Semester – 3

BRANCH	Subject	Subject Code
B.Sc. (Biotechnology - Major)	**Basic Molecular Biology**	**BTM1-131**

Course Objective:-The Main Objective of the course will be to build the basic foundation for studying Biotechnology. The Demand for Trained workforce in Biotechnology is ever growing in Fundamental Research and Industry Sector. Academic and Research Sectors also require Interdisciplinary trained manpower to foster the Biotechnology Revolution. The restructured syllabus combines basic principles of Chemical and Biological sciences in light of advancements in technology. The curriculum aims to impart basic knowledge with emphasis on its applications to make the students ready for industries and research work in concerned field.

Course learning outcomes (CLO):-

1. Students will be able to explain role of different protein/ enzymes involved in cell signalling.
2. They will be able to understand mechanism of genetic damage caused by mutation and role of various repair system in neglecting the effect t of these mutation.
3. Students will be able to explain mechanism of DNA replication, transcription, translation and other related processes

Unit – I

1.1 Genome organization:
Anatomy of gene, gene structure of prokaryotes and eukaryotes . Flow of genetic information.

1.2 Cell signalling: Hormones and their receptors, second messengers, signaling through Gprotein coupled receptors

1.3 Cancer: Oncogenes, Tumor suppress or genes ,Cancer and the cell cycle; Apoptosis, Necrosis.

Unit - II

2.1 Replication: Prokaryotic and Eukaryotic replication :models for replication, Unit of replication ,replication initiation, elongation and termination, replication inhibitors

2.2 DNA repair: Direct reversal, Excision repair -nucleotide and base excision, Mismatch repair Translesion DNA synthesis, Recombination repair, SOS Response

2.3 DNA recombination: Models for recombination, Enzymes and
Proteins involved in recombination, Site-specific recombination.

Unit – III

Transcription: Prokaryotic and Eukaryotic transcription: RNA polymerases, General and specific transcription factors, Promoters, insulator, repressor, enhancer.

Unit - IV

Translation: Prokaryotic and eukaryotic translation: Translation machinery, initiation, elongation and termination factors, translational inhibitors.
Regulation of translation.

Unit - V

5.1 Control of gene expression in Prokaryotes: DNA binding proteins, post transcriptional control of gene expression. Gene regulation in Bacteria**,** Gene silencing, Over view of ribozyme technology

5.2 Control of gene expression in Eukaryotes: enhancers, chromatin remodeling,

5.3 Mutation: Types and causes, mutant types–lethal, conditional, biochemical, loss of function, gain of function

List of Experiments/Exercise (Practical's)

1. Isolation of genomic DNA.
2. Isolation of Plasmid DNA.
3. Visualization of DNA using EtBr
4. Electrophoresis of DNA-linear, circular and super coiled plasmid.
5. Isolation of DNA from Tissue/Blood/Microorganism
6. Plasmid restriction map.
7. Quantification of DNA using UV/VIS spectrophotometer
8 Effect of UV on microbial/ plant cell.

Semester – 4

BRANCH	Subject	Subject Code
B.Sc. (Biotechnology - Major)	**Recombinant DNA Technology**	**BTM1-141**

Course Objective: -Course Objectives: To create general understanding about microbiology and immunology

1. The students will be able to understand microbial diversity and Nutrition.
2. The students will be able to understand immune system. Immune responses and Vaccination.
3. The students will be able to describe role of immune system in both maintaining health and contributing to disease.
4. The students will be able to understand immunological techniques.

Course Learning Outcomes: At the end of the course student will familiar with -

1. Theobjectivesofthiscoursearetoteachstudentswithvariousapproachestoconductgeneticenginee ringandtheirapplicationsinbiologicalresearchaswellasinbiotechnologyindustries.
2. Genetic engineering is a technology that has been developed based on our fundamental understanding of the principles of molecular biology and this is reflected in the contents of this course.
3. Given the impact t of genetic engineering in modern society, the students should be endowed with strong theoretical knowledge of this technology.
4. In conjunction with the practical's in molecular biology and genetic engineering, the students should be able to take up biological research as well as placement in the relevant biotech industry

Unit - I

The Basic Principles of Gene Cloning and DNA Analysis:-

Introduction, History, The advent and importance of gene cloning and the polymerase chain reaction, Purification of DNA from Living Cells, Manipulation of Purified DNA, Introduction of DNA into Living Cells, Plasmids

Unit – II

Vectors for Cloning:-

Cloning Vectors: PBR322, Bacteriophage, Cosmid, Phagemid, Shuttle vectors
Cloning Vectors for E.coli,λ and other high capacity vectors, Cloning Vectors for Eukaryotes, Genomics & Cdna Libraries

Unit – III

Enzymology of genetic manipulation:-
Enzymes useful in molecular cloning: Restriction endonuclease, DNA ligases, polynucleotide kinase, klenow enzyme, DNA Polymerase-I, reverse transcriptase, alkaline phosphatase, terminal nucleotidyltransferase

Unit – IV

Gene editing:-

Gene Recombination and Gene transfer: Bacterial Conjugation, Transformation, Transduction,
Gene transfer techniques: Approaches, gene silencing, Mutagenesis :random, site directed, Knock-in, Knock-out

Unit – V

Applications and Techniques of Gene Cloning:-

Polymerase Chain Reaction and qPCR, Labeling nucleic acids and blotting techniques (Southern, Northern, Western, Zooblot), DNA Sequencing, DNA Fingerprinting, Applications of recombinant DNA technologies- Agriculture, Medicine, health

List of Practical's

1. Isolation of DNA from bacterial/plant/animal cells
2. Demonstration of Polymerase Chain Reaction
3. Bacterial Transformation (Selection of transformants with blue whites election).
4. Demonstration of southern blotting.
5. Demonstration of Restriction digestion of DNA
6. Demonstration of conjugation.
7. .Demonstration of Transduction.