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 provide students 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- Trna synthetases; 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 genes commonly used in bacterial vectors; Screening by blue-white selection; Basic concept of C- DNA and genomic DNA libraries.

PRACTICAL (2 CREDITS)

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's Genes-X*: 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.*