

BACHELOR OF SCIENCE

6th SEMESTER

DISCIPLINE SPECIFIC ELECTIVES (DSEs)

BT620D3: BIO-TECHNOLOGY: CELL CYCLE, SIGNALING AND CANCER

CREDITS: THEORY – 4, PRACTICAL– 2(4+2)

OPTION-III

THEORY (4 CREDITS: 60 HOURS)

MAXIMUM MARKS: 60, MINIMUM MARKS: 24

Objectives: This course acquaints the students with coordination and communication at cellular level.

Unit–1 (15 HOURS)

Cell cycle: stages of cell cycle, cell cycle regulation - cyclin, CDKs, check points in cell cycle (G1 and G2), DNA damage check points.

Unit- 2(15 HOURS)

Types of mutations - base substitution, mis-sense, non-sense, deletion, insertion, frameshift, silent mutations, spontaneous and induced mutations; Chemical and physical mutagens; Reversion (brief idea); Overview of recombination (homologous recombination); DNA Repair - mismatch repair system, excision repair, specialized repair systems, photo reactivation, recombination repair, SOS repair, double stranded repair in eukaryotes.

Unit- 3(15 HOURS)

Signaling - autocrine, paracrine and endocrine signaling; Types of receptors and action (steroid and peptide); GPCR signaling; Second Messengers - cAMP, cGMP, Ca²⁺, NO (importance and role in signaling and signal transduction); Receptor tyrosine kinases.

Unit- 4(15 HOURS)

Characteristic of tumour cells; Use of cell culture in cancer research; Cancer- causes, types and stages; Role of tumor suppressor genes and (proto)-oncogenes; Cancer treatment- molecular approach; Apoptosis vs necrosis; Autophagy.

PRACTICALS (2 CREDITS: 60 HOURS)

MAXIMUM MARKS: 30, MINIMUM MARKS: 12

1. Study of different stages of cell cycle.
2. Study of different stages of mitosis and meiosis.
3. DNA fragmentation assay.
4. Permanent slides for different types of cancer.

BOOKS RECOMMENDED

1. Cell and Molecular Biology: Concepts and Experiments, Karp G. - John Wiley & Sons. Inc.
2. The Cell: A Molecular Approach. Cooper, G.M. and Hausman, R.E. - ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
3. Genomes 3, TA Brown, - Garland Science
4. Genetics: A Conceptual Approach, Benjamin Pierce, - WH Freeman

Expected Learning Outcomes:

1. Understanding of the process of cell cycle, cell division and its control.
2. Understanding different types of mutations, mutagens and the mechanism of repair.
3. Basic concept of cell signaling and cancer.