

DEPARTMENT OF PHYSIOLOGY
DR KANAILAL BHATTACHARYYA COLLEGE

Program Outcome, Course Outcome and Programme specific outcome in Physiology
(Undergraduate Level)

PROGRAMME OUTCOME (PO)

1. To provide a course study in mammalian, principally human system physiology, building on knowledge of basic physiological principles as introduced in the UG/CBCS Honours level curriculum.
2. To understand the chemical nature of life and life processes.
3. To expand knowledge on some specific areas and introduce new and more complex physiological knowledge in domain.
4. To develop practical skills in hematology, histology, cardio- respiratory physiology, sports physiology, pharmacology, molecular biology and qualitative and quantitative biochemistry as introduced in the curriculum.
5. To develop concept of designing experiments in laboratory, to note their observations, analyze data and interpret.
6. To have first-hand training on performing community-based field-survey on human subjects. To conduct Diet-survey in community and individual level following the latest ICMR guidelines.
7. To prepare UG level students for a number of higher level/PG courses principally in Physiology, Medical Physiology, Neuroscience, Pharmacology, Pathology, Biotechnology, Sports Sciences, Biochemistry etc.
8. To develop understanding of professional, ethical, security and social issues and responsibilities related to teaching, learning and evaluation in the subject domain.
9. To evaluate information on human health and medical research as to its social, ethical and environmental implications as part of responsible citizenship.
10. To develop the ability to communicate effectively among a range of audiences or stakeholders.
11. Students gain knowledge and skill in the fundamentals of Human Physiology and understand the complex interactions among various living organisms.
12. Recognized the relationships between structure and functions at different levels of biological organization (e.g., molecules, cells, organs, organisms, populations, and species) for humans.
13. Gains knowledge about research methodologies, effective communication and skills of problem-solving methods and to inculcate the scientific temperament in the students and outside the scientific community.
14. Perform procedures as per laboratory standards in the areas of hematology, histology, qualitative and quantitative biochemistry, experimental physiology and various human experiments. And develop research-oriented skills
15. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of physiological experiments.

PROGRAM SPECIFIC OUTCOME (PSO)

1. At the end of the course students of Physiology honours should have an enhanced knowledge and appreciation of mammalian physiology, especially human systems.
2. They should understand the functioning of important and classical physiological systems like cardio-respiratory, renal, neural, reproductive and metabolic system in humans.

3. They should understand how these separate systems interact to yield integrated physiological responses to challenges like fasting, exercise, high altitude etc. and also how they sometime fail to counteract.
4. They should be able to recognize and identify all principal cell and tissue structures in mammalian system.
5. They should learn to design experiment in laboratory, analyze data, and make reports on their observations in Physiology.
6. They should develop the ability to use the principles of the scientific method. They should have the basic understanding of concepts of instrumentation.
7. They should know how to perform field survey on various physiological and epidemiological parameters related to human subject and make report of the same.
8. They should develop data fluency including quantification and statistical analysis using appropriate statistical software.
9. They should know how to communicate effectively, both in written and oral form, and to deliver short seminar/lecture among range of stake holders using appropriate technologies.
10. Understanding of relationships between organisms through systemic physiology and cell biology and to have an enhanced knowledge and appreciation of mammalian physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems.
11. Fundamental concept of biochemistry and biophysics in cellular processes.
12. Fundamental concept of Molecular genetics like DNA Replication, transcription, Translation and Gene Regulation.
13. Understanding the modern concept of neurobiology with emphasis on human brain architecture, neurophysiology and molecular neurobiology.
14. Understand how separate systems interact to yield integrated physiological responses to challenges such as exercise, fasting and ascent to high altitude, and how they maintain homeostasis.
15. Be able to perform, analyze and report on laboratory experiments and observations in physiology.
16. Fundamental concepts of Instrumentation and methodology including microscopy, separation techniques, principle of spectrometry, radiography and various imaging techniques used in modern medical sciences –CT scan, MRI, PET scan etc.
17. Be able to recognize and identify principal tissue structures with histological and histochemical techniques.
18. Introduction to biostatistics, descriptive statistics, correlation and regression, graphical representation of data and concept of Hypothesis testing.

