

Name of Faculty	:	Faculty of Science
Name of Program	:	Bachelor of Science
Course Code	:	1BST02
Course Title	:	Laboratory Techniques in Biotechnology
Type of Course	:	Skill Enhancement
Year of Introduction	:	2023-24

Prerequisite	:	Ability to apply the fundamental knowledge of Biomolecules, protein, Carbohydrates, Nucleic acid and lipids as a biochemical techniques in the area of biochemistry.
Course Objective	:	By the end of the course, students will have developed a strong foundation in essential laboratory techniques used in biotechnology. They will be capable of applying these techniques safely and effectively, both theoretically and practically. Students will gain hands-on experience in various aspects of molecular biology, protein analysis, and cell culture, enabling them to contribute to research and development efforts in the biotechnology field.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	Understand the fundamental laboratory equipment used in biotechnology and their functions.
	CO2	Able to implement aseptic techniques effectively to prevent contamination and maintain a sterile environment.
	CO3	Remember the principles of Polymerase Chain Reaction (PCR) and its different types and applications.
	CO4	Apply Western blotting techniques effectively to detect and characterize proteins.
	CO5	Distinguish between different cell culture types and explain their relevance and developing cell counting skills in biotechnology.

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
L	T	P		Theory Marks		Practical Marks		Total Marks
				SEE	CIA	SEE	CIA	
2	0	0	2	50	25	00	00	75

Legends: L-Lecture; T-Tutorial/Teacher Guided Theory Practice; P – Practical, C – Credit, SEE – Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

Course Content

Unit No.	Topics	Teaching Hours	Weightage	Mapping With Cos
1	Introduction to Laboratory Techniques and Safety Introduction to laboratory equipment and their uses in biotechnology. Laboratory safety protocols, including personal protective equipment (PPE), chemical handling, and waste disposal. Basics of aseptic techniques and maintaining sterile environments. Introduction to documentation practices and lab notebooks.	15	33.43%	CO1 CO2
2	Molecular Biology Techniques DNA extraction methods from various sources. Polymerase Chain Reaction (PCR): principles, types (conventional, real-time), and applications. Gel Electrophoresis: agarose and polyacrylamide gels for DNA/RNA separation and analysis. Nucleic acid quantification and spectrophotometry. Basics of recombinant DNA technology and cloning.	10	22.22%	CO1 CO3
3	Protein Analysis and Characterization Protein extraction and purification techniques (centrifugation, chromatography). Sodium Dodecyl Sulfate-Polyacrylamide Gel Electrophoresis (SDS-PAGE) for protein separation. Western blotting: principles and applications in protein detection. Enzyme assays and kinetics. Protein quantification methods (Bradford, BCA, Lowry assays).	10	22.22%	CO1 CO3 CO4 CO5
4	Cell Culture Techniques Cell culture basics: types of cells (adherent, suspension), cell lines, primary cultures. Aseptic techniques in cell culture: handling, passaging, and maintaining cell lines. Cell counting methods (hemocytometer, automated cell counters). Cell viability and cytotoxicity assays. Introduction to 3D cell culture and its applications.	10	22.22%	CO1 CO2 CO3 CO5

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	20	40	40	-	-	-

NOT: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Suggested Learning Websites

Sr. No.	Name of Website
1	https://archive.nptel.ac.in/courses/102/106/102106096/
2	https://archive.nptel.ac.in/courses/102/104/102104059/

Reference Books

Sr. No.	Name of Reference Books
1	Cell and Molecular Biology: Concepts and Experiments" by Gerald Karp
2	Cell Biology: A Laboratory Handbook" by Julio E. Celis
3	Lehninger Principles of Biochemistry" by David L. Nelson and Michael M. Cox.
4	Text Book of Biochemistry – West, Todd, Mason, Bruggen – Amerind PublishingCo. Pvt., Ltd.
5	Genetics: A Conceptual Approach" by Benjamin A. Pierce
6	Molecular Cloning: A Laboratory Manual" by Michael R. Green and Joseph Sambrook
7	Microbiology: An Introduction" by Gerard J. Tortora, Berdell R. Funke, and Christine L. Case
8	Brock Biology of Microorganisms" by Michael T. Madigan, Kelly S. Bender, and Daniel H. Buckley
9	Microbiology: Concepts and Applications by Michael J. Pelczar Jr.
10	A Manual of Laboratory Techniques, MIN, ICMR Publications