

**Harimohan Ghose College**  
**Department of Physiology**

**1. Programme Specific Outcome**

- A. Physiology is a subject where the students study how the human body works in an integrated manner with the help of the different organ systems. It actually describes about the chemistry and physics behind human body's basic functions.
- B. Through this subject, students gain their knowledge about the different systems of the body like, Cardio vascular system, Respiratory system, Endocrine system, Nervous system, Digestive system and many more which play an important role in maintaining regular bodily functions.
- C. Indeed, Physiology is considered as the mother subject, by which students get the scope to enrich their comprehensive knowledge on different specific branches of subjects like, Biochemistry, Biophysics, Haematology, Endocrinology, Reproductive physiology, Immunology & Microbiology, Food & Nutrition, Public health, Toxicology & Pharmacology, Xenobiotics and many more.
- D. The Physiology honours syllabus, under the University of Calcutta, as per the CBCS curriculum runs for three years. It is specially designed as the students may gather some broad theoretical and as well as practical ideas about the different aspects of the subject.
- E. Moreover, the syllabus is comprised with some Core courses, Discipline Specific Elective Courses and Skill Enhancement Courses. Through the core courses students are introduced to the intensive core aspects of the subject as they may acquire their deep theoretical and practical knowledges about it. Through the various Discipline Elective Courses students become enriched with the different allied fields and through the Skill Enhancement Courses students are exposed to the various modern technical aspects of Physiology.

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<b>Semester</b>	<b>Paper</b>	<b>Outcome</b>
SEM-I	<p>CC1</p> <p>(Cellular basis of physiology and enzyme)</p>	<ol style="list-style-type: none"> <li>1. This module of the syllabus is designed such a way that students may build up their knowledge about the structure of the cell which is the main fundamental unit of our body. Moreover, with this course, students become enriched with the knowledge of the detailed and phasic cell cycle events.</li> <li>2. This section is comprised of the detailed structural and functional properties of chromosomes, including their microscopical structure, packaging and their molecular roles in various cellular events like cell divisions.</li> <li>3. This module of the syllabus also gives a proper idea about the structure, mechanism of actions, kinetic properties and physiological functions of various enzymes in our body. Along with that, it also contains the role of these enzymes in major biochemical reactions in our body.</li> </ol> <p>The practical portion of the module gives a transparent and vivid knowledge about the structure of different important cells and various phases of cell divisions along with the various basic experimental techniques associated with molecular biology.</p>
	<p>CC2</p> <p>(Biophysical principles, instrumentation and biochemistry of molecules)</p>	<ol style="list-style-type: none"> <li>1. Students are taught this module to develop a proper understanding about the different biophysical principles like diffusion, osmosis, surface tension, viscosity etc. and about their crucial role in maintaining proper homeostasis in our body.</li> <li>2. Students become enriched with the knowledge of physiological importance of chemical equilibrium in our body by studying the important sections like the principles of thermodynamics.</li> <li>3. The instrumentation section of the module gives comprehensive ideas to the students about the principles, uses and advantages and limitations of different instruments like, various microscopes, photometers, pH meters which have a broad and important function on every field of higher studies.</li> <li>4. Students gather their knowledge about the 3D structural properties of different biomolecules like carbohydrates, proteins, lipids, purines &amp; pyrimidines.</li> </ol> <p>The module also contains the practical portion which have the systematic analysis of different physiologically important biochemical substances and buffer preparation and pH measurement which is useful for the students to pursue their higher studies.</p>

