

Draft Syllabus Physiology (Hons)

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1. Introduction

The syllabus for Physiology at undergraduate level using the Choice Based Credit system has been framed in compliance with UGC CBCS Guidelines. The purpose of the course is to standardize physiology teaching at undergraduate level throughout the state.

The main objective of framing this new syllabus is to give the students a holistic understanding of the subject giving substantial weightage to both the core content and techniques used in Physiology.

The course content also lists new practical exercises, so that the students get a hands-on experience of the latest techniques that are in current usage both in the advanced research laboratories and in Industry.

The syllabus will equip all undergraduate students with knowledge on basic physiological mechanisms with references to their implications in pathogenesis of disease and the physiological basis of their management.

2.Scheme for CBCS Curriculum

2.1 Credit Distribution across Courses

		Credits	
Course Type	Total Papers	Theory + Practical	Theory*
Core Courses	14	$14 \times 4 = 56$ $14 \times 2 = 28$	$14 \times 5 = 70$ $14 \times 1 = 14$
Discipline Specific Electives	4	$4 \times 4 = 16$ $4 \times 4 = 2$	$4 \times 5 = 20$ $4 \times 1 = 4$
Generic Electives	4	$4 \times 4 = 16$ $4 \times 4 = 2$	$4 \times 5 = 20$ $4 \times 1 = 4$
Ability Enhancement Language Courses	2	$2 \times 2 = 4$	$2 \times 2 = 4$
Skill Enhancement Courses	2	$2 \times 2 = 4$	$2 \times 2 = 4$
Totals	22	140	140

*Tutorials of 1 Credit will be conducted in case there is no practical component

2.2 Scheme for CBCS Curriculum

Semester	Course Name	Course Detail	Credits
I	Ability Enhancement Compulsory Course - I	English communication / Environmental Science	2
	Core course - I	Cellular Basis of Physiology	4
	Core course - I Practical	Cellular Basis of Physiology	2
	Core course - II	Biological Physics and Enzymes	4
	Core course - II Practical	Biological Physics and Enzymes	2
	Genetic Elective - 1	TBD	4
	Generic Elective - 1 Practical	TBD	2
II	Ability Enhancement Compulsory Course - II	English communication / Environmental Science	2
	Core course - III	Physiology of Nerve and Muscle Cells	4
	Core course - III Practical	Physiology of Nerve and Muscle Cells	2
	Core course - IV	Chemistry of Biomolecules	4
	Core course - IV Practical	Chemistry of Biomolecules	2
	Generic Elective - 2	TBD	4
	Generic Elective - 2 Practical	TBD	2
III	Core course - V	Circulating body fluids	4
	Core course - V Practical	Circulating body fluids	2
	Core course - VI	Circulation	4
	Core course - VI Practical	Circulation	2
	Core course - VII	Functions of the Nervous System	4
	Core course - VII Practical	Functions of the Nervous System	2
	Skill Enhancement Course - 1	TBD	2

	Generic Elective - 3	TBD	4
	Generic Elective - 3 Practical	TBD	2
IV	Core course - VIII	Energy Balance, Metabolism and Nutrition	4
	Core course - VIII Practical	Energy Balance, Metabolism and Nutrition	2
	Core course - IX	Gastrointestinal Function	4
	Core course - IX Practical	Gastrointestinal Function	2
	Core course - X	Respiration	4
	Core course - X Practical	Respiration	2
	Skill Enhancement Course-2	TBD	2
	Generic Elective - 4	TBD	4
	Generic Elective - 4 Practical	TBD	2
V	Core course - XI	Special Senses	4
	Core course - XI Practical	Special Senses	2
	Core course - XII	Endocrinology	4
	Core course - XII Practical	Endocrinology	2
	Discipline Specific Elective - 1	TBD	4
	Discipline Specific Elective - 1 Practical	TBD	2
	Discipline Specific Elective - 2	TBD	4
	Discipline Specific Elective - 2 Practical	TBD	2
VI	Core course - XIII	Reproduction	4
	Core course - XIII Practical	Reproduction	2
	Core course - XIV	Formation and Excretion of Urine	4
	Core course - XIV Practical	Formation and Excretion of Urine	2
	Discipline Specific Elective - 3	TBD	4

	Discipline Specific Elective - 3 Practical	TBD	2
	Discipline Specific Elective - 4	TBD	4
	Discipline Specific Elective - 4 Practical	TBD	2

2.3 Choices for Discipline Specific Electives

Discipline Specific Elective - 1	Discipline Specific Elective - 2	Discipline Specific Elective - 3	Discipline Specific Elective - 4
Biological Statistics	Microbiology and Immunology	Ergonomics and Occupational Physiology	Nano-biotechnology and Bioinformatics
Human Nutrition and Dietetics	Genetics and Molecular Biology	Toxicology	Sports and Exercise Physiology
Research Methodology	Environmental Physiology		

2.4 Choices for Skill Enhancement Courses

Skill Enhancement Course-1	Skill Enhancement Course-2
Detection of food additives/adulterants	Histopathological Techniques
Clinical Biochemistry	Hematological Techniques
Pathological Microbiology/Bio-Medical Technology	Diet Surve and Formulation of Diet Chart

3. Core Subjects Syllabus

3.1 Core T1 - Cellular Basis of Physiology

Cellular Basis of Physiology	
	4 Credits
Unit 1	
1. Introduction 2. Body Fluid Components 3. Organ Systems, Tissues, and Cells 4. Functional Morphology of Cell 5. Transport Across cell Membranes 6. Capillary Wall 7. Intercellular Communication	
Unit 2	
1. Cell Cycle 2. Cell Division a. Mitosis b. Meiosis 3. Homeostasis 4. Aging	

3.2 Core P1 - Cellular Basis of Physiology Lab

Cellular Basis of Physiology	
	2 Credits
List of Practical	
Study and Identification of Stained Sections of Different Mammalian Tissues and Organs: Bone, Cartilage, Trachea, Lungs, Spleen, Lymph gland, Esophagus, Stomach, Duodenum, Ileum, Jejunum, large Intestine, Liver, Kidney, Ureter, Salivary glands, Pancreas, Adrenal gland, Thyroid gland, Testes, Ovary, Spinal Cord, Cerebral cortex, Cerebellum, Skin, Cardiac muscle, Skeletal muscle, Smooth muscle, Artery, Vein, Tongue, Uterus.	

