# FORMAT FOR PROGRAMME, COURSES AND OUTCOME

B.A./B.SC./B.COM. HONOURS

B.Sc (Hons) in Physiology

Programme: (within 200-250 words)

**Aims and Objectives**: To provide a course of study in mammalian, principally human, systems physiology, building on knowledge of basic physiological principles, introduce new and more complex physiological functions; develop further practical biological skills etc. After completing this course students should be able to define:

- Homeostasis and explain how homeostatic mechanisms normally maintain a constant interior milieu.
- State the functions of each organ system of the body, explain the mechanisms by which each functions, and relate the functions and the anatomy and histology of each organ system.
- Understand and demonstrate the interrelations of the organ systems to each other.
- Predict and explain the integrated responses of the organ systems of the body to physiological and pathological stresses.
- Explain the pathophysiology of common diseases related to the organ systems of the body.
- Understand the pharmacological basis of body – drug interaction.
- Understand the metabolic changes and alterations under different physiological conditions.
- Basic idea of working principle and handling techniques of biomedical instrumentation.
- Assess nutritional requirements under normal and altered physiological conditions as well as during various chronic disorders.
- Knowledge on different Research tools and techniques.
- Hands on training on different biochemical, histological, hematological, biotechnological laboratory techniques.
- Basic idea about sport physiology, type of training, sports medicine etc
- To learn man-machine interaction, implementation of ergonomics and enable to curtail occupational hazard.

| SEMESTER | COURSE NAME | OUTCOME |
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| SEMESTER I | CC1: Cellular Basis of Physiology | Students will understand the following:<br>• Structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.<br>• How these cellular components are used to generate and utilize energy in cells.<br>• The cellular components underlying mitotic & meiotic cell division.<br>• Knowledge of cell biology to selected examples of changes or losses in cell function. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation. |
| | CC2: Biological Physics and Enzymes | Students acquire knowledge on:<br>• Structural and functional features and kinetics about enzymes.<br>• Determine the optimum pH, temperature and concentration of an enzyme for a certain reaction.<br>• Acquire skill based knowledge in the clinical use of the enzymes<br>• Learn methods of enzyme inhibition, protein separation, purification, immunochemistry and their applications.<br>• Idea on different biophysical techniques and their biological applications. |

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| | GE-1: Blood and Immune System and Cardiovascular system | On course completion students have following outcome:<br>• Basic concept of compositions and functions of blood and blood related disorder.<br>• Idea of innate and acquired immunity, antigens, antibody-structure, inflammation, cytokines, autoimmune diseases.<br>• Basic idea about structure of heart and blood vessels.<br>• Physiology and pathology of cardiovascular system.<br>• Learn methods of estimation of different hematological experiments.<br>• Acquire skill-based knowledge in measurement of human experiments. |
| SEMESTER II | CC3: Physiology of Nerves and Muscle Cells | On course completion students have following outcome:<br>• Basic concept of muscle structure, mechanics and function.<br>• Idea about regulatory and contractile proteins<br>• Mechanism of muscle contraction, synaptic communication, Action potential.<br>• Receptor concept, Molecular basis of signal transduction at receptor level.<br>• Comparative and contrasting study on three types of muscles. |

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| | CC4: Chemistry of Bio-Molecules | On course completion students have following outcome:<br>• Explain the structure of carbohydrates, proteins, lipids and nucleic acids.<br>• Understand the molecular mechanism underlying protein folding.<br>• Chemical comparison of DNA and RNA.<br>• Application of DNA and protein denaturation and renaturation.<br>• Significance and application of melting temperature and half $C_0t$ value. |
| | GE- 2: Developmental Biology / Embryology | On course completion students have following outcome:<br>• Understand the processes of gametogenesis: spermatogenesis & oogenesis.<br>• The processes of fertilization in Sea-urchin and mammals.<br>• The processes of cleavage, gastrulation, organogenesis in mammals.<br>• Able to identify graafian follicle, corpus luteum by H & E staining method. |
| SEMESTER III | CC5: Circulating Body Fluids | • Understand the procedures of blood cell formation<br>• Concept of stem cell biology<br>• Factors regulating blood cell formation.<br>• Perform basic hematological laboratory testing, assess laboratory data and report findings according to laboratory protocol.<br>• Distinguish normal and abnormal |

