

K. T. S. P. Mandal's
Sahabraoji Buttepatil Mahavidyalaya, Rajgurunagar.

Department of Botany

Teaching Plan (A.Y.2025-2026)

S.Y. B. sc. Botany

Course Code – BOT-292-MN

Course Title: Biological Techniques

Sr. No	Month	Topics	Teacher
1.	Dec 2025	Introduction to basic biological techniques 1.1. Principle, components, procedure and applications of pH meter and Electrical Conductivity (EC) meter. Gel Electrophoresis 2.1. Principles of gel electrophoresis 2.2. Types: 1.2. a) Agarose gel electrophoresis: Principle; types – horizontal and vertical; Components: agarose gel matrix or media; instrumentation – electrophoretic unit (electrophoresis tank and power supply), gel casting trays and combs; electrophoresis buffer - Tris-acetate-EDTA (TAE) Tris-borate-EDTA (TBE), and sample loading buffer; staining and visualization - DNA/RNA: Ethidium bromide (EtBr) and SYBR Green or GelRed.	JRK
2.	Jan 2026	Stepwise procedure of agarose gel electrophoresis – gel casting, sample loading, electrophoresis, staining and visualization. b) Polyacrylamide Gel Electrophoresis (PAGE) – Principle; Types - Native PAGE and SDS-PAGE; Components: gel matrix – stacking and separating gel; Chemical components of PAGE and their role – Acrylamide, Bisacrylamide, Sodium dodecyl sulphate (SDS), Urea, Ammonium persulfate (APS), N, N, N', N'-tetramethylethylenediamine (TEMED); gel casting tray and comb, electrophoresis tank and power supply, buffer solutions – Tris-acetate-EDTA (TAE) and Tris-borate-EDTA (TBE), loading dye, DNA/protein ladder or marker; staining and visualization of protein: Commassie Brilliant Blue, Silver staining, western blotting Stepwise procedure of PAGE – gel casting, sample loading, electrophoresis, staining and visualization. 2.5. Limitations and Trouble shootings 2.6. Applications of gel electrophoresis	JRK
3.	Feb 2026	Hybridization (Blotting) Techniques 3.1. Southern hybridization for DNA – principle, procedure – DNA isolation, restriction digestion, gel electrophoresis, denaturation, blotting (transfer) using nitrocellulose or nylon membrane, fixation, hybridization and detection; Applications of southern hybridization. 3.2. Northern hybridization for RNA – principle, procedure – RNA extraction, gel electrophoresis, transfer / blotting, fixation, hybridization	JRK

		using labelled DNA/RNA probe and detection; Applications of northern blotting. 3.3. Western hybridization for Proteins – principle, procedure – protein extraction, SDS-PAGE, protein transfer to membrane, blocking, primary and secondary antibody incubation, and detection; Applications of western blotting.	
4.	Feb & March 2026	Chromatography Techniques 4.1 Introduction and definition of chromatography 4.2 Basic principles of chromatography - Partition and adsorption chromatography; Mobile and stationary phases 4.3 Classification of chromatographic techniques: 4.3.1 Based on physical state: Gas and Liquid Chromatography 4.3.2 Based on mechanism: Adsorption, Partition, Ion-exchange, Size-exclusion, and Affinity. 4.4 Paper Chromatography: Principle, types (ascending, descending, circular); Solvent systems and R _f value calculation; Applications. 4.5 Thin Layer Chromatography (TLC): Plate preparation, stationary phases, developing solvents; Visualization techniques (UV light, iodine vapor, spraying reagents); Quantitative analysis using TLC. 4.6 Introduction to Column Chromatography; Ion Exchange Chromatography; Gas Chromatography and High-Performance Liquid Chromatography (HPLC)	JRK
5.	March 2026	Spectrophotometry 5.1 Introduction and definition of spectrophotometry. 5.2 Principle of spectrophotometry – Beer Lambert Law 5.3 Types of absorption: UV, Visible and Infra Red (IR); Light Source; Monochromator; Cuvette Detector 5.4 UV-Visible Spectrophotometry: Instrumentation and working; Absorption spectra and λ_{max} ; Applications in qualitative and quantitative analysis. 5.5 IR Spectrophotometry: Principle of IR absorption; Functional group identification; IR instrumentation (FTIR basics) Biostatistics and Data Analysis 6.1 Introduction, Definition, scope, and importance of biostatistics in biology. 6.2 Types of data: Qualitative and quantitative; Types of variables: Discrete and continuous 6.3 Data collection methods: Primary and secondary data; Data tabulation and graphical representation (bar diagram, histogram, pie chart, line graph) 6.4 Measures of Central Tendency: Mean, median, and mode - definitions, formulas, and calculation. 6.5 Range, variance, standard deviation, coefficient of variation; Basic concepts of probability: definitions and rules. 6.6 Data Analysis: Sampling methods - random and non-random; Concept of population vs sample; Null and alternative hypotheses; Basics of t-test and chi-square-test.	JRK

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