BACHELOR OF SCIENCE

3rd SEMESTER

DISCIPLINE SPECIFIC COURSE -3 (CORE-3)

BT320C: BIO-TECHNOLOGY: MOLECULAR BIOLOGY AND GENETIC ENGINEERING

CREDITS: THEORY – 4, PRACTICAL–2 (4+2)

THEORY (4 CREDITS: 60 HOURS) **MAXIMUM MARKS: 60, MINIMUM MARKS: 24**

Objective:This course is designed to providestudents about the information flow in a living system at molecular level.

Unit - 1 (15 Hours)

DNA as genetic material; Building blocks of DNA; Structure of B-DNA, A-DNA and Z-DNA; Forces stabilizing DNA structure; General features of replication (mode of replication, directionality of replication, origin of replication); Enzymes and proteins involved in replication with emphasis on DNA polymerases; Mechanism of replication (initiation, elongation and termination) in prokaryotes; Differences in prokaryotic and eukaryotic replication.

Unit - 2 (15 Hours)

Structure and types of RNA (mRNA, tRNA, rRNA); Overview of transcription process; Detailed study of basic transcription machinery in prokaryotes – promoter elements and RNA polymerases (types, structure & function); Mechanism of transcription process in prokaryotes (initiation, elongation and termination); Differences in prokaryotic and eukaryotic transcription;Operon concept - positive and negative regulation with reference to lac and trp operons.

Unit - 3 (15 Hours)

Genetic code - salient features, wobble hypothesis; Concept of reading frame; Elaborate study of basic translation machinery - ribosome, tRNA, protein factors involved in translation, aminoacyl-tRNAsynthetases; Mechanism of translation (initiation, elongation and termination) in prokaryotes; Differences in prokaryotic and eukaryotic translation; Overview of post-translational modifications.

Unit - 4 (15 Hours)

Recombinant DNA technology tools – restriction endonucleases, ligases, phosphatases, T4 polynucleotide kinase, DNA polymerase I and Klenow fragment; Cloning vectors - general

features of plasmids, bacteriophages (lambda & M-13), cosmids, phagemids; Selectable marker genescommonly used in bacterial vectors; Screening by blue-white selection; Basic concept of C-DNA and genomic DNA libraries.

PRACTICALS (2 CREDITS: 60 HOURS) **MAXIMUM MARKS: 30, MINIMUM MARKS: 12**

1. Isolation of genomic DNA.
2. Quantification of DNA by spectrophotometry.
3. Analysis of DNA by agarose gel electrophoresis.
4. Restriction digestion of genomic/plasmid DNA.

BOOKS RECOMMENDED

1. Lewin'sGenes-XI: Krebs, J. E. et al. – Jones and Bartlett Learning.
2. Molecular Biology: Weaver, R. F. – McGraw-Hill.
3. Molecular Biology of the Gene: Watson, J. D. et al. – Pearson.
4. Molecular Biotechnology - Principles and Applications of Recombinant DNA: Glick, B. R. and Pasternak, J. J. - ASM Press.
5. Principles of Gene Manipulation - An Introduction to Genetic Engineering: Old, R. W. and Primrose, S. B. - Blackwell Scientific Publishers.

Expected Learning Outcomes:

1. Understanding of the structure of DNA, process of replication, transcription and translation.
2. Brief description of cloning vectors and various tools utilized in recombinant DNA technology.
3. Hands-on training on various commonly used techniques in molecular biology.