

Topics to be covered in Term I (September- December 2015)

1. General Physiology-

- Introduction to Physiology: functional organisation of human body and composition
- Homeostasis and control mechanism
- Cell membrane
- Cell organelle
- Inter cellular connection
- Genetic control of protein synthesis, apoptosis
- Transport across the cell membrane
- Resting membrane and action potential

2. Nerve and muscle physiology

- Introduction- structure and function of neuron
- Classification and properties of nerve fibres
- Conduction of action potential in nerve fibres and factors affecting nerve conduction ; monophasic and biphasic action potentials
- Strength duration curve, nerve degeneration and regeneration
- Structure of skeletal muscle including sarcotubular system; types of muscle fibres and motor unit
- Neuromuscular junction; structure , transmission and applied aspects
- Excitation- contraction coupling
- Molecular basis of muscle contraction
- Properties of skeletal muscle
- Muscle energetics and metabolism, fibrillation, fasciculation and EMG
- Smooth muscle ; structure, types , mechanism of contraction; properties and regulation of contraction

3. Blood

- Introduction: composition and functions of blood, plasma proteins
- Principles of hemopoiesis, RBC morphology; stages of erythropoiesis
- Regulation of erythropoiesis; stem cells and their clinical applications
- Haemoglobin: structure, function, types and abnormalities
- Iron metabolism and RBC breakdown
- Haemoglobin breakdown and physiological basis of jaundice
- ESR, PCV and blood indices
- Classification and physiological basis of anemia
- Types of WBC : leucopoiesis and its regulation
- Function of WBCs and phagocytosis
- Immunity : introduction, classification, monocyte-macrophage system
- Innate and acquire immunity
- Hypersensitivity; immunological basis of graft rejection
- Blood groups : types and clinical importance
- Physiological basis of transfusion reaction
- Platelets : thrombopoiesis and its regulation,, structure and functions
- Hemostasis and blood coagulation tests
- Anticoagulants ; fibrinolytic system ; abnormalities of hemostasis

4. Autonomic Nervous System

- Organisation, functions

5. Cardiovascular System

- Introduction, general organisation of CVS, functional anatomy of heart
- Properties of cardiac muscle
- Cardiac action potentials
- Origin & conduction of cardiac impulse
- ECG – basis of ECG, Normal ECG, method of recording, vectoral analysis, electrical axis of heart & abnormalities of ECG
- Cardiac cycle
- Heart sounds, murmurs & their clinical significance
- Regulation of cardiac contractility & heart rate
- Vascular system – anatomical consideration & their functional interrelationship
- Hemodynamics – pressure flow & resistance, functions of arterial & venous system
- Microcirculation & capillary fluid exchange
- Lymphatics & physiology of oedema
- Regulation of local blood flow
- Cardiac output – introduction, measurement, factors affecting & regulation
- Arterial pressure – introduction, short term regulation, long term regulation, hypertension.
- Shock – physiological basis, stages & management
- Physiological basis of cardiac failure
- Regional circulation – coronary, cerebral, cutaneous, splanchnic circulation

6. Exercise physiology

- Energetics, types of skeletal muscles, muscles in exercise, cardiorespiratory responses during exercise

7. Sensory system

- Functional organisation of central & peripheral nerves system
- Synapse – definition, types, properties, transmission, post synaptic potentials
- Neurotransmitters – classification & functions
- Receptors – definition, classification, properties & significance
- Somatic sensory modalities & related neurophysiology
- Sensory pathway – anterolateral system, dorsal column medial lemniscal system
- Physiology of pain – pain modulation., applied physiology
- Thalamus – functional anatomy, connections, functions & applied physiology
- Sensory cortex

8. Special senses

- Vision – structure, fluid system of eye, physical principles of optics, optics of eye, photochemistry of vision, visual pathway, color vision, visual cortex, visual reflexes, movements of eye & field of vision
- Hearing – structure & functions of external & middle ear, structure & functions of cochlea, theories of hearing, auditory pathways, audiometry & hearing disorders
- Physiology of smell
- Physiology of taste

Topics to be covered in Term II (From January 2016)

