

Programme Outcome

(B.Sc. Honours/General in Physiology)

1. The Physiology Honours programme equips students with in-depth theoretical and practical understanding of human body systems, enhancing their ability to pursue interdisciplinary and applied science careers.
2. It enables students to critically engage with scientific literature, conduct advanced experimental research, and interpret data through analytical techniques and biostatistics.
3. Students develop a scientific temperament and ethical outlook, fostering social responsibility and a commitment to contributing positively to public health and medical sciences.
4. Graduates gain skills to design, implement, and manage health-related projects, supporting career paths in clinical research, healthcare industries, or academic fields.
5. Exposure to the latest physiological and biomedical innovations enables students to adapt to evolving scientific and technological landscapes, preparing them for lifelong learning and professional development.

COURSE OUTCOME

SEMESTER- I

Course – I: Theory, Paper Code: PHY-CC11-TH-P01 [Credit: 03; Marks: 75] [History of Physiology and medicine and contribution of Indian Scientists in the field of Physiology and allied health sciences, Cellular Basis of Physiology, Cellular transport, Chemistry of Biomolecules]

Knowledge and Understanding:

- **Historical Perspective:** Demonstrate a comprehensive understanding of the historical development of physiology and medicine, with a focus on the significant contributions of Indian scientists.
- **Physiological Systems:** Acquire a foundational knowledge of the anatomy, functional organization, and physiological processes of major human physiological systems, including the cardiovascular, respiratory, digestive, endocrine, nervous, reproductive, excretory, blood, and immune systems.
- **Cellular Biology:** Develop a solid understanding of the structure and function of animal tissues and cells, including cell organelles, cellular transport mechanisms, and intercellular communication.
- **Biochemistry:** Gain a deep understanding of the structure, properties, and biological functions of carbohydrates, lipids, amino acids, peptides, proteins, and nucleic acids.

Intellectual Skills:

- **Critical Thinking:** Analyze and interpret complex physiological concepts and apply them to real-world scenarios.
- **Problem-Solving:** Utilize scientific problem-solving techniques to investigate physiological questions and develop solutions.
- **Information Literacy:** Effectively search for, evaluate, and utilize relevant scientific information from various sources.

Practical Skills:

- **Laboratory Skills:** Acquire practical skills in conducting physiological experiments and biochemical analyses.
- **Data Analysis:** Interpret experimental data and draw meaningful conclusions.
- **Scientific Communication:** Present scientific findings clearly and concisely, both orally and in writing.

SEMESTER – II

Course Outcome of Course – II: Practical, Paper Code: PHY-CC11-PR- P02 [Credit: 01; Marks: 25]

Course Outcome

Upon successful completion of this practical course, students will be able to:

Knowledge and Understanding:

- **Anatomical Structures:** Identify and describe the anatomical structures of various human body organ systems using models, charts, and specimens.
- **Microscopic Anatomy:** Recognize and distinguish between different types of epithelial tissues (squamous, ciliated, and columnar) under a microscope.
- **Biochemical Substances:** Identify and characterize important biochemical substances, such as carbohydrates, proteins, lipids, and other metabolites, through qualitative tests.

Practical Skills:

- **Laboratory Techniques:** Acquire proficiency in basic laboratory techniques, including tissue staining and biochemical tests.
- **Microscopic Observation:** Utilize a microscope to observe and analyze microscopic structures of tissues.
- **Data Interpretation:** Interpret the results of qualitative tests to identify specific biochemical substances.
- **Scientific Reporting:** Document experimental observations and results accurately and concisely.

General Skills:

- **Observation and Analysis:** Develop keen observational skills and the ability to analyze experimental data.
- **Problem-Solving:** Apply critical thinking to troubleshoot experimental challenges and interpret unexpected results.
- **Laboratory Safety:** Adhere to safety protocols and handle laboratory equipment and chemicals responsibly.

By mastering these practical skills and knowledge, students will develop a solid foundation in human anatomy and physiology, enabling them to apply their learning to future studies and careers in healthcare, biomedical sciences, or related fields.