3.3 Core T2 - Biological Physics and Enzymes

Biological Physics and Enzymes	
	4 Credits
Unit 1	
1. A study of units for Measuring Concentration of solutes: Moles, Equivalents, Osmoles 2. Principles of dilution, pH, Buffers	
Unit 2	
1. Bonds and Forces in Biomolecules 2. Colloids, Properties, Importance 3. Surface tension, Specific Gravity 4. Viscosity and Resistance 5. Acids, Bases, Buffers, and pH 6. Flow and Pressure 7. Dialysis and Ultracentrifugation 8. Chromatography	
Unit 3	
1. Electrophoresis 2. Autoradiography 3. Cell Fractionation and Tracer Techniques 4. Nanoparticles and its application in Physiology 5. Laminar and Streamline flow 6. Poiseuille-Hagen Formula 7. Laws of Laplace 8. Thermodynamics 9. Laws 10. Application in Physiology	
Unit 4	
1. Osmosis and Diffusion 2. A study of Enzymes:	

- a. Structure, coenzymes, Prosthetic Groups
- b. Mechanism of enzyme action
- c. Kinetics
- d. Michaelis constant
- e. Enzyme Inhibition
- f. Modulation of Enzymes Activities
- g. Factors regulating enzyme activities
- h. Isoenzymes, Allosteric enzymes
- i. Pro- enzymes
- j. Ribozymes, Abzymes
- k. Concept of Rate limiting enzymes

3.4 Core P2 - Biological Physics and Enzymes Lab

Biological Physics and Enzymes	
	2 Credits
List of Practical	
1. Determination of oncotic pressure of colloidal solutions 2. Determination of Systolic, Diastolic, Pulse and Mean Blood Pressure by non-invasive methods (Auscultatory Methods). 3. Determination of enzyme activities (e.g., SOD, CAT, Amylase, Transaminase etc.).	

3.5 Core T3 - Physiology of Nerve and Muscle Cells

Physiology of Nerve and Muscle Cells	
	4 Credits
Excitable Tissue: Nerve	
1. Introduction 2. Nerve Cells 3. Excitation & Conduction 4. Measurement of Electrical Events 5. Ionic Basis of Excitation & Conduction 6. Properties of Mixed Nerves 7. Nerve Fiber Types & Function 8. Neurotrophins 9. Glia	
Excitable Tissue: Muscle	
1. Introduction 2. Skeletal Muscle a. Morphology b. Electrical Phenomena & Ionic Fluxes c. Contractile Responses d. Energy Sources & Metabolism e. Properties of Muscle in the Intact Organism 3. Cardiac Muscle a. Morphology b. Electrical Properties c. Mechanical Properties d. Metabolism e. Pacemaker Tissue 4. Smooth Muscle a. Morphology b. Visceral Smooth Muscle c. Multi-Unit Smooth Muscle	

Synaptic & Junctional Transmission

1. Introduction
2. Synaptic Transmission
 - a. Functional Anatomy
 - b. Electrical Events at Synapses
 - c. Inhibition & Facilitation at Synapses
 - d. Chemical Transmission of Synaptic Activity
 - e. Principal Neurotransmitter Systems
 - f. Synaptic Plasticity & Learning
3. Neuromuscular Transmission
 - a. Neuromuscular Junction
 - b. Denervation Hypersensitivity

Initiation of Impulses in Sense Organs

1. Introduction
2. Sense Organs & Receptors
3. The Senses
4. Electrical & Ionic Events in Receptors
5. "Coding" of Sensory Information
 - a. CC4T

3.6 Core P3 - Physiology of Nerves and Muscle Cells Lab

Physiology of Nerves and Muscle Cells	
	2 Credits
List of Practical	
1. Isolation and Staining of nerve fibres with node(s) of Ranvier (AgNO₃) and muscle fibres (H and E). 2. Preparation of sciatic nerve innervated gastrocnemius muscle of toad. 3. Study of Kymograph, Induction coil, Key and other instruments used to study mechanical responses of skeletal muscle. 4. Kymographic recording of mechanical responses of gastrocnemius muscle to a single stimulus and two successive stimuli. 5. Kymographic recording of the effects of variations of temperature and load (after-load) on single muscle twitch. 6. Calculation of work done by the muscle. 7. Determination of nerve conduction velocity.	

3.7 Core T4 - Chemistry of Biomolecules

Chemistry of Biomolecules	
	4 Credits
Carbohydrates	
1. Classification of Carbohydrates 2. Structure of Carbohydrates 3. Properties of Carbohydrates 4. Functions of Carbohydrates	
Proteins and Lipids	
1. Classification of Proteins and lipids 2. Structure of Proteins and lipids 3. Properties of Proteins and lipids 4. Functions of Proteins and lipids	
DNAs and RNAs	
1. Structure of DNA and RNA 2. Types of DNA and RNA 3. Functions of DNA and RNA	

3.8 Core P4 - Chemistry of Biomolecules Lab

Chemistry of Biomolecules	
	2 Credits
List of Practical	
Qualitative tests for the identification of physiologically important substances: Hydrochloric acid, lactic Acid, Uric Acid, Glucose, Galactose, Fructose, Sucrose, Lactose, Albumin, Gelatin, Peptone, Starch, Dextrin, Urea, Glycerol, Bile salts.	

3.9 Core T5 - Circulating Body Fluids

Circulating Body Fluids	
	4 Credits
Concepts in theory	
1. Introduction 2. Blood 3. Bone Marrow 4. White Blood Cells 5. Immune Mechanisms 6. Platelets 7. Red Blood Cells 8. Blood Types 9. Plasma, Hemostasis 10. Lymph 11. Clinical implications	

3.10 Core P5 - Circulating Body Fluids Lab

Circulating Body Fluids	
	2 Credits
List of Practical	
1. Preparation and staining of blood film with Leishman's stain. 2. Identification of the blood corpuscles. 3. Differential count of WBC. 4. Total count of RBC and WBC. 5. Bleeding time and clotting time. 6. Hemoglobin estimation. 7. Preparation of haemin crystal. 8. Preparation and staining of bone marrow. 9. Measurement of diameter of megakaryocyte. 10. Reticulocyte staining. 11. Blood group determination.	

