UNIT I

1. Organization of coelom: Acoelomates, Pseudocoelomates and coelomates
2. Protostomia and Deuterostomia
3. Locomotion: Flagellar and ciliary movement in Protozoa
4. Hydrostatic movement in Coelenterata, Annelida and Echinodermata

UNIT II

5. Patterns of feeding and digestion in lower Metazoa
6. Filter feeding in Polychaeta, Mollusca and Echinodermata
7. Organs of respiration: Gills, lungs and trachea
8. Respiratory pigments and their functions
9. Mechanism of respiration and transport of gases UNIT III

10. Organs of excretion: Coelom, coelomoducts, nephridia and Malphigian tubules
11. Mechanism of excretion in invertebrates
12. Primitive Nervous system of Coelenterates and Echinoderms
13. Advanced Nervous system of Annelida, Arthropoda (Crustacea and Insecta) and Mollusca (Cephalopoda)

UNIT IV

14. Trends in neural evolution
15. Larval forms of crustacean, mollusca and echinodermata
16. Larval forms of invertebrate parasites
17. Strategies and evolutionary significance of larval forms

UNIT V

18. Organization and general characters of Rotifera
19. Organization and general characters of Acanthocephala
20. Organization and general characters of Ectoprocta
21. Organization and general characters of Endoprocta
22. Sedgwick, A.A. Student Text Book of Zoology
23. Organization and general characters of Phoronida

Suggested Readings:
ZOOL 102: BIOSTATISTICS, BIOINFORMATICS & RESEARCH METHODOLOGY

UNIT I

1. The mean, mode, median, Standard deviation and Standard error of classified Data
2. Distribution: Normal, Binomial and Poisson
3. Hypothesis testing: Chi Square test, t-Test
4. Student’s t test

UNIT II

5. Analysis of variance (one way and two way ANOVA)
6. Correlation & Regression
7. Sampling: Methods & significance
8. Tabulation & Presentation of data

UNIT III

9. Computers and their applications in biology
10. Operating systems: DOS, WINDOWS
11. Application softwares: MS Word, MS Access, MS Excel, MS Power Point
12. Internet and its uses

UNIT IV

13. Bioinformatics: Definition, history and scope
14. Analysis of DNA and protein sequences; molecular and genomic databases (e.g., GENEBANK, SWISS-PROT and other databases)
15. Introductory ideas on use of databases for sequence retrieval, similarity search and sequence alignment.
16. Bioinformatics in drug discovery

UNIT V

17. Research: Definition and meaning of research problem
18. Research design
19. Research methodology
20. Interpretation of research outcome and writing report

Suggested Readings:
Pielou, E.C. The Interpretation of Ecological Data: A Primer on Classification and Ordination.
De Sapio, Calculus for Biologists.
Rubinov, S.I. Introduction to Mathematical Biology.
Saxena, V.P. ‘Jaiv Ganit Ek Parichaya’ (M.P. Hindi Granth Academy).
ZOOL 103: CELLULAR AND MOLECULAR BIOLOGY

UNIT I

1. Biomembranes: Structure of Membrane (Fluid mosaic model), Molecular composition of the membrane, functional significance
2. Transport across cell membranes: Simple diffusion and osmosis, facilitated diffusion (Transporters, uniports and antiports carriers, symports, ion channels), Active transport, Membrane pumps, Bulk transport (Endocytosis and Exocytosis)
4. Intracellular transport: Axonal transport, Transport of pigment is melanophores: Role of kinesin and dynein

UNIT II

6. Cell junctions (occluding, Anchoring & Gap junctions)
7. Signal transduction mechanisms: Basic concept
8. Apoptosis: Basic concept

UNIT III

9. Neurons: General organization of neurons, Classification of neurons
10. Glia: Structure & Types of glia, Functions of glia
11. Synapses: Ultrastructure of a synapse, Types of synapses, Synaptic transmission: Electrical & chemical, Functions of nerve fibers
12. Muscle contraction: Excitation – contraction coupling and Sarcoplasmic reticulum

UNIT IV
14. Organelle genome: Structure and functions of Mitochondrial genome
15. Gene mutation: Induced and spontaneous mutations
16. DNA damage and repair: Types of DNA damage, Basic pathway of DNA Repair

UNIT V
17. Gene regulation in prokaryotes: DNA binding motifs, Lac operon, Tryptophan operon
18. Sex determination in Drosophila: Chromosomal & Molecular basis
19. Sex determination in mammals: Primary and Secondary sex determination
20. Basic concepts of Dosage compensation in Drosophila and mammals

Suggested Readings:
De Robertis & De Robertis. Cell and Molecular Biology. Lea & Febiger

ZOO 104: TOOLS AND TECHNIQUES FOR BIOLOGY

UNIT I
1. Microscopy, principle & applications of light microscope, phase contrast microscope and Fluorescence microscope
2. General principle and applications of Electron microscope (TEM & SEM)
3. Principle and applications of Confocal microscopy
4. Cryotechniques: Cryopreservation of cells, tissues, organs and organisms Freeze fracture & freeze drying

UNIT II
5. Principles and applications of photometry; Beer & Lambert's law, Absorption spectrum & absorption maxima
6. Colorimeter & spectrophotometer: Working principle and applications
7. Flame photometer: Working principle and applications
8. Atomic absorption spectrophotometer: Working principle and applications

UNIT III
9. Separation techniques: Chromatography, principle, types and applications
10. Electrophoresis, principle, types & applications, PAGE and agarose gel electrophoresis
11. Radioisotopes in biology: Units of radioactivity, Radioactive counters
12. Autoradiography

UNIT IV

13. Techniques in immunodetection I: Immunocytochemistry and immunohistochemistry
14. Techniques in immunodetection II: Immunoblotting and immunofluorescence
15. Histological techniques: Principles and methods of perfusion, tissue fixation, Mmcratomy, cryotomy, and histochemical staining; Stereotaxy
16. Immunological techniques: Immunodiffusion and Immunoelectrophoresis

UNIT V

17. Cell culture techniques: Design and functioning of tissue culture laboratory; Culture media, essential components and preparation; Cell viability testing
18. Cytological techniques:
   - Mitotic & Meiotic chromosome preparations from insects and vertebrates
   - Chromosome banding techniques (G-, C-, Q-, R- banding etc.)
19. Molecular cytological techniques:
   - In situ hybridization (radiolabelled & non-radiolabelled methods), FISH, and Restriction banding
20. Molecular biology techniques:
   - Southern hybridization and Northern hybridization
   - DNA sequencing
   - Polymerase chain reaction (PCR)

Suggested Readings:
Bisen. Laboratory protocols in applied lifescience. CRC Press, 2014