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| | | hematological laboratory findings to predict the diagnosis of hematological disorders and diseases.<br>• Recognize laboratory results consistent with blood cell disorders. |
| | CC6: Circulation | At the end of the course, the students acquire a basic understanding of:<br>• The electrical and mechanical activity of the heart at cellular level, ECG, ischemia, chamber functions and heart valves.<br>• The mechanical pumping function of the heart, the importance of contractility, pressure, contraction and the interaction between them.<br>• Evaluation of regional circulations and their peculiarities.<br>• The function of the vascular system and the interaction between the heart and the peripheral circulation. Coronary physiology / ischemia. |
| | CC7: Functions of the Nervous System | At the end of the course, the students acquire a basic understanding of:<br>• Reflex action and disorders related to reflex pathways.<br>• Major structures of the nervous system from both a structural and functional standpoint.<br>• Higher functions of brain like learning, memory and cognition as well as related disorders.<br>• Electrical basis of cortical activity, EEG and related disorders, physiology of sleep |
| | SEC1: Clinical Biochemistry | The course outcome develops skills of performing basic<br>biochemical **tests** important in clinical |

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| | | investigations, develop familiarity with biochemical laboratory techniques, instrument handling and introduce students to various practical aspects of enzymology and their correlation in disease conditions. |
| SEMESTER IV | CC8: Energy Balance, Metabolism and Nutrition | At the end of the course, the students acquire a basic understanding of:<br>• Basic knowledge about different metabolic pathways in the body.<br>• Interplay among different metabolic pathway.<br>• Regulatory mechanism of the metabolic pathways.<br>• Alteration of the metabolic pathways in different diseased conditions.<br>• Concept of Nutraceutical, Nutrigenomics, oxidative stress and antioxidants. |
| | CC9: Gastrointestinal Function | • Basic knowledge about absorption and digestion of carbohydrate, protein, nucleic acids and fat.<br>• Regulatory mechanism of the gastrointestinal functions.<br><br>The course outcome develops skills of performing normal movements of rat's intestine in Dale's apparatus along with the effects of hypoxia, acetylcholine and adrenaline. |
| | CC10: Respiratory Physiology | At the end of the course, the students acquire a basic understanding of:<br>• Basic knowledge about pulmonary functions, gas transport between the lungs & the tissues and neural and chemical regulation of respiration. |

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| | | • Alteration of the respiratory adjustments in different health & diseases conditions.<br>• Acquire skill based knowledge in measurement of peak expiratory flow rate, oxygen, forced expiratory volume (FEV). |
| | SEC2: Computer application in Health science | At the end of the course, the students acquire a basic understanding of:<br>• Basic knowledge about computer application in health sciences.<br><br>The course outcome develops skills of performing basic operation of computer, graphical presentation of data and making charts for representing physiological data. Computation of frequency and percentage distribution of different physiological parameters. Significance of testing by 't' test with interpretation. |
| SEMESTER V | CC-11: Sensory Physiology | Students acquire knowledge on:<br>• Classification of general and special senses and their receptors.<br>• Classification, distribution, function and neural pathway of general sense.<br>• Physiology of vision, hearing, smell & taste.<br>• Idea on different histological techniques for identification of nervous tissues.<br>• Determine colour blindness, peripheral field of vision.<br>• Mapping of physiological blind spot and calculation of optic disc size.<br>• Exploring auditory visual experiment. |

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| | CC-12: Endocrinology | On course completion students have following outcome:<br>• Basic concept of endocrine systems and glands.<br>• General classification and mechanisms of hormones actions.<br>• Idea about the pituitary gland, thyroid gland, parathyroid gland, adrenal medulla & adrenal cortex and their histological structure, hormonal functions, hypo and hyper secretion of these glands.<br>• Endocrine functions of the kidneys, heart, & pineal gland.<br>• Acquire skill-based techniques in fixation, staining and identification of endocrine glands.<br>• Learn methods of effects of oxytocin and adrenaline on uterine contraction of albino rat.<br>• Determine estrogen level by spectrophotometric method. |

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| | DSE-1: Biostatistics | On course completion students have following outcome:<br>• Knowledge of Principles of statistical analysis of biological data.<br>• Basic concepts of variable.<br>• Idea of graphical data presentation.<br>• Compute different classes of statistics.<br>• Able to compute degrees of freedom, probability, Student's t-distribution, Testing of hypothesis, Chi-square test, linear correlation and linear regression. |
| | DSE-2: Sports Physiology, Work Physiology and Ergonomics | On course completion students have following outcome:<br>• Basic concepts of sports physiology and ergonomics.<br>• Idea about exercise physiology and different tests.<br>• Knowledge about cardiovascular and respiratory changes during graded exercise.<br>• Concept of physical training, nutrition in sports, sports psychology, sports biochemistry, ergogenic aids & dietary supplement and anthropometry.<br>• Acquire skill-based knowledge in measurement of some common anthropometric parameters.<br>• Able to determine BSA, BMI, body fat percentage of human individuals. |
| SEMESTER VI | CC-13: Reproductive | At the end of the course, the students acquire a basic understanding of: |

