DEPARTMENT OF BOTANY

CURRICULUM PLAN 2025-2026 (ODD SEMESTER)

Dr. Naghma Parween

B.Sc. (H) Botany

Semester-V

Molecular Biology of the cell:

Theory	Allocation of Lectures	Month wise schedule	Tutorial/Assi gnment/Pres entation	Reading suggestions
Unit 1: 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. Unit 2: Structure and organization of the genetic material: DNA double helix structure (Chargaff's rule; Watson and		August 2025	Assignment	William S. Klug, Michael R. Cummings, Charlotte A. Spencer, Michael A. Palladino, & Darrell Killian (2019). Concepts of Genetics. Pearson; 12th edition.
Crick model); salient features of DNA double helix. Types of DNA: A, B & Z conformations, denaturation and renaturation (only melting profile- Tm), types of RNA (mRNA, rRNA, tRNA, small RNAs). split genes (Phillip Sharp). Unit 3: Central Dogma and Genetic Code		August 2025		2. Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M.,Losack, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, 6th edition.
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 transcription.		September 2025		3. Snustad, D.P. and Simmons, M.J (2019). Principles of Genetics. John Wiley, 7 th edition. 4. Russell, P. J. (2010). igenetics-Molecular Approach.
Unit 4: Replication of DNA; Delbruck's Dispersive mechanism model; Bloch and Butler's conservative replication model; Meselson and Stahl's semi-conservative replication model; Mechanism - initiation, elongation and termination Enzymes and other proteins involved in DNA replication; General principles – bidirectional, semiconservative and semi-discontinuous replication. (Replisome), RNA priming				Benjamin Cummings, U.S.A. 3rd edition.

(Primase &Primo some); Various modes of DNA replication, including rolling circle, θ (theta) mode of replication, replication of linear dsDNA. Replication of the 5'end of linear chromosome (end-replication problem & Telomerase).	September 2025	
Unit 5: Mechanism of Transcription; Transcription process in prokaryotes (Initiation, Elongation and Termination); structure and function of RNA polymerase enzyme; concept of promoters and transcription factors; comparison between prokaryotic and eukaryotic transcription; concept of post-transcriptional modifications (introduction to eukaryotic mRNA processing: 5' capping; Splicing and alternative splicing; 3' poly A tailing).		
Unit 6: Mechanism of Translation;		
Translation in prokaryotes: Initiation, Elongation and Termination; concept of charging of tRNA and role of aminoacyl synthetases; ribosome structure and assembly (prokaryotes and eukaryotes); comparison between prokaryotic and eukaryotic translation; post-translational modifications (phosphorylation, glycosylation).	October 2025	
Unit 7: Gene Regulation :		
Gene regulation in prokaryotes: Operon concept; inducible & repressible systems; regulation of lactose metabolism in E. coli (inducible system, positive & negative control); regulation oftryptophan synthesis (Repression-De-repression and concept of Attenuation) in E. coli. Gene regulation in eukaryotes: concept of gene silencing by DNA methylation and RNA interference.	October 2025	Russell, P. J. (2010). I Genetics- A Molecular Approach. Benjamin
Practical's:		Cummings,
Isolation of plasmid and genomic DNA from E. coli and quantification using agarose gel electrophoresis		
2. Isolation of genomic DNA from plant samples (at least two different genera / species) using CTAB method and quantification using agarose gel electrophoresis	August	
Quantification of unknown DNA by diphenylamine reagent (colorimetry).	2025	
4. To estimate the generation time of Escherichia coli (prokaryote) and budding yeast (eukaryote) by spectrophotometric measurement and plotting growth curve as an indirect method to study DNA replication.		
5. To study control of replication in budding yeast with the help of specific inhibitors (beta-lactams: -Clavulanic acid,	August 2025	

Ceftazidime, Piperacillin, Ceftriaxone etc) and studying budding frequency.		
6. To study control of transcription in Escherichia coli with the help of prokaryotic (Rifampicin) and eukaryotic (Actinomycin-D) transcription inhibitors and plotting growth curve.		
7. To study control of translation in Escherichia coli with the help of prokaryotic (Kanamycin / Streptomycin) inhibitors using an IPTG- inducible system.	September	
8. To understand the regulation of lactose (lac) operon (positive & negative regulation.	2025	
B. Sc. (Programme) Life Science,		
Botany DSC-for LS-III Semester	0	
Paper: Plant Cell and	October 2025	
Developmental Biology		
Theory:		
Unit 1. Introduction to Plant Cell: structure and function: Structure of plant cell, Structure and functions of cell organelles: cell wall (Primary and secondary wall), nucleus, chloroplast, mitochondria, dictyosomes, endoplasmic reticulum.		
Unit 2. Polarity in plant growth 6 hours Growth through primary meristems, and secondary meristems (discuss briefly), Organization of shoot apex (Tunica-Corpus theory, Waiting meristem theory) and root apex (Körper-Kappe theory).		
Unit 3. Differentiation of tissues: vegetative organs 7 hours Structure and functions of tissues (simple and complex), Structure of stem, root, and leaf (dicot and monocot), Brief mentioning of anomalous secondary growth in stem of Salvadora/Bignonia and Dracaena, Epidermal system: classification of stomata (Metcalfe and Chalk), trichomes.	August 2025	
Unit 4. Differentiation of tissues: reproductive organs 6 hours Flower development (ABCDE model), Anther and its wall layers (ontogeny not to be included), microsporogenesis and micro gametogenesis, pollen wall (intine, exine), male germ unit; Ovule: General structure, megasporogenesis (monosporic, bisporic, tetrachoric) and mega gametogenesis		

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	Bignonia, Dracaena		

7. Study reproductive structures through photographs/ micrographs/permanent slides/specimens:	August 2025	
a. Transverse section of anther with wall layers, secretory and amoeboid tapetum		
b. Microsporogenesis through micrographs of transverse section anther		
c. Pollen exine patterns (any four types)		
d. Types of ovule, associated structure (obturator, aril, caruncle)	September	
e. Mature Polygonum type of embryo sac and ultrastructure of egg apparatus	2025	
8. Study of pollen viability (TTC/FDA).		
9. Calculation of percent pollen germination in any one medium through sitting drop culture//Hanging drop culture.		
10. Dissection of embryo/endosperm from developing seeds.		
Plant tissue culture Practical's:	November 2025	
I. To study the equipment used in tissue culture: autoclave and laminar air flow		
chamber.		
Preparation of Murashige & Description Skoog's (MS) medium.		
Demonstration of sterilization and inoculation methods using leaf and nodal		
explants of tobacco, carrot, Datura, Brassica, etc. (any two).		
Study of anther, embryo and endosperm culture (demonstration/photographs)	August 2025	
5. Study of micropropagation, somatic embryogenesis & amp; artificial seeds	2320	
(demonstration/photographs).		
6. Isolation of protoplasts (demonstration/photographs).		
7. Visit to a plant tissue culture laboratory facility/ Industry and submission of report.	September 2025	

October 2025		
November 2025		
	2025 November	2025 November