



# TEERTHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)

Delhi Road, Moradabad (U.P.)

## Ph.D. PROGRAMME

### SYLLABUS FOR DISCIPLINE-SPECIFIC COURSE

#### MEDICAL PHYSIOLOGY

Course Code: PDS240148	BASICS OF MEDICAL PHYSIOLOGY	L	T	P	C
		0	0	0	4
<b>Objective:</b>	To prepare students for teaching and independent research careers in basic and applied physiology				
<b>Course Outcomes:</b>					
<b>CO 1:</b>	Understanding of the normal functioning of the organs and organ systems of the body.				
<b>CO 2:</b>	Comprehension of the normal structure and organization of the organs and systems based on the functions.				
<b>CO 3:</b>	Understanding of age-related physiological changes in the organ functions that reflect normal growth and development				
<b>CO 4:</b>	Understand the physiological basis of diseases				
<b>CO 5:</b>	Advanced knowledge of theory and existing research in physiology. Synthesize existing knowledge, identify and access appropriate resources, and critically analyze and evaluate others' findings to identify and design research questions in physiology				
<b>Course Content:</b>					
<b>Unit 1:</b>	General Physiology Including Biophysics: Homeostasis, Concepts of Physiological norms range and variations, Transport across the Cell membrane, relationship between stimulus and response. Structure of cell membrane, RMP, Cellular receptors, Intercellular communications. Body Fluids Compartments and Changes in Body Fluid Compartments and Measurements, Hyperproteinemia. Biological membranes with details of membrane receptors, Physiology of growth and aging, and Principles and applications of genetics				
<b>Unit 2:</b>	Environmental Physiology: Physiology of deep-sea diving, Space physiology, High altitude Physiology, Hyperbaric oxygen therapy, Structure and functions of skin, temperature regulation, Hypothermia and Hyperthermia, Air and Noise Pollution and Radiation Physiology.				
<b>Unit 3:</b>	Nerve Muscle Physiology: Classification of Nerves and Muscle, Structure of skeletal muscle. Types of muscle fibers. Mechanism of contraction and its molecular basis. Thermal and chemical changes during muscle contraction. Oxygen debt. Neuromuscular Transmission. Neuromuscular blocking drugs. Pathophysiology of muscle disorders. Pathophysiology of Myasthenia Gravis. Experimental techniques to study bioelectrical phenomena (Voltage clamp technique, cathode ray oscilloscope, S.D. curve, nerve conduction studies), EMG.				

<b>Unit 4:</b>	Blood: Blood composition; cellular elements of blood their formation and regulation. Hemoglobin: Synthesis and functions Jaundice, Anemia & their Classification, Hemostatic mechanisms, Anticoagulants, Blood groups, Rh- incompatibility Blood transfusion, ESR, Basic Mechanisms of Immunity, Function of WBCs, Lymph: Composition Circulation and functions. Plasmin system and Tissue typing.
<b>Unit 5:</b>	Cardiovascular System: Functional anatomy of heart, properties of cardiac muscle, Principles of Electrocardiography, Electrical and Mechanical changes in cardiac cycle, Conducting system of Heart Normal ECG, Cardiac output: Measurement in Man, Physiological Variations. Regulatory mechanisms of Heart rate and Blood pressure. Regional Circulations. Normal values, Physical Principles governing flow of blood in Heart and blood vessels, Measurement and regulation of coronary blood flow, changes in CVS during muscular exercise, Postural changes, Hypovolemia, Hypoxia, and cardiopulmonary resuscitation. Microcirculation. Hemodynamics, Pathophysiology of Hypertension, Shock, Cardiac Failure and Coronary Artery Disease. Echocardiography and vector cardiograph, ECG, Stress test, CT scan, Cardiac catheterization, Flow meters and Ultrasonography.
<b>Unit 6:</b>	Respiratory System: Functional anatomy of Respiratory systems, Mechanics of Normal respiration, Physical Principles of governing flow of air in respiratory passages, Lung Compliance, Alveolar ventilation, ventilation perfusion Ratio, Oxygen and (O <sub>2</sub> ) transport, Diffusing capacity, pulmonary function Tests. Regulation of respiration, Respiratory acidosis and alkalosis, Pulmonary blood flow, Hypoxia, Cyanosis, Asphyxia, Respiratory adjustments during muscle exercise, Hyperbaric conditions, Principles of Oxygen therapy, Artificial respiration, Cardiopulmonary resuscitation Hyaline Membrane disease, Pathophysiology of Restrictive and obstructive lung diseases, Pulmonary edema and Dyspnea. Lung function tests, Blood gas analysis. Exercise Physiology: Concept of physical fitness, Its components and evaluation, Adaptations.
<b>Unit 7:</b>	Endocrine System: General Principles of Regulation of Endocrine glands. Hormones function, cellular mechanism of hormone action, regulation of secretion. Experimental and clinical disorders of Anterior and Posterior Pituitary, Thyroid, Parathyroid, Adrenal Cortex and Medulla and Endocrine Pancreas. Stress and Hormones. Minor Endocrine glands: Pineal Body, Heart and Kidney. Radio immune assay.
<b>Unit 8:</b>	Reproductive system: Sex determination and differentiation Male Reproduction; Functions of Testes, Constituents of Semen, Testicular hormones, Spermatogenesis and regulation. Female Reproduction: Menstrual Cycle: Changes in ovary, uterus, Cervix, vagina and hormonal regulation. Ovulation and Its detection. Fertilization, Implantation, Physiological changes during pregnancy Feto-placental Unit, Nutritional needs of mother during pregnancy, Parturition, Lactation, composition of breast milk, Placental and Fetal Circulation Menopause, Physiology of Newborn, Family planning & welfare, Physiological basis of Contraception, safe period rhythm, and other methods of contraception. In-vitro fertilization,
<b>Unit 9:</b>	Alimentary System: Functional Morphology Smooth Muscle: Structure Mechanism of Contraction. Nerve supply and Nerve transmitters. Composition Function and regulation of secretion of Salivary glands, Stomach, Small Intestine, and large Intestine.

