

<b>Programme/Class:</b> Certificate	<b>Year:</b> First	<b>Semester:</b> Second
<b>Subject:</b> ZOOLOGY		
<b>Course Code:</b> B050201T	<b>Course Title:</b> Biochemistry and Physiology	
<b>Course outcomes:</b>		
The student at the completion of the course will learn:		
<ul style="list-style-type: none"> <li>• To develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates</li> <li>• How simple molecules together form complex macromolecules.</li> <li>• To understand the thermodynamics of enzyme catalyzed reactions.</li> <li>• Mechanisms of energy production at cellular and molecular levels.</li> <li>• To understand systems biology and various functional components of an organism.</li> <li>• To explore the complex network of these functional components.</li> <li>• To comprehend the regulatory mechanisms for maintenance of function in the body.</li> </ul>		
<b>Credits:</b> 4	<b>Core:</b> Compulsory	
<b>Max. Marks:</b> 25+75	<b>Min. Passing Marks:</b> as per rules	
Total No. of Lectures-Tutorials-Practical (in hours per week): <b>L-T-P:4-0-0</b>		
<b>Unit</b>	<b>Topics</b>	<b>Total No. of Lectures (60)</b>
<b>I</b>	<b>Structure and Function of Biomolecules</b> <ul style="list-style-type: none"> <li>• Structure and Biological importance of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates)</li> <li>• Lipids (saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids)</li> <li>• Structure, Classification and General properties of <math>\alpha</math>-amino acids; Essential and non-essential <math>\alpha</math>-amino acids, Levels of organization in proteins; Simple and conjugate proteins.</li> </ul>	<b>8</b>
<b>II</b>	<b>Enzyme Action and Regulation</b> <ul style="list-style-type: none"> <li>• Nomenclature and classification of enzymes; Cofactors; Specificity of enzyme action</li> <li>• Isozymes; Mechanism of enzyme action</li> <li>• Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Derivation of Michaelis-Menten equation, Concept of <math>K_m</math> and <math>V_{max}</math>, Lineweaver-Burk plot; Enzyme inhibition;</li> <li>• Allosteric enzymes and their kinetics; Regulation of enzyme action</li> </ul>	<b>8</b>
<b>III</b>	<b>Metabolism of Carbohydrates and Lipids</b> <ul style="list-style-type: none"> <li>• Metabolism of Carbohydrates: glycolysis, citric acid cycle, gluconeogenesis, phosphate pentose pathway</li> <li>• Glycogenolysis and Glycogenesis</li> <li>• Lipids --- Biosynthesis of palmitic acid; Ketogenesis,</li> </ul>	<b>8</b>

	<ul style="list-style-type: none"> <li>• <math>\beta</math>-oxidation and omega -oxidation of saturated fatty acids with even and odd number of carbon atoms</li> </ul>	
<b>IV</b>	<b>Metabolism of Proteins and Nucleotides</b> <ul style="list-style-type: none"> <li>• Catabolism of amino acids: Transamination, Deamination, Urea cycle</li> <li>• Nucleotides and vitamins</li> <li>• Review of mitochondrial respiratory chain, Oxidative phosphorylation, and its regulation</li> </ul>	<b>6</b>
<b>V</b>	<b>Digestion and Respiration</b> <ul style="list-style-type: none"> <li>• Structural organization and functions of gastrointestinal tract and associated glands</li> <li>• Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Histology of trachea and lung</li> <li>• 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</li> </ul>	<b>7</b>
<b>VI</b>	<b>Circulation and Excretion</b> <ul style="list-style-type: none"> <li>• Components of blood and their functions</li> <li>• Haemostasis: Blood clotting system, Blood groups: Rh factor, ABO and MN</li> <li>• Structure of mammalian heart</li> <li>• Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation</li> <li>• Structure of kidney and its functional unit; Mechanism of urine formation</li> </ul>	<b>8</b>
<b>VII</b>	<b>Nervous System and Endocrinology</b> <ul style="list-style-type: none"> <li>• Structure of neuron, resting membrane potential</li> <li>• Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers</li> <li>• Types of synapse</li> <li>• Endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them</li> <li>• Classification of hormones; Mechanism of Hormone action</li> </ul>	<b>8</b>
<b>VIII</b>	<b>Muscular System</b> 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	<b>7</b>
<b>Suggested Readings:</b> <ol style="list-style-type: none"> <li>1. Nelson &amp; Cox: Lehninger's Principles of Biochemistry: McMillan (2000)</li> <li>2. Zubayet <i>et al</i>: Principles of Biochemistry: WCB (1995)</li> <li>3. Voet&amp;Voet: Biochemistry Vols 1 &amp; 2: Wiley (2004)</li> <li>4. Murray <i>et al</i>: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press</li> </ol>		

5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology. XI Edition. Herculourt 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 C C Human Physiology Volume 1 & 2. 11th edition. CBS Publishers(2016).

