Branch Name:	**Physiotherapy**
Program Code:	**PT101**
Course Title:	**Human Physiology (HP)**
Course Code:	**3PT1010102**
Pre-requisite Course:	**Basic science**

Teaching and Examination Scheme:

Teaching Scheme			Evaluation Scheme (Marks)				
			Theory (Marks)		Practical (Marks)		
Lecture (L)	Practical (P)	Credit	University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	Total (Marks)
180	120	16	80	20	80	20	200

Course Outcomes:

1. Describe the key physiological terms. (K)
2. Discuss the structure and functions of cell and tissue. (KH)
3. Discuss the mechanism of homeostasis (KH).
4. Describe the structure and transport functions of cell membrane (carrier-mediated active transport systems, ion pumps and channels, origin of membrane potential and the basis of membrane excitability) (K)
5. Explain the physiology of skeletal muscle contraction. (KH)
6. Explain the functions of cardio-vascular, respiratory, musculoskeletal and nervous systems including regulatory mechanisms. (KH)
7. Describe the functions of digestive, renal and reproductive systems. (K)
8. Demonstrate competencies in performing common physiological and anthropological measurements. (SH)
9. Discuss the common physiological deviations of cardio-vascular, respiratory, musculoskeletal and nervous systems related to physiotherapy practice. (KH)
10. Explain normal physiological changes of various systems during exercise. (KH)
11. Discuss the physiological adaptations to exercise (KH)

Course Contents: B.P.T. HP 102 (L)

Unit 1: General Physiology

HP 1.1. Discuss Cell: Morphology. Organelles: their structure and functions and Transport Mechanisms across the cell membrane

HP 1.**2**. Discuss Body fluids: Distribution, composition.

Unit 2: Blood

HP 2.1. Explain Composition and functions of blood and Plasma:

HP 2.2. Describe RBC: count and its variations. Erythropoiesis- stages, factors regulating. Reticulo-endothelial system (in brief)

HP 2.3. Describe Haemoglobin –structure, function and derivatives Anaemia (in detail), types of Jaundice. Blood indices, PCV, ESR.

HP 2.4. Discuss WBC. Morphology, functions, count, its variation of each. Immunity

HP 2.5. Describe Platelets: Morphology, functions, count, its variations

HP 2.6. Discuss Hemostatic mechanisms: Blood coagulation–factors, mechanisms. Their disorders. Anticoagulants.

HP 2.7. Describe Blood Groups

HP 2.8. Describe Cross matching. Indications and complications of Blood Transfusion

HP 2.9. Discuss Composition, formation, circulation and functions of Lymph

Unit 3: Cardiovascular system

HP 3.1. Describe: Physiological anatomy and nerve supply of the heart and blood vessels. Organisation of CVS. Cardiac muscles: Structure. Ionic basis of action potential and pacemaker potential. Properties.
HP 3.2. Explain the Conducting system in terms of Components. Impulse conduction Cardiac Cycle: Definition. Phases of cardiac cycle. Pres- sure and volume curves. Heart sounds – causes, character. ECG: Definition. Different types of leads. Waves and their causes. P-R interval. Heart block.
HP 3.3. Discuss Normal value. Determinants. Stroke volume and regulation of Cardiac Output: Heart rate and its regulation. Their variations
HP 3.4. Describe Definition Normal values and its variations. Determinants. Peripheral resistance of Arterial Blood Pressure Regulation of BP Arterial Pulse
HP 3.5. Discuss the causes and features of Shock
HP 3.6. Discuss Regional Circulations such as Coronary, Cerebral and Cutaneous circulation.
HP 3.7. Discuss cardiovascular changes during exercise.

Unit 4: Respiratory System

HP 4.1. Discuss the functions of – Pleura, tracheo-bronchial tree, alveolus, respiratory membrane and their nerve supply. Functions of respiratory system. Respiratory muscles.
HP 4.2. Explain the Mechanics of breathing in terms of Intra pleural and intrapulmonary pressure changes during respiration. Chest expansion.
HP 4.3. Discuss Spirometry- Lung volumes and capacities. Timed vital capacity and its clinical significance. Maximum ventilation volume. Respiratory minute volume
HP 4.4. Discuss Pulmonary Circulation. Ventilation-perfusion ratio and its importance.
HP 4.5. Explain Transport of respiratory gases: Diffusion across the respiratory membrane.
Oxygen transport – Different forms, oxygen- haemoglobin dissociation curve. Factors affecting it. P50, Haldane and Bohr effect. Carbon dioxide transport: Different forms, chloride shift.
HP 4.6. Explain Regulation of Respiration: Neural Regulation. Hering-Breuer's reflex. Voluntary control. Chemical Regulation.
HP 4.7. Discuss Hypoxia: Effects of hypoxia. Types of hypoxia. Hyperbaric oxygen therapy. Acclimatization Hypercapnia. Asphyxia. Cyanosis – types and features. Dysbarism
HP 4.8. Explain Respiratory changes during exercise.