Course Outcome of Course – III: Theory, Paper Code: PHY-CC21-TH-P03 [Credit: 03; Marks: 75] [Cell signaling, Enzymes, Biophysiochemical principles]

Knowledge and Understanding:

- **Cell Signaling:** Understand the principles of cell signaling, including various types of signaling pathways, receptor-ligand interactions, and intracellular signaling cascades.
- **Enzyme Kinetics:** Acquire a comprehensive understanding of enzyme kinetics, including enzyme classification, enzyme-substrate interactions, factors affecting enzyme activity, and enzyme inhibition mechanisms.
- **Biophysical Principles:** Grasp the fundamental concepts of biophysical principles, such as diffusion, osmosis, surface tension, viscosity, pH, buffers, colloids, and thermodynamics.

Intellectual Skills:

- **Critical Thinking:** Analyze complex biochemical and biophysical phenomena and apply critical thinking to solve problems.
- **Problem-Solving:** Utilize mathematical and computational tools to analyze experimental data and model biological systems.
- **Information Literacy:** Effectively search for, evaluate, and synthesize information from various sources to gain a deeper understanding of the subject matter.

Course Outcome of Course – IV: Practical, Paper Code: PHY-CC21-PR- P04 [Credit: 01; Marks: 25]

Knowledge and Understanding:

- **Histological Structures:** Identify and describe the histological structures of various mammalian tissues and organs, including epithelial, connective, muscular, and nervous tissues.
- **Cell Signaling Pathways:** Understand the basic principles of cell signaling pathways and their significance in cellular processes.

Practical Skills:

- **Microscopic Observation:** Utilize a microscope to observe and analyze histological sections of different tissues and organs.
- **Laboratory Techniques:** Acquire proficiency in basic laboratory techniques, such as buffer preparation and pH measurement.
- **Data Interpretation:** Interpret microscopic observations and draw conclusions about tissue structure and function.
- **Scientific Reporting:** Document experimental observations and results accurately and concisely.

General Skills:

- **Observation and Analysis:** Develop keen observational skills and the ability to analyze microscopic structures.
- **Problem-Solving:** Apply critical thinking to troubleshoot experimental challenges and interpret unexpected results.
- **Laboratory Safety:** Adhere to safety protocols and handle laboratory equipment and chemicals responsibly

Course: Theory, Paper Code: PHY-SEC11-TH-P01[Credit: 02; Marks: 50] [Clinical Importance of Biomolecules, Protein Disorders, Age Related Health Issues, Work and Exercise Physiology]

Knowledge and Understanding:

- **Clinical Significance of Biomolecules:** Understand the role of various biomolecules (carbohydrates, lipids, proteins) in human health and disease.
- **Protein Disorders:** Identify and analyze the clinical features and laboratory findings associated with different protein disorders.
- **Age-Related Health Issues:** Gain knowledge about the specific health challenges faced by infants, adults, and elderly individuals.
- **Work and Exercise Physiology:** Grasp the fundamental concepts of work and exercise, their physiological basis, and how the body adapts to different workloads. Gain a basic understanding of the nutritional needs of athletes. Evaluate the impact of aerobic and anaerobic capacity on athletic performance

Application and Problem-Solving:

- **Interpret Laboratory Findings:** Apply their understanding of biomolecules to interpret laboratory data and diagnose potential health problems.
- **Develop Management Strategies:** Utilize their knowledge of age-related health issues to develop appropriate health management plans for different age groups.
- **Optimize Performance:** Apply principles of work and exercise physiology to optimize physical performance and prevent injuries.

Course Outcome for PHY-SEC11-PR-P02

Upon successful completion of this practical course, students will be able to:

Practical Skills:

- **Solution Preparation:** Accurately prepare solutions of various concentrations, including molar, normal, and percentage solutions.
- **Titrimetric Analysis:** Conduct precise titration experiments to standardize solutions and determine the concentrations of unknown substances.
- **Physiological Measurements:** Measure various physiological parameters like BMI, BSA, PI, waist-hip ratio, body fat percentage, blood pressure, pulse rate, and heart rate.

- **Data Analysis:** Analyze and interpret experimental data to draw meaningful conclusions.
- **Laboratory Techniques:** Demonstrate proficiency in basic laboratory techniques, such as weighing, volumetric measurements, and using laboratory equipment.