**Course Books published in Hindi may be prescribed by the Universities and Colleges**

**Course prerequisites:** To study this course, a student must have had the subject biology in class/12<sup>th</sup>

Suggested Continuous Evaluation Methods:

**Total Marks: 25**

**House Examination/Test:** 10 Marks

**Written Assignment/Presentation/Project / Term Papers/Seminar:** 10 Marks

**Class performance/Participation:** 5 Marks

Further Suggestions: None

At the End of the whole syllabus any remarks/ suggestions: None

<b>Programme/Class:</b> Certificate	<b>Year:</b> First	<b>Semester:</b> Second
<b>Subject:</b> ZOOLOGY		
<b>Course Code:</b> B050202P/R	<b>Course Title:</b> Physiological, Biochemical & Hematology Lab	
<b>Course outcomes:</b> The student at the completion of the course will be able to: <ul style="list-style-type: none"> <li>• Understand the structure of biomolecules like proteins, lipids and carbohydrates</li> <li>• Perform basic hematological laboratory testing,</li> <li>• Distinguish normal and abnormal hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.</li> </ul>		
<b>Credits:</b> 2	<b>Core:</b> Compulsory	
<b>Max. Marks:</b> 25+75	<b>Min. Passing Marks:</b> as per rules	
Total No. of Lectures-Tutorials-Practical (in hours per week): <b>L-T-P:0-0-4</b>		
<b>Unit</b>	<b>Topics</b>	<b>Total No. of Lectures (60)</b>
<b>I</b>	<ol style="list-style-type: none"> <li>1. Estimation of haemoglobin using Sahli's haemoglobinometer</li> <li>2. Preparation of haemin and haemochromogen crystals</li> <li>3. Counting of RBCs and WBCs using Haemocytometer</li> <li>4. To study different mammalian blood cell types using Leishman stain.</li> <li>5. Recording of blood pressure using a sphygmomanometer</li> <li>6. Recording of blood glucose level by using glucometer</li> </ol>	<b>20</b>
<b>II</b>	<ol style="list-style-type: none"> <li>1. Study of permanent slides of Mammalian skin, Cartilage, Bone, Spinal cord, Nerve cell, Pituitary, Pancreas, Testis, Ovary, Adrenal, Thyroid and Parathyroid</li> <li>2. Recording of simple muscle twitch with electrical stimulation (or Virtual)</li> <li>3. Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex)</li> </ol>	<b>15</b>
<b>III</b>	<ol style="list-style-type: none"> <li>1. Ninhydrin test for <math>\alpha</math>-amino acids.</li> <li>2. Benedict's test for reducing sugar and iodine test for starch.</li> <li>3. Test for sugar and acetone in urine.</li> <li>4. Qualitative tests of functional groups in carbohydrates, proteins and lipids.</li> <li>5. Action of salivary amylase under optimum conditions.</li> </ol>	<b>10</b>
<b>IV</b>	<b>Virtual Labs (Suggestive sites)</b> <ol style="list-style-type: none"> <li>1. <a href="https://www.vlab.co.in">https://www.vlab.co.in</a></li> <li>2. <a href="https://zoologysan.blogspot.com">https://zoologysan.blogspot.com</a></li> <li>3. <a href="http://www.vlab.iitb.ac.in/vlab">www.vlab.iitb.ac.in/vlab</a></li> <li>4. <a href="http://www.onlinelabs.in">www.onlinelabs.in</a></li> <li>5. <a href="http://www.powershow.com">www.powershow.com</a></li> <li>6. <a href="https://vlab.amrita.edu">https://vlab.amrita.edu</a></li> <li>7. <a href="https://sites.dartmouth.edu">https://sites.dartmouth.edu</a></li> </ol>	<b>15</b>

<b>Suggested Readings:</b>		
<ol style="list-style-type: none"> <li>1. Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.</li> <li>2. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.</li> <li>3. Guyton, A.C. &amp; Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Herculart Asia PTE Ltd. /W.B. Saunders Company.</li> <li>4. Tortora, G.J. &amp; Grabowski, S. (2006). Principles of Anatomy &amp; Physiology. XI Edition John Wiley &amp; sons</li> <li>5. Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. &amp; Wilkins.</li> <li>6. Arey, L.B. (1974). Human Histology. IV Edition. W.B. Saunders.</li> <li>7. Kesar, Saroj and Vashishta N. (2007). Experimental Physiology: Comprehensive Manual. Heritage Publishers, New Delhi</li> </ol>		
<b>Course Books published in Hindi may be prescribed by the Universities and Colleges</b>		
<b>Course prerequisites:</b> To study this course, a student must have had the subject biology in class/12 <sup>th</sup> The eligibility for this paper is 10+2 from Arts/ Commerce/ Science		
Suggested Continuous Evaluation Methods:		
<b>Total Marks: 25</b>		
<b>House Examination/Test:</b> 10 Marks		
<b>Written Assignment/Presentation/Project / Term Papers/Seminar:</b> 10 Marks		
<b>Class performance/Participation:</b> 5 Marks		
Further Suggestions: None		

At the End of the whole syllabus any remarks/ suggestions: University must ensure incorporation of all 04 units including virtual labs in practical evaluation.