



UNIVERSITY OF SCIENCE & TECHNOLOGY, MEGHALAYA
DEPARTMENT OF APPLIED BIOLOGY

Program Name: BSc Biotechnology

Course Name: Molecular Biology (BBT 401)

Theory

Credit: 4

After successful completion, this course enables students

CO1. To get an insight in to the molecular basis of biological activity between biomolecules in the various systems of a cell.

CO2. To have the basics of DNA, RNA, and proteins; their structure and interactions within the cell to promote growth, division and development.

CO3. To understand the different mechanism DNA replication adopted in prokaryotic and eukaryotic system.

It also highlights the factors inducing and inhibiting replication.

CO4. To get an insight in to the wide range of mechanisms required for the regulation of transcription, translation and expression of gene in prokaryotic and eukaryotic system.

CO5. To understand the responses to environmental or physiological changes or alterations of cell function brought about by mutation.

It also highlights the molecular basis for cancer and other related abnormalities and the molecular tools and techniques to study such abnormalities.

Course Content:

UNIT 1: Basic concepts of Genetic Information (15 hrs + 5 hrs)

1.1 Nucleic acids as genetic information carriers, experimental evidences.

1.2 Primary structure of nucleic acids and their properties. Highly repetitive, moderately repetitive and unique DNA sequences, Classes of RNA, secondary and tertiary structure.

1.3 Secondary structures of nucleic acids, anti-parallel strands, base composition, base equivalence, base pairing and base stacking, types of DNA, structural characteristics, chirality and cot curve.

UNIT 2: DNA Replication (12 hrs + 5 hrs)

2.1 DNA replication in prokaryotes: Conservative, semiconservative and dispersive types, DNA polymerases, enzymes and protein factors involved in replication.

2.2 Mechanism of replication in eukaryotes, inhibitors of replication.

UNIT 3: Transcription, Translation and Regulation of Gene Expression (18 hrs + 5 hrs)

3.1 Transcription in prokaryotes and eukaryotes, RNA polymerases; promoters, differences in transcription termination, post translational modifications.

3.2 Genetic code: Basic features of genetic code, biological significance of degeneracy, Wobble hypothesis; gene within genes and overlapping genes, mechanism of translation in prokaryotes and eukaryotes, ribosome assembly.

3.3 Regulation of Gene Expression in Prokaryotes and eukaryotes, Enzyme induction and repression, operon concept, Lac operon, Trp operon, eukaryotic gene arrangements.

UNIT 4: Mutation and Repair (15 hrs + 5 hrs)

4.1 Mutation: molecular basis of mutation, types of mutation, dominant and recessive mutations, spontaneous and induced mutations.

4.2 Mutagenicity testing: Correlation of mutagenicity and carcinogenicity: Ames testing, Random and site directed mutagenesis. DNA Repair- Types and evidences.

Suggested Readings:

1. Glick, B.T and Pasternak J.J (1998) Molecular Biotechnology, Principles and application of recombinant DNA, Washington D.C. ASM press.
2. Howe.C. (1995) Gene Cloning and Manipulations, Cambridge University Press, USA
3. Lewin, B., Gene VI New York, Oxford University Press.
4. Rigby, P.W.J. (1987) Genetic Engineering, Academic Press Inc. Florida, USA.
5. Sambrook et al (2000) Molecular Cloning Volumes I, II, & III Cold Spring Harbor Lab. Press, New York, USA
6. Walker J.M. and Gingold, E.B. (1983) Molecular Biology and Biotechnology (Indian Edition) Royal Society of Chemistry U.K
7. Karp.G (2002) Cell and Molecular Biology, 3rd Edition, John Wiley and Sons; INC
8. Cell and Molecular Biology- P.K. Gupta, Rastogi Publishers, Meerut.