# 22BT101 CELL AND MOLECULAR BIOLOGY

Hours Per Week :

L	Т	Р	С
3	0	2	4

#### PREREQUISITE KNOWLEDGE: Basics of Biology and Biochemistry.

#### COURSE DESCRIPTION AND OBJECTIVES:

This course helps to know different cell components and their functions like transport of material, signalling etc. And also, it imparts knowledge on cell division & cancer, structure, synthesis and processing of nucleic acids and protein synthesis in prokaryotes and eukaryotes. Further, familiarize students about the classification and types of mutations and how they affect the gene and its expression.

# MODULE-1

#### 9L+0T+6P=15 Hours

#### **CELL STRUCTURE AND FUNCTION**

Plasma membrane organization, cellorganelles- nucleus (chromatin and chromosome organization, karyotyping, cell division), mitochondria, chloroplast, endoplasmic reticulum,golgi bodies, lysosomes, cytoskeletal elements - microtubules, microfilaments and intermediate filaments.

#### UNIT-2

UNIT-1

#### 15L+0T+10P=25 Hours

#### **CELLULAR COMMUNICATION**

Types of extra cellular signal molecules and their binding mechanisms, secondary messengers, types of signaling pathways-G-protein linked cell surface receptor mediated system, enzyme-linked cell surface receptors, cell cycle- mitosis and meiosis, molecular regulation of cell cycle (check points), mechanisms of cellular death, regulation of programmed cell death.

#### **PRACTICES:**

- Karyotyping of human chromosomes along with normal, Down and Turner syndromes.
- Cell Counting by Haemocytometer.
- Meiosis.
- Mitosis.
- MTT assay.

#### MODULE-2

# NUCLEIC ACIDS AND DNA REPLICATION

DNA discovery and structure, DNA models (A, B, Z models), DNA denaturation and melting curves, semi conservative DNA replication of prokaryotes and eukaryotes, rolling circle replication, replication in bacteriophages, inhibitors of DNA replication, DNA damage and repair mechanisms, site directed mutagenesis and reverse genetics.

## UNIT-2

VFSTR

UNIT-1

#### 15L+0T+10P=25 Hours

69

9L+0T+6P=15 Hours

#### TRANSCRIPTION AND TRANSLATION

Transcription machinery, RNA polymerases, mechanism of transcription in prokaryotes and eukaryotes, post transcriptional modifications, inhibitors of transcription, genetic code and wobble hypothesis, mechanism of translation in prokaryotes and eukaryotes, post-translational modifications.



source: https://www. illumina.com/areas-ofinterest/cellular-molecularbiology-research.html

#### SKILLS:

- ✓ Regulation of cell cycle.
- ✓ Processing of transcripts.
- ✓ Modification by site-directed mutagenesis.
- ✓ Identify various stages of cell division and differentiation.
- ✓ Handling reagents, enzymes and biochemicals related to molecular biology.

## PRACTICES:

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- Isolation of genomic DNA from bacteria, plants and animals.
  - Tm value for the genomic DNAs of bacteria, Plants and animals.
- Quantification of extracted genomic DNA from bacteria, plants and animals.
- Restriction enzyme digestion.
- Plasmid DNA isolation.

# COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the concepts of gene expression and regulation.	Analyze	2	1,2,4,5,6,8,9,10
2	Analyze different mechanisms of cell signalling and role of secondary messenger pathways.	Analyze	1	2,4,5,9,10
3	Evaluate the leads of cancers through metastasis.	Evaluate	2	3,5,6,9,10
4	Design experiments incorporating the principles of microscopy and identification of different cell types.	Create	1	3,4,5,9,10

#### **TEXT BOOKS:**

- 1. G M Cooper, "The Cell: A Molecular Approach", 8th edition, Oxford University Press, 2019.
- 2. Channarayappa, "Molecular Biotechnology: Principles and Practices", 1st edition, CRC Press, 2007.

# **REFERENCE BOOKS:**

- 1. B Alberts, A Johnson, J Lewis, M Raff, K Roberts and P Walter, "Molecular Biology of the Cell", 6th edition, Garl and Science, 2014.
- 2. H Lodish, A Berk, S L Zipursky, P Matsudaira, D Baltimore and J Darnell, "Molecular Cell Biology", 6th edition, Palme, 2018.
- 3. Jocelyn E. Krebs, Elloit S. Goldstein and Stephen T. Kilpatrick, "Lewin's Genes XI", 11th edition, Jones & Bartlett Learning, 2014.