Course: Theory, Paper Code: PHY-SEC21-P03 [Credit: 02; 50 Marks]

Knowledge and Understanding:

- **Clinical Biochemistry:** Understand the normal function and clinical significance of various enzymes, proteins, and metabolites in the human body.
- **Laboratory Techniques:** Gain knowledge of the principles, working, and maintenance of various laboratory instruments and equipment.
- **Histological Techniques:** Understand the principles and techniques involved in tissue fixation, sectioning, and staining.
- **Quality Assurance:** Acquire knowledge of quality assurance principles and their application in clinical laboratories.
- **Pathological Changes:** Recognize morphological alterations in cells and tissues due to various diseases.

Course Outcome for PHY-SEC21-PR-P04

Upon successful completion of this practical course, students will be able to:

Practical Skills:

- **Biochemical Assays:** Perform biochemical assays to quantify various analytes in biological samples, including cholesterol, triglycerides, HDL, LDL, urea, creatinine, and uric acid.
- **Histological Techniques:** Prepare and stain histological sections of various tissues using hematoxylin and eosin staining.
- **Microscopic Examination:** Utilize a microscope to examine histological sections and identify different tissue structures.
- **Data Analysis:** Analyze and interpret experimental data to draw meaningful conclusions.
- **Laboratory Techniques:** Demonstrate proficiency in basic laboratory techniques, such as pipetting, centrifugation, and spectrophotometry.

SEMESTER – III

Course Outcome of Course – V: Theory, Paper Code: PHY-CC31-TH-P05

Knowledge and Understanding:

- **Fundamental Concepts:** Demonstrate a solid understanding of the structure and function of bone marrow, blood cells, and body fluids.

- **Cardiovascular Physiology:** Explain the anatomy, physiology, and regulation of the cardiovascular system, including cardiac cycle, heart sounds, blood pressure, and electrocardiography.
- **Respiratory Physiology:** Describe the anatomy, physiology, and mechanics of respiration, including lung volumes, gas exchange, and ventilation-perfusion matching.
- **Digestive Physiology:** Understand the anatomy, physiology, and regulation of the digestive system, including digestion, absorption, and secretion of digestive juices.
- **Genetics:** Grasp the fundamental principles of Mendelian genetics, chromosome structure and function, and molecular genetics, including DNA replication, transcription, and translation.

Application of Knowledge:

- **Clinical Relevance:** Apply knowledge of blood disorders, cardiovascular diseases, respiratory disorders, and digestive disorders to clinical scenarios.
- **Problem-Solving:** Analyze and interpret data related to blood tests, ECGs, pulmonary function tests, and genetic disorders.
- **Experimental Design:** Design and conduct experiments to investigate the effects of various factors on blood, cardiovascular, respiratory, digestive, and genetic systems.

Course Outcome of Course – VI: Practical, Paper Code: PHY-CC31-PR- P06

Knowledge and Understanding:

- **Hematology:**
 - Understand the morphology and identification of blood cells.
 - Apply techniques for blood cell counting and hemoglobin estimation.
 - Recognize the significance of blood parameters in health and disease.
- **Cardiovascular Physiology:**
 - Analyze the effects of posture on blood pressure.
 - Interpret the mechanisms underlying postural changes in blood pressure.
- **Respiratory Physiology:**
 - Understand the mechanics of respiration and lung function tests.
 - Analyze the effects of various respiratory maneuvers on lung function.
- **Electrocardiography:**
 - Interpret normal electrocardiogram (ECG) tracings.
 - Recognize the significance of different ECG waveforms.

Practical Skills:

- **Laboratory Techniques:**
 - Prepare and stain blood films effectively.
 - Perform accurate blood cell counts and hemoglobin estimations.

- Use spirometry equipment to measure lung function.
- Record and analyze ECG tracings.
- **Data Analysis:**
 - Interpret and analyze the results of laboratory experiments.
 - Draw conclusions based on experimental data

Demonstration

- Identify the anatomical locations of radial, brachial, popliteal, and dorsalis pedis arteries.
- **Physiology:** Understand the principles of pulse palpation and its significance in assessing cardiovascular health.

