SEMESTER - V

BRANCH	Subject	Subject Code
B.Sc. (Microbiology - Major)	**Microbial Genetics and Molecular Biology**	**MBM1- 151**

Course Objective:- The objective of the course is to make students gain knowledge about the diverse life forms, life cycles, morphology and importance of microorganisms Microbial Genetics and Molecular Biology

Course learning outcomes (CLO):-

To study this course, a student must have had this subject in Diploma (Second Year)

On successful completion of this course, the students will be able to:

1. Develop basic understanding of genetic material Present in cells, Integrate knowledge of general principles of replication, transcription and translation.
2. Employ knowledge about mutations and their repair mechanisms
3. Differentiate between genetic recombination and gene regulation in prokaryotes and eukaryotes.

Unit – I

History of Genetics and Genetic material:

1.1 Historical developments in the field of genetics.

1.2 Organisms suitable for genetic experimentation and their genetic significance.

1.3 DNA as Genetic material. Experimental evidences (Griffith's experiment of transformation and Avery, MacLeod and McCarty Experiment, Hershey and Chase Experiment).

1.4 Composition and structure of DNA, Different of DNA (A, B and Z),

1.5 RNA as genetic material. Composition and structure of RNA. Different forms of RNA (mRNA, RNA and (RNA)

Unit – II

DNA Replication and Transcription

2.1 DNA replication: General principles . Mechanism of DNA replication (Leading strand, Lagging strand, Okazaki fragmention , role of enzyme (DNA Helicase, DNA Gyrase, DNA polymerases and their types RNA Primase and DNA Ligase) and accessory proteins (SSB initator proteins, Clamp proteins)

2.2 Models of DNA Replication (Theta model and Rolling the in model).

2.3 Differering between DNA replication in prokaryotes and eukaryotes

2.4 Transcription la prokaryotes and eukaryotes: Definition, promoter, RNA Polymerase and transcription factors. Mechanism of initiation, elongation and termination of transcription

Unit – III

Translation, DNA Damage and DNA Repair:

3.1 Genetic code: General characteristics and coding dictionary.

3.2 Translation: Translation machinery (mRNA, Ribosomes and tRNA), Charging of tRNA, Mechanisms of initiation, elongation and termination of polypeptides in both prokaryotes and eukaryotes.

3.3 Mutations: Definition and types of mutations (Point mutations, Lethal mutations, Silent mutations, Missense mutations, Nonsense mutations, base substitutions additions and deletions, Frame shift mutations, transitions and transversions).

3.4 Mutagens: Physical mutagens and chemical mutagens.

3.5 Biochemical basis of Spontaneous (Errors in replication and Spontaneous lesions) and induced mutations (Base replacement by base analogues, Base alteration by alkylating, Intercalating agents, Base damage and Formation of photo adducts).

3.6 DNA Repair mechanisms: Photoreactivation repair and Mismatch Repair.

Unit – IV

Genetic recombination and gene regulation:

4.1 Genetic recombination: Discovery and mechanism of Transformation, Conjugation, Transduction.

4.2 Transposable transposons). elements (Insertion sequences, transposons

4.3 Plasmids: General properties, some important types of plasmids (F-plasmid, R-Plasmids and Col-Plasmids).

4.4 Regulation of gene expression in prokaryotes: Operon model. lac and trp, operons.

4.5 Regulation of gene expression in eukaryotes:

General Introduction. Regulation of transcription-Cis- acting regulatory elements (Promoter proximal elements and enhancers), Trans-acting proteins (Transcription factors-activators and repressors

List of Experiments (Practical's)

SNO	Practical's
1.	• Study of different types of DNA and RNA using micrographs and model/schematic representations • Study of semi-conservative replication of DNA through micrographs/schematic representations
2.	• Preparation of Master and replica plates. • Study the effect of chemical (HNO3) and physical(UV) mutagens on bacterial cells.
3.	• Isolation of bacterial chromosomal DNA • Isolation of bacterial plasmid DNA
4.	• Gel electrophoresis of DNA and examination of agarose gels. • Quantitative estimation of DNA and RNA • Any other experiment(s) bused on theoreticalaspects