

Course Code	Course Name	Credits
26ZY513	MOLECULAR BIOLOGY	04

Course Objectives

- To understand the fundamental concepts and principles of molecular biology.
- To explain the structure, organization, and functions of DNA, RNA, and proteins.
- To develop knowledge on replication, transcription, translation, and gene regulation.
- To analyze molecular mechanisms involved in cellular function and inheritance.
- To enhance practical and analytical skills related to molecular biology techniques and applications.

Learning Outcomes

- Explain the structure and functions of nucleic acids and proteins.
- Differentiate the processes of DNA replication, transcription, and translation.
- Examine mechanisms of gene regulation and expression in living organisms.
- Analyze molecular processes associated with heredity and cellular activities.
- Apply molecular biology concepts and laboratory techniques in biological research.

Unit 1 – Nucleic Acids, DNA Replication & Repair (12 Hrs.)

Properties of DNA and RNA. Watson and Crick model of DNA. DNA Replication in prokaryotes and eukaryotes, mechanism of DNA replication, Semi-conservative, bidirectional and semi-discontinuous replication, RNA priming, Replication of circular and linear dsDNA, replication of telomeres. Pyrimidine dimerization and mismatch repair.

Unit 2 – Transcription & Translation (12 Hrs.)

RNA polymerase and transcription Unit, mechanism of transcription in prokaryotes and eukaryotes, synthesis of rRNA and mRNA, transcription factors and regulation of transcription. Genetic code, Degeneracy of the genetic code and Wobble Hypothesis;

Unit 3 - Process of protein synthesis (12 Hrs.)

Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNA synthetases and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptide chain; Inhibitors of protein synthesis; Difference between prokaryotic and eukaryotic translation.

Unit 4 – Post Transcriptional Modifications and Processing of Eukaryotic RNA (12 Hrs.)

Structure of globin mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing, exon shuffling, and RNA editing, Processing of tRNA.

Unit 5 - Gene Regulation & Regulatory RNAs (12 Hrs.)

Transcription regulation in prokaryotes: Principles of transcriptional regulation with examples from lac operon and trp operon; Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencer elements; Gene silencing, RNA interference, miRNA, siRNA.

Reference Books:

1. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley and Sons. Inc.
 2. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
 3. McLennan A., Bates A., Turner, P. and White M. (2015). Molecular Biology IV Edition. GS, Taylor and Francis Group, New York and London.
 4. Suvarna S, Lyton C, Bancroft JD (2013) Theory and practice of histological techniques, Churchill Livingstone, Elsevier, UK
 5. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
- <https://openstax.org/details/books/biology-2e>
<https://www.biologydiscussion.com/molecular-biology>
<https://www.easybiologyclass.com/category/molecular-biology/>