

Name of Faculty	:	Faculty of Science
Name of Program	:	Bachelor of Science
Course Code	:	1BST01
Course Title	:	Molecular Biology
Type of Course	:	Professional Core
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	:	This syllabus provides a comprehensive introduction to molecular biology over the course of one semester. It covers essential topics including the structure and function of nucleic acids, genetic information flow, mechanisms of DNA repair, mutations, and practical applications of molecular techniques. The syllabus can be adjusted based on the specific curriculum and learning objectives of the course.
Course Outcomes	:	At the end of this course, students will be able to:
	CO1	Understanding the process of DNA replication, including enzymes involved and fidelity mechanisms
	CO2	Analyze post-transcriptional gene regulation mechanisms such as miRNA and RNA interference. Compare and contrast prokaryotic and eukaryotic gene expression regulation.
	CO3	Remembrance of the principles of Polymerase Chain Reaction (PCR) and its different types and applications.
	CO4	The significance of DNA repair mechanisms, such as mismatch repair and excision repair. The types of mutations and their potential consequences on genetic information.
	CO5	Critically evaluate and interpret DNA damage and their sources with genetic testing, cloning, and other molecular techniques.

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
L	T	P		Theory Marks		Practical Marks		Total Marks
				SEE	CIA	SEE	CIA	
3	0	2	4	50	25	50	25	150

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 Molecular Biology Historical overview and significance of molecular biology. Structure and function of nucleic acids: DNA and RNA. DNA replication: enzymes, mechanisms, and fidelity. Central dogma of molecular biology: transcription and translation. Techniques in molecular biology: PCR, gel electrophoresis, DNA cloning.	15	33.43%	CO1 CO3
2	Genetic Information Flow Transcription: RNA synthesis, RNA polymerase, promoter regions. RNA processing: splicing, capping, polyadenylation. Translation: ribosome structure, tRNA, genetic code. Post-transcriptional regulation: miRNA, siRNA, RNA interference. Gene expression regulation in prokaryotes and eukaryotes.	10	22.22%	CO1 CO2
3	DNA Repair and Mutations DNA damage and repair mechanisms: mismatch repair, excision repair. Types of mutations: point mutations, insertions, deletions. Mutagens and carcinogens: chemical and physical agents. Consequences of mutations: genetic disorders, cancer. Genetic variation and its role in evolution.	10	22.22%	CO1 CO4 CO5
4	Molecular Techniques and Applications DNA sequencing methods: Sanger sequencing, next-generation sequencing. Recombinant DNA technology: gene cloning, plasmid vectors. Polymerase Chain Reaction (PCR): principles and applications. DNA fingerprinting and forensic applications. Application of molecular biology in medicine, biotechnology, and research	10	22.22%	CO2 CO3 CO4 CO5



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

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 List of Experiments/Tutorials

Sr. No.	Name of Experiment/Tutorial	Teaching Hours
1	Introduction to laboratory instruments and basic handling techniques.	02
2	Execute accurate pipetting, dilution, and reagent preparation techniques.	02
3	Introduction to Bioinformatics.	02
4	PCR amplification of a known DNA sequence. (Demo)	02
5	Agarose Gel Electrophoresis: Separate DNA fragments of different sizes and analyze the results.	02
6	Extraction of DNA from blood	02
7	Extraction of RNA	
8	Introduction to genetic disorders	02
9	Extraction of DNA from blood	02
10	DNA finger printing (Demo.)	02
11	Introduction to Human Genome Project	02
12	UV spectroscopic assay of DNA	02
13	To study types of mutations.	02
14	To study mutation causing physical agents.	02
15	To study mutation causing chemical agents.	02

Major Equipment/Instruments and Software Required

Sr. No.	Name of Major Equipment/ Instruments and Software
1	Colori meter
2	Ultraviolet-visible spectroscopy
3	PCR
4	Electrophoresis
5	Test tube
6	Hot air oven
7	Blotting paper
8	Thermometers
9	Freezer
10	Micro Pipettes
11	pH meter
12	Burettes and volumetric burette
13	Beakers
14	Bulb and graduated pipettes
15	Volumetric flasks.



16	Funnels
17	Vials
18	Stirring or glass rods
19	Watch glass
22	Weight balance
23	Dryer

Suggested Learning Websites

Sr. No.	Name of Website
1	https://archive.nptel.ac.in/courses/102/104/102104052/
2	https://archive.nptel.ac.in/courses/102/106/102106025/

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	Introduction to Genetic Analysis" by Anthony J.F. Griffiths, Susan R. Wessler, Sean B. Carroll, and John Doebley.
5	Genetics: A Conceptual Approach" by Benjamin A. Pierce
6	Molecular Cloning: A Laboratory Manual" by Michael R. Green and Joseph Sambrook
7	Molecular Biology by David P. Clark and Nanette J. Pazdernik.
8	"Principles of Gene Regulation" by Lewis Wolpert and Rosa Beddington.
9	Microbiology: Concepts and Applications by Michael J. Pelczar Jr.
10	A Manual of Laboratory Techniques, MIN, ICMR Publications