes	Mr. Subir Samanta

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Sl. No.	TOPIC	Teacher
1	Study epidermal system: cell types, stomata types; trichomes: non-glandular and glandular through temporary whole mounts/peels.	Dr. Sayani Biswas
2	Study of morphological peculiarities from the families: Arecaceae, Apiaceae, Orchidaceae, Poaceae, Magnoliaceae, Apocynaceae, Brassicaceae, Malvaceae, Cucurbitaceae, Euphorbiaceae, Asteraceae, Lamiaceae (from live specimens as well as digital images).	Dr. Sayani Biswas
3	Study the types and features of wood: ring porous; diffuse porous; heartwood and sapwood through specimens and permanent slides.	Mr. Subir Samanta

4	Prepare permanent slides with double staining to study organisation of dicot-primary and secondary growth and anomalous secondary growth (<i>Bignonia</i> , <i>Dracaena</i> , <i>Boerhavia</i> , <i>Nyctanthes</i> , <i>Tecoma</i>).	Mr. Subir Samanta
5	Study the adaptive anatomy in halophytes (from permanent slide) xerophytes and hydrophytes through permanent slide preparation.	Mr. Subir Samanta
6	Study the secretory tissues: cavities, lithocysts and laticifers through permanent slides /digital resources.	Mr. Subir Samanta
7	Submission of permanent slides and lab copy.	Dr. Sayani Biswas & Mr. Subir Samanta

LESSON PLAN SUBJECT: BOTANY (Theory) SEMESTER- 5, PAPER: BOTN5012 – Botany: GENETICS AND PLANT BREEDING		
Unit	TOPIC	Teacher
Unit 1: Mendelian genetics	Principles of inheritance, History and concept of inheritance, chromosomal theory of inheritance, autosomes and sex chromosomes, and probability pedigree analysis (autosomal and sex linked traits); autonomous and sex-linked traits; non-Mendelian genetics – Allelic (incomplete and co – dominance) and non- allelic gene interactions (complementary, supplementary, dominant and recessive epistasis), lethal gene interaction, multiple alleles, pleiotropy, polygenic inheritance.	Dr. Sk. Aftabul Alam
Unit 2: Linkage, crossing over and chromosome mapping	Concept of linkage and crossing over, cytological basis of crossing over including molecular mechanism (Holliday Model), recombination frequency, three factor crosses, interference and coincidence, linkage map, linkage map, sex - linked inheritance.	Dr. Sk. Aftabul Alam
Unit 3: Variation in chromosome number and structure	Structural changes of chromosomes - deletion, duplication, translocation and inversion with their meiotic behaviour and genetic consequences. Numerical changes of chromosomes – euploidy, aneuploidy and polyploidy and crop evolution.	Dr. Jiban Kumar Pal
Unit 4: Gene mutation	Types, molecular basis of mutations; mutagens, - Physical and chemicals, (base analogs, deaminating, alkylating and intercalating agents); detection of mutations: CIB method, DNA repair systems.	Dr. Sayani Biswas
Unit 5: Fine structure of gene	Classical and molecular concept of genes, Cis-trans complementation test.	Mr. Sujit Pal
Unit 6: Extra chromosomal inheritance	Concept of extra chromosomal inheritance, maternal effects, variegation in four o'clock plant.	Mr. Sujit Pal
Unit 7: Population and evolutionary genetics	Allele frequencies, genotype frequencies, Hardy - Weinberg Law, role of natural selection, mutation and genetic drift.	Mr. Sujit Pal
Unit 8: Aims and methods of plant breeding	Introduction, domestication, selection (pure line, mass selection, inbred line selection), hybridization, heterosis and inbreeding depression, achievements of plant breeding.	Dr. Jiban Kumar Pal