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SEM-II	<p>CC3</p> <p>Cell-signaling, nerve and muscle physiology</p>	<p>1. Upon completion of the course the student would have enhanced knowledge and appreciation of various cell-signaling pathways and understand the EM structure, histology, properties, and functions of nerves and muscles of the human body.</p> <p>2. To understand how these separate systems interact to yield integrated physiological responses.</p> <p>3. To stain and identify fresh tissues like nerves, skeletal muscle, cardiac muscles, and collagen tissue using laboratory equipment.</p>
	<p>CC4</p> <p>Nervous system and molecular neurobiology</p>	<p>1. On completion of this course, students will have the knowledge and skills to describe the structure of major centers of human brain and explain their role in the maintenance of overall homeostasis.</p> <p>2. Students will also have an elaborate idea about different senses of human body and how they are perceived by our brain.</p> <p>3. To have an enhanced knowledge and appreciation of the molecular structure of various neurotransmitter molecules and their mode of function.</p> <p>4. To be able to perform, analyse and report on kymographic experiments and observations in nerve-muscle physiology and to have a first-hand idea of various reflexes of the human body.</p>
SEM-III	<p>CC5</p> <p>Blood and Body Fluids, Haematological Experiments</p>	<p>The major connective tissue of the human body is blood, needed to keep us alive. Its main function is to transport oxygen and nutrients to all the parts of the body and give us immunity. An understanding of this module can make themselves more knowledgeable regarding our own blood group, immunity and blood related diseases. The genetics behind the topics would prepare the base for future postgraduate study and research.</p> <p>There are the opportunities that make the students able to identify different blood cells morphologically, staining the blood and allied cells, estimate the haemoglobin and prepare haemin crystal.</p>

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	<p>CC6 (Cardiovascular System)</p>	<p>Heart and blood vessels, the parts of the cardiovascular system, are important because they bring oxygen, nutrients and other good things to every cell in body. They also take away carbon dioxide and waste. This supply of nutrients and the removal of waste is the main function of the cardiovascular system. Diabetes, hypertension, atherosclerosis, ischemic heart diseases has recently been elevated the risk of morbidity and mortality. The intense knowledge of students regarding cardiovascular physiology having physiology background, enables them to manage the cardiovascular abnormalities at initial level and also reduces the risk of developing cardiovascular diseases.</p> <p>Students will have the opportunity to get trained in measuring blood pressure, preparing physiological fluid and also observing the effects of different drugs on heart and lastly, compare normal and abnormal cardiac functioning by ECG.</p>
	<p>CC7 (Respiratory System and Respiratory Human Experiments)</p>	<p>Oxygen from the atmosphere is needed for our survival. The specialized organs of respiratory system provide us the oxygen by trapping it from the atmosphere and dissolving them into blood. The structural and functional collaboration of different parts of this system helps us to do that as long as we live. The section emphasizes on the underlying mechanisms of the delivery of oxygen and removal of carbon dioxide from each and every cell. The neural and chemical regulation of respiration and associated diseases like asphyxia, asthma, COPD, emphysema and other muscle weakness that lead to respiratory insufficiency are discussed.</p> <p>Students will get direct exposure to lung functions test and observing the effect of hyperventilation, breath holding and talking on pneumographic recording.</p>
	<p>Skill Enhancement Course SEC-A 1. Haematological Techniques</p>	<p>The students would be able to collect the information regarding biochemical basis of ABO and Rh blood groups and build the concept of blood bank and also its impact on blood transfusion and the hazards related to blood transfusion. They would have the proper explanation for the cause and symptoms of anaemia, leucopenia, haemoglobinopathies, purpura and leucocytosis. The significance of glycated haemoglobin, C-reactive protein, Ghrelin and Leptin in health and disease would also be enlightened by them. Different blood parameters of pathophysiological importance like TC, DC, ESR, Arneth count, etc could be elucidated. The precise knowledge</p>

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SEM-IV	2. Clinical Biochemistry	<p>about all the above facts will ultimately enable them to manage any blood related pathophysiological conditions primary in level.</p> <p>The pathophysiological significance of blood constituents like glucose, serum protein, albumin, urea, creatinine, uric acid, bilirubin and ketone bodies, various serum enzyme, lipid profiles and tissue specific substances like Cardiac Troponins can be clearly comprehended by the students at the terminal part of the course. They would have the knowledge to analyse the significance of lipid and thyroid profile in health and diseases.</p>
	CC-8 Digestion and Metabolism	<p>The students would be able to explain the structure-function relation of different parts of the GI tract, the breakdown of food particles into simpler absorbable forms, and would be able to comprehend the mechanism of transport of nutrients across the mucosal membrane. Students would also be able to explain the pathophysiology of several disorders related to digestion like gall bladder stone, jaundice, peptic ulcer etc. They would learn critically the metabolism of the major nutrients like carbohydrate, lipid, proteins, nucleic acids and the energy generation from these nutrients. Students would be able to explain the enzymatic dysfunctions related to different metabolic disorders.</p> <p>They would gain the technical knowledge of demonstrating the effects of sympathetic and parasympathetic nervous system on the movement of intestine in a mammalian model using rat as experimental animal. They would also learn to quantitate amino acids by titrimetric method.</p>
	CC-9 Molecular Biology	<p>Students would gain in depth knowledge of the processes constituting the central dogma of life namely transcription, translation and DNA synthesis. They would be able to explain mutation and relation between mutation and generation of oncogenes in the development of cancer. They would be able to comprehend the basic concepts of recombinant DNA technology and its uses in cure by gene therapy. The students would be able to describe the working principle and uses of common molecular techniques like chromatography, electrophoresis, ultracentrifugation and RIA, ELISA. They would also be understand the principles of Western, Northern and Southern blotting techniques and Polymerase chain reaction.</p> <p>The students would be able to estimate calorimetrically molecules of bio medical importance like serum protein, blood glucose and urea and separate biomolecules from mixtures by paper chromatography.</p>

