



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

<b>COURSE TITLE</b>	<b>CELL BIOLOGY &amp; INTRODUCTION TO GENETICS</b>
<b>COURSE CODE</b>	<b>24IBT1(T)</b>
<b>COURSE CREDITS</b>	<b>03</b>
<b>TOTAL CONTACT HOURS</b>	<b>56 Hours</b>
<b>DURATION OF ESE</b>	<b>3 Hours</b>
<b>CONTINUOUS INTERNAL ASSESSMENT (CIA)</b>	<b>20Marks</b>
<b>END SEMESTER EXAMINATION (ESE)</b>	<b>80 Marks</b>

**Course Outcomes: At the end of the course student should be able to**

- Demonstrate proficiently the structure and function of cell, different organelles and their intricate organization.
- Illustrate the Genetic aspect towards linkage, recombination and determination of phenotypic characters.
- Compare and contrast about cell cycle and its regulatory mechanisms.
- Summarize the applications of Cell Bio techniques in health sector.

**Learning outcomes:**

- Assess the importance of the chemical foundation and the overall architecture of prokaryotic and eukaryotic cells and their internal structures including organelles in living organisms .
- Compare the importance of various stages of cell cycle, and their regulation.
- Describe the principles of inheritance, chromosomal aberrations, linkage and crossing over.
- Explain the different cell communications and cell Biotechniques .

## Unit-1 Cellular organelles & cell Division

14 HRS

Historical perspectives of cell biology, Discovery of cell, cell theory, Ultrastructure of prokaryotic cell ,eukaryotic cell-( Both plant and animal cells), **Surface Architecture:** Structural organization and functions of plasma membrane and cell wall of eukaryotes.

**Cellular Organelles:** Structure and functions of cell organelles -Endoplasmic reticulum, Golgi complex, Mitochondria, Chloroplast, Ribosomes, Lysosomes, Peroxisomes, Nucleus (Nuclear envelope with nuclear pore complex, Nucleolus, Nucleoplasm and Chromatin). Vacuole, Cytosol and Cytoskeleton structures (Microtubules, Microfilaments and Intermediate filaments). Cell junctions and its types( Gap , tight, desmosomes , tight junctions and plasmodesmata.

**Cell Division:** Cell cycle, phases cell division- Mitosis and meiosis, regulation of cell cycles -cell cycle checkpoints, and enzymes involved in regulation, Significance of cell cycle, Cell Senescence and programmed cell death.).

## Unit-2 Cell Communications & Cell Bio techniques

14 HRS

Introduction cell signalling, types of cell signalling (autocrine, paracrine, endocrine,), receptors (cell surface and nuclear), and secondary messengers (CAMP and Calcium ions), G protein coupled cell signalling (Example: Epinephrine). Applications of Cell signalling in Pathological process (Cancer).**Stem cells:** Definition, Salient features - self-renewal, totipotency and pluripotency, Types-embryonic and adult stem cells, stem cell model – cancer metastasis.

**Advanced cell Biology techniques: Histochemical analysis, cell sorting & cytotoxic assay** – tissue sectioning, freeze etching, Flow cytometry and MTT assay.( principle , procedure and applications) **Cell and Tissue Banking** - umbilical cord blood stem cells, Cord blood banking, Tissue banking of Skin & Cardiovascular tissue , current status of cell based therapies example - **Synthetic cells** – artificial blood cells.

## Unit-3 Genetics

14 HRS

**History of Genetics:** Introduction and brief history of genetics. **Mendelian theory:** Laws of inheritance- dominance, segregation, incomplete dominance, codominance with an example. Law of independent assortment, test cross, back cross. General Introduction, Discovery, Morphology and structural organization - (Centromere, Secondary constriction, Telomere, Chromonema,) Euchromatin & Heterochromatin, solenoid model and nucleosome models. **Special type of chromosomes-** polytene chromosomes and Lampbrush chromosomes .

**Maternal Inheritance:** Plastid inheritance in *Mirabilis*, Petite characters in yeast and Kappa particles in paramecium, Sex-linked inheritance, Chromosome theory of inheritance.

**Gene interaction:** Supplementary factors: comb pattern in fowls, **Complementary genes:** Flower colour in sweet peas, Multiple factors-Skin colour in human beings, **Epistasis:** Plumage colour in poultry, **Multiple allelism:** Blood groups in Human beings.

#### **Unit-4 Linkage and crossing over**

**14 HRS**

**Linkage and Crossing Over:** Introduction, Coupling and repulsion hypothesis, Linkage in maize and Drosophila, Mechanism of crossing over and its importance, chromosome mapping-linkage map in maize.

**Chromosomal variations:** A general account of structural and numerical aberrations, chromosomal evolution of wheat and cotton.

**Sex Determination in Plants and animals:** Concept of allosomes and autosomes, XX- XY, XX-XO, ZW-ZZ, ZO-ZZ types.)

**Human Genetics:** Karyotype in man, inherited disorders - Allosomal (Klinefelter syndrome and Turner's syndrome), Autosomal (Down syndrome and Cri-Du-Chat Syndrome).