Course – VII: Theory, Paper Code: PHY-CC32-TH-P07

Knowledge and Understanding:

- **Neurophysiology:** Understand the structure and function of neurons, synapses, and muscle fibers. Explain the mechanisms of nerve impulse conduction and muscle contraction.
- **Nervous System:** Describe the anatomy and function of the central and peripheral nervous system, including sensory and motor pathways, reflex arcs, and cerebrospinal fluid.
- **Special Senses:** Explain the structure and function of the auditory, olfactory, gustatory, and visual systems, including sensory transduction, neural pathways, and perception.
- **Biostatistics:** Understand basic statistical concepts and apply them to analyze biological data.

Application of Knowledge:

- **Problem-Solving:** Analyze and interpret data related to neurophysiological, sensory, and statistical experiments.
- **Critical Thinking:** Evaluate the implications of neurophysiological and sensory disorders.
- **Experimental Design:** Design and conduct experiments to investigate neurophysiological and sensory phenomena.

Practical Skills:

- **Laboratory Techniques:** Perform experiments involving nerve and muscle preparations, sensory testing, and statistical analysis.
- **Data Analysis:** Analyze and interpret experimental data, including statistical analysis and graphical representation.
- **Scientific Communication:** Effectively communicate scientific findings through written reports and oral presentations.

Course- VIII: Practical, Paper Code: PHY-CC32-PR- P08

Knowledge and Understanding:

- **Neuroanatomy and Histology:** Understand the microscopic structure of nerve fibers and muscle tissues.
- **Muscle Physiology:** Apply techniques to study muscle contraction and its properties.
- **Sensory Physiology:** Assess visual acuity, color vision, and auditory function.
- **Biostatistics:** Calculate and interpret statistical measures for physiological data.

Practical Skills:

- **Laboratory Techniques:**
 - Prepare and stain nerve and muscle tissues.
 - Set up and operate kymograph and induction coil.
 - Use Snellen's chart, Ishihara chart, and tuning forks for sensory testing.
- **Data Collection and Analysis:**
 - Collect physiological data and perform statistical calculations.
 - Interpret experimental results and draw conclusions.

Course: Theory, Paper Code: PHY-SEC31TH--P03

Knowledge and Understanding:

- **Public Health:** Understand the concepts of community and public health, malnutrition, obesity, diabetes, infertility, and infectious diseases.
- **Microbiology:** Classify microorganisms, identify them using microscopic and biochemical techniques, and understand methods of microbial control.
- **Ergonomics:** Apply ergonomic principles to design safe and efficient workplaces.
- **Nanotechnology:** Understand the concepts of nanotechnology, types of nanomaterials, and their properties.
- **Computer Science:** Understand the basic architecture of computers, software, and programming languages.

Application of Knowledge:

- **Problem-Solving:** Analyze and solve problems related to public health issues, microbial infections, ergonomic challenges, and nanotechnology applications.
- **Critical Thinking:** Evaluate the impact of technology on human health and the environment.
- **Decision-Making:** Make informed decisions regarding public health interventions, microbial control strategies, ergonomic design, and nanotechnology applications.

Practical Skills:

- **Laboratory Techniques:** Perform microbiological techniques, such as staining, culturing, and biochemical tests.
- **Data Analysis:** Analyze data related to public health statistics, epidemiological studies, and ergonomic assessments.
- **Computer Skills:** Utilize computer software for data analysis, presentation, and communication.

Course: Practical, Paper Code: PHY-SEC31PR-P04

Knowledge and Understanding:

- **Public Health:** Understand the concept of field surveys and analyze physiological parameters in different populations.
- **Microbiology:** Perform basic microbiological tests to identify microorganisms.
- **Ergonomics:** Assess workplace conditions, including heat stress, illumination, and anthropometric measurements.
- **Biostatistics:** Use statistical tools to analyze data and draw meaningful conclusions.
- **Laboratory Safety:** Understand and follow safety protocols for handling microorganisms and disposing of waste.

