JYOTI NIVAS COLLEGE AUTONOMOUS BANGALORE – 560 095
DEPARTMENT OF GENETICS
B.Sc. I SEMESTER GENETICS PAPER I SYLLABUS (2024 SEP BATCH)
CELL BIOLOGY

COURSE TITLE	**CELL BIOLOGY**
COURSE CODE	**24IGT1(T)**
COURSE CREDITS	**03**
TOTAL CONTACT HOURS	**56 Hours**
DURATION OF ESE	**3 Hours**
CONTINUOUS INTERNAL ASSESSMENT (CIA)	**20 Marks**
END SEMESTER EXAMINATION (ESE)	**80 Marks**

Course objectives:

The course enables the students to:

- Understand the basic principles of different types of microscopes and its application
- Gain knowledge of structure and function of cell and cell organelles.
- Explore the mechanism of cell division, cellular aging and cell death and its regulation.
- Study the structure and organization of prokaryotic and eukaryotic chromosomes.

Course outcomes

After the successful completion of the course, the student will be able to:

CO1. Identify and comprehend the working principles of various types of microscopes and demonstrate their applications in biological research.

CO2. Correlate the cell organelles with their structure and their roles in cellular processes.

CO3. Recall the process of cell division and asses the mechanisms of cellular aging and cell death.

CO4. Compare and contrast the chromosomal organization and their significance in prokaryotic and eukaryotic cells.

Unit-I **14 hrs.**

- **Microscopy**: Introduction, History, Principle and Optical Components of microscope: Eye piece, Eye piece tube, Objective lenses, Coarse and Fine Focus knobs, Stage and stage clips, Aperture, Illuminator, Condenser, Condenser Focus Knob, Iris Diaphragm
- **Types of microscopes:** Principle and Applications of: Light microscopes - Simple, Compound and Stereo, Phase contrast, Confocal, Fluorescence, Electron microscopy- TEM and SEM.

Biological applications of Microscopy: High resolution imaging, immunohistochemistry, high-content screening and high throughput imaging.Clinical and Forensic applications

Unit-II **14 hrs.**

Ultrastructure and functions of cytoplasmic organelles

- **Concept of cell: -** Discovery of cell, cell theory, Cell as a basic unit, Classification of cell types – Acellular (virus), Prokaryotic, Eukaryotic cell, Comparison between plant and animal cells.
- **Plasma membrane** – Fluid mosaic model, chemical composition, functions of plasma membrane – passive transport (osmosis, diffusion), active transport, bulk transport (endocytosis, exocytosis).
- **Nucleus**: Morphology, nuclear envelope, nucleoplasm. Nucleolus.

Other cell organelles: Structure and function of Mitochondria- Kreb's cycle, BIS oxidative phosphorylation, Structure and function of Chloroplast, Endoplasmic reticulum, Golgi bodies, Ribosomes, Lysosomes, and Peroxisomes.

Unit-III **14 hrs.**

- **Cell division in Bacteria and Archaea** – Process of Binary fission.
- **Cell Cycle and its Regulation**: Cell cycle, Interphase - G1, S, G2 and M phase, Checkpoints. Mitosis: Stages, Mitotic apparatus, Cytokinesis, role of cyclins and cdks. Mitogens and Inhibitors, Significance. Meiosis: Stages, Synaptonemal complex, crossing over and chiasma formation, Significance. Cytokinesis in plant and animal cells. Endocycle and Endomitosis.
- **Cell senescence and Cell death:** cellular features of Senescence- spontaneous and induced, Apoptosis – Process and Mechanisms of Programmed cell death

and its significance. Fundamental processes of necrosis, differences between apoptosis and necrosis.

Unit-IV **14 hrs.**

- **Prokaryotic Chromosome (Bacterial)** – HU proteins, Topoisomerase, nucleoid structure.
- **Eukaryotic Chromosome:** Definition, description of chromatin structure, Macro-molecular organization - Primary and Secondary constriction, Sat- bodies, Telomeres, Ultrastructure of chromosome: Histones, DNA, Nucleosome, Higher order chromatin structure, Types of chromosomes based on position and number of centromeres, Heterochromatin and Euchromatin and its significance, Comparison between prokaryotic and eukaryotic chromosome, Karyotype and Ideogram.
- **Special types of Chromosomes**: Structure and Significance of Special types of Chromosomes: Polytene (Salivary gland) chromosome in *Drosophila*, Lamp brush chromosome in amphibian oocyte. Supernumerary B Chromosome.