SYLLABUS OF PHYSIOLOGY

OBJECTIVES

Knowledge
At the end of the course the student will be able to:

1. Explain the normal functioning of all the organ systems of the body and their interactions.
2. Narrate the contribution of each organ system to the maintenance of homeostasis.
3. Elucidate the physiological aspects of normal growth and development.
4. Describe the physiological response and adaptations to environmental stresses.
5. List the physiological principles underlying pathogenesis and treatment of disease.

Skills
At the end of the course the student will be able to:

1. Perform experiments designed either primarily for the study of physiological phenomena or for assessment of function.
2. Analyse and interpret experimental/investigative data critically.
3. Distinguish between normal and abnormal data derived as a result of tests which he/she has performed and observed in the laboratory.

COURSE CONTENT

Lectures

General Physiology

1. Principles of Homeostasis
2. Structure of cell membrane
3. Transport mechanisms
4. Intercellular communications
5. Fluid compartments of the body

Nerve–Muscle

1. 3. Principles of bioelectricity
2. 4. Genesis of resting membrane potential
6. Action potential
7. Properties of nerve-fibres
8. Functional anatomy of neuromuscular junction
9. Neuromuscular transmission
10. Muscle proteins – (Biochemistry)
11. Excitation – contraction coupling
12. Contraction kinetics of skeletal muscles
13. Smooth muscle
14. Injury & repair of nerves and muscles
15. Energetics of nerve & muscle

Blood

1. Functions of plasma proteins
2. Principles of hemopoiesis
3. Regulation of erythropoiesis
4. Destruction of red cells: Jaundice
5. Regulation of WBC production
6. Functions of WBC
7. Functions of platelets
8. Hemostasis
9. Blood groups
10. Physiological basis of transfusion medicine
11. Anemia

Respiratory System
1. Introduction to respiratory system
2. Lung volumes and capacities
4. Mechanics of respiration – II
5. Composition of respired air: pulmonary ventilation
6. Exchange of gases in the lungs
7. Ventilation – perfusion ratio
8. O₂:carriage, O₂–dissociation curve
9. CO₂:carriage, CO₂–dissociation curve
10. Neural regulation of respiration
11. Chemical regulation of respiration
12. Hypoxia, cyanosis and dyspnoea
13. Special features of pulmonary circulation
14. Artificial respiration, acclimitisation and decompression sickness
15. Therapeutic use of oxygen
16. Lung function test- clinical significance

Cardiovascular System
1. Introduction to CVS
2. Properties of cardiac muscle
3. Action potential and spread of impulse in the heart
4. E-C coupling in the myocardium
5. ECG
6. Pressure changes in the heart. Cardiac cycle
7. Functional basis of heart sounds and murmurs
8. Neural regulation of cardiac activity
9. Regulation of heart rate
10. Intrinsic regulation of heart’s action. Cardiac output
11. Cardiac output: measurement and regulation
12. Nutrition and metabolism of heart
13. Exercise physiology
14. General principles of hemodynamics
15. Cardiovascular reflexes
16. Neural control of circulation
17. Special features of cerebral circulation
18. Special features of circulation in skeletal muscles and skin

Gastrointestinal System
1. Introduction to G.I. Physiology: general organization of G.I. tract
2. Mastication and deglutition
3. Gastric secretion
4. Regulation of gastric secretion
5. Pathophysiology of peptic ulcer
6. Biliary and pancreatic secretions
7. Physiology of colon
8. Pathophysiology of diarrheal disease
Nutrition
1. Introduction to nutrition. RMR
2. Carbohydrates and dietary fiber
3. Proteins
4. Fats
5. Recommended dietary allowances
6. Diet during pregnancy and lactation
7. Diet during infancy and childhood

Environmental Physiology
1. Introduction to environmental physiology
2. Body temperature regulation
3. Man in cold environment
4. Man in hot environment
5. Hypothermia and its clinical applications
6. Physiological responses to high attitude
7. Physiological responses to high atmospheric pressure

Reproduction
1. Introduction to reproductive system
2. Male reproductive physiology
3. Female reproductive physiology
4. Hypothalamic – pituitary – gonadal axis
5. Puberty
6. Pregnancy
7. Parturition and lactation
8. Reproductive ageing
9. Contraceptive methods

