

Curriculum Planner 2025-26
Dr. Monika Keisham
(Department of Botany, Kalindi College)

Course: B. Sc. Botany (H) 3rd Year

Semester: VI

Paper: Advanced tools & Analytical Techniques in Plant Biology (DSC)

THEORY		
Topic	Essential and Suggested Readings	Approximate schedule (2026)
<p>Unit 1: Imaging and related techniques 06 Hours Electron microscopy: Transmission and Scanning electron microscopy, cryofixation, negative staining, shadow casting, freeze-fracture, freeze-etching; Chromosome banding, FISH, GISH, chromosome painting.</p>	<p>1. Hofmann, A., & Clokie, S. (2018) Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology (8th ed.). Cambridge University Press. 2. Gerald Karp, Janet Iwasa, Wallace Marshall (2019). Karp's Cell and Molecular Biology, 9th Edition: Wiley 3. O' Brien, T.P. and Cully M.E (1981). The Study of Plant Structure. Principles and selected Methods, Termarcarphi Pty. Ltd., Melbourne.</p>	<p>January</p>
<p>Unit 2: Fractionation methods 04 Hours Centrifugation: types of rotors, differential and density gradient centrifugation, sucrose density gradient, ultracentrifugation, caesium chloride gradient; marker enzymes for analysis of cellular fractions.</p> <p>Unit 5: Chromatography 05 Hours Principles and applications of Paper chromatography, Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography, Molecular sieve chromatography, Affinity chromatography.</p>	<p>Additional Resources: 1. Cooper, G.M., Hausman, R .E. (2009). The Cell: A Molecular Approach, 5th edition. Washington, D.C.: ASM Press & Sunderland, Sinauer Associates, MA.</p>	<p>February</p>
<p>Unit 6: Techniques for detection and analysis of nucleic acids and proteins 09 Hours PCR – design of PCR primers, enzymes used for PCR, cloning of PCR products; DNA polymorphism and its applications (RFLP, AFLP, SSR, SNPs); RNA isolation and analysis, cDNA synthesis and qRT-PCR; Extraction of proteins, PAGE (Native and denaturing); Blotting and hybridization techniques: Southern (Radioactive and Non-radioactive), Northern and Western; DNA</p>		<p>March- April</p>

sequencing – Sanger’s dideoxy sequencing; ELISA.		
Assignment topics given and assessment of submitted assignments		
Conduction of tests for internal assessment		

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PRACTICAL		
Topic	Essential and Suggested Readings	Approximate schedule (2026)
1. Study of microscopic techniques using digital resources (freeze-fracture, freeze-etching, negative staining, FISH, chromosome banding). 2. Isolation of chloroplasts by differential centrifugation. 3. Separation of nitrogenous bases by paper chromatography.	1. Hofmann, A., & Clokie, S. (2018) Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology (8th ed.). Cambridge University Press. 2. Gerald Karp, Janet Iwasa, Wallace Marshall (2019). Karp's Cell and Molecular Biology, 9th Edition: Wiley	January
4. Separation of sugars by thin layer chromatography 5. Separation of chloroplast pigments by column chromatography (demonstration) 6. Amplification of DNA by PCR and visualization of PCR products.	3. O' Brien, T.P. and Cully M.E (1981). The Study of Plant Structure. Principles and selected Methods, Termarcarphi Pty. Ltd., Melbourne.	February
7. Detection of DNA polymorphism (SSR based DNA fingerprinting). 8. Gel based and capillary based DNA sequence data analysis. 9. Estimation of protein concentration by Bradford method. 10. PAGE to study overexpression of proteins/ Separation of proteins by PAGE. 11. Blotting techniques: Southern, Northern and Western using digital resources.	Additional Resources: 1. Cooper, G.M., Hausman, R .E. (2009). The Cell: A Molecular Approach, 5th edition. Washington, D.C.: ASM Press & Sunderland, Sinauer Associates, MA.	March-April
Conduction of practical mock exam		