

Department of Zoology

❖ Outline Course Structure under CCF for Zoology, C.U.

PART I; SEM I

Subject Code	Name of Paper	Theory	Practical
CC 1	Cell Biology	75	25
SEC-1	Applied Entomology	75	25
IDC	Animal Science	50	25

PART I; SEM II

CC 2	Biochemistry	75	25
SEC-2	Aquaculture	75	25
IDC	Animal Science	50	25

❖ Course Title: ZOOM CC-1 Cell Biology

Course Outcome: Upon completion of this course, students will be able to:

1. Describe the structure and function of the plasma membrane, including its role in cell signaling, transport, and cell-cell interactions.
2. Identify and explain the functions of cytoplasmic organelles, including mitochondria, endoplasmic reticulum, Golgi apparatus, lysosomes, and peroxisomes, and their roles in cellular processes such as metabolism, protein synthesis, and degradation.
3. Explain the composition and functions of the cytoskeleton, including microtubules, microfilaments, and intermediate filaments, and their roles in cell shape, movement, and division.
4. Describe the structure and function of the nucleus, including the nuclear envelope, chromatin, and nucleolus, and its role in gene expression and cell regulation.
5. Explain the principles of cell signaling, including signal transduction pathways, second messengers, and gene regulation, and how cells respond to internal and external stimuli.
6. Demonstrate an understanding of tools and techniques in cell biology, including microscopy, cell culture, and molecular biology techniques, and their applications in research and medicine.

Skills and Competencies that student will attain upon successful completion of this course:

- Analyse and interpret scientific data related to cell biology
- Apply knowledge of cell biology to real-world problems and scenarios
- Design and propose experiments to investigate cellular processes
- Communicate complex scientific concepts effectively through written and oral presentations

❖ **Course Title: ZOOM CC-2 Biochemistry**

Course Outcome: Upon completion of this course, students will be able to:

1. Describe the structure and function of various kinds of monosaccharides like aldose and ketose carbohydrates, disaccharides, polysaccharides; they will be acquainted with isomerism of monosaccharides (D and L, optical isomers, furanose and pyranose, α and β anomers, epimers) as well as reducing and non-reducing sugars. They will also know physiological importance of monosaccharide, disaccharides and polysaccharides.
2. Identify structure, classification, general and electrochemical properties of α -amino acids; essential and non-essential amino acids; structures of protein: primary, secondary, tertiary and quaternary) of protein, classification of proteins.
3. Explain the saturated and unsaturated fatty acids, essential and non-essential fatty acids, structure and formation of triglyceride.
4. Describe the cofactors and coenzymes, effect of temperature, pH, substrate concentration, enzyme concentration on enzyme action, isozymes and proenzyme, mechanism of enzyme action (Lock and key model, Induced fit model), enzyme kinetics, also learn the process of derivation of Michaelis-Menten equation with its significance, Lineweaver-Burk plot and its significance. enzyme inhibition – competitive, non-competitive, allosteric / feedback and its effect on V_{max} and K_m .
5. Describe and explain glycolysis, citric acid cycle, pentose phosphate pathway, gluconeogenesis from lactate and glycerate, glycogenesis and glycogenolysis along with the name of the enzymes and their significance.
6. Explain protein metabolism like transamination, deamination and their types as well as pathways with name of enzymes and significance. They also learn the fate of C-skeleton of glucogenic and ketogenic amino acids.
7. Describe lipid metabolism such as β -oxidation of fatty acids like palmitic acid (saturated), linoleic acid (unsaturated) including fatty acid biosynthesis pathway.
8. Explain nucleic acid metabolism such as degradation of purine; purine salvage pathway and significance.
9. Gather fundamental knowledge on free radicals and antioxidants and can also describe concepts of free radicals and antioxidants along with examples.

Skills and Competencies that student will attain upon successful completion of this course:

- ❖ Describe, analyze and interpret scientific data related to Biochemistry.
- ❖ Apply knowledge of Biochemistry to real-world problems and situations.
- ❖ Design and propose experiments to investigate biochemical processes.

- ❖ Communicate complex scientific concepts related to Biochemistry effectively through written and oral presentations

❖ **Course Title: ZOOM SEC-1 Applied Entomology**

Course Outcome: Upon completion of this course, students will be able to:

