DEPARTMENT OF ZOOLOGY

BSc. (H) Zoology

Semester II

DISCIPLINE SPECIFIC CORE COURSE– 4 (DSC-4): Non-Chordata: Coelomates

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Non-Chordata: Coelomates	04	02	0	02	Class XII pass with Biology/ Biotechnology	NIL

Learning Objectives

The learning objectives of this course are as follows:

- The course aims to impart in-depth knowledge about the diverse life forms from the taxonomic positions of Annelida to Echinodermata.
- It will help the students to identify the body plan types of complex non-chordates and their systematic organization based on evolutionary relationships, structural and functional affinities.
- The course will help the students to understand the characteristic morphological, adaptive and anatomical features of diverse animals
- The course will help students to understand the economic and ecological significance of various animals in human life.
- The course will create interest among them to explore and appreciate the animal diversity in nature.

Learning Outcomes

By studying this course, students will be able to

- learn about the importance of systematics, taxonomy, and structural organization ofnon- chordate coelomates.
- recognize the diversity of non-chordates living in varied ecological habitats.
- critically analyse the organization, complexity and characteristic features of non- chordates.
- comprehend the economic importance of non-chordates, their interaction with the environment and their role in the ecosystem.
- enhance collaborative learning and communication skills through practical

sessions, teamwork, group discussions, assignments, and projects.

SYLLABUS OF DSC-4

UNIT – I Annelida **07 Hours**

General characteristics and classification; Excretion in Annelida; Evolution of coelom and metamerism.

UNIT – II Arthropoda and Onychophora **12 Hours**

General characteristics and classification (Special reference to Insecta up to orders); Vision and Respiration in Arthropoda; Metamorphosis in insects; Social life of bees and termite, Evolutionary significance of Onychopora.

UNIT – III Mollusca **06 Hours**

General characteristics and classification; Respiration in Mollusca; Torsion and Detorsion in Gastropoda; Pearl formation in bivalves.

UNIT – IV Echinodermata **05 Hours**

General characteristics and classification; Water-vascular System in Asteroidea.

Note: Outline classification up to classes to be followed from "Ruppert, Fox and Barnes (2004). Invertebrate Zoology: A Functional Evolutionary Approach". VII Edition, Cengage Learning, India.

Practical component - **60 Hours**

1. Study of *Aphrodite, Nereis, Heteronereis, Sabella, Serpula, Chaetopterus, Pheretima, Hirudinaria,* Trochophore larva.
2. Study of T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.
3. Study of *Limulus*, *Palamnaeus, Palaemon, Daphnia*, *Balanus*, *Sacculina*, *Cancer*, *Eupagurus*, *Scolopendra*, *Julus*, *Bombyx*, *Periplaneta,* termite, *Apis, Musca.*
4. Study of *Peripatus.*
5. Study of *Chiton, Dentalium, Pila, Doris, Helix, Unio, Patella, Ostrea, Pinctada, Sepia, Octopus, Nautilus.*
6. Study of *Pentaceros*/*Asterias, Ophiura, Clypeaster, Echinus, Cucumaria, Antedon*; Any two larval forms.
7. Study of mouth parts, digestive system and nervous system of *Periplaneta.**
8. Study of the digestive system of *Pheretima*. *
9. Submit a Project Report on the larval forms in different phyla OR field study of the insect diversity.

*Subject to UGC approval and guidelines

Essential/recommended readings

1. Ruppert, Fox and Barnes (2004). Invertebrate Zoology. VII Edition,Cengage Learning, India.
2. Pechenik, J. A. (2015). Biology of the Invertebrates. VII Edition,McGraw-Hill Education.
3. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis. III Edition, Blackwell Science

Suggestive readings

1. Ruppert, E.E., Fox, R.S., Barnes, R. D. (2003). Invertebrate Zoology: A Functional Evolutionary Approach. VII Edition, Cengage Learning, India
2. Barrington, E.J.W. (2012). Invertebrate Structure and Functions. II Edition, EWP Publishers