3.11 Core T6 - Circulation

Circulation	
	4 Credits
Origin of the Heartbeat & the Electrical Activity of the heart	
1. Introduction 2. Origin & Spread Of Cardiac Excitation 3. The Electrocardiogram 4. Cardiac Arrhythmias 5. Electrocardiographic Findings in Other Cardiac & Systemic Diseases, hypertrophy and cardiac myopathy	
The Heart as a Pump	
1. Introduction 2. Mechanical Events of the Cardiac Cycle 3. Cardiac Output	
Dynamics of Blood & Lymph Flow	
1. Introduction 2. Anatomic Considerations 3. Biophysical Considerations 4. Arterial & Arteriolar Circulation 5. Capillary Circulation 6. Lymphatic Circulation & Interstitial Fluid Volume 7. Venous Circulation	
Cardiovascular regulatory Mechanisms	
1. Introduction 2. Local Regulatory Mechanisms 3. Substances Secreted by the Endothelium 4. Systemic Regulation by Hormones 5. Systemic Regulation by the Nervous System	

Circulation Through special Regions

1. Introduction
2. Cerebral Circulation
 - a. Anatomic Considerations
 - b. Cerebrospinal Fluid
 - c. The Blood-Brain barrier
 - d. Cerebral Blood Flow
 - e. Regulation of Cerebral Circulation
 - f. Brain Metabolism & Oxygen Requirements
3. Coronary Circulation
4. Splanchnic Circulation
5. Circulation of the skin
6. Placental & Fetal Circulation

Cardiovascular Homeostasis in Health & Disease

1. Introduction
2. Compensation for Gravitational Effects
3. Exercise
4. Inflammation & Wound Healing
5. Shock
6. Hypertension
7. Heart Failure, stroke

3.12 Core P6 - Circulation Lab

Circulation	
	2 Credits
List of Practical	
1. Preparation of Amphibian Ringer solution. 2. Kymographic recording of the movements of perfused heart of toad. 3. Study of the effects of changes in perfusion fluid pressure, changes in temperature, excess calcium and potassium ion concentration, acetylcholine, adrenaline on the on the movement of heart.	

3.13 Core T7 - Functions of the Nervous System

Functions of the Nervous System	
	4 Credits
Reflexes	
1. Introduction 2. Monosynaptic Reflexes: The Stretch Reflex 3. Polysynaptic Reflexes: The Withdrawal Reflex 4. General Properties of Reflexes	
Cutaneous, Deep & Visceral Sensation	
1. Introduction 2. Pathways 3. Touch 4. Proprioception 5. Temperature 6. Pain 7. Other Sensations	
Arousal Mechanisms, Sleep, & the Electrical Activity of the Brain	
1. Introduction 2. The Reticular Formation & the Reticular Activating System 3. The Thalamus & the Cerebral Cortex 4. Evoked Cortical Potentials 5. The Electroencephalogram 6. Physiological Basis of the EEG, Consciousness, & Sleep 7. Interpretation of abnormal EEG pattern	
Control of Posture & Movement	
1. Introduction 2. General Principles 3. Corticospinal & Corticobulbar System 4. Anatomy & Function	

5. Posture and its regulation
6. Basal Ganglia
7. Cerebellum
8. Movement disorders

The Autonomic Nervous System

1. Introduction
2. Anatomic Organization of Autonomic Outflow
3. Chemical Transmission at autonomic Junctions
4. Responses of Effector Organs to Autonomic Nerve Impulses
5. Cholinergic and Adrenergic Discharge

Central Regulation of Visceral Function

1. Introduction
2. Medulla Oblongata
3. Hypothalamus
 - a. Anatomic Considerations
 - b. Hypothalamic Function
 - c. Relation to Autonomic Function
 - d. Relation to Sleep
 - e. Relation to Cyclic Phenomena
 - f. Hunger
 - g. Thirst
 - h. Control of Posterior Pituitary Secretion
 - i. Control of Anterior pituitary Secretion
 - j. Temperature Regulation, fever

Neural Basis of Instinctual Behaviour & Emotions

1. Introduction
2. Anatomic Considerations
3. Limbic Functions
4. Sexual Behavior
5. Fear & Rage
6. Motivation

Higher Functions of the Nervous System

1. Introduction
2. Methods

3. Learning & Memory
4. Functions of the Neocortex
5. Disorders relating learning and memory

3.14 Core P7 - Functions of the Nervous System Lab

Functions of Nervous System	
	2 Credits
List of Practical	
1. Experiments on superficial (plantar) and deep (knee jerk) reflex 2. Measurement of grip strength 3. Reaction time by stick drop test 4. Short term memory test (shape, picture word) 5. Two point discrimination test	

3.15 Core T8 - Energy Balance, Metabolism, and Nutrition

Energy Balance, Metabolism, and Nutrition	
	4 Credits
Concepts in theory	
1. Introduction 2. Energy metabolism 3. Carbohydrate metabolism 4. Protein metabolism 5. Fat and cholesterol metabolism 6. Integration of carbohydrate, fat and protein metabolism 7. Nutrition - BMR, RQ, RDA, SDA, NPU, Biological value of proteins, vitamins and minerals	

3.16 Core P8 - Energy Balance, Metabolism, and Nutrition Lab

Energy Balance, Metabolism, and Nutrition	
	2 Credits
Biochemical Estimation	
1. Quantitative estimation of glucose and sucrose by Benedict's method. 2. Quantitative estimation of amino nitrogen (Sorensen's formol titration method [percentage as well as total quantity to be done]). 3. Estimation of percentage quantity of lactose in milk by Benedict's method.	

3.17 Core T9 - Gastrointestinal Function

Gastrointestinal Function	
	4 Credits
Digestion & Absorption	
1. Introduction 2. Carbohydrates 3. Proteins & Nucleic Acids 4. Lipids 5. Absorption of Water & Electrolytes 6. Absorption of Vitamins & Minerals	
Regulation of Gastrointestinal Function	
1. Introduction 2. General Considerations 3. Gastrointestinal hormones 4. Mouth & Esophagus 5. Stomach 6. Exocrine Portion of the Pancreas 7. Liver & Biliary System 8. Small Intestine 9. Colon	

3.18 Core P9 - Gastrointestinal Function Lab

Gastrointestinal Function	
	2 Credits
List of Practical	
1. Kymographic recording of normal movements of rat's intestine in Dale's apparatus. 2. Effects of hypoxia, acetylcholine and adrenaline on normal intestinal movements.	

3.19 Core T10 - Respiration

Respiration	
	4 Credits
Pulmonary Function	
1. Introduction 2. Properties of Gases 3. Anatomy of the Lungs 4. Mechanics of breathing 5. Gas Exchange in the lungs 6. Pulmonary Circulation 7. Other Functions of the Respiratory System	
Gas Transport Between the Lungs & the Tissues	
1. Introduction 2. Oxygen Transport 3. Carbon Dioxide Transport 4. Respiratory acidosis and alkalosis	
Regulation of Respiration	
1. Introduction 2. Neural control of Breathing 3. Chemical Control of Breathing 4. Nonchemical Influences on Respiration	
Respiratory Adjustments in Health & Disease	
1. Introduction 2. Effects of Exercise 3. Other Forms of Hypoxia 4. Oxygen Treatment 5. Hypercapnia & Hypocapnia 6. Other Respiratory Abnormalities 7. Effects of Increased Barometric Pressure	

8. Artificial Respiration

3.20 Core P10 - Respiration Lab

Respiration	
	2 Credits
List of Practical	
1. Measurement of peak expiratory flow rate 2. Measurement of oxygen saturation by pulse oxymeter before and after exercise 3. Measurement of forced expiratory volume (FEV) in first second.	

