

Course Code	Course Name	Credits
26BT006	MOLECULAR BIOLOGY AND ARTIFICIAL INTELLIGENCE	04

Course Objectives

- Explain the structure of nucleic acids and DNA replication
- Understand the molecular process of transcription.
- Understand the basic machinery of translation and its mechanisms
- Understand the regulation of gene expression and various types of mutation.
- Gain knowledge on applications of Artificial intelligence in molecular Biology.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Discuss the concepts related to eukaryotic and prokaryotic genetics.
- Identify the structure of nucleic acids, DNA replication and chromosome organization.
- Illustrate the prokaryotic and eukaryotic transcription, and its post transcriptional modifications.
- Outline the concept of genetic code, translation process and post translational modifications.
- Construct and simulate metabolic and gene regulatory networks using computational tools

Unit 1 - Introduction to molecular biology (12 Hrs.)

Discovery historical and connectional background of DNA, DNA as genetic material, Griffith Experiment, Structure of DNA and RNA. To prove semi conservative mode of replication. Types of replication and its mechanism.

Unit 2 - Transcription (12 Hrs.)

Gene as the unit of expression-co linearity, transcription, post transcriptional modifications (mRNA, tRNA, rRNA), transcriptional regulation in prokaryotes (operon concept-lac operon) and eukaryotes, inhibitors of transcription, Elucidation of genetic code.

Unit 3 - Translation (12 Hrs.)

Translation of protein-post translational modification and folding of newly assembled polypeptides, protein targeting, translational regulations, signal sequences and protein export.

Unit 4 - Replication, Repair and Recombination (12 Hrs.)

Replication in prokaryote and Eukaryote. Gene Mutation-types of mutations, DNA Damage- types repair mechanism. Homologous and non-homologous recombination. Genetic Exchange – bacterial transformation, transduction, conjugation, and their mapping.

Unit 5 - Introduction to AI & Data Science (12 Hrs.)

Basics of AI and ML. Data types in biology. Python/R for biological data. AI Applications in molecular biology.

Reference Books:

1. Harti D.L. Basics genetics. Jones & Bartlett Publication. 1991.
2. Friefelder. Microbial Genetics. Jones & Bartlett Publication. 1987.
3. Waston et al, Molecular Biology of Gene. Benjamin/Cummings co. 4th Edition.
4. Lodish. Molecular Cell Biology. Baltimore Scientific American Brooks. 1994.
5. Rastogi, S.C. Cell and Molecular Biology. New Age International Publishers, India. 3rd Edition, 2012.
6. Gupta P.K, Cell and Molecular Biology. Rastogi Publications, India, 2005.
7. Alberts B, Bray D, Hopkin, K Johnson, A.D, A Lewis J, Raff, M, Roberts K and Walter P. Essential Cell Biology. Garland Science, USA. 2nd Edition, 2009.
8. Cooper G.M and Haishman, R.E. The Cell Molecular Approach. American Society of Microbiology Press, USA. 5th Edition, 2009.