Practical Skills:

- **Fieldwork:** Conduct field surveys, collect data, and analyze results.
- **Microbiological Techniques:** Perform basic microbiological tests and interpret results.
- **Ergonomic Assessments:** Measure environmental factors and anthropometric parameters.
- **Data Analysis:** Use statistical software to analyze data and create visualizations.
- **Laboratory Safety:** Adhere to safety protocols in the microbiology laboratory.

SEMESTER – IV

Course – IX: Theory, Paper Code: PHY-CC41-TH-P09

Knowledge and Understanding:

- **Hematology:** Understand the mechanisms of hemostasis, blood disorders, and blood transfusion.
- **Cardiovascular Physiology:** Explain the pathophysiology of cardiovascular diseases, including arrhythmias, myocardial infarction, and heart failure.
- **Renal Physiology:** Understand the structure and function of the kidney, renal regulation of fluid and electrolyte balance, and renal diseases.

- **Gastrointestinal Physiology:** Explain the pathophysiology of gastrointestinal disorders, including IBS, GERD, peptic ulcer, and jaundice.
- **Bioinformatics:** Understand the basic concepts of bioinformatics and its applications in physiology and biomedical sciences.

Application of Knowledge:

- **Clinical Relevance:** Apply knowledge of hematological, cardiovascular, renal, and gastrointestinal disorders to clinical scenarios.
- **Problem-Solving:** Analyze and interpret data related to blood tests, ECGs, renal function tests, and genetic disorders.
- **Research:** Utilize bioinformatics tools to analyze biological data and conduct research in physiology and biomedical sciences.

Course – X: Practical, Paper Code: PHY-CC41-PR- P10

Knowledge and Understanding:

- **Hematology:** Understand blood group systems, hemostasis, and hematological parameters.
- **Clinical Chemistry:** Identify normal and abnormal constituents of urine and their clinical significance.
- **Molecular Biology:** Understand the basic principles of DNA isolation and purification.

Practical Skills:

- **Laboratory Techniques:**
 - Perform blood grouping, bleeding time, and clotting time tests.
 - Perform hematological tests, such as Arneht count, PCV, MCV, MHC, and MCHC.
 - Conduct qualitative tests for urine analysis.
 - Isolate and purify DNA from biological samples.

Course – XI: Theory, Paper Code: PHY-CC42-TH-P11

Knowledge and Understanding:

- **Bioenergetics:** Understand the principles of bioenergetics, redox reactions, and oxidative phosphorylation.
- **Carbohydrate Metabolism:** Explain the pathways of glycolysis, the citric acid cycle, gluconeogenesis, glycogen metabolism, and the pentose phosphate pathway.
- **Lipid Metabolism:** Describe the processes of fatty acid oxidation, fatty acid synthesis, and cholesterol biosynthesis.

- **Protein and Nucleotide Metabolism:** Explain the metabolism of amino acids, purines, and pyrimidines.
- **Metabolic Disorders:** Understand the causes, symptoms, and pathophysiology of common metabolic disorders.

Application of Knowledge:

- **Problem-Solving:** Analyze and interpret biochemical data related to metabolic pathways and disorders.
- **Critical Thinking:** Evaluate the impact of metabolic disorders on human health and develop strategies for prevention and treatment.
- **Research:** Utilize biochemical knowledge to investigate the mechanisms of metabolic diseases and develop new therapeutic approaches.

Course – XII: Practical, Paper Code: PHY-CC42-PR- P12

Knowledge and Understanding:

- **Biochemical Techniques:** Understand the principles and applications of various biochemical techniques, including titration, colorimetry, and chromatography.
- **Biochemical Analysis:** Analyze biological samples to determine the concentration of specific biomolecules, such as amino acids and glucose.
- **Quality Control:** Implement quality control measures to ensure the accuracy and reliability of experimental results.

Practical Skills:

- **Laboratory Techniques:**
 - Perform quantitative estimations using titration and colorimetric methods.
 - Conduct paper chromatography to separate and identify biomolecules.
 - Use automated methods for glucose estimation.
- **Data Analysis:** Analyze experimental data, calculate results, and interpret the findings.
- **Problem-Solving:** Troubleshoot experimental problems and optimize techniques.

