

K.L.E. Society's
Raja Lakhamagouda Science Institute [Autonomous],Belagavi
DEPARTMENT OF ZOOLOGY
B.Sc. I Semester: DSCC5Z00T1 (NEP)
Cytology, Genetics and Infectious Diseases

04 Credits - 56 Hours
14 Hours

UNIT 1

I-Structure and Function of Cell Organelles in Animal cell

- Plasma membrane: Chemical structure - lipids, carbohydrates and proteins, Fluid Mosaic Model
- Endomembrane system: Protein targeting and sorting, transport, endocytosis and exocytosis

II- Structure and Function of Cell Organelles in Animal cell

- Cytoskeleton: Microtubules, Microfilaments and Intermediate filaments
- Mitochondria: Structure, oxidative phosphorylation, electron transport system
- Peroxisome and Ribosome: Structure and function

UNIT 2

14 Hours

Nucleus and Chromatin Structure

- Structure and function of nucleus in eukaryotes
- Chemical structure and base composition of DNA and RNA
- Ultrastructure of chromosome
- Types of DNA and RNA

Cell cycle, Cell Division and Cell Signaling

- Cell division: Mitosis and Meiosis
- Introduction to Cell cycle and its regulation, Apoptosis
- Signal transduction: Intracellular 11 signaling and cell surface receptors, via G-protein linked receptors
- Cell-cell interaction: Cell adhesion molecules, Cellular junctions

UNIT 3

14 Hours

Mendelism and Sex Determination

- Basic principles of heredity: Mendel's laws- Monohybrid cross and Dihybrid cross
- Complete and Incomplete Dominance with examples
- Genetic Sex-Determining Systems, Environmental Sex Determination, Sex Determination and mechanism in *Drosophila melanogaster*.

Extensions of Mendelism, Genes and Environment

- Extensions of Mendelism: Multiple Alleles, Gene Interaction – Supplementary genes and Complementary genes, Epistasis, Lethal genes.
- The Interaction between Sex and Heredity: Sex-Influenced and Sex-Limited Characteristics
- Interaction between Genes and Environment: Environmental Effects on Gene Expression, Inheritance of Continuous Characteristics

UNIT 4

14 Hours

Human Chromosomes and Patterns of Inheritance :

- Patterns of inheritance: Autosomal dominance, Autosomal recessive, X-linked recessive, X-linked dominant, Y-linked, XY-linked.
- Chromosomal anomalies: Structural and numerical aberrations with examples (Down's syndrome, Klinefelter's syndrome, Turner's syndrome and Cry-du-chat syndrome)
- Human karyotyping and Pedigree analysis.
- Eugenics: Positive and Negative eugenics.

Infectious Diseases

- Introduction to pathogenic organisms: Viruses, Bacteria, Fungi, Protozoa and worms (one example for each).

Structure, life cycle, pathogenicity including diseases- causes, symptoms and Prophylaxis of common parasites: *Plasmodium vivax*, *Taenia solium* and *Wuchereria bancrofti*.

DSC (Cytology, Genetics and Infectious Diseases)

COURSE OUTCOMES

CO1: Students are able to understand the basic unit of life.

CO2: Ability to understand the structure and functions of Nucleus, types of DNA, RNA, ultrastructure of chromosome and importance of cell division.

CO3: To impart the knowledge to understand the various principles of Inheritance.

CO4: Students are able to gain knowledge of sex-linked inheritance, chromosomal structural and numerical aberrations and also understand various parasites that affect human beings, their life cycle, treatment and preventive measures.

Practicals:

1. Understanding of simple and compound microscopes.
2. To study different cell types such as buccal epithelial cells, neurons, striated muscle cells using Methylene blue/any suitable stain (virtual/ 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).
5. To check the permeability of cells using salt solution of different concentrations.
6. Study of parasites in humans (e.g. Protozoans, Helminthes in compliance with examples being studied in theory) permanent microslides.
7. To learn the procedures of preparation of temporary and permanent stained slides, with available mounting material.
8. Study of mutant phenotypes of *Drosophila* species (from Cultures or Photographs).
9. Preparation of polytene chromosomes (*Chironomus* larva or *Drosophila* larva).
10. Preparation of human karyotype and study the chromosomal structural and numerical aberrations from the pictures provided. (Virtual/optional)
11. Pedigree Analysis.

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 H Freeman (2007).
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt_s Essential Immunology, 13 thEdition. 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

PRACTICAL

COURSE OUTCOMES

CO1: Students gain the knowledge of various parasites that affect human beings, their life cycle, treatment and preventive measures.

CO2: Provides knowledge about parasitic Protozoans, Helminthes, and their life cycle, pathogenicity and control measures.

CO3: Imparts the knowledge about fundamental techniques used in molecular diagnosis.

