

Syllabus for MD (Physiology) Programme



Atal Medical & Research University

A state University established by the Govt of H.P

Atal Medical & Research University, H.P.

(A State Govt. University)

(SLBS Govt. Medical College & Hospital Campus, Ner Chowk, Mandi, H.P.)

Minutes of meeting of PG Board of Studies (Physiology) held on

12th May, 2023 in Conference Hall, AMRU at 11:00 AM

A meeting of PG Board of Studies (Physiology) was held on 12th May, 2023 at 11:00 AM at Conference Hall, AMRU under the Chairmanship of Dr. Anita Padam, Professor & HOD, Physiology, IGMC, Shimla.

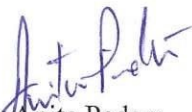
Following members attended the meeting:


1. Dr. Anita Padam, Professor & HOD Physiology, IGMC, Shimla -cum-Chairperson.
2. Dr. Rupali, (External Expert), Deptt. of Physiology, AIIMS Bilaspur nominated by the Hon'ble Vice Chancellor -cum-Member.
3. Dr. Yuv Raj, Professor, Dept. of Physiology, IGMC, Shimla-cum-Member.
4. Dr. Shivani Mahajan, Associate Professor, Dept. of Physiology, IGMC, Shimla, -cum-Member.
5. Dr. Anju Madan Gupt, Assistant Professor, Dept. of Physiology, IGMC, Shimla-cum-Member.

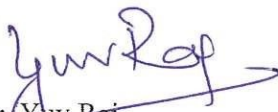
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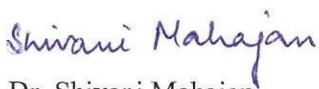
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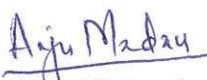
1. The syllabus for degree of MD Physiology was discussed in details among the members of board of Physiology. The syllabus being used by other universities (AIIMS, RUHS, JIPMER, BFU) was also discussed and relevant points were added.
2. Consensus was arrived at regarding periodic assessment & Log book maintenance.
3. Online courses recognised by NMC like BCBR, ACLC, BCLS will be included in the curriculum.
4. After detailed deliberation with all the board members, it was decided to inculcate online courses in the curriculum for professional and skill development such as introductory Neuroscience and Neuro instrumentation, Sleep Medicine, Introduction to Proteomics, AI for Medical Diagnosis, etc.
5. Detailed deliberation of District Residency Programme introduced by NMC was done. It was decided that physiology residents should actively participate and focus on Life style modification, Stress management, Sleep pattern and role of exercise as applicable to patient. Exposure to Biochemical Lab, Haematology Lab and Blood Bank. They should also be exposed to cases of metabolic syndrome.


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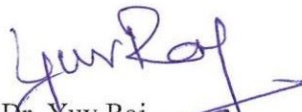
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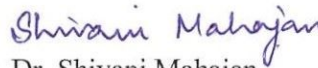
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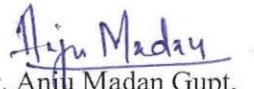
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SYLLABUS IN THE SUBJECT OF PHYSIOLOGY

A. THEORY

Paper I: General and Cellular Physiology including Genetic basis and historical perspectives

1. Physiology of cell, various cellular mechanisms and genetic control mechanisms.
 2. Various Bio-physics principles involved in physiological phenomenon e.g., hemodynamics, bio-electrical potentials, mechanics of breathing.
 3. Body fluids and methods of measurements
 4. History of Physiology, Nobel laureates and discoveries.
 5. Biostatistics, Biophysics, Physiological-anatomy.
 6. Growth and development including aging.
 7. Excretion, pH, water and electrolyte balance.
 8. Biochemistry - All clinical biochemical test and basis of operation of various equipment's and interpretation of data
 9. Basics of medical education in teaching and assessment
- Principles of adult learning, taxonomy of learning, educational objectives, principles of assessment and question paper setting, methods of assessing knowledge, appropriate use of media, microteaching, small group teaching.

Paper II: Systemic Physiology (system providing transport, nutrition and energy) including comparative Physiology

1. Blood and Immunity.
2. Cardiovascular System.
3. Respiratory System.
4. Gastro- Intestinal Tract (GIT) and dietary requirements.