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	<p>CC- 10 (Nutrition and Dietetics Public Health )</p>	<p>From this part, at the end of the course, the students are enriched with knowledge about dietary sources, daily requirements, and biochemical functions of several vitamins such as Thiamine, Riboflavin, Niacin, Pyridoxine, Pantothenic Acid, Biotin, Cyanocobalamin, Folic Acid, Ascorbic Acid, Inositol. Vitamins A, D, E, and K and minerals such as sodium, potassium, calcium, phosphorus, iron, zinc, iodine and fluoride. They also possess good ideas about dietary requirements of carbohydrates, proteins, lipid and other nutrients as well as formulation of balanced diet for adult men, adult women, lactating women and pregnant women.</p> <p>The students acquire exposure of the conduction of a diet survey with preparation of a survey report.</p>
	<p>SEC-B (Detection of Food Additives /Adulterants and Xenobiotics )</p>	<p>The students would learn about chemical contaminants in food in general and their impacts on human health. They would learn about the tests identifying specific food adulterants like Metanil yellow, and Rhodamine B, Arsenic, Lead and other contaminants in food samples and their pathophysiological effects. They would learn about the concept of xenobiotics and mechanisms of detoxification of xenobiotics by the human body.</p>
<p>SEM-V</p>	<p>CC11 Special Sense</p>	<p>The student after completing the course should have an enhanced knowledge of special sense organs and physiology of senses including those of vision, audition, gustation and olfaction. They would be able to describe the various steps in the biological transduction of different types of external stimuli like light, sound, chemicals, odorants into nerve impulse by sense organs ultimately leading to physiological perception of vision, audition, gustation and olfaction. They would also be able to explain the pathophysiology of diseases associated with vision, hearing, taste and smell.</p> <p>At the completion of Practical component, they will be able to perform simple experiments on colour vision, visual acuity and tests for deafness. They should also be able to identify permanent histological slides under microscope related to these sense organs.</p>

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<p>CC12 Endocrinology</p>	<p>On completion of the course the student should be able to understand the concept and knowledge of the histological structures and locations of various endocrine gland and to understand the chemical nature, biosynthesis, biological action including mechanism of action at cellular level and disorders associated with those hormones. They would be able to understand the regulation of secretion of hormones under different physiological conditions and situations and appreciate the role of these hormones in the maintenance of homeostasis. They would also be able to associate the function of these hormones with the symptoms arising from the deficiency or excess amount of these hormones in various endocrine disorders.</p> <p>At the end of the Practical component of the course, the student would be able to identify permanent histological slides of endocrine glands and organs associated with hormonal function under microscope and would be able to stain and identify tissue glycogen via Periodic acid – Schiff (PAS)staining.</p>
<p>DSEA2 Microbiology &amp; Immunology</p>	<p>The students would be able to classify microorganisms and describe the growth patterns and disinfection techniques with special emphasis on bacteria. They would gain thorough knowledge of bacteriology namely bacterial structure, metabolism, genetics and artificial culture techniques practiced in laboratories. They would be enlightened about the beneficial aspects of bacteriology in the food industry and also on the principles of controlling bacterial growth by different generations of antibiotics when they become the pathogens and cause infectious diseases in humans. The students would also be able to describe the structure – virion, prion and bacteriophages, classify virus based on nucleic acid composition and explain the replication of bacteriophages – lytic and lysogenic cycle.</p> <p>The students would gain insight into the intriguing world of immunology and would be able to explain the importance of different branches of immunity namely innate and adaptive and the humoral and cellular branches of adaptive immunity, the functions of individual cells of each branch and the coordination among the different branches in conferring protection to individual against pathogens. They would also be able to explain the mechanism of development of diseases due to overt immune functions like autoimmune diseases, allergy, graft rejection on one hand and diseases due to deficiency of immune system like cancer, AIDS etc. They would be able to explain the underlying principles of vaccination and immunization protocols.</p>