3.21 Core T11 - Special Senses

Special Senses	
	4 Credits
Vision	
1. Introduction 2. Anatomic Considerations 3. The Image-Forming Mechanism (accommodation and visual acuity) 4. The Photoreceptor Mechanism: Genesis of Electrical Responses 5. Visual Pathways and effects of lesions of these pathways 6. Color Vision 7. Other Aspects of Visual Function 8. Eye Movements 9. Errors in visual process	
Hearing & Equilibrium	
1. Introduction 2. Anatomic considerations 3. Hair cells 4. Mechanism of hearing 5. Vestibular function 6. Loss of hearing	
Smell & Taste	
1. Introduction 2. Smell 3. Receptors & Pathways 4. Physiology of Olfaction 5. Taste a. Receptor Organs & Pathways b. Physiology of Taste	

3.22 Core P11 - Special Senses Lab

Special Senses	
	2 Credits
List of Practical	
1. Principles of fixation and staining, 2. Staining and identification of fixed endocrine glands and nervous tissue. 3. Determination of visual acuity by Snellen's chart / Landolt's C chart. 4. Determination of colour blindness by Ishihara chart.	

3.23 Core T12 - Endocrinology

Endocrinology	
	4 Credits
The Thyroid Gland	
1. Introduction 2. Anatomic Considerations 3. Formation & Secretion of Thyroid Hormones 4. Transport of Thyroid Hormones 5. Effects of Thyroid Hormones 6. Regulation of Thyroid Secretion 7. Clinical Correlates	
Endocrine Functions of the Pancreas & the Regulation of Carbohydrate Metabolism	
1. Introduction 2. Islet Cell Structure 3. Structure, Biosynthesis, & Secretion of Insulin 4. Effects of Insulin 5. Mechanism of action 6. Insulin Excess 7. Regulation of Insulin Secretion 8. Glucagon 9. Other Islet Cell Hormones 10. Hypoglycemia & Diabetes Mellitus in Humans	
The Adrenal Medulla & Adrenal Cortex	
1. Introduction 2. Adrenal Morphology 3. Adrenal Medulla a. Structure & Function of Medullary Hormones b. Regulation of Adrenal Medullary Secretion 4. Adrenal Cortex a. Structure & Biosynthesis of Adrenocortical Hormones	

- b. Effects of Adrenal Androgens & Estrogens
- c. Physiologic Effects of Glucocorticoids
- d. Pharmacologic & Pathologic Effects of Glucocorticoids
- e. Regulation of Glucocorticoid Secretion
- f. Effects of Mineralocorticoids
- g. Regulation of Aldosterone Secretion
- h. Summary of the effects of Adrenocortical Hyper & Hypofunction in Humans

Hormonal Control of Calcium Metabolism & the Physiology of Bone

- 1. Introduction
- 2. Calcium & Phosphate Metabolism
- 3. Bone Physiology
- 4. Vitamin D & the Hydroxycholecalciferols
- 5. The Parathyroid Glands
- 6. Calcitonin
- 7. Effects of Other Hormones & Humoral Agents on Calcium Metabolism

The Pituitary Gland

- 1. Introduction
- 2. Morphology
- 3. Posterior pituitary hormones
- 4. Growth Hormone
- 5. Physiology of Growth
- 6. Pituitary Insufficiency
- 7. Pituitary Hyperfunction in Humans

Endocrine Functions of the Kidneys, Heart, & Pineal Gland

- 1. Introduction
- 2. The Renin-Angiotensin System
- 3. Erythropoietin
- 4. The Endocrine Function of the Heart: Atrial Natriuretic Peptide
- 5. Pineal Gland
- 6. Human chronobiology, biological rhythms; basic concepts and implications

3.24 Core P12 - Endocrinology Lab

Endocrinology	
	2 Credits
List of Practical	
1. Study of the effects of oxytocin on uterine contraction. 2. Study of the effects of adrenaline on intestinal / uterine movements.	

3.25 Core T13 - Reproduction

Reproduction	
	4 Credits
List of Topics to be studied	
1. Introduction 2. Sex Differentiation & Development a. Chromosomal Sex b. Embryology of the Human Reproductive System c. Aberrant Sexual Differentiation d. Puberty e. Precocious & Delayed Puberty f. Menopause 3. Pituitary Gonadotropins & Prolactin 4. The male reproductive System a. Structure b. Gametogenesis & Ejaculation c. Endocrine Function of the Testes d. Control of Testicular Function e. Abnormalities of Testicular Function 5. The Female Reproductive system a. The Menstrual Cycle b. Ovarian Hormones c. Control of Ovarian Function d. Abnormalities of Ovarian Function 6. Pregnancy 7. Lactation 8. Physiological concepts for a planned family	

3.26 Core P13 - Reproduction Lab

Reproduction	
	2 Credits
List of Practical	
1. Study of estrous cycle 2. Staining and identification of kidney and uretersEstimation of estrogen by spectrophotometric method 3. Pregnancy test from human urine by kit method.	

3.27 Core T14 - Formation and Excretion of Urine

Formation and Excretion of Urine	
	4 Credits
Concepts in theory	
Renal Functions and Malnutrition: 1. Introduction 2. Function of Malpighian corpuscles and renal tubule, counter-current mechanism 3. Water Excretion 4. Acidification of the Urine & Bicarbonate Excretion 5. Regulation of Na⁺ & Cl⁻ Excretion 6. Renal Circulation 7. Diuretics 8. Disorders of Renal Functions 9. Filling of the Bladder 10. Emptying of the Bladder 11. Non-excretory function of kidney	

3.28 Core P14 - Formation and Excretion of Urine Lab

Formation and Excretion of Urine	
	2 Credits
List of Practical	
Identification of normal and abnormal constituents of urine.	