Paper-III: Systemic Physiology (system concerned with procreation, regulation and neural control)

1. Nerve-Muscle Physiology including muscle mechanics
2. Endocrine Physiology
3. Nervous System (Central, peripheral and autonomic)
4. Special Senses
5. Reproduction & family planning/foetal& neonatal Physiology

Paper-IV: Applied Physiology including recent advances

1. Recent advances relevant to Physiology
2. Patho-physiology pertaining to systemic Physiology
3. Physiological basis of various clinical investigation tests
4. Interaction of human body in ambient environment - high altitude, space and deep sea
5. Exercise & Sports physiology
6. Transgender Physiology
7. Integrated Physiology



8. Yoga and Meditation
9. Social responsibilities of physiologists

1. General Physiology:

- i. Principles of homeostasis and feedback control mechanisms
- ii. Functional organization of cell, intercellular connections, molecular motors, cell death (apoptosis)
- iii. Physiology of genetics
- iv. Transport across cell membrane
- v. Membrane potential
- vi. Cell to cell and local communications
- vii. Body fluid compartments: Define and explain, measurement of body fluids. Regulation of volume and composition of body fluids.
- viii. Physiology of Ageing: Changes in various systems and mechanisms involved Factors affecting ageing.
- ix. Genetic control of protein synthesis, genetic code and regulation of gene expression, cell cycle and its regulation.

2. Renal Physiology

- i. Functional Anatomy of Kidney
- ii. Renal Blood Flow and Glomerular Filtration
- iii. Urine formation involving processes of filtration, tubular reabsorption, secretion and concentration.
- iv. Mechanisms of Urine Concentration and Dilution
- v. Water Excretion; Diuresis and Diuretics
- vi. Acidification of Urine, Acid base balance
- vii. Renal mechanisms for the control of volume, blood pressure and ionic composition
- viii. Kidney Function Tests
- ix. Physiology of Micturition and Bladder Dysfunctions
- x. Renal failure, Artificial kidney, dialysis and renal transplantation.

3. Comparative Physiology of all systems





4. Basics of Biostatistics and its applications

- i. Fundamentals of statistical methods used in biological and medical research including mean, standard deviation, median, inter-quartile range, hypothesis testing, concepts of p-values and confidence intervals.
- ii. Research question for a study, Describe and discuss the principles and demonstrate the methods of collection, classification, analysis, interpretation and presentation of statistical data

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- ## 5. Blood:

- ## 6. Cardiovascular System:

- closing pressure
- 




- viii. Various types of circulation, local regulation of blood flow to tissues.
- ix. Arterial Blood Pressure: Definition, normal value, variations, measurement, mean arterial pressure (MAP) its determinants and its regulation. Hypertension and Hypotension
- x. Regional circulation: Coronary, cerebral, cutaneous, splanchnic, skeletal muscle and foetal. Normal values, special features and regulation.
- xi. Cardiovascular changes during exercise.
- xii. Circulatory shock, Cardiac failure.

7. Respiratory System:

- i. Functional Organization of Respiratory System
- ii. Mechanics of Breathing: Movements of thoracic cage during respiration, muscles involved and their nerve supply, intrapleural and pulmonary pressure and volume changes, pressure-volume inter-relationships, lung compliance - surfactant, airway resistance, work of breathing.
- iii. Spirometry, lung volumes & capacities: Definitions, normal values, significance and special features. Pulmonary gas exchange: Alveolar-capillary membranes, diffusion capacities, partial pressure gradients and factors influencing diffusion of gases, measurement of diffusion capacity using carbon monoxide.
- iv. Applied physiology
- v. Pulmonary Circulation and Ventilation-Perfusion Ratio and its importance in respiratory diseases.
- vi. Transport of Gases in Blood: Oxygen transport – factors influencing the combination of haemoglobin with oxygen, oxygen dissociation curve- plotting, features, physiological advantage of its shape, factors affecting its shift and Bohr's effect. Carbon dioxide transport – tissue uptake, carriage in blood and release at the lungs, importance of red blood cell, chloride shift, role in acid base balance, Haldane effect.
- vii. Regulation of respiration: Neural control – medulla, pons and vagus. Chemo-receptors: peripheral and central, chemical and non-chemical influences on respiration, integrated responses
- viii. Respiration in unusual environments: Hypoxia and Oxygen Therapy, High altitude hypoxia and space flight. Deep sea diving: Effects of Increased Barometric Pressure, nitrogen narcosis, Hyperbaric oxygen and oxygen toxicity.
- ix. Abnormal breathing: Apnoea, hyperpnoea, tachypnoea, dyspnoea, Cheyenne-stokes breathing and Biot's breathing- definition, features and physiological basis.
- x. Artificial Respiration: Definition, types, principles, indications, advantages and disadvantages, Cardiopulmonary Resuscitation
- xi. Pulmonary Function Tests, pulmonary abnormalities.