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| | Physiology, Embryology and Chronobiology | • Anatomy and functions of male reproductive system, female reproductive system.<br>• Idea about physiology of pregnancy, lactation and its hormonal regulation.<br>• Concept of reproductive health and human reproductive disorders.<br>• Basic concept of chronobiology, biological rhythm and biological clock. |
| | CC14: Renal Physiology, Skin and Body Temperature Regulation, Biomedical Instrumentation | At the end of the course, the students acquire a basic understanding of:<br>• Renal physiology and mechanism of urine formation.<br>• Structure and functions of skin and body temperature regulation.<br>• Principles and uses of biomedical instruments and techniques.<br>• Learn methods of renal tissue fixation, normal, abnormal constituents of urine.<br>• Estimate albumin, urea, phosphates in urine. |
| | DSE-3: Microbiology and Biotechnology | At the end of the course, the students acquire a basic understanding of:<br>• Structure of DNA & RNA viruses, bacteriophage, bacteria<br>• Nutritional requirements of bacteria and culture media.<br>• Concept of bacterial genetics and metabolism.<br>• Elementary knowledge of food, industrial and environmental microbiology.<br>• Cloning and recombinant DNA technology. |

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| | DSE-4: Cognitive Science | • Learn basic molecular biology techniques, culture procedure and isolation of bacteria and their biochemical characterization.<br><br>At the end of the course, the students acquire a basic understanding of:<br><br>• Anatomy of brain and spinal cord.<br>• Methods of neuroscience.<br>• Idea on memory, emotion, language and speech.<br>• Knowledge about developmental and cognitive disorders.<br>• Acquire skill-based knowledge in short term memory, cognitive assessment and psychometric tests for children. |

## B.Sc (General) in Physiology

Programme: (within 200-250 words)

**Aims and Objectives:** To provide a course of study in mammalian, principally human, systems physiology, building on knowledge of basic physiological principles, introduce new and more complex physiological functions; develop further practical biological skills etc. After completing this course students should be able to define:

- Cellular Physiology, Principles of biophysical phenomenon, biochemistry, digestive system & metabolism.

- State the functions of each organ system of the body, explain the mechanisms by which each function, and relate the functions and the anatomy and histology of each organ system.

- Understand and demonstrate the interrelations of the organ systems to each other.

- Predict and explain the integrated responses of the organ systems of the body to physiological and pathological stresses.

- Explain the pathophysiology of common diseases related to the organ systems of the body.

- Understand the developmental aspects of embryo and foetus.

- Understand the metabolic changes and alterations under different physiological conditions.

- Basic idea of working principle and handling techniques of biomedical instrumentation.

- Assess nutritional requirements under normal and altered physiological conditions as well as during various chronic disorders.

- Knowledge on nerve –muscle physiology, nervous system.

- Hands on training on different biochemical, histological, hematological, biotechnological laboratory techniques.

- Basic idea about sport physiology, type of training, sports medicine etc

- To learn man-machine interaction, implementation of ergonomics and enable to curtail occupational hazard.

| SEMESTER | COURSE NAME | OUTCOME |
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| SEMESTER I | CC- I: Cellular Physiology, Biophysical Principles, Biochemistry, Digestive system &Metabolism | Students will understand the following:<br>• Structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles.<br>• How these cellular components are used to generate and utilize energy in cells.<br>• Basic concept of enzymology.<br>• Explain the structure of carbohydrates, proteins, lipids and nucleic acids.<br>• Basic knowledge about different metabolic pathways in the body.<br>• Basic knowledge about absorption and digestion of carbohydrate, protein, nucleic acids and fat.<br>• Regulatory mechanism of the gastrointestinal functions.<br>• Acquire skill based knowledge in fresh tissue experiments & identification of permanent slides. |

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| SEMESTER II | CC4: Blood, body fluid and immune System, Cardiovascular System and Respiratory System | Students acquire knowledge on:<br>• Basic concept of compositions and functions of blood and blood related disorder.<br>• Idea of innate and acquired immunity, antigens, antibody-structure, inflammation, cytokines, autoimmune diseases.<br>• Basic idea about structure of heart and blood vessels.<br>• The mechanical pumping function of the heart, the importance of contractility, pressure, contraction and the interaction between them.<br>• Physiology and pathology of cardiovascular system.<br>• Learn methods of estimation of different hematological experiments.<br>• Basic knowledge about pulmonary functions, gas transport between the lungs & the tissues and neural and chemical regulation of respiration.<br>• Alteration of the respiratory adjustments in different health & diseases conditions. |
| SEMESTER III | CC-3: Nerve – Muscle Physiology, Nervous system, Skin and Body Temperature Regulation | On course completion students have following outcome:<br>• Structure and functions of skin and body temperature regulation.<br>• Reflex action and disorders related to reflex pathways.<br>• Major structures of the nervous system from both a structural and functional standpoint.<br>• Higher functions of brain like learning, memory and cognition |

