

GUJARAT TECHNOLOGICAL UNIVERSITY

BIO-TECHNOLOGY(04)

ADVANCED MOLECULAR BIOLOGY-II

SUBJECT CODE: 2160401

B.E. 6thSEMESTER

Type of course: B.E. (Biotechnology)

Prerequisite: Basic Concepts of Molecular Biology and Genetics

Rationale: It is one of the advanced subjects of Biotechnology. It involves various aspects of mutations and repair systems, various molecular events at cellular level.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
				PA	ALA	ESE	OEP			
3	0	0	3	70	20	10	0	0	0	100

Course Contents:

Sr. No.	Topics	Teaching Hours	Module Weight age
1	UNIT I: Mutation and Repair General properties and terminologies of mutation, Molecular basis of mutation, Types of mutation, Detection and selection of mutants, Reverse mutation and suppression of mutation Mismatch repair, Photodeactivation, Excision repair, Mismatch repair, Post replicational repair, Recombinational repair and SOS system.	10	21%
2	Unit II: DNA sequencing and Gene Mapping Maxam-Gilbert's and Sanger's methods, Shot gun sequencing, sequencing strategies for large genomes, primer walking, LM (Ligation mediated) PCR, chemical synthesis of oligonucleotides; automated DNA sequencing, gene replacement and gene targeting Genetic mapping, physical mapping, genetic linkage, linkage disequilibrium, DNA finger printing.	9 hrs	19%

3.	UNIT III: Regulation of Central Dogma and Splicing of RNA Regulation of replication in prokaryotes and eukaryotes at genomic level, Positive and negative regulation of transcription, lac-, ara- and trp- operon regulation, Regulation of gene expression in eukaryotes, Post transcriptional controls, Regulation of translation in prokaryote and eukaryotes, regulation of metabolic pathways Biochemical mechanism, Splicing pathways, Spliceosomal introns, Spliceosome formation and activity, Alternative and Trans splicing, Splicing errors	10	21%
4.	Unit IV: Transposable Elements: Types of transposable elements, structure, genetic organization and mechanism of transposition of Tn5, Tn3 and related transposons. Integrons, Retrotransposons, Conjugative and Mobilizable transposons, Assay of transposition.	10	21%
5.	Unit V: Phage Genetics – T4 phage, Lambda phage, M13 phage, Retrovirus	9	18%

Suggested Specification table with marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
12	12	22	16	08	0

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Molecular Biology of the Gene by Watson et. al., Publisher: Benjamin Cummings and CSHL Press, 5th Edition.
2. Molecular Biology of the Cell, by Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter, 5th Edition, Publisher : Garland Science
3. Genes VIII by Benjamin Lewin, Publisher: Benjamin Cummings; United States ed edition
4. Cell and Molecular Biology by De Roberties, Publisher: Lippincott Williams and Wilkins, 1st Edition

Course Outcome:

After learning the course, the students should be able to:

1. Develop a fundamental understanding of basic concepts of mutation, repair and transposition of gene.
2. Evaluate applications of advanced molecular biology techniques like sequencing and mapping in real field.

List of Open Source Software/learning website:

Students can refer to video lectures available on the websites including NPTEL. Students can refer to the CDs which are available with some reference books. Students can develop their own flowsheets for demonstration of various molecular biology techniques.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.