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Sl. No.	TOPIC	Teacher
1	Testing of goodness of fit with Mendelian mono – and dihybrid ratios.	Dr. SK Aftabul Alam
2	Numerical problems on gene interaction. (12:3:1, 9:3:4, 13:3, 9:7)	Dr. SK Aftabul Alam
3	Numerical problems on Linkage Map construction.	Mr. Sujit Pal
4	Studies on determination of crossover frequencies (Meiotic cell division in <i>Allium cepa</i> flower bud by aceto carmine staining method).	Mr. Sujit Pal
5	Studies on effects of mutagens (methyl methane sulphonate/ ethyl methane sulphonate/gamma ray) – Cytological study using <i>Allium cepa</i> root tip by acetoorcein staining method.	Dr. Jiban Kumar Pal
6	Pollen viability test from fresh material.	Dr. Jiban Kumar Pal
7	Studies on emasculation and plant hybridization methods.	Mr. Sujit Pal

LESSON PLAN
SUBJECT: BOTANY (Theory)
SEMESTER- 5 , PAPER: BOTN5013 - Botany: MOLECULAR BIOLOGY

Unit	TOPIC	Teacher
Unit 1: Structure and organisation of the genetic material	DNA double helix structure (Chargaff's rule; Watson and Crick model); salient features of DNA double helix. Types of DNA: A, B & Z conformations, denaturation and renaturation (only melting profile- T_m), Organization of DNA- prokaryotes and eukaryotes, mitochondria and chloroplast DNA, the nucleosome structure, euchromatin, heterochromatin- constitutive and facultative heterochromatin, types of RNA (mRNA, rRNA, tRNA, small RNAs). Split genes (Phillip Sharp)	Dr. Manjusha Sarkar
Unit2: Nucleic acids as carriers of genetic information	: Discovery of nucleic acids, Experiments that established nucleic acids (DNA & RNA) as the carrier of genetic information: Griffith's, Hershey & Chase, Avery, McLeod & McCarty, and Fraenkel-Conrat's experiment.	Dr. Jiban Kumar Pal
Unit 3: Central Dogma and Genetic Code	: Beadle and Tatum's one gene one enzyme hypothesis; The Central Dogma, Genetic code and its salient features, Experiments for deciphering Genetic code (Experiments by Nirenberg & Matthaei, and Har Gobind Khorana). Adaptor hypothesis by Crick; Baltimore and Temin's discovery of reverse transcription.	Mr. Sujit Pal
Unit 4: Structure and function of nucleic acids at molecular level	; molecular details of DNA replication and its types; cellular processes of transcription, modification of transcripts - concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, alternative splicing, eukaryotic mRNA processing (5' cap, 3' polyA tail); Ribozymes, translation - steps in protein synthesis - initiation, elongation and termination of polypeptides, inhibitors of protein synthesis; post-translational modifications of proteins. Mechanism of regulation of gene expression - Principles of transcriptional regulation; Prokaryotes: regulation of lactose metabolism and tryptophan synthesis in <i>E.coli</i> , gene silencing in eukaryotes.	Dr. Manjusha Sarkar and Dr. Sk. Aftabul Alam

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Sl. No.	TOPIC	Teacher
1	Isolation of plasmid and genomic DNA from E. coli and quantification using agarose gel Electrophoresis	Dr. M. Sarkar, Dr. Sk. A. Alam & S. Pal
2	Isolation of genomic DNA from plant samples (atleast two different genera / species) using CTAB method and quantification using agarose gel electrophoresis	Dr. M. Sarkar, Dr. Sk. A. Alam & S. Pal
3	Quantification of unknown DNA by diphenylamine reagent (Spectrophotometry).	Dr. M. Sarkar, Dr. Sk. A. Alam & S. Pal
4	Quantification of unknown RNA by orcinol reagent (spectrophotometry)	Mr. Sujit Pal
5	Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel and Conrat's experiments).	Dr. Jiban Kumar Pal
6	. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).	Dr. Manjusha Sarkar
7	Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs.	Dr. Jiban Kumar Pal