BACHELORS WITH MICROBIOLOGY AS MAJOR (CT – III)

6th SEMESTER

MBY622J3 MICROBIOLOGY _ MOLECULAR MICROBIOLOGY AND RECOMBINANT DNA TECHNOLOGY

CREDITS: THEORY: 4; PRACTICAL: 2

COURSE OBJECTIVES:

- *This course has been designed to teach students about DNA and RNA of eukaryotes and prokaryotes.*
- *This course will provide students comprehensive information about the mutation and different types of mutation*
- *This course will provide students comprehensive information about the Recombinant DNA technology and its applications*

LEARNING OUTCOME:

- *Students will get knowledge about eukaryotic and prokaryotic genome organization, mutations*
- *They will acquire knowledge about the recombinant DNA technology and its significance*

UNIT - I: THE NATURE OF GENETIC MATERIAL AND MUTATIONS

- The structure, function and properties of DNA, semi-conservative replication of DNA, the central dogma
- hnRNA, mRNA, snRNA, capping and polyadenylation
- Organization of DNA in Prokaryotes
- Organization of Eukaryotic Genomes.
- Extrachromosomal genetic elements

UNIT - II: REPAIR OF DNA, RECOMBINATION AND BLOTTING TECHNIQUES

- DNA repair mechanism
- Recombination as a molecular biology tool.
- Transcription machinery of eukaryotes
- Blotting techniques (Southern and Northern blotting)
- Mutation and its types

UNIT - III: BASICS OF RECOMBINANT DNA TECHNOLOGY

- Milestones in genetic engineering.
- Restriction enzymes: Types I, II and III.
- Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering
- DNA modifying enzymes and their applications: DNA polymerases, DNA ligases, kinases and phosphatases.
- Vectors and types of vectors

UNIT - IV: TOOLS, STRATEGIES AND APPLICATIONS

- Construction of recombinant DNA and its screening
- Applications of Recombinant DNA Technology: Products of human therapeutic interest-insulin, and HGH
- cDNA and genomic DNA libraries
- *Agrobacterium* - mediated delivery.
- Bt transgenic-cotton and Brinjal

PRACTICAL (2 CREDITS)

- 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.
- Isolation of genomic DNA from *E. coli.*
- Estimation of RNA using colorimeter (orcinol reagent) and UV spectrophotometer (A260 measurement).
- Resolution and visualization of DNA by Agarose Gel Electrophoresis.
- Preparation of competent cells for transformation.
- Demonstration of Bacterial Transformation and calculation of transformation efficiency.
- Digestion of DNA using restriction enzymes and analysis by agarose gel electrophoresis.
- Demonstration of Ligation of DNA fragments.
- Demonstration of Amplification of DNA by PCR

Note: Those experiments which can't be performed in laboratory, should be conducted via Virtual lab

RECOMMENDED BOOKS

- Harvey Lodish, Arnold Berk, Chris A. Kaiser, Monty Krieger, Anthony Bretscher, Hidde Ploegh, Kelsey C. Martin, Michael Yaffe, Angelika Amon (2021) Molecular Cell Biology, Ninth Edition, W.H Freeman and Company.
- David L. Nelson, Albert L. Lehninger, Michael M. Cox (2021) Principles of Biochemistry. WH Freeman and company, 8th Edition.
- Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication.
- Karp G (2010) Cell and Molecular Biology: Concepts and Experiments, 6th edition, John Wiley & Sons. Inc.
- Practical Biochemistry Principal and Technology, K. Wilsone and John Walker, Cambridge University Press (2004)