PHYSIOLOGY

Objectives

At the end of the course, the lerarner shall be able to understand

1. Functions of organ systems in a normal subject
2. Various regulatory mechanisms and their integration in maintenance of homeostasis
3. Altered physiology on exposure to stress, during disease process to diagnose and manage it relevant to other specialties.
4. The comparison of the normal and abnormal data; interpret the same to assess health status.
5. Reproductive physiology as relevant to National Family Welfare programme.
6. Basic laboratory investigations relevant for a rural setup
7. Concept of professionalism.
8. The approaches to the patient with humanity and compassion.

Course Contents

	Must know	Desirable to know
General Physiology		
– Principles of homeostasis	✓	
– Structure of cell membrane	✓	
– Transport mechanisms	✓	
– Intercellular communications	✓	
– Fluid compartments of the body.	✓	
Blood		
- Composition and functions		
– RBC- formation, function and anemia's	✓	
– WBC- formation, functions and Leukemia's	✓	
– Hemoglobin- synthesis and functions	✓	
– Blood groups- basis of blood grouping, clinical importance, blood banking and transfusion	✓	
– Haemostasis, anticoagulants	✓	
Muscle and nerve physiology		
– Structure and functions of a neuron and neuralgia	✓	
– Molecular basis of resting membrane and action potential	✓	
– Transmission of nerve impulse	✓	
– Structure and transmission across neuro-muscular junction	✓	
– Neuro-muscular blocking agents	✓	
– Pathophysiology of Myasthenia gravis		✓
– Types and structure of muscle fiber	✓	
– Action potential in different muscle types	✓	
– Molecular basis of muscle contraction	✓	

	Must know	Desirable to know
– Muscular changes during exercise	✓	
– Properties of excitable tissue.		✓
Renal system		
– Structure and function of nephron	✓	
– Urine formation involving processes of filtration, tubular absorption, secretion and concentration	✓	
– Structure and function of a Juxta glomerular apparatus		
– Role of renin-angiotensin system	✓	
– Fluid and electrolyte balance and its regulation	✓	
– Innervations of bladder, micturition, abnormalities of micturition	✓	
– Artificial kidney, dialysis and renal transplantation		✓
– Renal Function Test		✓
• **Digestive system**		
– Basic structure of Digestive system	✓	
– functions of	✓	
• Salivary secretion	✓	
• Gastric secretion	✓	
• Pancreatic secretion	✓	
• Intestinal secretion	✓	
• Bile	✓	
• Gastro-intestinal hormones-source, regulation and functions	✓	
• Gastro-intestinal movements	✓	
• Pathophysiology of peptic ulcer, Gastro-oesophageal reflux disease, vomitting, diarrhoea, constipation	✓	
• **Endocrinology**		
– Physiological actions and effect of altered secretion of Pituitary gland, Thyroid gland, Parathyroid gland, Adrenal gland, Pancreas and hypothalamus	✓	
Estimation and assessment of Hormones		✓
• **Reproductive system**		
– Functions of testis & ovary	✓	
– Spermatogenesis & factors influencing it	✓	
– Menstrual cycle-hormonal, uterine and ovarian changes	✓	
– Physiological changes during pregnancy and lactation	✓	
– Physiological basis for pubertal changes	✓	
– Physiological effect of sex hormones	✓	
– Contraceptive methods (male and female methods)	✓	

	Must know	Desirable to know
• **Cardiovascular system**		
– Properties of cardiac muscle	✓	
– Conducting system of heart	✓	
– Haemodynamics of circulatory system	✓	
– Regulation of heart rate and blood pressure and cardiac output	✓	
– Electrocardiogram-physiological basis and applications.	✓	
– Regional circulation-coronary, cerebral, capillary, foetal and pulmonary circulation	✓	
– Pathophysiology of shock, coronary artery disease, hypertension	✓	
– Cardio-pulmonary resuscitation	✓	
– Abnormal ECG		✓
• **Respiratory system**		
– Functional anatomy	✓	
– Mechanics of normal respiration	✓	
– Regulation of respiration	✓	
– Transport of respiratory gases	✓	
– Lung function test-clinical significance	✓	
– Principles of artificial respiration, oxygen therapy, acclimatization and decompression sickness.	✓	
– Pathophysiology –hypoxia, cyanosis and asphyxia.	✓	
• **Central nervous system**		
– Organization of nervous system	✓	
– Functions and properties of synapse, reflex, receptors.	✓	
– Functions of cortex, basal ganglia, thalamus, hypothalamus, cerebellum and limbic system.	✓	
– Structure and function of reticular activating system, autonomic nervous system	✓	
– Mechanism of maintenance of tone, posture and equilibrium-vestibular apparatus	✓	
– Higher functions (Memory, Learning, Speech)		✓
– Pathophysiology of Parkinsonism, section of spinal cord.	✓	
– EEG and Sleep	✓	
– Pain and referred pain	✓	
• **Special senses**		
– Functional anatomy of eye	✓	
– Physiology of image formation, colour vision, refractive errors Visual reflexes-pupillary and light reflex	✓	