Unit 5: Digestive System

HP 5.1. Describe the functions of digestive system
HP 5.2. Describe Salivary Secretion: Saliva: Composition. Functions. Regulation. Mastication
HP 5.3. Discuss the stages and Function of Swallowing
HP 5.4. Describe Stomach in terms of Functions. Gastric juice: Gland, composition, function, regulation. Gastrin: Production, function and regulation. Peptic ulcer. Gastric motility.
Gastric emptying. Vomiting.
HP 5.5. Describe Pancreatic Secretion: Composition, production, function. Regulation.
HP 5.6. Discuss the Functions of liver, Gall bladder And Composition, functions of bile.

Unit 6: Renal System

HP 6.1. Describe the functions of the renal system. Nephrons – cortical and juxtamedullary. Juxta-glomerular apparatus. Glomerular mem- brane. Renal blood flow and its regulation.
Functions of kidneys.
HP 6.2. Discuss the Mechanism of Urine Formation: Glomerular Filtration: Mechanism of glomerular filtration. GFR – normal value and factors affecting. Renal clearance. Inulin clearance. Creatinine clearance.
HP 6.3. Explain Tubular Reabsorption: Reabsorption of Na+, glucose, HCO3-, urea and water.
Filtered load. Renal tubular transport maxi- mum. Glucose clearance: TmG. Renal
threshold for glucose.
HP 6.4. Discuss the Mechanism of concentrating and diluting the Urine: Counter-current mechanism. Regulation of water excretion. Diuresis. Diuretics.
HP 6.5. Describe Mechanism of micturition. Cystometrogram. Atonic bladder, automatic bladder.
HP 6.6. Describe Acid-Base balance

Unit 7: Reproductive System

HP 7.1. Discuss the physiology of reproductive organs. Sex determination. Sex differentiation. Disorder

HP 7.2. Describe Male Reproductive System: Functions of testes. Pubertal changes in males. Spermatogenesis. Testosterone: action. Regulation of secretion. Semen.

HP 7.3. Describe Female Reproductive System: Functions of ovaries and uterus. Pubertal changes in females. Oogenesis.

HP 7.4. Hormones: estrogen and progesterone-action. Regulation of secretion.

HP 7.5. Describe Menstrual Cycle: Phases. Ovarian cycle. Uterine cycle. Hormonal basis. Menarche. Menopause.

HP 7.6. Describe Pregnancy: Pregnancy tests. Physiological changes during pregnancy. Functions of placenta. Lactation. Contraception methods

Unit 8: Endocrine System

HP 8.1. Enumerate Major endocrine glands.

HP 8.2. Describe classification, mechanism of action and Functions of hormones

HP 8.3. Describe Pituitary hormones: Secretory cells, action on target cells, and regulation of secretion of each hormone.

HP 8.4. Describe Thyroid hormone and calcitonin: secretory cells, synthesis, storage, action and regulation of secretion. Disorders: Myxedema, Cretinism, Grave's disease

HP 8.5. Describe Parathyroid hormones: secretory cell, action, regulation of secretion. Disorders: Hypoparathyroidism. Hyperthyroidism. Calcium metabolism and its regulation.

HP 8.6. Describe Adrenal Medulla: Secretory cells, action, regulation of secretion of adrenaline and noradrenaline. Disorders: Pheochromocytoma.

HP 8.7. Describe Endocrine Pancreas: Secretory cells, action, regulation secretion of insulin and glucagon. Glucose metabolism and its regulation. Disorder: Diabetes mellitus.

Unit 9: Nerve Muscle Physiology

HP 9.1. Discuss Resting membrane potential. Action potential – ionic basis and properties.

HP 9.2. Describe Structure and functions of neurons. Classification, Properties and impulse transmission of nerve fibres. Nerve injury – degeneration and regeneration.

HP 9.3. Describe Neuroglia: Types and functions

HP 9.4. Classify Skeletal Muscle Structure.

HP 9.5. Discuss the physiology of neuromuscular transmission

HP 9.6. Discuss the applied aspects of neuromuscular disorders.