4. Discipline Specific Electives Syllabus

4.1 DSE T1 - Biological Statistics

Biological Statistics	
	4 Credits
Concepts in theory	
1. Scope of statistics - Principles of statistical analysis of biological data. 2. Basic concepts - variable, parameter, statistics. Sampling. 3. Presentation of data-frequency distribution, frequency polygon, histogram, bar diagram and pie diagram. 4. Parameters. 5. Different classes of statistics- mean, median, mode, mean deviation, variance, standard deviation, standard error of mean. 6. Standard score. 7. Degrees of freedom. 8. Probability. 9. Normal distribution. 10. Student's t-distribution. 11. Testing of hypothesis - Null hypothesis, errors of inference, levels of significance, students' t-test and z score for significance of difference. 12. Distribution-free test - Chi-square test.	

4.2 DSE P1 - Biological Statistics Lab

Biological Statistics	
	2 Credits
List of Practical	
1. Computation of mean, median, mode, standard deviation and standard error of the mean with physiological data like body temperature, pulse rate, respiratory rate, height and weight of human subjects. 2. Graphical representation of data in frequency polygon and histogram. 3. Student's t test for significance of difference between means. 4. Demonstration: Statistical analysis and graphical representation of biological data with computer using One way ANOVA.	

4.3 DSE T2 - Microbiology and Immunology

Microbiology and Immunology	
	4 Credits
Bacteria	
1. Structure & morphological classification. 2. Gram positive, gram negative, pathogenic & nonpathogenic bacteria. Sterilization, pasteurization, brief idea about antibiotics. 3. Bacterial growth curve. 4. Elementary idea of bacteriostatic and bacteriocidal agentsBacterial genetics. 5. Viruses- Structure and types, Lytic and lysogenic cycle. Prions - basic ideas and prion diseases.	
Overview of Immune System	
1. Idea about innate and acquired immunity. Immuno-competent Cells. 2. Humoral and cell mediated immunity. 3. Antigen-antibody interaction. 4. Immunoglobulin - classification, basic structure and function. 5. Antigen presentation. Major Histocompatibility Complex (MHC). 6. Cytokines. Complement system. 7. Vaccination - principles and importance of immunization. 8. Basic principles of immunological detection of pregnancy. 9. Immunization program - immunization against Polio, Hepatitis-B, Tetanus, Measles,Whooping cough, Tuberculosis, Rabbits through vaccine, AIDS- causative virus, mode of transmission, effects on human body, preventive measures, principles of diagnostic test for AIDS (ELISA). 10. Immunopathology - basic principles of autoimmune disease and transplantation immunology.	

4.4 DSE P2 - Microbiology and Immunology Lab

Microbiology and Immunology	
	2 Credits
List of Practical	
1. Gram staining of bacteria and identification of Gram positive and Gram negative bacteria. 2. Demonstration: Spore Staining, Radial immuno-diffusion.	

4.5 DSE T3 - Ergonomics and Occupational Physiology

Ergonomics and Occupational Physiology	
	4 Credits
Concepts in theory	
1. Genesis and concept of ergonomics. 2. Importance of ergonomics in occupational health and well-being. 3. Classification of Physiological work load. Concept of work rest cycle. 4. Physical work environment: (a) Thermal environment, its' effect, Heat stress indices, (b) Noise and vibration, its' effect on workers. Occupational deafness, (c) Illumination level and its' effect on visual performances, (d) Ergonomic principles of control of Physical hazards. 5. Static anthropometry, Application of anthropometric data in design. 6. User interface and control display compatibility. 7. Prevention of accidents, concept of Industrial safety. 8. Occupational Diseases: pneumoconiosis, asbestosis, silicosis and work-related musculoskeletal disorders.	

4.6 DSE P3 - Ergonomics and Occupational Physiology Lab

Ergonomics and Occupational Physiology	
	2 Credits
List of Practical	
1. Measurement of working heart rate by ten beats methods. 2. Determine cardiac cost of specific work. 3. Measurement of blood pressure before and after different grades of exercise. 4. Measurement of Some common anthropometric parameters. Calculation of BSA and BMI from anthropometric data. 5. Measurement of WBGT indices. 6. Measurement of noise level by noise level meter.	

4.7 DSE T4 - Sports and Exercise Physiology

Sports and Exercise Physiology	
	4 Credits
Concepts in theory	
1. Importance of regular exercise in health and wellbeing. 2. Basic concept of Bioenergetics, Energy sources during exercise (Phosphagen, Anaerobic system and Aerobic system). 3. Cardio-respiratory responses during different grades of exercise. 4. Concept of excess post exercise oxygen consumption (EPOC), physiological fatigue and recovery. 5. Aerobic work Capacity: Measurement, physiological factors and applications. 6. Training: Principles of physical training, Training to improve aerobic and anaerobic power. Effect of overtraining and detraining. 7. Nutritional supplements and ergogenic aids. 8. Sports injury and its' management. 9. Basic idea sports rehabilitation and sports medicine.	

4.8 DSE P5 - Sports and Exercise Physiology Lab

Sports and Exercise Physiology	
	2 Credits
List of Practical	
1. Measurement of blood pressure before and after different grades of exercise. 2. Recording of recovery heart-rate after standard exercise. 3. Determination of Physical Fitness Index by Harvard Step Test (Modified). 4. Determination of VO₂max by Queen College step test. 5. Measurement of body fat percentage. 6. Six minute walk test. 7. Determination of endurance time by hand grip dynamometer. 8. Pneumographic recording of effect of talking, laughing, coughing, breath holding and hyperventilation	

4.9 DSE T5 - Human nutrition and dietetics

Human nutrition and dietetics	
	4 Credits
Concepts in theory	
1. Constituents of food and their significance. 2. Basal metabolic rate -factors, determination by Benedict-Roth apparatus. 3. Respiratory quotient. 4. Specific dynamic action. 5. Basic concept of energy and units. 6. Calorific value of foods. 7. Body calorie requirements - adult consumption unit. 8. Dietary requirements of carbohydrate, protein, lipid and other nutrients. 9. Balanced diet and principles of formulation of balanced diets for growing child, adult man and woman, pregnant woman and lactating woman. 10. Nitrogen balance, essential amino acids, biological value of proteins. 11. Supplementary value of protein. 12. Protein efficiency ratio and net protein utilization of dietary proteins. 13. Dietary fibres. 14. Vitamins. 15. Principle of diet survey. 16. Composition and nutritional value of common food stuffs. 17. Physiology of starvation and obesity. 18. Sources and physiological significances of vitamins and minerals. 19. Space nutrition.	

4.10 DSE P5 - Human nutrition and dietetics Lab

Human nutrition and dietetics	
	2 Credits
Nutrition and Dietetics - Diet Survey (Field Study Record)	
1. Diet survey report (hand-written) of a family (as per ICMR specification) : Each student has to submit a report on his/her own family. 2. A report (hand-written) on the basis of field survey from ONE of the followings: a. Physiological parameters of human (at least three parameters). b. Anthropometric measurements on human (at least three parameters). c. Epidemiological studies on human.	