Course – XIII: Theory, Paper Code: PHY-CC43-TH-P13

Knowledge and Understanding:

- **Endocrine Physiology:** Understand the structure and function of the endocrine glands, hormones, and their role in regulating physiological processes.
- **Reproductive Physiology:** Explain the structure and function of the reproductive organs, the menstrual cycle, and the hormonal control of reproduction.
- **Nutrition:** Understand the role of vitamins, minerals, and macronutrients in human health, and the principles of balanced diet.

- **Microbiology:** Classify bacteria, understand their structure and growth requirements, and apply techniques for bacterial culture.
- **Immunology:** Explain the principles of innate and adaptive immunity, the role of immune cells and organs, and the mechanisms of antibody-antigen interactions.

Application of Knowledge:

- **Clinical Relevance:** Apply knowledge of endocrine, reproductive, nutritional, and immunological disorders to clinical scenarios.
- **Problem-Solving:** Analyze and interpret data related to hormonal imbalances, nutritional deficiencies, and immune system dysfunction.
- **Research:** Utilize knowledge of endocrine, reproductive, nutritional, and immunological principles to conduct research in biomedical sciences.

Course – XIV: Practical, Paper Code: PHY-CC43-PR- P14

Knowledge and Understanding:

- **Nutrition:** Conduct dietary surveys and analyze nutritional data.
- **Biochemistry:** Perform quantitative estimations of biomolecules, such as lactose, sucrose, and ascorbic acid.
- **Microbiology:** Apply microbiological techniques, including Gram staining, double immunodiffusion, and bacterial culture.
- **Immunology:** Understand the principles of immunological techniques, such as direct hemagglutination.

Practical Skills:

- **Laboratory Techniques:**
 - Prepare culture media and perform aseptic techniques.
 - Perform quantitative biochemical estimations.
 - Conduct Gram staining and double immunodiffusion.
 - Perform direct hemagglutination tests.
- **Data Analysis:** Analyze and interpret experimental data, including dietary surveys and laboratory results.
- **Report Writing:** Prepare clear and concise scientific reports.

Course – XV: Theory, Paper Code: PHY-CC44-TH-P15

Knowledge and Understanding:

- **Chronobiology and Stress Physiology:** Understand the principles of biological rhythms, the effects of stress on the body, and the mechanisms of adaptation to stress.

- **Aviation and Space Physiology:** Explain the physiological challenges of spaceflight, the adaptations of the human body to space environments, and the strategies for mitigating these challenges.
- **Stem Cell Biology:** Understand the types, properties, and applications of stem cells, and the ethical considerations associated with stem cell research.
- **Biostatistics:** Apply statistical methods to analyze physiological data and draw meaningful conclusions.
- **Computer Applications:** Utilize computer software for data analysis, presentation, and simulation of physiological processes.

Application of Knowledge:

- **Problem-Solving:** Analyze and interpret data related to chronobiology, stress physiology, space physiology, and stem cell research.
- **Critical Thinking:** Evaluate the ethical implications of stem cell research and the impact of spaceflight on human health.
- **Research:** Design and conduct experiments to investigate the mechanisms of biological rhythms, stress responses, and stem cell differentiation.

Practical Skills:

- **Data Analysis:** Use statistical software to analyze data and draw conclusions.
- **Computer Skills:** Utilize computer software for data analysis, presentation, and simulation of physiological processes.
- **Scientific Communication:** Effectively communicate scientific findings through written reports and oral presentations.

Course – XVI: Practical, Paper Code: PHY-CC45-PR-P16

Knowledge and Understanding:

- **Chronobiology:** Understand the concept of circadian rhythms and their variations among individuals.
- **Biostatistics:** Apply statistical methods to analyze and interpret data, including t-tests and ANOVA.
- **Computer Skills:** Utilize computer software for data analysis, visualization, and presentation.

Practical Skills:

- **Research Methodology:** Design and conduct research studies, including questionnaire-based surveys.
- **Data Collection and Analysis:** Collect and analyze data using statistical software.
- **Data Visualization:** Create graphical representations of data, such as frequency polygons, histograms, and bar charts.

- **Scientific Communication:** Present research findings effectively through written reports and oral presentations.