DISCIPLINE SPECIFIC CORE COURSE– 5 (DSC-5): Fundamentals of Biomolecules

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Fundamentals of Biomolecules	04	02	0	02	Class XII pass with Biology/ Biotechnology	NIL

Learning Objectives

The learning objectives of this course are as follows:

- To provide fundamental and precise knowledge of biomolecules that play a crucial role in all processes of life and the development of diseases.
- To make the students understand the fundamental building blocks of living organisms that include carbohydrates, proteins, lipids, nucleic acids
- To apprise the students of the various functions of the molecules like providing structural integrity to the tissue-engineered constructs.
- Through this course, the students would be able to understand the physiological importance of these biomolecules.
- The enzymatic study would enable them to understand the various metabolic pathways and physiological reactions.

Learning Outcomes

By studying this course, students will be able to

- Interpret the structure-functional relationships of carbohydrates, proteins, lipids and nucleic acids.
- Understand the qualitative analysis of functional groups
- understand the properties of various biomolecules.
- appreciate the action of the enzyme and the various factors that affect their action detail.

SYLLABUS OF DSC-5

UNIT – I Carbohydrates **06 Hours**

Structure and biological importance: with emphasis on aldose, ketose, chiral centre, polarised Light, Fischer nomenclature, Haworth projection formula, mutarotation of glucose, anomers, pyranose, furanose, glycosidic linkage; reducing and non-reducing sugars: monosaccharides, disaccharides, polysaccharides and glycoconjugates.

UNIT – II Lipids **04 Hours**

Structure and Significance: Physiologically important saturated and unsaturated fatty acids, tri- acylglycerols, phospholipids, glycolipids, steroids.

UNIT – III Proteins **08 Hours**

Amino acids: Structure, classification and general properties of □-amino acids; physiological importance of essential and non-essential amino acids; proteins: bonds stabilizing protein structure; Levels of organization in protein motifs, folds and domains; Denaturation.

UNIT – IV Nucleic Acids **04 Hours**

Structure: purines and pyrimidines, nucleosides, nucleotides, nucleic acids; Cot Curves: Base pairing, Denaturation and Renaturation of DNA; Types of DNA and RNA.

UNIT – V Enzymes **08 Hours**

Nomenclature and classification, cofactors; specificity of enzyme action, Isozymes, Mechanism of enzyme action; Enzyme kinetics; factors affecting rate of enzyme-catalysed reactions; derivation of Michaelis-Menten equation, concept of K_m and V_{max}, Lineweaver-Burk plot, multi-substrate reactions, enzyme inhibition; Allosteric enzymes and their kinetics; Regulation of enzyme reaction.

Practical component – 60 Hours

1. Understanding the structures of biomolecules through ball and stick models.
2. To understand the preparation and roles of two important biological buffer systems: phosphate and bicarbonate; Preparation of buffers and determination of pH.
3. Identification of the functional groups by qualitative tests:
    a. Carbohydrates
    b. Lipids
    c. Proteins
4. Separation of amino acids by paper chromatography.
5. Study the action of salivary amylase under optimum conditions.
6. Study the effect of pH, temperature and inhibitors on the action of salivary amylase.

Essential/recommended readings

1. Nelson, D.L., Cox, M.M. (2017). Lehninger: Principles of Biochemistry (7th ed.). New York, WH: Freeman Company.
2. Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). Harper's Illustrated Biochemistry. XXVIII Edition, International Edition, The McGraw- Hill Companies Inc.

Suggestive readings

1. Stryer, L., Berg, J., Tymoczko, J., Gatto, G. (2019). Biochemistry (9th ed.). New York, WH: Freeman.
2. Voet, D., Voet. J. G. (2013). Biochemistry (4th ed.). New Jersey, John Wiley & Sons Asia Pvt. Ltd.