4.11 DSE T6 - Genetics and Molecular Biology

Genetics and Molecular Biology	
	4 Credits
Genetics:	
Basic principles of Mendelian genetics - monohybrid and dihybrid, test and back crosses, Bacterial genetics-transformation, transduction, conjugation (mention of F+ /F- , Hfr strain, function of pillus). Extension of Mendelism - Epistasis and its different types present in plants and animals. Penetrance, expressivity, pleiotropism. Crossing over and Gene mapping. Numerical and Structural variations in chromosome - basic concepts of aneuploids and polyploids. Human Cytogenetics - human karyotype, banding technique, use of human cytogenetics in medical science, inborn errors of metabolism, aneuploidy in humans. Sex determination and sex linkage.	
Molecular Biology	
Genes - definition. DNA- structure, DNA replication, transcription of RNA in prokaryotes, Genetic code - properties and wobble hypothesis, translation in prokaryotes, regulation of gene expression - operon concept: lac operon, gene mutation, DNA repairing processes. Basic idea of Recombinant DNA technology and its applications, Polymerase chain reaction (PCR) - basic concepts.	

4.12 DSE P6 - Genetics and Molecular Biology Lab

Genetics and Molecular Biology	
	2 Credits
List of Practical	
DNA gel electrophoresis (agarose gel)	

4.13 DSE T7 - Toxicology

Toxicology	
	4 Credits
List of topics to be studied	
1. Toxins and Toxicology 2. Factors Affecting toxicity 3. LD₅₀, LOD₅₀, ED₅₀, NOEL, LOEL 4. Concept of Acute and Chronic Effects 5. Birth defects and Teratogens 6. Concepts of Biomagnification and Bioconcentration 7. Popular Food Additives and Food Adulterants 8. Prevention of Food Adulteration Act, 1954 9. Other Food Toxicants: BPA, BPS, Pesticides, PAH, Dioxin, PCB, Heavy Metals: Pb, Hg, Cd, As etc.	

4.14 DSE P7 - Toxicology Lab

Toxicology	
	2 Credits
Physiological (experimental) Experiments	
Kymographic recording of the effects of Hg, Pb and As compounds on: the contraction of perfused heart of toad, the intestinal movements of rats in Dale's bath.	
Histo-chemical Experiments	
Histochemical studies: chronic effects of food additives and arsenic compounds on liver, kidney, intestine, brain, muscle and lung tissues in rat.	

4.15 DSE T8 - Nano-biotechnology and Bioinformatics

Nano-biotechnology and Bioinformatics	
	4 Credits
Concepts in theory	
1. Introduction to nanoscience and nano-biotechnology. 2. Definition of a Nano system. 3. Types of Nanostructures; Types of Nanocrystals-One Dimensional (1D)-Two Dimensional (2D) -Three Dimensional (3D) nanostructured materials - Quantum dots - Quantum wire; Core/Shell structures. 4. Synthesis of Nanomaterials. 5. Characterization techniques for Nanomaterials: X-ray diffraction; Scanning Electron Microscope (SEM); Atomic force microscopy (AFM); scanning tunneling microscopy (STM), scanning near field optical microscopy (SNOM); Transmission Electron Microscopy (TEM); Infrared spectroscopy (IR). 6. Properties of Nanomaterials: Size dependent properties - Mechanical, Physical and Chemical properties.Types of Nanomaterials: Carbon Nanotubes (CNT) - Metals (Au, Ag) - Metal oxides (TiO₂, CeO₂, ZnO) - Sem iconductors (Si, Ge, CdS, ZnSe) - Ceramics and Composites . Applications of Nanomaterials in Biology: Biochemical sensors; Imaging; Cancer treatment etc. 7. Toxicity of nanomaterials in the environment - Health threats.	

4.16 DSE P8 - Nano-biotechnology and Bioinformatics Lab

Nano-biotechnology and Bioinformatics	
	2 Credits
List of Practical	
To be decided by respective universities board of studies based on the availability of infrastructure.	

4.17 DSE T9 - Research Methodology

Research Methodology	
	4 Credits
Concepts in theory	
1. Microscopy, Spectrophotometry, spectrofluorometry, Chromatography: Principles and uses of paper and thin layer chromatography, Electrophoresis: Principles and method, uses of agarose gel electrophoresis, SDS - PAGE. 2. Affinity and ion-exchange chromatography. 3. Staining of DNA/RNA gel by ethidium bromide. 4. Principles of ultracentrifugation: moving boundary and density gradient ultracentrifugation. Radioactivity - classification and properties. 5. Concept of radiolabelling of biomolecules and their detection by autoradiography. 6. Principles of radioimmunoassay (RIA), ELISA and immunoblotting. 7. Ethics in research. Planning an experiment.	

4.18 DSE P9 - Research Methodology Lab

Research Methodology	
	2 Credits
List of Practical	
1. Preparation of a standard curve of protein using Lowry's method. 2. Determination of pH optima of amylase or any other enzyme	

4.19 DSE T10 - Environmental Physiology

Environmental Physiology	
	6 Credits
Toxicology	
1. Toxins and Toxicology 2. Factors Affecting toxicity 3. LD₅₀, LOD₅₀, ED₅₀, NOEL, LOEL 4. Concept of Acute and Chronic Effects 5. Birth defects and Teratogens 6. Concepts of Biomagnification and Bioconcentration 7. Popular Food Additives and Food Adulterants 8. Prevention of Food Adulteration Act, 1954 9. Other Food Toxicants: BPA, BPS, Pesticides, PAH, Dioxin, PCB, Heavy Metals: Pb, Hg, Cd, As etc	
Environmental Pollutions and Health Hazards	
1. Definition: hygiene, health and public health. 2. Air, Water, Food Borne Diseases: causes, symptoms and control. 3. Food Additives and Adulterants: definition, examples and human health hazards. 4. Vector Borne Epidemic Diseases: Malaria and Plague-etiology and control.	
Environmental Pollution and Human Health Hazards	
1. Air Pollution: definition, sources, air pollutants, effects of air pollution on human health, concept of ozone hole, green house effects and global warming. 2. Water Pollution: definition, types, health hazards, water pollutants, biochemical oxygen demand (BOD), thermal pollution, concept of safe drinking water standards. 3. Soil Pollution: causes, health hazards, solid waste managements- bioremediation, phytoremediation. 4. Sound Pollution: definition, concept of noise, source of sound pollution, effects of sound pollution on human health, noise index (noise standards). 5. Radionuclide Pollution: ionizing radiations, effects of ionizing radiation on human health, permissible doses.	

