

JYOTI NIVAS COLLEGE AUTONOMOUS
PROGRAMME: B.SC.
SEMESTER: I - ZOOLOGY - I
CYTOLOGY, GENETICS AND INFECTIOUS DISEASES

COURSE CODE: 21IZO1
CREDITS: 4

NO. OF HOURS: 60

COURSE OBJECTIVES (COS):

- Describe the structure and function of cell organelles.
- Analyse different stages of cell division and understand cell communication
- Understand Mendel's laws and its deviations
- Differentiate patterns of inheritance in humans and construct pedigrees
- *Illustrate the differences in structures and life cycle of parasites*

LEARNING OUTCOMES:

At the end of the course the student

- Acquires in depth knowledge on the structure and functions of cell organelles
- Recognise the stages in cell division and types of cell communication
- Apply Mendel's laws and deviations to solve problems
- Interpret and construct pedigrees charts
- Recognize and differentiate parasites and the diseases caused by them

CHAPTER 1. ULTRA-STRUCTURE AND FUNCTION OF CELL ORGANELLES IN ANIMAL CELL I

07 HRS

- Plasma membrane: Chemical composition—Fluid mosaic model
- Trans membrane transport: Active and passive transport, endocytosis and exocytosis
- Types of cell junctions: Gap Junctions, Desmosomes, Tight Junctions

CHAPTER 2. STRUCTURE AND FUNCTION OF CELL ORGANELLES IN ANIMAL CELL II

08 HRS

- Cytoskeleton: microtubules, microfilaments, intermediate filaments
- Mitochondria: Structure, oxidative phosphorylation, electron transport system.
- Endoplasmic reticulum: Structure and function.
- Peroxisome and Ribosome: structure and function

CHAPTER 3. NUCLEUS AND CHROMATIN STRUCTURE

07 HRS

- Structure and function of nucleus in eukaryotes
- Chemical structure and base composition of DNA and RNA
- Ultra structure of eukaryotic chromosome, Chromatin Organization-Nucleosome model, Types of DNA and RNA

CHAPTER 4. CELL CYCLE, CELL DIVISION AND CELL SIGNALING **08 HRS**

- Cell division: mitosis and meiosis
- Introduction to Cell cycle and its regulation, Apoptosis
- Signal transduction: Signalling molecules and cell surface receptors intracellular signal transduction, via G-protein linked receptors.
- Cell-cell interaction: -autocrine, paracrine and endocrine types.

CHAPTER 5. MENDELISM AND SEX DETERMINATION **07 HRS**

- Basic principles of heredity: Mendel 's laws- monohybrid cross and dihybrid cross
- Incomplete Dominance
- Related problems
- Genetic Sex-Determining Systems, Environmental Sex Determination,
- Chromosomal Sex Determination and mechanism in *Drosophila melanogaster*.
- Sex-linked characteristics in humans and dosage compensation.

CHAPTER 6. EXTENSIONS OF MENDELISM, GENES AND ENVIRONMENT **08 HRS**

- Extensions of Mendelism: Multiple Alleles
- Gene Interaction-Inheritance of comb pattern in fowl.
- Related problems
- The Interaction Between Sex and Heredity: Sex-Influenced and Sex- Limited Characters
- Cytoplasmic Inheritance- Kappa particles in Paramecium, Sigma factor in *Drosophila*
- Interaction between Genes and Environment.
- Inheritance of Continuous Characteristics.

CHAPTER 7. HUMAN CHROMOSOMES AND PATTERNS OF INHERITANCE **08 HRS**

- Patterns of inheritance: autosomal dominance, autosomal recessive, X- linked recessive, X-linked dominant.
- Chromosomal anomalies: Structural and numerical aberrations with examples.
- Human karyotyping and Pedigree analysis.

CHAPTER 8. INFECTIOUS DISEASES **07 HRS**

- Introduction to morphological and physiological adaptations in human pathogenic organisms- Protozoa and Helminth worms.
- Structure, life cycle, pathogenicity, including diseases, causes, symptoms and control of common parasites: *Plasmodium vivax*, *Taenia solium*, *Ascaris lumbricoides*

ZOOLOGY PRACTICAL PAPER I
CELL BIOLOGY & CYTOGENETICS

CREDITS: 2

NO. OF HOURS: 56

1. Understanding of simple and compound microscopes.
2. To study different cell types such as buccal epithelial cells, striated muscle cells using Methylene blue/any suitable stain (virtual/ slide/slaughtered tissue).
3. To study the different stages of Mitosis in root tip of *Allium cepa*.
4. To study the different stages of Meiosis in grasshopper testis (virtual/ slides).
5. Study of parasites in humans (e.g. Protozoans, Helminthes in compliance with examples being studied in theory) permanent micro slides.

6. To learn the procedures of preparation of temporary slides with available mounting material (sex comb of *Drosophila*/Insect mouth parts).
7. Study of life cycles of *Drosophila* sp. (from Cultures or Photographs).
8. Preparation of Polytene chromosomes (*Chironomus* larva or *Drosophila* larva).
9. Preparation of human karyotype and study the chromosomal structural and numerical aberrations from the pictures provided.
10. To prepare family pedigrees.

Virtual Labs (Suggestive sites)

- <https://www.vlab.co.in>
- <https://zoologysan.blogspot.com>
- www.vlab.iitb.ac.in/vlab
- www.onlinelabs.in
- www.powershow.com
- <https://vlab.amrita.edu><https://sites.dartmouth.edu/>

SUGGESTED READINGS:

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
2. Alberts et al: Molecular Biology of the Cell: Garland (2002).
3. Cooper: Cell: A Molecular Approach: ASM Press (2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson (2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby- Kuby Immunology. W HFreeman (2007).
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13th Edition. Wiley Blackwell (2017).
9. Principles of Genetics by B. D. Singh
10. Cell-Biology by C. B. Pawar, Kalyani Publications
11. Economic Zoology by Shukla and Upadhyaya
12. Lodish et al: Molecular Cell Biology: Freeman & Co, USA (2004).
13. Alberts et al: Molecular Biology of the Cell: Garland (2002).
14. Cooper: Cell: A Molecular Approach: ASM Press (2000).
15. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman (2004).
Kesar, Saroj and Vasishta N. 2007 Experimental Physiology: Comprehensive Manual. Heritage Publishers, New Delhi