DISCIPLINE SPECIFIC CORE COURSE– 6 (DSC-6): Human Physiology-Control and Coordination Systems

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical / Practice		
Human Physiology-Control and Coordination Systems	04	02	0	02	Class XII pass with Biology/ Biotechnology	NIL

Learning Objectives

The learning objectives of this course are as follows:

- The course will provide a thorough understanding of the normal body function and helps to determine the cause of disease.
- It will enable the development of new and more effective treatments and guidelines for maintaining good health.
- It will equip the students with an ability to pursue career in medical and healthcare sector, pharmaceuticals and other related areas.
- It will help in understanding how these systems interact among themselves to maintain stability or homeostasis.

Learning Outcomes

By studying this course, students will be able to:

- appreciate human physiology and have its enhanced knowledge.
- recognize and identify principal tissue structures and functions
- understand the functions of important physiological systems including the nervous system, muscular system, endocrine and reproductive system
- learn an integrative approach to understand how these separate systems interact to yield integrated physiological responses to maintain homeostasis in the body along with feedback mechanisms.
- synthesize ideas to make the connection between knowledge of physiology and real- world situations, including healthy lifestyle decisions and problems faced due to homeostatic imbalances
- perform, analyze and report on experiments and observations in physiology
- know the fundamentals and understand advanced concepts so as to develop a strong foundation that will help them to acquire skills and knowledge to pursue an advanced degree.

SYLLABUS OF DSC-6

UNIT – I Nervous System and Sense Organs **08 Hours**

Structure of neuron, resting membrane potential, origin and conduction of action potential across the myelinated and unmyelinated nerve fibers; Types of synapses, synaptic transmission, Neuromuscular junction.

UNIT – II Muscle Physiology **07 Hours**

Mechanism of muscle contraction; Characteristics of muscle twitch; Motor unit, summation, and tetanus.

UNIT – III Endocrine System **08 Hours**

Hormones secreted by the glands, their physiological action and the disorders related to their secretion; Classification of hormones and their regulation; Mode of hormone action- Signal transduction pathways for peptide and steroid hormones.

UNIT – IV Reproductive System **07 Hours**

Physiology of male and female reproduction– spermatogenesis, oogenesis, follicular development, steroidogenesis, implantation, pregnancy, and mammary gland development.

Practical component – 60 Hours

1. Classification, structure and functions of tissues: epithelial, connective, muscular and nervous tissue.
2. Structure, histology, types and function of bones and cartilage.
3. Classification and histological structure of muscle; ultrastructure of striated muscle.
4. Preparation of temporary mounts: Squamous epithelium, Striated muscle fibres, Nerve cells.
5. Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex).
6. Recording of simple muscle twitch with electrical stimulation (Interpretation/ Virtual).
7. Study of permanent slides of Mammalian Skin, Spinal cord, Hypothalamus, Pineal, Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal, Testis and Ovary.
8. Permanent slide preparation from various tissues: Tissue fixation, block preparation, tissue sectioning, H&E staining, microscopy (Minimum three tissues; tissue can be procured from the slaughterhouse).

Essential/recommended readings

1. Tortora, G.J. and Derrickson, B.H. (2012). Principles of Anatomy and Physiology. XIII Edition, John Wiley and Sons, Inc.
2. Widmaier E, Raff H and Strang K. (2013) Vander's Human Physiology: The Mechanism of Body Functions. XIII Edition, McGraw-Hill Education.

3. Guyton, A.C. and Hall, J.E. (2011) Textbook of Medical Physiology. XII Edition, Harcourt Asia Pvt. Ltd/ W.B. Saunders Company.
4. Eroschenko, Victor P. (2012) Di Fiore's Atlas of Histology with Functional Correlations; 12th edition, CBS Publishers and Distributors Pvt. Ltd.

Suggestive readings

1. Chatterjee, C.C. (2021) Human Physiology, 14th Edition, Volume 1 & Volume II, CBS Publishers and Distributors Pvt. Ltd.
2. Kesar, S. and Vashisht, N. (2007) Experimental Physiology. Heritage Publishers.