Unit 10: Nervous System

HP 10.1. Describe Organisation of CNS – central and peripheral nervous system.

HP 10.2. Describe Functions of the nervous system. Synapse: Functional anatomy, classification, Synaptic transmission. Properties

HP 10.3. Discuss Sensory Mechanism: Sensory receptors: function, classification and properties. Sensory pathway: The ascending tracts, Posterior column tracts, lateral spinothalamic tract and the anterior spinothalamic tract – their origin, course, termination and functions. The trigeminal pathway

HP 10.4. Discuss Sensory cortex. Somatic sensations: crude touch, fine touch tactile localization, tactile discrimination, stereo gnosis vibration sense,

HP 10.5. Describe kinesthetic sensations. Pain sensation: mechanism of pain. Cutaneous pain – slow and fast pain, hyperalgesia. Deep pain. Visceral pain – referred pain.

HP 10.6. Describe Motor Cortex. Motor pathway: The descending tracts – pyramidal tracts, extrapyramidal tracts – origin, course, termination and functions. Upper motor neuron and lower motor neuron. Paralysis, monoplegia, paraplegia, hemiplegia and quadriplegia.

HP 10.7. Describe Muscle tone – definition, and properties hypotonia, atonia and hypertonia. UMNL and LMNL

HP 10.8. Discuss Spinal cord Lesions: Complete transection and Hemi section of the spinal cord.

HP 10.9. Describe Cerebellum: Functions. Cerebellar ataxia.

HP 10.10. Describe Posture and Equilibrium: Postural reflexes – spinal, medullary, midbrain and cerebral reflexes.

HP 10.11. Describe Functions of Thalamus and Hypothalamus: Nuclei. Thalamic syndrome
HP 10.12. Describe Reticular Formation and Limbic System: Components and Functions.
HP 10.13. Describe Structures and functions of Basal Ganglia: Parkinson's disease
HP 10.14. Describe Cerebral Cortex: Lobes. Brodmann's areas and their functions. Higher functions of the cerebral cortex – learning, memory and speech.
HP 10.15. Describe Formation, composition, circulation and functions of CSF Lumbar puncture and its significance. Blood brain barrier. Hydrocephalus.
HP 10.16. Describe Features and actions of parasympathetic and sympathetic nervous system.

Unit 11: Physiology of Exercise

Explain the Effects of acute and chronic exercise on
HP 11.1 Respiratory,
HP 11.2 Cardio vascular
HP 11.3 Musculoskeletal system

Practical: B.P.T. Human Physiology 102 Practical: HP (P)

12.1 Practical classes include
1. Hematology experiments,
2. Clinical examinations,
3. Amphibian chart, and
4. Recommended demonstrations.

12.2 Recommended demonstrations include but are not limited to:
1. Differentiate Blood cells
2. Determine the blood cell counts
3. Determine Blood groups
4. Calculate bleeding and clotting time
5. Observe the procedures of common blood investigations
6. Elicit superficial and deep tendon reflexes
7. Determine muscle tone
8. Interpret normal ECG wave pattern
9. Identify normal breath sound
10. Differentiate Heart sounds including murmurs

12.3 Perform the following clinical examination procedures:
1. Body Temperature measurement
2. Pulse rate
3. Blood Pressure
4. Oxygen saturation
5. Respiratory rate

Text Books:

1. Text book of Physiology –Anand & Manchanda, Tata McGraw Hill.
2. Human Physiology – Vol. 1 & 2, Chatterjee. CC, Calcutta. Medical Allied.
3.4. Principles of Anatomy and Physiology. Tortora & Grabowski –Harper Collins.
5. Text book of Practical Physiology – Ghai – Jaypee

Reference Books:

1.Text book of Medical Physiology –Guyton Arthur (Mosby.)
2.Nunn and Lumb's Applied Respiratory Physiology

List of Open-Source Software/learning website:

- k-hub.in e library|A single platform for all e resources (K-hub, E Resource)
  - User Name- KB4605VNG
  - Password- BL@69BX!
- knowledgegainer.delnet.in (Delnet, E Resource)
  - User Name-gjspum
  - Password- spu10924

Mapping of CO with PO:

Course Outcomes	Program Outcomes (POs)										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
CO1	M										
CO2		M									
CO3			L							M	
CO4				M							
CO5					H						
CO6						H					
CO7				M			M				
CO8								M			
CO9									H		
CO10										H	
CO11											M

H: High, M: Medium, L: Low