8. Gastro-intestinal System:

- i. Introduction to Gastrointestinal Physiology: Functions of GI System – individual parts. Innervation of the gut, regulation of GI functions. Gut brain axis– physiology and its applied significance

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- ii. Oral Cavity: Mastication and digestion in mouth and its importance. Salivary secretion: mechanism, composition, functions and regulation. Physiology of deglutition: Definition, stages and neural control and applied aspects.
- iii. Stomach: Physiology of gastric secretion – mechanism, composition, function and control, phases of gastric secretion. Gastric function tests and pathophysiology of Peptic Ulcer. Gastric motility – characteristics and control, gastric emptying and antral pump mechanism
- iv. Small intestine: functions, Secretion, movement and control.
- v. Large intestine: functions, secretions, movements and Defecation
- vi. Gastrointestinal hormones and their role in secretomotor functions of the gut.
- vii. Principles of Digestion and Absorption
 - x. Pancreatic secretions: Composition, mechanism, functions and control.
 - xi. Physiology of vomiting, diarrhoea, constipation.
 - xii. Physiology of Nutrition and Metabolism Carbohydrates, Fats Proteins, Minerals, Vitamins, Dietary fibre, Recommended dietary allowances. Balanced diet. Energy metabolism. Obesity and starvation
 - xiii. Hepatobiliary system: Liver: functions, entero hepatic circulation, Bile formation, secretion, regulation and jaundice, Physiological basis of liver function tests. Gall bladder: functions, mechanism and regulation of gall bladder contraction, applied aspects and Oral cholecystography

9. Nerve and muscle:

- i. Structure and functions of a neuron and neuroglia. Nerve fibre types, functions, classification of nerve fibers, responses of nerve to injury.
- ii. Physiology of nerve: properties of nerve, nerve action potential, propagation and conduction of action potential. Molecular basis of resting membrane and action potential, compound action potential, Recording.
- iii. Physiology of muscle (structure and properties of skeletal, cardiac and smooth muscles; Action potential in different muscle types and molecular basis of muscle contraction), Energetics – energy source and muscle metabolism, muscular dystrophy: myopathies
- iii. Neuromuscular transmission. Structure and transmission across neuro-muscular junction. Neuro-muscular blocking agents. Pathophysiology of Myasthenia gravis and other applied aspects of NM junction.
- iv. EMG.

10. Endocrine Physiology:

- i. Mechanism of action and Regulation of hormones, hormonal assay
- ii. Endocrine functions of hypothalamus and hypothalamo-pituitary axis. Anterior and posterior pituitary glands – synthesis and secretion of hormones, actions, regulation, and applied aspects
- iii. Thyroid gland - synthesis and secretion of hormones, actions, regulation, and applied aspects
- iv. Adrenal cortex and medulla – synthesis and secretion of hormones, actions, regulation and applied aspects

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- v. Endocrine pancreas - synthesis and secretion of hormones, actions, regulation and applied aspects
- vi. Parathyroid gland and calcium homeostasis, bone physiology - synthesis and secretion of hormones, actions, regulation and applied aspects
- vii. Pineal gland and Local hormones
- viii. Physiology of Reproduction:
 - a. Sex differentiation and development
 - b. Physiology of puberty and menopause
 - c. Male reproductive system: Primary and accessory organs and their functions. Spermatogenesis and its regulation. Testosterone - secretion, transport, metabolism, mechanism and physiological actions. Control of testicular function – feedback mechanism and abnormalities.
 - d. Female reproductive system. Physiology of menstrual cycle: Ovarian cycle, Uterine cycle, changes in cervix and vagina. Physiology of ovulation and its detection. Ovarian hormones – Estrogen and progesterone – physiological actions and mechanism of action. Control of ovarian function: feedback mechanism, menopause and abnormalities.
 - e. Physiology of fertilization and implantation.
 - f. Physiology of pregnancy Endocrine changes, feto-placental unit, changes in mother during pregnancy, tests for pregnancy
 - g. Physiology of parturition: Role of oxytocin
 - h. Physiology of breast development and lactation Role of oxytocin and prolactin
 - i. Infertility and contraception
 - j. Systemic physiology of fetus and newborn
 - k. Transgender physiology