	Regulation of gastrointestinal Movements, Functions of Gall bladder, liver. Site of production and action of GI Hormones. Mechanism of Absorption of food. Physiological basis of Peptic ulcer, Diarrhea and Constipation. Motility disorders: Achalasia, Hirschsprung disease. Gastro intestinal hormones and Absorption of nutrients, Relationship of diet and diseases, Starvation and obesity.
<b>Unit 10:</b>	Renal Physiology: Functions of different parts of Nephron urine formation. Role of Kidney in water and Electrolyte balance. Acidification of urine. Diuresis, Kidney function tests. Juxtaglomerular apparatus. Renin-Angiotensin system, Renal blood flow. Structure and its measurement regulation. Innervation of the bladder, Micturition, Cystometrogram, Disorders of Micturition, and Principles of Artificial kidney and Dialysis.
<b>Unit 11:</b>	Central Nervous System: Organization of Central Nervous system, Functions and Neuronal organization at spinal cord level, synaptic transmission, motor and sensory systems and their lesions, Reticular system in the brain stem, sleep, wakefulness, EEG waves and Physiological changes in EEG, clinical lesions and Experimental sections at the spinal cord, brain stem, and sub-cortical levels, Physiology of Basal Ganglia, Cerebellum, Thalamus, Hypothalamus limbic system, Prefrontal lobe and cerebral cortex, speech and its disorders, Autonomic Nervous system, Formation, circulation and functions of CSF, Blood Brain Barrier, Central Neurotransmitters. Cerebral blood flow and its measurements. Neuroglia, Methods to study the functions with diagnostic techniques and Physiological basis of features of diseases of the Cerebellum, Basal Ganglia, Thalamus, Cerebral Cortex, Reticular formation, Hypothalamus, ANS and the limbic system, CT Scan, and MRI Techniques.
<b>Unit 12:</b>	Special Senses: Eye: Functional anatomy of Eye, image formation on Retina, Structure of photoreceptors, Electrical activity of photoreceptors, Errors of Refraction, Functions of Aqueous humor, Intraocular tension. Mechanisms of Accommodation Dark adaptation, pupillary reflexes functions of Retina optic pathway and lesions. Role of visual cortex in perception. Field of vision. Color vision, Acuity of vision, Photochemistry of vision, Electrophysiology of Retina, and Nutritional deficiency blindness. Auditory Apparatus: Functional anatomy of Ear, Physics of sound, Role of Tympanic Membrane, Middle ear and cochlea in hearing, Auditory Receptors and Pathway, Electrophysiology of cochlea, Deafness and its causes, Principles of Audiometry, Tuning fork tests & Interpretation. Vestibular apparatus: Structure and Functions, Connections and lesions of vestibular apparatus. Taste and Smell: Modalities, Receptors, pathways, Cortical and limbic areas associated with taste and smell.
<b>Unit 13:</b>	Stress Relaxation Technique: Principles of Yoga, Breathing exercise, Meditation, and Biofeedback techniques.
<b>Text Books:</b>	<ol style="list-style-type: none"> <li>1. Text Book of Medical Physiology by Hall And Guyton</li> <li>2. Text Book of Medical Physiology by A.K Jain</li> <li>3. Review of Medical Physiology by W.F. Ganong</li> <li>4. Text Book of Medical Physiology by R. L. Bijlani</li> <li>5. Practical Physiology by C.L Ghai</li> <li>6. Practical Physiology by A. K. Jain</li> <li>7. Practical Physiology by G.K Pal</li> </ol>

**Reference Books:**

1. Text Book of Medical Physiology by Berne And Levy
2. Text Book of Medical Physiology by Best And Taylor
3. Text Book of Medical Physiology by G.K Pal
4. text Book of Physiology by Kandel and Schwartz
5. Mosby series