COURSE SPECIFIC OUTCOMES (CO)			
SEM	COURSE	CONTENT	OUTCOME
SEM-1	CC1	Cellular basis of physiology and enzyme.	<ol style="list-style-type: none"> 1. Upon completion of the course the student should be able to understand the concept and knowledge of cell structure, functions, cellular transport, concept of chromosome, its structure and cell-cycle. The student should also be able to understand the concept of enzyme, its properties, kinetics and functions. 2. Use scientific laboratory equipment in order to gather and analyse data on cell biology. 3. Communicate information related to cell biology, chromosome and enzyme system through written, verbal, or multimedia formats, in order to assess

			current knowledge, answer investigative questions, and explore new questions.
	CC2	Biophysical principles, instrumentation and biochemistry of molecules	<ol style="list-style-type: none"> 1. Upon completion of the course the student should be able to understand biophysical principles like osmosis, diffusion, surface tension & viscosity, pH & buffer, thermodynamic principles, colloid etc., in details and their physiological application as far as human body is concerned. 2. To understand principle of construction, uses, advantages and disadvantages of some instruments of importance in biology such as Microscopes, Spectrophotometer, Photoelectric-colorimeter, pH meter. 3. They should also be able to understand the structure, isomerism, properties, reactions and uses of some major biomolecules like carbohydrate, lipid, protein and nucleic acid. 4. To be able to identify an unknown solution of physiological importance through sequential biochemical tests and to prepare a buffer solution and determination of pH of that using pH meter and buffer capsules.
	CC3	Cell-signaling, nerve and muscle.	<ol style="list-style-type: none"> 1. Upon completion of the course the student should have an enhanced knowledge and appreciation of various cell-signalling pathways and understand the EM structure, histology, properties and functions of nerves and muscles of human body. 2. To understand how these separate systems interact to yield integrated physiological responses. 4. To stain and identify fresh tissues like nerves, skeletal muscle, cardiac muscles and collagen tissue using laboratory equipment.
SEM-2	CC4	Nervous system and molecular neurobiology	<ol style="list-style-type: none"> 1. On satisfying the requirements of this course, students will have the knowledge and skills to describe the structure of major centres of human brain and explain their role in the maintenance of overall homeostasis. 2. To have an enhanced knowledge and appreciation of molecular structure of various neurotransmitter molecules and their mode of functions. 3. To be able to perform, analyze and report on kymographic experiments and observations in nerve-muscle physiology and to have a first-hand idea of various reflexes of human body.
SEM-3	CC5	Physiology of Blood and Body-fluids.	<ol style="list-style-type: none"> 1. Upon completion of the course the student should be able to understand the concept and knowledge of various blood corpuscles, their formations, physiological functions and disorders related to their malformation or malfunction. 2. To be able to perform various hematological experiments in laboratory using human blood and to analyze and interpret their observations.
	CC6	Cardio-vascular system	<ol style="list-style-type: none"> 1. Upon completion of the course the student should have an enhanced knowledge and appreciation of basic structural and functional features of heart and blood vessels with their regulation through brain-centers.

			<p>2. To be able to understand the principle of electrocardiography, the lead system, interpretation of normal ECG in laboratory.</p> <p>3. To be able to carry out kymographic experiments on perfused heart of toad.</p> <p>4. To be able to record the blood pressure of human subject using sphygmomanometry and interpret the observations.</p>
	CC7	Respiratory system	<p>1. To be able to understand the structure and function of lung and the normal physiology of respiration and to know various disorders associated with breathing.</p> <p>2. To understand how cardiovascular, respiratory and nervous system interact to yield integrated physiological responses to challenges such as exercise or ascent to high altitude etc.</p> <p>3. to be able to perform the pneumographic experiments on human breathing and to carry out lung-function tests.</p>
	SEC A1	Haematological techniques	<p>Upon completion of this course the student be able to gather knowledge on various hematological techniques like blood group identification, blood banking, determination of TC, DC, ESR, Arneht count etc. of human. He /she will be able to learn various disorders related to RBC, WBC and platelets.</p>
SEM-4	CC8	Digestion and metabolism	<p>1. Upon completion of the course the student should have an enhanced knowledge and appreciation of general anatomy of digestive system, process of digestion of food and metabolism of biomolecules in human.</p> <p>2. To be able to perform Dale's mono bath experiments to record the movement of isolated intestine of mammalian system.</p> <p>3. To be able to quantify amino-nitrogen content using Sorensen's formol titration method.</p>
	CC9	Molecular biology and Methodologies	<p>1. Upon completion of the course the student should be able to understand the concept and knowledge of the molecular activities of genetic element like replication, transcription, translation and repair and also the biology of cancer.</p> <p>2. To understand the methodologies of various techniques of molecular biology which includes chromatography, electrophoresis, blotting techniques and centrifugation.</p> <p>3. To be able to perform colorimetric estimation of various serum parameters in laboratory and to interpret the observations thereafter and to be able to conduct paper-chromatography experiments to identify amino-acid.</p>
	CC10	Nutrition & dietetics.	<p>1. Upon completion of the course the student should have an enhanced knowledge and appreciation of dietary sources, biological function, deficiency symptoms of different vitamins and minerals.</p> <p>2. To be able to understand the principle of formulation of balanced diet for people under various biological conditions and needs.</p>

