

**Semester II- Zoology
Core Course Content:**

Course Title: Biochemistry and Physiology	Course Credits: 4
Course Code: DSCC5Z00T2	L-T-P per week: 4-0-0
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60
Model Syllabus Authors:	

Course outcomes:

The student at the completion of the course will learn:

1. To develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates.
2. How simple molecules together form complex macromolecules.
3. To understand the thermodynamics of enzyme catalyzed reactions.
4. Mechanisms of energy production at cellular and molecular levels.
5. To understand various functional components of an organism.
6. To explore the complex network of these functional components.
7. To comprehend the regulatory mechanisms for maintenance of function in the body.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	CC 1	CC T2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11
I Core competency		X									
II Critical thinking		X									
III Analytical reasoning		X									
IV Research skills		X									
V Team work		X									

Note: Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark =X 'in the intersection cell if a course outcome addresses a particular program outcome.

Core Course content:

Content	Hours
Unit I	14
<p>Chapter 1. Structure and Function of Biomolecules:</p> <ul style="list-style-type: none"> • Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates). • Lipids (saturated and unsaturated Fatty acids, Tri-acyl glycerols, Phospho lipids, 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. 	
<p>Chapter 2. Enzyme Action and Regulation</p> <ul style="list-style-type: none"> • Nomenclature and classification of enzymes; Cofactors; Specificity of enzyme action. • Isozymes; Mechanism of enzyme action. Clinical use of Isozymes. • 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
<p>Chapter 3. Metabolism of Carbohydrates and Lipids</p> <ul style="list-style-type: none"> • Metabolism of Carbohydrates: glycolysis, citric acid cycle, gluconeogenesis, phosphate pentose pathway Glycogenolysis and Glycogenesis Lipids- Biosynthesis of palmitic acid; Ketogenesis, • β-oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbon-atoms 	
<p>Chapter 4. Metabolism of Proteins and Nucleotides</p> <ul style="list-style-type: none"> • Catabolism of amino acids: Transamination, Deamination, Urea cycle, Nucleotides and vitamins • Peptide linkages 	
Unit 3	14

<p>Chapter 5. Digestion and Respiration in humans</p> <ul style="list-style-type: none"> • 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 of respiration. 	
<p>Chapter 6. Circulation and Excretion in humans</p> <ul style="list-style-type: none"> • Components of blood and their functions; haemopoiesis • Blood clotting: Blood clotting system, Blood groups: Rh-factor, ABO and MN • Structure of mammalian heart • Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation • Structure of kidney and its functional unit; Mechanism of urine formation 	
<p>Unit IV</p>	<p>14</p>
<p>Chapter 7. Nervous System and Endocrinology in humans</p> <ul style="list-style-type: none"> • Structure of neuron, resting membrane potential(RMP) • Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers. Types of synapse • Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas and adrenal; hormones secreted by them. • Classification of hormones; Mechanism of Hormone action. 	
<p>Chapter 8. Muscular System in humans</p> <ul style="list-style-type: none"> • Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus 	

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).
5. Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
6. Guyton, A.C & Hall, J.E. Textbook of Medical Physiology, XI Ed. W.B.Saunders Co. (2006).
7. Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Ed. John Wiley & sons (2006).
8. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Ed. Pearson Education (2016).
9. Hill, Richard W., et al. Animal physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
10. Chatterjee CC Human Physiology Volume 1 & 2, 11th edition, CBS Publishers (2016).

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	20
Written Assignment/Presentation/Project / Term Papers/Seminar	15
Class performance/Participation	05
Total	40

Zoology Semester II Core Course Lab Content

Course Title/Code: Biochemistry and Physiology	Course Credits: 2
Course Code: DSCC5Z00P2	L-T-P per week: 0-0-4
Total Contact Hours: 56	Duration of ESA: 4 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the student should be able to understand:
 Basic structure of biomolecules through model making.
 Develop the skills to identify different types of blood cells.
 Enhance basic laboratory skill like keen observation, analysis and discussion.
 Learn the functional attributes of biomolecules in animal body.
 Know uniqueness of enzymes in animal body and their importance through enzyme kinetics.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	CC P1	CC P2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11
I Core competency		X									
II Critical thinking		X									
III Analytical reasoning		X									
IV Research skills		X									
V Team work		X									

Note: Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark =X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

List of labs to be conducted	Hours
1. Preparation of models of nitrogenous bases- nucleosides and nucleotides. 2. Preparation of models of amino acids and dipeptides. 3. Preparation of models of DNA and RNA. 4. Qualitative analysis of Carbohydrates, Proteins and Lipids. 5. Qualitative analysis of Nitrogenous wastes – Ammonia, Urea and Uric acid. 6. Separation of amino acids or proteins by paper chromatography.	20

7. Determination of the activity of enzyme (Urease)-Effect of [S] and determination of Km and Vmax. 8. Determination of the activity of enzyme (Urease) - Effect of temperature and time. 9. Action of salivary amylase under optimum conditions. 10. Quantitative estimation of Oxygen consumption by fresh water Crab. 11. Quantitative estimation of salt gain and salt loss by fresh water.	15
12. Estimation of Hemoglobin in human blood using Sahli's haemoglobinometer.	15
13. Counting of RBC in blood using Hemocytometer. 14. Counting of WBC in blood using Hemocytometer. 15. Differential staining of human blood corpuscles using Leishman stain. 16. Recording of blood glucose level by using glucometer.	
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	06

Text Books

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 Ed., 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).

Web References:

- Mammalian Physiology – www.biopac.com

TOPICS RECOMMENDED FOR SEMINAR/PROJECT REPORT

1. Biochemical pathways, their evolutionary background and regulation.
2. Blood groups and their importance.
3. Vital enzymes for human body.
4. Essential and nonessential amino acids.
5. Important body lipids.
6. Significance of animal proteins.
7. Role of carbohydrates in animal body.
8. Role of lipids in structural and functional organization of body.
9. Nature of proteins and nurture of animal body.

Pedagogy: Lectures, Presentations, videos, Virtual Labs, Assignments, Tests,

Individual or group Field oriented Project Report on or visit to a research institute.

Formative Assessment	
Assessment Occasion	Weightage in Marks
Assignment/Monograph	05
Test	05
Record	05
Viva	05
Participation in class	05
Total	25