Semester IV
C8: Molecular Biology (MBTCR4081T)

Theory: CIA: 20 Marks; End-Sem: 80 Marks

Theory:
Module A: (25 marks) **(2 classes per week including tutorial)**
DNA Replication
UNIT I: DNA structure and replication: DNA as genetic material; Structure of DNA - DNA supercoiling – linking number, negative and positive supercoilng, topoisomerases; Replication of DNA in prokaryotes - Semiconservative nature of DNA replication, Bi-directional replication, DNA polymerases, Replication complex - pre-primming proteins, primosome, replisome, Rolling circle replication, Fidelity of replication.
UNIT II: DNA damage repair by homologous recombination
Mechanism of recombination – Holliday intermediate;
Recombinational repair of damaged replication forks and of double stranded breaks.

Module B: (55 marks) **(4 classes per week including tutorial)**
Gene expression and its regulation
UNIT III: Transcription and translation in prokaryotes
Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains, Regulation of gene expression in prokaryotes: Operon concept (inducible and repressible system)
Translation in prokaryotes: RNA structure and types of RNA, Genetic code and its characteristics, Prokaryotic and eukaryotic translation: ribosome structure and assembly, Charging of tRNA, aminoacyl tRNA synthetases, Mechanism of initiation, elongation and termination of polypeptides, Fidelity of translation, Inhibitors of translation
UNIT IV: Transcription and translation in eukaryotes:
Eukaryotic RNA polymerases, transcription factors, promoters, enhancers and silencers, mechanism of transcription initiation, formation of preinitiation complex, promoter clearance and elongation, enhancers and silencers, Activator/Coactivator interaction.
Translation in eukaryotes: mechanism of translation initiation, regulation of translation.

Teachers involved: Dr. Uma Siddhanta (Module A), Dr. Chandana Barat (Module B)

Texts & Reading/Reference Lists:
1. Lehninger Principles of Biochemistry - Cox & Nelson.
2. Molecular Biology – Weaver.
3. Biochemistry - Voet and Voet.
4. Biochemistry Berg – Tymoczko & Stryer.