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**DEPARTMENT OF ZOOLOGY
B.Sc. I Semester : OEC5ZOOT1**

OPEN-ELECTIVE SYLLABUS : ECONOMIC ZOOLOGY

03Credits - 42 Hours

UNIT-1

14 Hours

1. Sericulture:

- History and present status of sericulture in India
- Mulberry and non-mulberry species in Karnataka and India
- Mulberry cultivation
- Morphology and life cycle of *Bombyx mori*
- Silkworm rearing techniques: Processing of cocoon, reeling
- Silkworm diseases and pest control

2. Apiculture:

- Introduction and present status of apiculture
- Species of honey bees in India, life cycle of *Apis indica*
- Colony organization, division of labour and communication
- Bee keeping as an agro based industry; Methods and equipments: Indigenous methods, extraction appliances, extraction of honey from the comb and processing, Bee pasturage, honey and bees wax and their uses
- Pests and diseases of bees and their management

UNIT-2

14 Hours

3. Live Stock Management:

Dairy:

- Introduction to common dairy animals and techniques of dairy management, Types, loose housing system and conventional barn system
- Advantages and limitations of dairy farming, Establishment of dairy farm and choosing suitable dairy animals- cattle, Cattle feeds, milk and milk products
- Cattle diseases

Poultry:

- Types of breeds and their rearing methods
- Feed formulations for chicks

- Nutritive value of egg and meat
- Disease of poultry and control measures

4. **Aquaculture:**

- Aquaculture in India: An overview and present status and scope of aquaculture
- Types of aquacultures: Pond culture: Construction, maintenance and management; carp culture, shrimp culture, shellfish culture, composite fish culture and pearl culture.

UNIT-3

14 Hours

5. **Fish culture:**

- Common fishes used for culture.
- Fishing crafts and gears.
- Ornamental fish culture: Fresh water ornamental fishes biology, breeding techniques
- Construction and maintenance of aquarium:
- Construction of home aquarium, materials used, setting up of freshwater aquaria, aquarium plants, ornamental objects, cleaning the aquarium, maintenance of water quality. control of snail and algal growth. Modern techniques of fish seed production

6. **Prawn culture:**

- Culture of fresh and marine water prawns.
- Preparation of farm.
- Preservation and processing of prawn, export of prawns.

7. **Vermiculture:**

- Scope of vermiculture.
- Types of earthworms.
- Habit categories - epigeic, endogeic and anecic;
- Indigenous and exotic species.
- Methodology of vermicomposting : containers for culturing raw materials required, preparation of bed, environmental pre-requisites, feeding, harvesting and storage of vermicompost. Advantages of vermicomposting.
- Diseases and pests of earthworms.

8. Lac Culture:

- History of Lac and its organization, Lac production in India.
- Life cycle, host plants and strains of Lac insect.
- Lac cultivation: Local practice, improved practice
- Propagation of Lac insect, inoculation period, harvesting of Lac, Lac composition, processing, products, uses and their pests.

OEC (ECONOMIC ZOOLOGY)

COURSE OUTCOMES

CO1: Students gain knowledge of Sericulture and Apiculture and are able to apply their skill and take up entrepreneurship.

CO2: To gain the knowledge of Dairy, Poultry and Aquaculture and are able to apply their talent and acquire the ability of entrepreneurship

CO3: Students develop skill in Fish culture, Prawn culture, Vermiculture and Lac culture techniques

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**DEPARTMENT OF ZOOLOGY
B.Sc II Semester: DSCC5Z00P2**

Biochemistry and Physiology

04 Credits - 56 Hours

UNIT 1

14 Hours

Structure and Function of Biomolecules:

- Chemical Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates).
- Lipids (saturated and unsaturated Fatty acids, Triglycerols, Phospholipids, Glycolipids and Steroids)
- Structure, Classification and General Properties of α amino acids; Essential and non-essential amino acids, Levels of organization in proteins; Simple and conjugate proteins.

Enzyme action and regulation:

- Nomenclature and classification of enzymes, co-factors, specificity of Enzyme action
- Isozymes; Mechanism of Enzyme action- Induced model, Lock and key Hypothesis
- Enzyme kinetics; Factors affecting rate of enzyme catalyzed reactions; Equation of Michaelis-Menten, concept of K_m and V_{max} , Enzyme inhibition.
- Allosteric enzymes and their kinetics, Regulation of Enzyme action.

UNIT 2

14 Hours

Metabolism of Carbohydrates and Lipids

- Metabolism of Carbohydrates: glycolysis, citric acid cycle, gluconeogenesis, phosphate pentose pathway, Glycogenolysis and Glycogenesis
- Lipids- Biosynthesis of palmitic acid; Ketogenesis
- β -oxidation and ω -oxidation of saturated fatty acids with even and odd number of carbon atoms

Metabolism of Proteins and Nucleotides

- Metabolism of Vitamins, Catabolism of amino acids: Transamination, Deamination, Urea cycle, Nucleotides
- Peptide linkages

UNIT 3

14 Hours

Digestion and Respiration in humans:

- Structural organization and functions of gastrointestinal tract and associated glands.
- Mechanical and chemical digestion of food.
- Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins
- Physiology of trachea and Lung, Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood, Respiratory pigments, Dissociation curves and the factors influencing it.
- Control centre of respiration

Circulation and Excretion in humans

- Components of blood and their functions; haemopoiesis
- Blood clotting: Blood clotting system, Blood groups, Rh-factor, ABO and MN
- Structure of mammalian heart, Origin and conduction of heart beat.
- Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation
- Structure of kidney and its functional unit; Ornithine cycle, Mechanism of urine formation.

