

PBM31104

## ENGINEERING PHYSIOLOGY

*Theory L/T (Hours per week): 3/0, Credit: 3*

### Module-1

1. Basic functional concept of the body as whole & contribution of individual systems & their inter-dependence for achieving the goal.
2. Cell physiology: Ionic currents, Conductance and capacitance properties of excitable membranes, basic idea on cable properties and core conductor theory, transmembrane potential and its determination, equivalent electrical circuit diagram for neural membranes.
3. Nerve physiology: Types of neurons, their electrical properties, electrical potentials, nature, origin and propagation of action potential (AP), EPSPs, IPSPs, and Non-propagatory potentials (Generator Potential, Receptor Potential).
4. Muscle physiology: Types of muscles (functional classification), muscle action potential, EPP, cross bridge cycle and electromechanical coupling during contraction, role of Calcium ions, functional difference between smooth, cardiac and skeletal muscles during contraction, muscles as energy transducer, types of muscle contraction (isotonic, isometric, isokinetic) measurement and characterization (Force-velocity and Load-Tension relationships).

### Module - 2

1. Respiratory physiology: Respiratory pathways (upper and lower). Mechanism of respiration, Feedback control, Blood-alveolar gas exchange ( $O_2$  and  $CO_2$ ) in details
2. Cardiovascular physiology: Vessels and their functional properties, heart as pump. Cardiac cycle, regulation of cardiac pump (extrinsic, intrinsic factors, auto regulation), Starling's Law, cardiac output measurement methods, pacemaker potentials. ECG and formation of normal ECG, cardiac sounds and correlation with ECG.
3. Renal physiology: Nephron structure and functions, counter current exchange mechanism. Voiding of urine, Reflex Control, Bladder Plasticity and Urine Volume relationship.
4. Heat equilibrium in body: Heat equilibrium equation, temperature regulation and role of hypothalamic thermostat, responses to cold and warm environment, thermo neutral range & lethal Temperature concepts.
5. Haematology: Blood as Newtonian fluid –Its physical properties, mechanism of homeostasis, intrinsic and extrinsic pathways, blood pressure and its measuring techniques, feedback control of BP.

### Module -3

1. Hormones: classification, second messenger hypothesis, sources, half-life, effective concentration, feedback control, hypothalamic-pituitary axis, molecular mechanism of peptide & steroids hormones.

2. CNS physiology: Electroencephalography (EEG) – its basic principles. Electro-corticogram (ECOG). Neuro- physiological and Bioelectrical basis of Learning and Memory.
3. General sensation: Receptors. role of transducers, general and specific functional characteristics, classification, receptor potential, generator potential, amplification and propagation to CNS, spinal pathways of common sensations (pressure, touch, pain and temperature) in brief.
4. Special sensation:
  - I. Audition: Sound as stimulus. quality of sound, pitch, loudness, SPL, auditory receptor, genesis of potential change in the Internal ear, mechanism of hearing;
  - II. Vision: Optics of the eye, camera principles applied to the eye, accommodation and its pathway, refractive errors, Purkinje Shift, Electroretinogram (ERG), and Electrooculogram (EOG).

**Reference Books:**

- 1) Concise Medical Physiology By Chauduri
- 2) Anatomy and Physiology – Ross & Wilson, Churchill Livigstone publications.
- 3) Principles of Anatomy & Physiology – Tortora & Grabowski – Harper Collins College Publisher – latest edition
- 4) J Gibson, Modern Physiology & Anatomy for Nurses; Black-well Scientific Publishers, 1981