1. The unit 1 comprising of Basic entomology has been incorporated to encourage students to gain interest in knowing the structural adaptability of insects to cope up their interacting environment. After completing this unit, they will be able to identify and characterize insects having agricultural, medical, sericultural and apicultural importance.
2. The unit 2, entitled 'Medical entomology' comprises of description of insect and related arthropod creatures having medical importance. The students will acquaint with the biology and ecology of various insect vectors in relation to certain vector borne diseases like malaria, filaria, dengue etc. and also will be able to know about how these diseases can be prevented/controlled. They will further enhance their knowledge about how forensic science could utilize insects and related arthropods in the estimation of time of death of human/animal cadavers needed by legal authorities to solve unnatural death.
3. In the Unit 3 (Agricultural Entomology), students will gain knowledge about the insect pests of crops with special reference to pest dynamics, nature of damage and their management process so that crop yield can be increased to meet human demand.
4. The Unit 4 or Sericulture deals with insects directly involved in the production of Silk, the queen of threads. The students will get vivid knowledge about the biology of silk producing moths, their commercial rearing, cocoon harvesting, silk reeling and the marketing of silk. They will explore the huge potentiality of the sericulture used to uplift Indian rural economy. Students will also be able to identify the SWOC of this cottage industry.
5. In the Unit 5 (Apiculture) students will gain knowledge about the biology of Honey bees, scientific rearing of such beautiful insect creatures, their enemies & management of such enemies, scientific production and uses of honey.
6. After completing the practical unit, students will be able to handle insects and will get hands on training through their visit to places of having applied entomological interest.

❖ **Course Title: ZOOM SEC-2 Aquaculture**

Course Outcome: Upon completion of this course, students will be able to:

1. The course on basic fish biology in aquaculture typically aims to provide students with an understanding of fish anatomy, physiology, and behaviour, as well as how these aspects influence aquaculture practices.
2. Students will gain knowledge of the principles and practices of sustainability in aquaculture, including resource management, waste reduction, and the use of renewable resources. Students will also explore emerging technologies and innovative practices in sustainable aquaculture, and assess their potential impact on the future of the industry.

3. Students will gain insight into the latest technological innovations in aquaculture, such as advanced breeding techniques, genetic modification, and automation. They will learn how to apply recent advancements in aquaculture practices, including novel feeding strategies, disease management techniques, and water quality monitoring systems. They will explore emerging trends and future directions in aquaculture research and technology, and assess their potential to shape the industry.
4. Students will gain knowledge of common and emerging diseases affecting finfish in aquaculture, including their aetiology, epidemiology, and impact on fish health and production.
5. Students will develop hands-on skills in operating and managing various aquaculture systems, including pond, tank, and recirculating systems. Students will gain hands-on experience and knowledge in advanced breeding techniques for shrimp and prawns, including selective breeding, hatchery management, and larval rearing. Students will perform economic evaluations of breeding and pearl culture operations, including cost management, profitability analysis, and market trends.

The Program Specific Outcomes (PSOs) of this course might include:

1. Students will be equipped to apply sustainable aquaculture practices, including resource conservation, waste management, and minimizing environmental impact, in line with best practices and regulatory standards.
2. Students will integrate knowledge from related disciplines, such as environmental science, marine biology, and biotechnology, to address complex challenges in aquaculture and contribute to interdisciplinary solutions.
3. Students will be able to conduct research and apply innovative technologies in aquaculture, including advancements in nutrition, health management, and system design, to enhance productivity and sustainability.

❖ Course title: IDC-1: Animal Biology

Course Outcome: Upon completion of this course, students will be able to:

Unit 1: Animal Diversity

1. Unit 1(Animal Diversity) comprises of diversity of animals.
2. Students will understand the fundamental theories of living world and capability of developing ideas based on them.
3. Students will be motivated for research studies in Zoology and related fields.
4. Provide knowledge of a wide range of scientific techniques and application of methods/tools in related fields
5. Understanding animal diversity is fundamental to appreciating the myriad forms and functions that life has taken on our planet
6. Knowledge gained on the concept of maintenance systems in non-chordates and chordate groups.
7. Collaboration of structure and function, functional basis of body structures and Organ systems, relationships of the Chordates with such other animal groups/Phyla

Unit 2: Genetics

1. Knowledge gained on the fundamental genetic principles, from inheritance patterns to molecular mechanisms, Gene concept, genome organization

Unit 3: Biodiversity and Wildlife

1. Knowledge gained on wildlife, the ecological roles of animals, conservation challenges, and the impact of human activities on animal populations, the threats responsible for decimation of Biodiversity and Wildlife.
2. How to tackle issues of sustainable development and conservation of Biodiversity and Wildlife.
3. Conservation of Wildlife.

Unit 4: Insect Vectors

1. Knowledge gained on insect vectors, explored in detail for their roles in disease transmission and ecological balance.
2. Understanding their biology and behaviors that is crucial for effective pest management and disease control
3. The vital role of insect vectors in animal biology and behavior of vectors, their interactions with pathogens, and the implications for disease transmission, providing critical insights into the dynamics of infectious diseases.

Unit 5: Laboratory techniques and Instrumentation

1. Knowledge gained on laboratory techniques and instrumentation form the backbone of modern biological research.
2. This section covers essential methodologies, from microscopy to molecular biology tools,