UNIT 4

14 Hours

Nervous System and Endocrinology in humans

- Structure of neuron, resting membrane potential (RMP)
- Origin of action potential and its propagation across the myelinated and non-myelinated nerve fibers. Types of synapse.
- Endocrine glands - Pineal, pituitary, thyroid, parathyroid, pancreas and adrenal, their structure, function and hormones secreted.
- Classification of Hormones based on origin, Mechanism of Hormone action

Muscular System in humans:

- Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Sliding filament theory, Characteristics of muscle twitch; Motor unit, summation and Tetanus.

DSC (Biochemistry and Physiology)

COURSE OUTCOMES

CO1: Students are able to gain knowledge of the various biomolecules and their importance to understand the biochemical reactions in human body.

CO2: Helps students to understand the metabolic pathways in human body.

CO3: Students acquire knowledge of the process of digestion and respiration in man.

CO4: Students gain knowledge about the function of nervous system and understand the major controlling, regulatory and communication system along with endocrine system and muscle contraction.

Practicals:

1. Preparation of models of nitrogenous bases- nucleosides and nucleotides.
2. Preparation of models of DNA and RNA.
3. Qualitative analysis of Carbohydrates, Proteins and Lipids.
4. Qualitative analysis of Nitrogenous wastes – Ammonia, Urea and Uric acid.
5. Separation of amino acids or proteins by paper chromatography.
6. Determination of the activity of enzyme (Urease)-Effect of [S] and determination of - Km and Vmax.
7. Determination of the activity of enzyme (Urease) - Effect of temperature and time.
8. Preparation of Haematin crystals.
9. Estimation of Hemoglobin in human blood using Sahli's haemoglobinometer
10. Counting of RBC in blood using Hemocytometer.
11. Counting of WBC in blood using Hemocytometer.
12. Differential staining of human blood corpuscles using Leishman's stain.
13. Recording of blood glucose level by using Glucometer.

Virtual Labs (Suggestive sites)

06 hours

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

Suggested Readings

1. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet & Voet: Biochemistry Vols 1 & 2: Wiley (2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press

5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, XI Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Animal physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume 1 & 2, 11th edition, CBS Publishers (2016).

PRACTICAL

COURSE OUTCOMES

- CO1: The various qualitative tests help to analyze some very important, basic parameters of human body
- CO2: To impart Knowledge in counting of RBC and WBC in blood is used to evaluate overall health and detect disorders.

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**DEPARTMENT OF ZOOLOGY
B.Sc II Semester**

OPEN-ELECTIVE SYLLABUS: PARASITOLOGY

03Credits - 42 Hours

UNIT-1

14 Hours

- **1.General Concepts** Introduction, Parasites, parasitoids, host, zoonosis
 - Origin and evolution of parasites
 - Basic concept of Parasitism, symbiosis, phoresis,
 - commensalisms and mutualism Host-parasite interactions and adaptations
 - Life cycle of human parasites
 - Occurrence, mode of infection and prophylaxis
- **2. Parasitic Platyhelminthes** Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of
 - Fasciolopsis buski
 - Schistosoma haematobium
 - Taenia solium
 - Hymenolepis nana
- **3. Parasitic Protists** Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of
 - Entamoeba histolytica
 - Giardia intestinalis
 - Trypanosoma gambiense
 - Plasmodium vivax

UNIT-2

14 Hours

- **4. Parasitic Nematodes** Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of
 - Ascaris lumbricoides
 - Ancylostoma duodenale
 - Wuchereria bancrofti
 - Trichinella spiralis
 - Nematode plant interaction ; Gall formation

5. Parasitic Arthropods Biology, importance and control of Ticks (Soft tick Ornithodoros, Hard tick Ixodes)

- Mites (Sarcoptes)
- Lice (Pediculus)
- Flea (Xenopsylla)
- Bug (Cimex)
- Parasitoid (Beetles)

6. Parasitic Vertebrates

- Cookiecutter Shark
- Hood mockingbird and Vampire bat and their parasitic behavior and effect on host

UNIT-3

14 Hours

7. Molecular diagnosis & clinical parasitology

- General concept of molecular diagnosis for parasitic infection Advantages and disadvantages of molecular diagnosis
- Fundamental techniques used in molecular diagnosis of endoparasites
- Immunoassay or serological techniques for laboratory diagnosis of endoparasites on the basis of marker molecules like G.intestinalis, B. coli, E. histolytica, L. donovani, Malarial parasite using ELISA, RIA
- Counter Current Immunoelectrophoresis(CCI)
- Complement Fixation Test (CFT) PCR, DNA, RNA probe

OEC (PARASITOLOGY)

COURSE OUTCOMES

CO1: Students gain the knowledge of various parasites that affect human beings, their life cycle, treatment and preventive measures.

CO2: Provides knowledge about parasitic Nematodes, Arthropods and Vertebrates and their life cycle, pathogenicity and control measures.

CO3: Imparts the knowledge about fundamental techniques used in molecular diagnosis.