			3. To be able to conduct simple qualitative analysis of some common food stuff like milk, rice, pulses, potatoes and flour.
	SEC-B1	Detection of Food additives and xenobiotics.	1. Upon completion, the student would have enhanced knowledge on health hazards associated with various food additive and adulterants. 2. To understand the types, sources, reactions and fate of different xenobiotic compound and their de-toxification.
SEM-5	CC11	Special senses	1. Upon completion of the course the student should have an enhanced knowledge of special sense organs and physiology of senses including those of vision, audition, gustation and olfaction. 2. To be able to perform simple experiments on colour vision, visual acuity and hearing. They should also be able to identify permanent histological slides under microscope.
	CC12	Endocrinology	1. Upon completion of the course the student should be able to understand the concept and knowledge of the histological structures of various endocrine gland and to understand the chemical nature, biosynthesis, biological action, regulation of synthesis and disorders associated with those hormones. 2. 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 tissue glycogen via PAS staining.
	DSE-A1	Biostatistics	1. Upon completion of the course the student should have an elaborated knowledge of the basics of biostatistics. The student will also learn to apply the knowledge in planning of experiments on human population. 2. At the end of the course the student will be able to perform statistical analysis and ANOVA on biological data in computer. He/she will also able to graphically express the results of analysis as and when required.
	DSE-B1	Work, exercise and sports physiology	1. Upon completion of 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. 2. The student should be able to determine various human body-indices using direct anthropometric data on human subject. The student should also be able to record the variation of cardio-vascular parameters like blood pressure and hear rate in static and dynamic work conditions.
SEM-6	CC13	Reproductive biology and developmental biology.	1. Upon completion of the course the student should have an enhanced knowledge and appreciation of reproductive biology of human, i.e., histology of major sex organs, maturation of sperm and ovum, process of fertilization, and implantation etc. 2. To be able to know the embryonic development of various organ system in details.

		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.
CC14	Excretory system and environmental pollution & human health.	<p>1. Upon completion of the course the student should have an understanding of anatomy, histology and biology of excretion. The student should be able to know the normal process of formation urine and renal clearance tests.</p> <p>2. At the end of the course, the student should be able to have a clear concept of mechanism of sweat secretion and body temperature regulation.</p> <p>3. to have a clear understanding of the effects of various environment pollutants including chlorinated hydrocarbons, organophosphorus, organo-carbamate, lead, arsenic, fluorine etc. on human.</p> <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 hematoxylin -eosin stain and be able to identify sections under microscope.</p>
DSE-A4	Community and public health	<p>1. Upon completion of this course, the student will be able to know the basics of various community health issues. He/she would be able to know the etiology, symptoms and prevention of different public health conditions like PCM, infertility, endemic goiter, xerophthalmia, beriberi, nutritional anemia etc. and many other communicable and non-communicable diseases.</p> <p>2. The student will be able to calculate many body-indices depending on anthropometric measurements.</p> <p>3. the student will be able to perform community survey and epidemiological survey on field and will be able to draw inferences from their observations.</p>
DSE-B3	Chronobiology and stress physiology	<p>1. On completion of the course, the student will have an enhanced knowledge on stress physiology particularly the concept of GAS and effect of chronic stress on various organ -system.</p> <p>2. the student will be able to understand various aspects of biological rhythm and its influence on major endocrine system and other physiological parameters.</p> <p>3. The student will also develop knowledge on influence of hypobaric and hyperbaric conditions on human body. He/she will also be able to decrypt the condition of oxidative stress on human body.</p> <p>4. To be able to conduct community survey to find out the chronotype of human population and assess environmental heat -load and noise-level in the immediate surroundings.</p>