11. Central nervous system:

- i. Functional Organization of Nervous System; Functions of glial cells
- ii. Synaptic Transmission in CNS: Synapse: Definition and types, structure, mechanism of transmission and properties. Neurotransmitters – excitatory and inhibitory – formation, sites of secretion and actions
- iii. Sensory System - Physiology of Receptors: Definition, classification and properties, Ascending Pathways, Physiology of Pain including referred pain, Analgesia system. Trigeminal System. Thalamus and Sensory Cortex - Components, connections, functions, thalamic syndrome
- iv. Motor System - Segmental Organization of Motor System, Muscle Spindle and Golgi Tendon Organ. Reflexes: Definition and classification. Reflex arc and stretch reflex. Properties of reflexes and their clinical significance. Descending Pathways. Control of Posture and Movement. Basal Ganglia, Cerebellum, Vestibular Apparatus, motor cortex, basal ganglia and cerebellum - motor control and their disorders
- v. Hypothalamus: components, connections and functions. EEG and Sleep
- vi. Reticular formation: Definition, connections and functions
- vii. Limbic System and Higher Functions
- ix. Cerebrospinal Fluid, Blood brain barrier and its importance

- x. Frontal, Parietal, occipital and temporal lobe: components, connections, functions and effects of lesions.
- xi. Higher cortical functions: Learning, memory, judgement, language and speech.
- xii. ANS: Functional organization of ANS, Sympathetic System, Parasympathetic System, Control of Autonomic Functions; Autonomic Dysfunction; Autonomic Function Tests

12. Special senses:

- i. Physiology of vision: Visual system : Structure of eye and overview of functions, Structure and function of cornea, Aqueous humor – formation, circulation and drainage, Intraocular pressure and functions, Optics of vision – image forming mechanism, Pupil and its functions, Light reflex and accommodation, Binocular and monocular vision, Common errors of refraction, Visual acuity and visual fields – clinical importance. Ophthalmoscopy, retinoscopy and perimetry, Photoreceptors – distribution, visual pigments and their functions. Light and dark adaptation: photopic and scotopic vision. Visual pathway – transduction, transmission, synaptic modulation and visual cortex. Effects of transection of visual pathway at various levels. Eye movements – neurophysiological basis of fixation of gaze and conjugate movements. Physiology of colour vision – theories and electrophysiological aspects. Colour blindness – classification and tests.
- ii. Physiology of hearing: Functional anatomy of ear and general properties of sound. External ear – functions. Middle ear – functions of tympanic membrane and ossicles. Mechanism of sound transmission, impedance matching, function of Eustachian tube. Internal ear – structure and function of cochlea, sound transduction, electrical potentials from cochlea, pitch and intensity discrimination. Auditory pathway – receptive fields and tonotopic maps, binaural interactions, nerve pathway from the cochlea to the auditory cortex. Organization of auditory cortex and functions, sound localization. Deafness: types, tests to diagnose deafness. Audiometry and its clinical applications.
- iii. The Vestibular System: Structure of labyrinth. Vestibular transduction – response to rotational and linear acceleration. Central vestibular pathway. Vestibulo-ocular reflex and its clinical importance. Clinical tests for vestibular integrity, disorders of labyrinth.
- iv. Physiology of smell. The Olfactory System: Location of receptors and pathways, physiology of olfaction and disorders of olfactory sensation.
- v. Physiology of taste. The Gustatory System: Location of receptors and pathways, physiology of gustation and disorders of gustatory sensation.