6. Arsenic Pollution: sources, sources of arsenic in ground water, drinking water standard for arsenic (WHO, USEPA), health effects of chronic arsenic poisoning

Environmental management

1. Environmental ethics
2. Conservation of topsoil, ground water and wild lives; rain water harvesting; sanctuary, national park, biosphere reserve, wildlife (conservation) Act, 1992.

5.Skill Enhancement Subjects Syllabus

5.1 SEC T1 - Detection of Food Additives/ Adulterants

Detection of Food Additives / Adulterants	
	2 Credits
Qualitative tests for Food Adulteration	
Qualitative tests for identifying Food Adulterants in some food samples: Metanil yellow, Rhodamin B, Saccharin, Monosodium glutamate, Aluminium foil, Chicory, Bisphenol A and Bisphenol S, Chocolate Brown HT, Margarine, Pb, Hg, As, PCB, Dioxin etc in turmeric powder, besan, laddoo, noodles, chocolate and amriti.	

5.2 SEC T2 - Histopathological Techniques

Histopathological Techniques	
	2 Credits
List of Practical	
1. Preparation of tissue sections, H&E staining of tissue sections, 2. Preparation and staining of bone marrow smear, measurement of diameter of megakaryocyte, reticulocyte staining, staining of collagen in tissue sections.	

5.3 SEC T3 - Clinical Biochemistry

Clinical Biochemistry	
	2 Credits
Concepts in theory	
1. Photo-colorimetric estimation of blood constituents. 2. Measurement of blood glucose by Nelson-Somogyi method, measurement of blood inorganic phosphate by Fiske - Subbarow method, measurement of serum total protein by Biuret method and determination albumin globulin ratio, determination of serum amylase by iodometric method.	

5.4 SEC T4 - Hematological Techniques

Hematological Techniques	
	2 Credits
List of practical	
1. Preparation of blood smear and identification of blood cells. 2. Determination of haematocrit, MCV, MCH,MCHC, bleeding time, clotting time etc. 3. Measurement of haemoglobin in blood. Preparation of serum, Estimation of SGOT and SGPT.	

5.5 SEC T5 - Pathological Microbiology / Bio-Medical Technology

Pathological Microbiology / Bio-Medical Technology	
	2 Credits
Concepts in theory	
1. Staining of gram positive and gram negative bacteria. 2. Identification of tubercular bacteria in sputum (demonstration: with utmost precautionary measure taken before students handle the samples). 3. Demonstration of an ECG machine at work. Handling of Doctor's centrifuge. 4. Handling of colorimeter / spectrophotometer.	

5.6 SEC T4 - Diet survey and formulation of diet chart

Diet survey and formulation of diet chart	
	2 Credits
List of practical	
Survey of dietary status of people in the nearby area by the students, analysis of survey results, and, formulation of diet chart.	

6. Generic Electives Subjects Syllabus

6.1 GE T1 - Developmental Biology / Embryology

Developmental Biology / Embryology	
	4 Credits
Concepts in theory	
1. Gametogenesis: Spermatogenesis & Oogenesis. ,Ultra-structure: sperm and ovum in mammals. 2. Egg Membranes, Fertilization: In Sea-urchin and mammals Cleavage: Cleavage plane, types, role of yolk in cleavage; cleavage process in mammals. 3. Blastula formation: mammals Morphogenetic movements: Types and examples. 4. Gastrulation: Mammals Concept of induction, determination, and differentiation. 5. Organogenesis: development of eye as an example of reciprocal and repeated inductive events.	

6.2 GE P1 - Developmental Biology / Embryology Lab

Developmental Biology / Embryology	
	2 Credits
List of Practical	
H & E staining of ovarian tissue sections and identification of Graafian follicle, Corpus Luteum, and demonstration of preserved mammalian embryo.	

6.3 GE T2 - Instrumentation

Instrumentation	
	4 Credits
Concepts in theory	
1. Microscopy, Spectrophotometry and Spectrofluorometry. Principles and uses of paper and thin layer chromatography. 2. Electrophoresis: Principles and method, uses of agarose gel electrophoresis, SDS - PAGE. 3. Staining of DNA/RNA gel by ethidium bromide,Ultracentrifugation: moving boundary and density gradient ultracentrifugation. 4. ELISA and immunoblotting.	

6.4 GE P2 - Instrumentation Lab

Instrumentation	
	2 Credits
List of Practical	
1. Handling of compound microscope, 2. Measurement of protein concentration of a sample using spectrophotometer and separation of amino acids through paper chromatography (demonstration).	

6.5 GE T3 - Environmental pollution and human health

Environmental pollution and human health	
	4 Credits
Air Pollution	
Definition, sources, air pollutants, effects of air pollution on human health, concept of ozone hole, green house effects and global warming.	
Water Pollution	
Definition, types, health hazards, water pollutants, biochemical oxygen demand (BOD), thermal pollution, concept of safe drinking water standards.	
Soil Pollution	
Causes, health hazards, solid waste managements- bioreme- diation, phytoremediation.	
Sound Pollution	
Definition, concept of noise, source of sound pollution, effects of sound pollution on human health, noise index (noise standards).	
Radionuclide Pollution	
Ionizing radiations, effects of ionizing radiation on human health, permissible doses.	
Arsenic Pollution	
Sources, sources of arsenic in ground water, drinking water standard for arsenic (WHO, USEPA), health effects of chronic arsenic poisoning.	

6.6 GE P3 - Environmental Pollution and Human Health Lab

Environmental Pollution and Human Health	
	2 Credits
Physiological (experimental) Experiments	
Kymographic recording of the effects of Hg, Pb and As compounds on: The contraction of perfused heart of toad. The intestinal movements of rats in Dale's bath.	
Histo-chemical Experiments	
Histochemical studies: chronic effects of food additives and arsenic compounds on liver, kidney, intestine, brain, muscle and lung tissues in rat.	

6.7 GE T4 - Biotechnology

Biotechnology	
	4 Credits
Concepts in theory	
1. Definition 2. History of biotechnology 3. Importance of biotechnology 4. Cloning 5. Gene therapy 6. Transgenic animals 7. Hybridoma, 8. Monoclonal antibody 9. DNA finger printing and its application in forensic science 10. Polymerase chain reaction 11. RT-PCR 12. Enzyme immobilization 13. Basic idea of tissue culture and CO₂-incubators.	

6.8 GE P4 - Biotechnology Lab

Biotechnology	
	2 Credits
List of Practical	
Measurement of concentration of CT-DNA in a solution.	