1. Motor system

- Functional organisation of motor system
- Reflexes – introduction & stretch reflex, inverse stretch reflex, other spinal cord reflexes
- Cortical control of motor function – overview , corticospinal system, brainstem control of motor function & other motor pathways
- Physiological bases of upper & motor neuron lesions & hemiplegia
- Vestibular apparatus – vestibular neck reflexes & equilibrium
- Cerebellum – functional anatomy, circuitry functions, disorders & their physiological bases
- Basal ganglia – functional anatomy, functions, neurotransmitters & disorders
- Control of tone & posture – introduction, animal preparations, postural reflexes
- Spinal cord lesions & spinal shock
- Integrated control of motor functions

2. Higher mental functions

- Functional organisation of cortical areas & their functions
- Experimental methods to study cerebral functions
- Role of brain in language & speech
- Limbic system – physiology of emotions, motivation & behaviour
- Hypothalamus – organisation & functions
- Learning & memory – types, physiological bases, applied aspects
- Reticular formation – organisation & functions
- Electrical activity of brain & EEG
- Physiology of sleep
- CSF & blood brain barrier

3. Endocrinology

- Introduction & mechanism of hormone action
- Methods of hormone assay, hypothalamopituitary axis, overview of pituitary hormones
- Growth hormone – actions , regulation & applied physiology
- Thyroid hormones – synthesis , regulation, actions & applied physiology
- Adrenal cortex – synthesis & functions of glucocorticoids, mineralocorticoids & adrenal sex steroids, regulation of adrenal cortical hormones & related disorders
- Adrenal medullary hormones – synthesis, action & applied physiology
- Calcium homeostasis – synthesis & actions, overview, actions & role of calcitonin & Vit – D, disorders
- Functional anatomy of endocrine pancreas, mechanism of action & secretion of glucagon, regulation of blood glucose level, physiological basis of diabetes mellitus
- Pineal gland – melatonin

4. Respiratory system

- Introduction – lungs, airways, alveoli, blood flow, ciliary function, functions of nose
- Mechanism of ventilation- inspiration, expiration, intrapleural pressure, alveolar and expired air composition, surfactant, airway resistance, factors affecting tissue resistance, compliance, work of breathing, pulmonary ventilation and alveolar ventilation

- Lung volumes and capacities
- Diffusion of gases across alveolar membrane
- Pulmonary circulation, ventilation perfusion ratio
- Transport of O₂, oxygen haemoglobin dissociation curve
- Transport of CO₂
- Neural control of respiration, chemical control of respiration
- Hypoxia , cyanosis, asphyxia, dyspnoea
- Physiological peculiarities of pulmonary abnormalities(COPD, pneumonia, asthma)
- Pulmonary function tests, oxygen therapy& artificial respiration

5. Renal system

- Introduction and functional anatomy of kidney and renal function tests, renal blood flow
- Glomerular filtration and its regulation
- Tubular functions
- Concentration and dilution of urine
- Acid base balance- introduction, buffer systems, respiratory regulation, renal regulation, disorders
- Micturition and related disorders
- Body fluid compartments- introduction, measurement, renal regulation of ECF volume, regulation of ECF osmolarity and its disorders
- Pathophysiology of renal failure and principles of dialysis

6. GIT

- Introduction, organisational plan
- GI smooth muscle- structure, innervation, concept of BER
- Hormonal control of GIT
- Salivary secretion- composition, mechanism, phases, regulation
- Mastication, deglutition, oesophageal motility and its disorders
- Gastric secretion- composition, mechanism, phases, regulation and applied physiology
- Pancreatic secretion- composition, phases, regulation
- Liver- functions, liver function tests
- Biliary secretion- composition and regulation of biliary secretion
- Small and large intestine- functional anatomy and secretions
- Digestion and absorption of fats, carbohydrates and proteins
- Gastric and intestinal motility and applied physiology
- GI reflexes and related disorders

7. Reproductive system

- Sex differentiation and development, hypothalamo pituitary gonadal axis in males and females, puberty
- Male reproductive system- introduction , spermatogenesis & its regulation, testosterone actions & its regulation of secretion
- Female reproductive system- introduction, oogenesis, actions & regulation of ovarian hormones, phases of menstrual & ovarian cycles & their regulation, tests of ovulation, fertilization & implantation
- Physiology of pregnancy & lactation
- Contraception
- Fetal & neonatal physiology

8. Miscellaneous

- Physiology of growth & ageing
- Nutrition – concept of balanced diet, BMR, physiological basis of obesity & starvation
- Body temperature regulation – hypothermia, balance between heat gain & heat loss, regulation of body temperature, applied physiology
- Environmental physiology – high altitude physiology, acclimatization & disorders, aviation & space physiology, deep sea physiology