12. Integrative Physiology:

- i. Environmental physiology: mechanism of temperature regulation, adaptation to altered temperature (heat and cold), fever, cold injuries and heat stroke
- ii. Exercise physiology: types and grading, Concept of physical fitness, its components and evaluation, cardio-respiratory and metabolic adjustments during exercise; changes at the tissue level, Effects of training- on cardiovascular system, respiratory system, skeletal muscle, psychological effects, metabolic effects, adjustments to exercise.
- iii. Nutrition – diet charts in infancy, pregnancy and lactation. Obesity

Antibiotic *Angi* *Shivani* *Yash* *Har*

- iv. Stress Relaxation Technique: Principles of Yoga, Breathing exercise, Meditation and Bio feedback techniques.
- v. Social responsibilities of Physiologist - Role and responsibilities of physiologist

13. Recent advances:

- i. Advances in all branches of physiology like neurophysiology, cell physiology etc.
- ii. Advances in techniques like recombinant DNA technology, voltage clamping, patchclamping, echocardiography, MRI, computerized investigations etc.
- iii. Advances in applied physiology
- iv. Advances in research methodologies
- v. Use of Technical Interface and Artificial Intelligence in Basic Medical Sciences

Physiological basis of various clinical investigation tests-

- Lung function tests and interpretation of results.
- Diffusion capacity of Carbon monoxide
- Autonomic function testing and HeartRate variability
- Cardiopulmonary exercise training
- Semen analysis and sperm function test
- Electroencephalography (EEG and sleep studies)
- Electrocardiography (ECG)
- Electromyography (EMG)
- Electro Oculography (EOG)
- Electronystagmography (ENG)
- Nerve conduction study (NCV)
- Visual evoked potential (VEP)
- Brainstem auditory evoked potential(BAEP)
- Somato-sensory evoked potential(SEP)
- Motor evoked potential (MEP)
- Any other newer technology

B. PRACTICALS

I. Hematological profile

1. Estimation of hemoglobin
2. Determination of Total Erythrocyte (RBC) Count and RBC Indices (Blood Standards)
3. Determination of Total Leucocytes (WBC) Count: TLC
4. Preparation of a peripheral Blood Smear and Determination of Differential Leucocyte Count: DLC

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5. Determination of Arneth Count
6. Determination of Bleeding Time (BT) and Clotting Time (CT)
7. Determination of Blood groups (A, B, O and Rh system)
8. Determination of Erythrocyte Sedimentation Rate (ESR) and Packed cell volume (PCV)
9. Determination of Osmotic Fragility of Red Blood Cells
10. Determination of Platelet Count
11. Determination of Reticulocyte Count

II. Human Physiology

a. Clinical Physiology

1. Detailed clinical examination of various systems.

b. Nerve muscle physiology

1. Ergography and hand grip spring dynamography and study of human fatigue.
2. Recording of electromyography (EMG) and its application.
3. Recording of nerve conduction.

c. Cardiovascular system (CVS)

1. Clinical examination of CVS
2. Examination of arterial & venous pulses
3. Measurements of arterial blood pressure and effect of head-up/head-down tilt
4. Recording of 12 leads Electrocardiography (ECG) and its interpretation
5. Measurement of blood flow
6. Heart rate variability
7. Ambulatory Blood pressure monitoring

d. Respiratory system

1. Clinical examination of respiratory system.
2. Stethography – study of respiratory movements and effect of various factors.
3. Assessment of respiratory functions (spirometry, vitalography, and gas analysis).
4. Measurement of BMR.
5. Cardio pulmonary resuscitation (CPR) and Artificial respiration.

e. Gastrointestinal system:

1. Clinical examination of abdomen.

f. Integrative Physiology / Excretory system

1. Recording of body temperature/effect of exposure to cold and hot environment

g. Reproductive system

1. Determination of ovulation time by basal body temperature chart and pregnancy diagnostic test - Immunological Tests.
2. Semen analysis: sperm count, motility and sperm morphology.

Arpit

Ajita

Shivani

Yashraj

Paul

h. Nervous System including Special senses

1. Clinical examination of the nervous system and its physiological basis.
2. Examination of higher mental functions.
3. Examination of cranial nerves.
4. Examination of sensory system.
5. Examination of motor system including reflexes.
6. Clinical examination of special senses:
 - (i) Smell and Taste
 - (ii) Test for hearing to differentiate deafness
 - (iii) Physiology of eye:
 - (a) Clinical examination of the eye and pupillary reflex
 - (b) Visual acuity
 - (c) Perimetry – mapping out of visual field and blind spot
 - (d) Accommodation
 - (e) Fundoscopy
 - (f) Colour vision and colour blindness
7. Reaction (visual and auditory) and reflex time.
8. Electroencephalography (EEG) and Polysomnography
9. Autonomic Nervous System (ANS) Testing.
10. Neuro-electrodiagnostic techniques: Nerve conduction study, Visual evoked potential (VEP), Brainstem auditory evoked potential (B.A.E.P), Somato-sensory evoked potential (SEP), Motor evoked potential (MEP).
11. Use of various test batteries for psychological evaluation of subject.