6.9 GE T5 - Plant Physiology / Parasitology

Plant Physiology / Parasitology	
	4 Credits
Concepts in theory	
1. Water and Plant cells-Water transport processes in plants, Water balance of plants. 2. The Soil-Plant-Atmosphere continuum. 3. Solute transport: Passive and Active transport, Ion transport in roots. 4. Translocation in the phloem: Pathways, patterns and mechanism of translocation. 5. Mineral nutrition: Essential nutrients, deficiencies and plant disorders. 6. Plant hormones - Strigolactone Biosynthesis, storage, breakdown and transport. 7. Stress Physiology: responses of plants to abiotic stress- osmotic stress, temperature stress, Oxidative stress. 8. Photosynthesis: Light and dark phase reaction, photophosphorylation, Calvin Cycle, photorespiration, C4 pathway (tropical plants). 9. Basic concepts of parasitology. Basic idea on malaria parasite etc.	

6.10 Ge P5 - Plant Physiology / Parasitology Lab

Plant Physiology / Parasitology	
	2 Credits
List of Practical	
Some experiments on plant growth. Observation on some parasitic organisms.	

6.11 GE T6 - Community and Public Health

Community and Public Health	
	4 Credits
Concepts in theory	
1. Basic idea about community health and public health issues, Malnutrition in a community, over nutrition, issues of obesity; possible remedial measures. 2. Composition and nutritional value of common Indian foodstuffs, rice, wheat, pulses, egg, meat, fish and milk. 3. Dietary fibers. Calorie requirement. 4. Concept of ACU. 5. Principles of formulation of balanced diets for growing child, adult man and woman, pregnant and lactating woman. 6. Diet management of obese, diabetic, hypertensive person and athlete. 7. Basic idea on PCM, marasmus, kwashiorkor and their prevention. Iron and iodine deficiency. 8. Sound pollution as a community health issue; definition, concept of noise, source of extraordinary sound, effects of sound pollution on human health, noise index (noise standards).	

6.12 Ge P6 - Community and Public Health Lab

Community and Public Health	
	2 Credits
List of Practical	
Qualitative assessment of noise, survey on the status of dietary intake in the surrounding area through visits, etc.	

7. Appendix I - Scheme for CBCS Curriculum for Pass Course

7.1 Credit Distribution across Courses

Credits				
Course Type		Total Papers	Theory + Practical	Theory*+Tutorials
Core Courses	4 papers each from 3 disciplines of choice	12	12*4 =48 12*2 =24	12*5 =60 12*1=12
Elective Courses	2 papers each from 3 discipline of choice including interdisciplinary papers	6	6*4=24 6*2=12	6*5=30 6*1=6
Ability Enhancement Language Courses		2	2*2=4	2*2=4
Skill Enhancement Courses		4	4*2=8	4*2=8
Totals		24	120	120

*Tutorials of 1 Credit will be conducted in case there is no practical component

- All Pass courses will have 3 subjects/disciplines of interest. Student will select 4 core courses each from discipline of choice including Physiology as one of the disciplines. The details for core courses available in Physiology have been detailed in Section 3 of this document
- Student will select 2 core courses each from discipline of choice including Physiology as one of the disciplines. The details for elective courses available in Physiology have been detailed in Section 4 and 6 of this document
- Student may also chose Skill Enhancement courses in Physiology. The details for skill enhancement courses available in Physiology have been detailed in Section 5 of this document

7.2 Scheme for CBCS Curriculum

Semester	Course Name	Course Detail	Credits
I	Ability Enhancement Compulsory Course-I	English communication / Environmental Science	2
	Core course-I	Core Course 1A from Physiology	4
	Core course-I Practical	Core Course 1A Practical from Physiology	2
	Core course-II	Core Course 2A from other chosen discipline	4
	Core course-II Practical	Core Course 2A Practical from other chosen discipline	2
	Core course - III	Core Course 3A from other chosen discipline	4
	Core course - III Practical	Core Course 3A Practical from other chosen discipline	2
II	Ability Enhancement Compulsory Course-II	English communication / Environmental Science	2
	Core course-IV	Core Course 1B from Physiology	4
	Core course-IV Practical	Core Course 1B Practical from Physiology	2
	Core course-V	Core Course 2B from other chosen discipline	4
	Core course- V Practical	Core Course 2B Practical from other chosen discipline	2
	Core course - VI	Core Course 3B from other chosen discipline	4
	Core course - VI Practical	Core Course 3B Practical from other chosen discipline	2
III	Core course VII	Core Course 1C from Physiology	4
	Core course-VII Practical	Core Course 1C Practical from Physiology	2
	Core course - VIII	Core Course 2C from other chosen discipline	4
	Core course - VIII Practical	Core Course 2C Practical from other chosen discipline	2
	Core course-IX	Core Course 3C from other chosen discipline	4
	Core course-IX Practical	Core Course 3C Practical from other chosen discipline	2
	Skill Enhancement Course-1	TBD	2

IV	Core course-X	Core Course 1D from Physiology	4
	Core course - X Practical	Core Course 1D Practical from Physiology	2
	Core course-XI	Core Course 2D from other chosen discipline	4
	Core course-XI Practical	Core Course 2D Practical from other chosen discipline	2
	Core course-XII	Core Course 3D from other chosen discipline	4
	Core course-XII Practical	Core Course 3D Practical from other chosen discipline	2
	Skill Enhancement Course-2	TBD	2
V	Skill Enhancement Course - 3	TBD	2
	Discipline Specific Elective 1	DSE 1A from Physiology	4
	Discipline Specific Elective 1 Practical	DSE 1A Practical from Physiology	2
	Discipline Specific Elective 2	DSE 2A from other chosen discipline	4
	Discipline Specific Elective 2 Practical	DSE 2A Practical from other chosen discipline	2
	Discipline Specific Elective 3	DSE 3A from other chosen discipline	4
	Discipline Specific Elective 3 Practical	DSE 3A Practical from other chosen discipline	2
VI	Skill Enhancement Course - 4	TBD	2
	Discipline Specific Elective 4	DSE 1B from Physiology	4
	Discipline Specific Elective 4 Practical	DSE 1B Practical from Physiology	2
	Discipline Specific Elective 5	DSE 2B from other chosen discipline	4
	Discipline Specific Elective 5 Practical	DSE 2B Practical from other chosen discipline	2
	Discipline Specific Elective 6	DSE 3B from other chosen discipline	4
	Discipline Specific Elective 6 Practical	DSE 3B Practical from other chosen discipline	2

