

**Dr. V. S. KRISHNA GOVERNMENT DEGREE AND PG COLLEGE (A), VSKP**  
**DEPARTMENT OF BIOTECHNOLOGY**  
**I B.Sc BIOTECHNOLOGY SYLLABUS**  
**SEMESTER I**

**Course I – CELL BIOLOGY & GENETICS**

(Total Hours of Teaching 60 @ 04 hrs/week)

Credits - 04

**Course Outcomes:**

On successful completion of this course, the students will have the knowledge and skill to

- Compare and contrast, ultra structures and purposes of prokaryotic and eukaryotic cells and list their similarities and differences.
- Explain and draw the structures of cell organelles and locate their parts along with functions.
- Explain overall mechanism of sequential events of cell growth and cell division cycles.
- Explain the structure and functions of genes and chromosomes
- Understand the laws and concepts of Mendelian inheritance, deviation from Mendel laws, concepts of linkage, autosomal and allosomal inheritance and sex determination in different organisms

**MODULE I: Cell Structure and Functions**

**12 Hours**

- 1.1. Cell as a basic unit of living organism- Bacterial, fungal, plant and animal cells.
- 1.2. Ultrastructure of prokaryotic cell- Cell membrane and plasmids, nucleoid.
- 1.3. Ultrastructure of Eukaryotic cell- Cell wall, cell membrane, mitochondria, chloroplast, endoplasmic reticulum, Golgi complex, vacuoles, lysosomes, peroxisomes, Ribosomes and nucleus.
- 1.4. Fluid mosaic model and cell membrane permeability.

**MODULE II: Cell Division and Cell Cycle**

**12**

**Hours**

- 2.1. Bacterial cell division.
- 2.2. Eukaryotic cell cycle –phases.
- 2.3. Mitosis- Stages, and Significance.  
Meiosis – Stages and Significance.
- 2.4. Senescence and necrosis, Apoptosis.

**MODULE III: Mendelian Inheritance: Principles and Mechanisms**

**12 Hours**

- 3.1 Structure of Gene and Chromosomes – Components of chromosomes and specialized chromosomes (Polytene and Lampbrush).
- 3.2 Mendel's laws of inheritance: Law of Segregation- Monohybrid ratio; Law of Independent Assortment- Dihybrid ratio and Trihybrid ratio.
- 3.3 Mendel laws of heredity deviations- incomplete dominance & co-dominance, Epistasis. Penetrance and Expressivity; Multiple alleles.
- 3.4 X-Y Chromosomes- Sex determination in Drosophila and Man; Autosomal and Allosomal Inheritance.

**MODULE IV: Linkage and Recombination**

**12**

**Hours**

- 4.1. Linkage and Phases of Linkage.

- 4.2. Crossing over-Cytological basis of crossing over (eg: Stern's experiment in *Drosophila*, Creighton and Mc Clintock's experiment in maize).
- 4.3. Recombination frequency, Interference, Coincidence, Gene mapping, and Gene distance.
- 4.4. Non-Mendelian Inheritance: Maternal effect (Shell coiling in Snail), Variegation in leaves of *Mirabilis jalapa*.

**MODULE V: Extension to Mendel's Laws**

**12**

**Hours**

- 5.1 Cytoplasmic male sterility in Maize.
- 5.2 Mitochondrial Inheritance in human and *Neurospora crassa*.
- 5.3 Chloroplast Inheritance in *Chlamydomonas*; Hardy-Weinberg Equilibrium.
- 5.4 Chromosomal Aberrations: Structural and numerical.

## **PRACTICALS SEMESTER -I**

### **Course I – CELL BIOLOGY AND GENETICS**

**(Total hours of Laboratory Exercises – 30 hours @ 03 hrs/week)**

**Credits - 02**

#### **Course Outcomes:**

On successful completion of this practical course, the students have the knowledge and skills to:

- Observe and explain bacterial, plant, fungal and animal cells
- Perform mitosis and meiosis and identify the stages under microscope
- Solve monohybrid and dihybrid ratio experiments.
- Solve Incomplete and Co-dominance, linkage, crossing over and gene mapping problems.
- Explain the applications of Hardy-Weinberg Equilibrium.

#### **Practical Syllabus**

1. Microscopic observation of cells: bacteria, fungi, plant and animal.
2. Preparation of different stages of Mitosis (Onion root tips).
3. Preparation of different stages of Meiosis (Onion flower buds).
4. Monohybrid and Dihybrid ratios.
5. Problems on Incomplete dominance, Co-dominance, Linkage, Crossing over and Gene mapping.
6. Statistical applications of Hardy-Weinberg Equilibrium.