i. Sports Physiology

Tests for physical fitness: Cardio – respiratory responses to steady state exercise using:

- (i) Body Composition
- (ii) Conducting the Clinical Exercise Test
- (iii) Harvard step test
- (iv) Bicycle Ergometry
- (v) Treadmill test for determination of VO₂ max

j. Yoga and Meditation Physiology

- i. Physical, Mental and Emotional well being
- ii. Effect of yoga and pranayama on physiological parameters
- iii. Mindfulness
- iv. Concentration, anxiety and stress
- v. Counseling in health and diseases

k. Others

1. Construction of dietary chart for growing children, pregnant woman, elderly individuals, hypertensive patients, & diabetes mellitus patients.
2. Basic Life Support and Cardiac Life Support

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3. Effective Digital presentation, medical photography, Good Clinical Practice, Humanities and Bioethics.

III. Amphibian (Frog) Experiments

All animal experiments must be compliant with Government of India Regulations, notified from time to time). Experiments in Amphibian/Dog/Cat should be conducted by computer assisted simulation models/ facilities. Other experiments should be performed as permissible by CPCSEA guidelines.

1. Effect of temperature on simple muscle twitch.
2. Effect of two successive stimuli (of same strength) on skeletal muscle.
3. Effect of increasing strength of stimuli on skeletal muscle.
4. Effect of increasing frequency of stimuli on skeletal muscle (genesis of tetanus).
5. Effect of free load and after load on skeletal muscle.
6. Effect of repeated stimuli on skeletal muscle (study of phenomenon of Fatigue).
7. Study of isometric contraction in skeletal muscle.
8. Determination of conduction velocity of sciatic nerve and effect of variables on it.
9. Properties of cardiac muscle – Refractory period, All-or-None Law, extrasystole and compensatory pause, beneficial effect.
10. Regulation of Heart, Vagus dissection and effect of Vagal and WCL stimulation.
11. Effect of physiological and pharmacological variables on intact frog's heart.
12. Perfusion of isolated frog's heart-role of sodium, potassium, calcium ions and drugs.

B. The postgraduate student during the training period must ASSIST in the following procedures:

Human Physiology

- i. Cardiovascular system (CVS)
Cardiac TMT Holter Monitoring
Collection and Assessment of Arterial blood gas
- ii. Nervous System including Special senses
☐ Intra operative neuro monitoring (IONM)

C. The postgraduate student during the training period must OBSERVE the following procedures:

i. Hematological profile

Determination of Absolute Eosinophil Count
Study of Haemopoietic Cells present in the Bone Marrow
Other high end hematological investigations (specify): Flow cytometry, Platelet functions, D Dimers, coagulation profile etc.

ii. Human Physiology

Cardiovascular system (CVS)

- Echocardiography

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- Central venous line insertion, CVP monitoring

Respiratory system

- Introduction to working of continuous positive airway pressure and Bilevel positive airway pressure (CPAP & BiPAP) Therapy o Ventilator setting

Gastrointestinal system:

- GI Manometry

Reproductive system

- Ovulation study by using ultrasonography

Integrative Physiology / Excretory system

- Pressure and PH studies in esophagus, stomach, intestine and rectum

Others

- Genetic testing and introduction to procedural skills for clinical genetics/ prenatal diagnosis/ adult genetics - birth defects, genetic hematology, dysmorphology, skeletal dysplasia, neurological and muscular disorders, primary immunodeficiency diseases, autoimmune and multi-factorial disorders, biology and genetics of cancer.
- Interaction of human body in ambient environment - high altitude, space and deep sea
- Exercise & Sports physiology
- Integrated Physiology
- Yoga and Meditation
- Social responsibilities of physiologists
- Application of Artificial Intelligence in Physiology

ii. Mammalian Experiments (Dog/Rabbit/Guinea pig/Rat/Mice)

- General management of mammalian experiments.
- Recording of heart rate, blood pressure and respiration and study the effects of various factors; drugs; asphyxia; occlusion of common carotid artery.
- Effect of stimulation of central and peripheral end of vagus on arterial blood pressure and respiration after vagotomy.
- Effect of stimulation and distension of carotid sinus on blood pressure and respiration.
- Effect of stimulation of splanchnic nerve.
- Effect of stimulation of peripheral somatic nerve (sciatic nerve).
- Study of hypovolemic shock and its reversal.
- Perfusion of isolated mammalian heart and study the effects of drugs and ions.
- Recording of Isolated Intestinal movement and tone and studying the effect of drugs and ions.
- Study of various stages of menstrual cycle, cervical smear and vaginal smear.