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<b>SEM-VI</b>	<p>DSE-B4</p> <p>Work, Sports &amp; Exercise Physiology</p>	<p>On completing the course, the student should have an enhanced knowledge of work and exercise physiology. The student should have a clear understanding of assessment of work load, fitness, training and bioenergetics in particular. The students would be able to understand how the body functions in working condition and would gain knowledge to develop activities and programs that establish, maintain and promote physical fitness. They would gain knowledge in the scientific study of human movement and can help athletes to improve their performance and help them to recover from injuries.</p> <p>After completion of the Practical component the student should be able to determine various human body-indices using direct anthropometric data on human subjects. They should also be able to record the variation of cardio-vascular parameters like blood pressure and heart rate in static and dynamic work conditions. They would also be able to assess physical fitness and predict anaerobic power and maximal aerobic capacity through standardized experimental protocols.</p>
	<p>Paper CC13</p> <p>Reproductive physiology and developmental biology.</p>	<ol style="list-style-type: none"> <li>1. Upon completion of the course the student will have an enhanced knowledge and appreciation of reproductive physiology of human, histology of major sex organs, maturation of sperm and ovum, process of fertilization, and implantation etc.</li> <li>2. To be able to know the embryonic development of various organ system in details.</li> <li>3. At the end of the course, the student would be able to identify permanent histological slides under microscope and would be able to stain and identify cell spaces of urinary bladder.</li> </ol>
	<p>Paper -CC14</p> <p>Excretory system, environmental pollutants and human health</p>	<ol style="list-style-type: none"> <li>1. Upon completion of the course the student would have an understanding of anatomy, histology and biology of excretion The student will be able to know the normal process of formation of urine and renal clearance tests, renal dialysis, etc.</li> <li>2. At the end of the course, the student would be able to have a clear concept of mechanism of sweat secretion and body temperature regulation.</li> <li>3. to have a clear understanding of the effects of various environmental pollutants including chlorinated hydrocarbons, organophosphorus, Organocarbamates, lead, arsenic, fluorine etc. on human.</li> </ol>



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		<p>4.To be able to identify normal and abnormal constituents of urine using proper biochemical tests in laboratory. The student would also be able to stain histological slides with haematoxylin -eosin stain and be able to identify sections under microscope.</p>
	<p>Paper- DSE-B3            Chronobiology and stress physiology</p>	<ol style="list-style-type: none"> <li>1. On completion of the course, the student will have an enhanced Knowledge on stress physiology particularly the concept of ROS and effect of chronic stress on various organ -system.</li> <li>2. The student will be able to understand various aspects of biological rhythm and its influence on major endocrine systems and other physiological parameters.</li> <li>3. The student will also develop knowledge on influence of hypobaric and hyperbaric conditions on human body and the condition of oxidative stress on human body.</li> <li>4. To be able to conduct a community survey to find out the Chrono type of human population and assess environmental heat-load and noise level in the immediate surroundings.</li> </ol>
	<p>DSE-A4            (Community and Public Health)</p>	<ol style="list-style-type: none"> <li>1. After going through this paper, students may gather their knowledge about the basic important sides of the public health. They are taught about the various nutritional strata of the society and introduced with the different terms related with this like malnutrition, overnutrition, PCM and how they are relevant to our socio economic status of the nation.</li> <li>2. Students are also introduced with the various socio medical problems like infertility and how to overcome it with the help of the boon of modern treatment like assisted reproductive technologies.</li> <li>3. The practical section of the module also helps the students to calculate different body indices through anthropometric measurements.</li> </ol> <p>Students also do the various community surveys through which they become able to determine the various epidemiological data.</p>

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