	Must know	Desirable to know
– Effect of lesion for visual pathway	✓	
– Pathophysiology of blindness	✓	
– Functional anatomy ear	✓	
– Mechanism of hearing	✓	
– Pathophysiology of deafness	✓	
– Perception of smell and taste sensation	✓	
– Pathophysiology of altered smell and taste sensation		✓
– Auditory & visual evoke potential		✓
Skin and body temperature regulation		
Mechanism of temperature regulation	✓	
Adaptation to altered temperature (heat and cold)	✓	
Mechanism of fever, cold injuries and heat stroke.	✓	
Physiology of sports, exercise, yoga and meditation,		
Cardio-respiratory and metabolic adjustments	✓	
Physiological effects of yoga and meditation		✓

SKILLS

A medical student, in Physiology, must be able to perform and interpret following skills:

	Able to to perform independently	Able perform under guidance	Assist	Observe
Haematology				
RBC count	✓			
WBC count	✓			
Differential WBC count	✓			
Eosinophil count	✓			
Platelet count	✓			
Clotting and bleeding time	✓			
Blood grouping and cross matching	✓			
Interpret peripheral smear – identify abnormality and anaemia		✓		
Calculate various blood indicies	✓			
Muscle and nerve physiology				
Properties of nerve and muscle to to be demonstrated by computer based modules				✓
Reproductive system				
Pregnancy test				✓

	Able to to perform independently	Able perform under guidance	Assist	Observe
Cardiovascular system History taking	✓			
Examine peripheral arterial pulse	✓			
Record arterial blood pressure using sphygmomanometer	✓			
Record ECG, identify normal waves, intervals and pick up abnormalities				✓
Locate the apex beat	✓			
Auscultate the areas of heart, appreciate heart sound,	✓			
Pickup abnormal sounds		✓		
Echocardiography				✓
Respiratory system				
Perform spirometry (computer spirometer, if available) and interpret the recording to appreciate restrictive and obstructive airway diseases	✓			
Locate the position of trachea and appreciate its deviation in disease	✓			
Percuss lung fields to appreciate the change in note in disease	✓			
Auscultate lung fields appreciate the normal breath sound and pickup adventitious sounds	✓			
Cardio-pulmonary resuscitation				✓
Nervous system				
Examination of Sensory system (touch, pain, pressure and temperature)	✓			
Examination of motor system (nutrition, tone, power and co-ordination)	✓			
Examination of superficial and deep reflexes. Examination of cranial nerves (sensory and motor division)	✓			
Examination of autonomic nervous system	✓			
EEG, EMG and nerve conduction studies				✓
Special senses				
Acuity of vision (near and distant vision)	✓			
Colour vision	✓			
Field of vision	✓			
Tests for hearing	✓			
Test for smell and taste	✓			

	Able to to perform independently	Able perform under guidance	Assist	Observe
Principle of opthalmoscopy		✓		
Optometry		✓		
Audiometry		✓		
Body temperature and metabolism				
Recording body temperature in different location	✓			

METHOD OF ASSESSMENT:

- Modified essay question
- Microscopic examination
- Short answer questions
- MCQs
- Problem solving exercises
- OSPE,
- Records Review.
- Checklist,
- Oral Viva Voce

TEACHING LEARNING METHODS:

- Structured interactive sessions
- Small group discussion
- Focused group discussion (FGD)
- Practical including demonstrations
- Problem based exercises
- Skill labs
- Video clips
- Written case scenario
- Self learning tools
- Interactive learning
- e-modules

TIME OF EVALUATION:

There should be regular formative assessment. Formative assessment, day-to-day performance should be given greater importance. Examination of Physiology should be at the end of 2nd semester and formative assessment in middle of 1st and 2nd semester and summative assessment at the end of 2nd semester.

LEARNING RESOURCE MATERIALS

- Text books
- Reference books

- Practical note books
- Internet resources
- Video films etc.

Topic for integrated teaching:

1. Digestive system
2. Endocrinology
3. Hematology and immunology
4. Central Nervous system
5. Special senses
6. Renal system
7. Respiratory system
8. Cardiovascular system
9. Reproductive system
10. Musculoskeletal system

LIST OF E-MODULES

1. Action potentials of nerve, muscle
2. Transport across cell membrane
3. Types of blood cells
4. Transmission across neuromuscular junction
5. conduction system of heart
6. ECG: Normal and abnormal

SUGGESTIVE TEXTBOOKS OF PHYSIOLOGY

1. Review of Medical Physiology by W F Ganong
2. Textbook of Medical Physiology by Guyton
3. Textbook of Medical Physiology by A K Jain
4. Textbook of Medical Physiology by Beerne and Levy
5. Textbook of Medical Physiology by Best and Taylorx