Recommended Reading:

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Books (latest edition)

1. A.C. Guyton – Text book of Medical Physiology
2. W.F. Ganong – Review of Medical Physiology
3. Berne and Levy- Medical Physiology
4. Principles of medical physiology by Sircar
5. J.E. Cotes- Respiratory Physiology
6. D.T. Harris – Experimental Physiology
7. Wintrobe's – Clinical Hematology
8. Brown B.L. – Cell signaling, Biology and medicine of signal transduction
9. William's Textbook of Endocrinology
10. Textbook of Medicine by Harrison
11. Principles of Neural sciences edited by E. R. Kandel, J. H. Schwartz and T. M. Jessell
12. Williams Hematology by M.A. Lichtman, E. Beutler, K. Kaushansky, T.J. Kipps, U. Seligsohn, J. Prchal
13. Medical Physiology: by W. F. Boron and E. L. Boulpaep
14. Medical Physiology: by A. Rhodes and G. A. Tanner
15. Neuroscience : by Dale Purves

Practical Books:

1. Hutchison's Clinical Methods: An Integrated Approach to Clinical Practice.
2. Macleod's clinical Examination
3. Textbook of Practical Physiology: by Dr. G. K. Pal and Dr. Pravati Pal
4. Textbook of Practical Physiology: by Dr. C. L. Ghai
5. Textbook of Practical Physiology: by Dr. Ranade
6. Textbook of Practical Physiology: by Dr. A. K. Jain

Journals:

03-05 International Journals and 02 National (all indexed) journals

Signature 1 *Signature 2* - *Signature 3* *Signature 4* *Signature 5*

Shram

DUTIES AND RESPONSIBILITIES OF PG STUDENTS

1. Attends all undergraduate classes taken by faculty members during 1st and 2nd year of his PG course.
2. Actively participates and conducts undergraduate practical classes.
3. Actively participates in all PG programmes of the department (PG seminars, symposia, PG talk, journal club and presentation of review articles)
4. Carries out dissertation work (research work of the thesis) and completes itsatisfactorily and submits thesis on time
5. Learns all research and clinical investigations carried out by the department
6. Participates in all notified examinations of the department
7. Should have minimum 80% attendance

Essential pre-requisites for PG students to appear in the final examination include:

1. Post graduate students shall maintain a log book for recording the training they have undergone, and details of the procedures done during laboratory and clinical postings in real time.
2. It is mandatory for all postgraduate students to complete an online research methods' course (Basic Course in Biomedical Research) to be conducted by ICMR-NIE, by the end of the second semester of their course.
3. Thesis shall be submitted at least six months before the Theory and Clinical/Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A postgraduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.
4. At least two presentations at national level conference. One research paper should be published / accepted in an indexed journal.

The following course work shall be common and desirable for all postgraduate students irrespective of discipline / specialty.

1. Course in Ethics:

All postgraduate students shall complete course in Ethics including Good Clinical Practices / Good Laboratory Practices, whichever is applicable to them, to be conducted by Institutes themselves or by any other method.

2. Course in Cardiac Life Support Skills (CLS)

All postgraduate students shall complete a course in Basic Cardiac Life Support (BCLS) and Advanced Cardiac Life Support (ACLS) skills and get duly certified.

Arjun Patel *Arjun - Shivani* *Yuvraj* *P. Patel*

Online Desirable Courses for Professional development and skills in Physiology

1. **Introductory Neuroscience & Neuro – Instrumentation:** offered by IISc Bangalore
Available at: <https://onlinecourses.nptel.ac.in>
2. **Sleep: Neurobiology, Medicine, and Society** – offered by University of Michigan
Available at: <https://www.coursera.org>
3. **Introduction to Proteomics** – offered by IIT Bombay Available at:
<https://onlinecourses.nptel.ac.in>
4. **AI for Medical Diagnosis** – offered by Deep Learning AI Available at:
<https://www.coursera.org>

Aditya Agni

Shivani

Yunus