Kidney
1. Renal hemodynamics and glomerular filtration
2. Renal tubular function – I
3. Renal tubular function – II
4. Regulation of renal function
5. Physiological basis of renal function tests
6. Micturition
7. Artificial kidney, dialysis and renal transplantation

Neurophysiology
General
1. Introduction to neurophysiology I
2. Introduction to neurophysiology II
3. CSF
4. Neuroglial cells
5. Synaptic transmission
6. Properties of synaptic transmission
7. Neurotransmitters

Sensory system
1. Coding of sensory information
2. Functional organization of ascending sensory pathways
3. Thalamus
4. Sensory cortex
5. Perception of sensory stimuli
6. Physiology of pain

Motor system
1. Characteristics and properties of reflexes
2. Functional organization of motor system – I
3. Functional organization of motor system – II
4. Brain stem reflexes, stretch reflexes and tendon reflexes
5. Basal ganglia
6. Cerebellum
7. Vestibular neck reflexes: maintenance of equilibrium
8. Localizing the level of lesion in neurological disease

**Visceral and motivational system**
1. Autonomic nervous system
2. Hypothalamus
3. Limbic system and emotions
4. 24 Syllabus MBBS — AIIMS

**EEG, sleep and higher nervous functions**
1. Electroencephalography
2. Sleep and wakefulness
3. Learning and memory – I
4. Learning and memory – II
5. Speech

**Special Senses**
1. Functional anatomy of eye
2. Functions of retina: photoreception
3. Functions of retina: colour vision and electroretinography
4. Central mechanisms of vision and visual perception
5. Functional anatomy of ear: impedance matching
6. Organ of Corti: peripheral auditory mechanism
7. Auditory pathway
8. Central auditory mechanism and auditory perception
9. Olfaction
10. Physiology of taste

**Practicals**

**Blood**
1. Preparation and examination of peripheral blood smear and determination of differential leucocyte count
2. Determination of total red blood cell count
3. Determination of total leucocyte count
4. Determination of platelet count
5. Determination of reticulocyte count
6. Determination of eosinophil count
7. Determination of osmotic fragility of erythrocytes
8. Determination of erythrocyte sedimentation rate, packed cell volume and calculation of the absolute values
9. Determination of hemoglobin concentration of blood
10. Determination of ABO and Rh blood groups
11. Determination of bleeding time, clotting time and plasma prothrombin time

**Nerve and Muscle**
1. Study of salient features of electromyography
2. Study of excitable and contractile properties of a nerve-muscle preparation. Demonstration of (i) effect of sub-threshold, threshold, and supra-threshold stimuli, (ii) Isotonic contraction, (iii) Effect of two or more stimuli, (iv) Isometric contraction, (v) Length-tension relationship
3. Demonstration of work performed by skeletal muscle in vitro under (i) After loaded conditions, and (ii) Free loaded conditions
4. Demonstration of muscle fatigue and neuromuscular transmission in an amphibian model
5. Demonstration of compound action potential in a frog’s sciatic nerve
6. Determination of strength-duration curve in frog’s nerve and muscle
Cardiovascular System
1. Recording and analysis of 12 lead electrocardiogram and to measure the mean electrical axis of Heart
2. examine peripheral arterial pulse
3. Record arterial blood pressure using sphygmomanometer
4. Determination of the effect of posture and exercise on blood pressure
5. Clinical examination of the human cardiovascular system (CVS)
6. Demonstration of the properties of cardiac muscle in the frog
7. To observe Echocardiography and cardiopulmonary resuscitation

Respiration
1. Determination of various lung volumes and lung capacities and calculation of maximum voluntary ventilation (MVV) and forced expiratory volume (FEV) by spirometry
2. Recording of chest movements by a stethograph and to study the effects of Speech, swallowing,
coughing, breath-holding and hyperventilation
3. Examination of human respiratory system

Reproduction
1. Pregnancy tests.
2. Determination of sperm count, motility and morphology in a human Sample

Neurophysiology
1. Examination of nervous system including cranial nerves, sensory system, motor system and reflexes
2. Human electroencephalography: Methods of recording and identification of different types of EEG waves.
3. Demonstration of non-invasive assessment of autonomic nervous functions

Special senses
1. Determination of visual acuity
2. Clinical assessment of colour vision
3. Perimetry: Mapping of visual field
4. Blind spot in the field of vision
5. Demonstration of audiometry