

BTPC2004 MOLECULAR BIOLOGY (3-0-0)

Module I

DNA as genetic material, Structure and function of DNA, Nucleosome, packaging of DNA molecules into chromosome

DNA Replication: prokaryotic and eukaryotic DNA replication, Mechanism of DNA replication, Enzymes and accessory proteins involved in DNA replication. Rolling circle replication, Fidelity of replication

Module II

Mutability and DNA repair. Types and mechanism of DNA repair, Recombination method: Homologous, Site-specific and Transposition Recombination

Module III

Prokaryotic transcription: Principle and mechanism of gene regulation, The Operon concept, (lac & trp-, operon). Transcript processing of tRNA and rRNA Eukaryotic transcription and regulation: RNA polymerases structure and assembly, Post transcriptional modifications (processing, capping and polyadenylation, splicing)

Module IV

Genetic code and its characteristics, Prokaryotic and Eukaryotic Translation, charging up tRNA, Mechanism of initiation elongation and termination, Post translational modification.

Module V

Signaling at the cell surface: Signaling molecules and cell-surface receptors, second messengers, G protein coupled receptor, activation of gene transcription by G protein coupled receptors. Signaling pathways that control gene activity: TGF β receptors, Cytokine Receptors and JAK-STAT pathway, Receptor Tyrosine kinases and Ras, MAP kinase pathways.

Course Outcomes (COs):

1. Explain the molecular mechanisms of DNA replication, transcription, and translation in prokaryotic and eukaryotic cells.
2. Identify key molecular biology techniques, such as PCR, gel electrophoresis, and DNA sequencing, and their applications in research.
3. Develop analytical skills to evaluate biological data and interpret experimental results effectively.
4. Communicate scientific concepts clearly through written reports and oral presentations using appropriate terminology.
5. Apply critical thinking to design experiments that test hypotheses related to molecular biology.

Program Outcomes (POs):

1. Demonstrate a comprehensive understanding of molecular biology concepts and their relevance to real-world problems.
2. Prepare for careers in research and development, showcasing the ability to conduct independent scientific investigations.
3. Integrate knowledge from various scientific disciplines to address complex biological questions.
4. Foster a commitment to lifelong learning and professional development in the field of molecular biology.

5. Exhibit leadership qualities and collaborative skills necessary for effective teamwork in scientific environments.

Books:

- [1] Molecular Biology by T.A. Brown
- [2] Molecular biology of the gene by J.D. Watson, T.A. Baker, S.P. Bell, A. Gann, M. Levine and R. Losick
- [3] Gene – VIII by B. Lewin.
- [4] Molecular Biology by David Friedler.