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| | SEC-1: Environmental Epidemiology | as well as related disorders.<br>• Electrical basis of cortical activity, EEG and related disorders, physiology of sleep.<br>• Learn methods of staining of nerve tissue, skeletal and cardiac muscle.<br>• Learn methods of experiments on superficial (plantar) and deep (knee jerk) reflex, reaction time by stick drop test, short term memory test, two-point discrimination test.<br><br>At the end of the course, the students acquire a basic understanding of:<br>• Basic idea about man - environment relationship.<br>• Knowledge of descriptive and biostatistical research.<br>• Learn about principles of an epidemic and ingredients.<br>• Measurements and statistical associations.<br>• Sampling and its type, methods in field study.<br>• Idea about environmental hazards and public health management. |

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| SEMESTER IV | DSC-1D (CC-4): Sensory Physiology, Endocrinology and Reproductive, Physiology, Renal Physiology | At the end of the course, the students acquire a basic understanding of:<br><br>• Classification of general and special senses and their receptors.<br>• Classification, distribution, function and neural pathway of general sense.<br>• Physiology of vision, hearing, smell & taste.<br>• Idea on different histological techniques for identification of nervous tissues.<br>• Determine colour blindness, peripheral field of vision.<br>• Mapping of physiological blind spot and calculation of optic disc size.<br>• Exploring auditory visual experiment.<br>• Regulatory mechanism of the metabolic pathways.<br>• Basic concept of endocrine systems and glands.<br>• General classification and mechanisms of hormones actions.<br>• Idea about the pituitary gland, thyroid gland, parathyroid gland, adrenal medulla & adrenal cortex and their histological structure, hormonal functions, hypo and hyper secretion of these glands.<br>• Endocrine functions of the kidneys, heart, & pineal gland.<br>• Acquire skill-based techniques in fixation, staining and identification of endocrine gland.<br>• Anatomy and functions of male reproductive system, female reproductive system.<br>• Idea about physiology of pregnancy, lactation and its hormonal regulation. |

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| | | • Concept of reproductive health and human reproductive disorders.<br>• Basic concept of chronobiology, biological rhythm and biological clock.<br>• Knowledge about structure and functions of kidney and mechanism of formation of urine.<br>• Learn methods of renal tissue fixation, normal, abnormal constituents of urine.<br>• Estimate albumin, urea, phosphates in urine. |
| | SEC-2: Biochemical Techniques | At the end of the course, the students acquire a basic understanding of:<br><br>• Learn about principle and use of spectroscopic, chromatography centrifugation and electrophoresis techniques. |

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| SEMESTER V | DSE-1A: Biostatistics | On course completion students have following outcome:<br><br>• Knowledge of Principles of statistical analysis of biological data.<br>• Basic concepts of variable.<br>• Idea of graphical data presentation.<br>• Compute different classes of statistics.<br>• Able to compute degrees of freedom, probability, Student's t-Test. |

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| | DSE-2: Sports Physiology, Work Physiology and Ergonomics<br><br>SEC-3: Nutrition and Fitness | On course completion students have following outcome:<br>• Basic concepts of sports physiology and ergonomics.<br>• Idea about exercise physiology and different tests.<br>• Knowledge about cardiovascular and respiratory changes during graded exercise.<br>• Concept of physical training, nutrition in sports, sports psychology, sports biochemistry, ergogenic aids & dietary supplement and anthropometry.<br>• Acquire skill-based knowledge in measurement of some common anthropometric parameters.<br>• Able to determine BSA, BMI, body fat percentage of human individuals.<br>On course completion students have following outcome:<br>• Understanding the definition of fitness, health and related terms,<br>Importance of nutrition, physical activity.<br>• Knowledge of weight management. |
| SEMESTER VI | DSE-1B: Developmental aspects of embryo | On course completion students have following outcome:<br>• Understand the processes of gametogenesis: spermatogenesis & oogenesis.<br>• The processes of fertilization in Sea-urchin and mammals.<br>• The processes of cleavage, gastrulation, organogenesis in mammals.<br>• Able to identify graafian follicle, corpus luteum by H & E staining |

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| | SEC-4: Health Psychology, Physiology of stress and Stress Management | method.<br>On course completion students have following outcome:<br>• Knowledge of health psychology.<br>• Learn about physiology of Stress and stress management. |