Marwadi University

Syllabus for Master of Science in Biotechnology

Subject Code: 02BT0454

Subject Name: Principles of Molecular Biology (Core)

M. Sc. Semester - II

Objective: To impart the knowledge of processes associated with central dogma of life.

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to

1. Understand the advanced concepts in molecular biology.
2. Comprehend the scientific basis of the current understanding in the broad domain of molecular biology.
3. Understand the ways to manipulate biological systems at the molecular level for scientific or technological gains.
4. Devise suitable strategies using the knowledge in molecular biology to solve technical problems.

Pre-requisite of course: Biochemistry and Cell Biology.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE(I)	Viva (V)	Practicals/ TW	
4	0	0	4	50	30	20	0	0	100

Contents:

Unit	Topics	Contact Hours
1	**DNA Replication and Repair** Historical perspective of discovering DNA as a genetic material. Organization of genetic material in Prokaryotes and Eukaryotes; Chromatin structure and DNA packaging; Centromeres and Telomeres. Chemistry of phosphodiester bond and directionality in replication. Components and process of DNA replication in prokaryotes and eukaryotes. Cell cycle control of DNA replication. Types of DNA mutations: Spontaneous and induced mutations. Physical and chemical mutagenesis – Transition, Transversion, Frame-Shift, Mis-sense and non-sense mutations. DNA repairs: Photo- reactivation, excision repair, Mismatch repair, SOS repair.	20
2	**Transcription** A brief overview of prokaryotic and eukaryotic gene structures. Types of RNAs and their genes. The components and process of transcription (initiation, elongation and termination) and transcriptional control of gene expression. Post transcriptional modification and RNA editing: RNA splicing (and their types), RNA editing, RNA capping and Polyadenylation.	15
3	**Genetic Code and Translation** Historical perspectives and contributions to decipher the genetic code. Characteristics of genetic code and codon bias. Mitochondrial and chloroplast genetic code. tRNA charging and proof reading activity amino acyl tRNA sythetase. Structural insights of ribosome. Process and regulation of translation. Post translational modification of proteins.	15
4	**Recombination** Homologous, Non-homologous and Site-specific recombination: Types of recombinases: Tyrosine and serine recombinases. Recombination during meiosis and DNA repair. Application of recombination in gene mapping.	10
	Total Hours	**60**

References:

1. Benjamin Lewin. (2008) *Genes IX,* Jones and Bartelett Publishers Inc.

2. Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts, and James D. Watson (2004), *Molecular Biology of the Cell*, 4th Edition, Garland Publishing.

3. Watson James D., Tania Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Lodwick (2004) *Molecular Biology of the Gene,* 5th Edition, Pearson Education, Inc. and Dorling Kindersley Publishing, Inc.

4. Weaver R., (2007) *Molecular Biology*, 4th Edition, McGraw Hill Science.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.

c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.