



Department of Paramedical Sciences

Faculty of Allied Health Sciences

SGT UNIVERSITY

Shree Guru Gobind Singh Tricentenary University

Gurgaon-122505

Syllabus

B.Sc. Neurophysiology Technology (NPT)

Duration: 3 years (6 Semester)

W.e.f. Academic Session 2020-21

1st

Semester

HUMAN ANATOMY-I

PAPER CODE-

B. Sc. Semester I (Neurophysiology Technology)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

UNIT-I

Introduction: human body as a whole

Definition of anatomy and its subdivisions

Anatomical nomenclature and terminology (planes & positions)

Surface Anatomy of main structures and vessels

Applied anatomy & Joints

Musculoskeletal system

Connective tissue & its modification, tendons, membranes, special connective tissue.

Bone structure, blood supply, growth, ossification, and classification.

Muscle classification, structure and functional aspect.

Joints classification, structures of joints, movements, range, limiting factors, stability, blood supply

Nerve supply, dislocations and applied anatomy

UNIT-II

Extremity (Lower & Upper extremities)

Bony architecture

Joints – structure, range of movement

Muscles – origin, insertion, actions, nerve supply

Major nerves – course, branches and implications of nerve injuries Development of limb bones, muscles and anomalies

Radiographic identification of bone and joints Applied anatomy

Lower extremity

Bony architecture

Joints – structure, range of movement

Muscles – origin, insertion, actions, nerve supply

Major nerves – course, branches and implications of nerve injuries Development of limb bones, muscles and anomalies

Radiographic identification of bone and joints Applied anatomy

UNIT-III

Spine and thorax

Back muscles -Superficial layer

Deep muscles of back, their origin, insertion, action and nerve supply.

Vertebral column – Structure & Development, Structure & Joints of vertebra. Thoracic cage

Head and neck: Cranium

Facial Muscles – origin, insertion, actions, nerve supply Temporal mandibular Joints – structure, types of movement

UNIT-IV

Cardiovascular system (with relevant applied anatomy)

Heart-Size,location, chambers.

Circulation -Systemic &pulmonary

Great vessels of the heart, branches of aorta.

Overview of blood vessels of upper extremity and lower extremity

Lymphatic system- (with relevant applied anatomy)

Salient features of lymphatic organs (spleen, tonsil, thymus, lymph node)

UNIT-V

Gastro-intestinal system (with relevant applied anatomy)

Partsofthe gastrointestinal tract

Gross anatomy of Tongue, stomach, small and large intestine, liver, gall bladder Pancreas and other digestive organ& related applied anatomy

Respiratory system (with relevant applied anatomy)

Partsof respiratory system with salient gross features of lung

Brief description of intercostal muscles andPara-nasal air sinuses

Text/ Reference Books:

1. Essential Clinical Neuroanatomy by Thomas H. Champney
2. Human Neuroanatomy by Inderbir singh
3. Neuroanatomy by B.D. Chaurasia

HUMAN ANATOMY I-PRACTICAL

PAPER CODE-

B. Sc. Semester I (Neurophysiology Technology)

L	T	P	Credits	Examination:	30 Marks
-	-	2		Int. Assessment:	20 Marks
				Total:	50 Marks

- 1) Identification and description of all anatomical structures.
- 2) Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face and brain).
- 3) Demonstration of skeleton-articulated and disarticulated.
- 4) Surface anatomy: Surface land mark-bony, muscular and ligamentous. Surface anatomy of major nerves, arteries of the limbs.

HUMAN PHYSIOLOGY-I

PAPER CODE-

B. Sc. Semester I (Neurophysiology Technology)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

UNIT-I

General Physiology

Cell: morphology, Structure and function of cell organelles Structure of cell membrane

Transport across cell membrane Intercellular communication Homeostasis

Blood

Introduction-composition & function of blood

W.B.C., R.B.C., Platelets formation & functions, Immunity

Plasma: composition, formation & functions, Plasma Proteins: -types & functions, Blood Groups-
types, significance, determination.

Hemoglobin, Haemostasis

Lymph-composition, formation, circulation & functions

UNIT-II

Cardiovascular system

Conducting system-components, impulse conduction Heart valves Cardiac cycle-definition, phases of
cardiac cycle.

Cardiac output-definition, normal value, determinants.

Stroke volume and its regulation.

Heart rate and its regulation:

Arterial pulse, Blood pressure-definition, normal values, factors affecting blood pressure.

Shock-definition, classification, causes and features, Basic idea of ECG, Cardiovascular changes
during exercise

UNIT-III

Respiratory System

Mechanics of respiration Lung volumes and capacities

Pulmonary circulation, transport of respiratory gases

Factors affecting respiration, Regulation of respiration-neural regulation, voluntary control and
chemical regulation

Hypoxia, Hypercapnoea, Hypocapnoea,

Artificial respiration Disorders of respiration- dyspnoea, orthopnoea, hyperpnoea, hyperventilation,
apnoea, Tachypnoea, Respiratory changes during exercise.

Digestive System Digestion & absorption of nutrients, Gastrointestinal secretions & their regulation
Functions of Liver & Stomach

UNIT-IV

Nervous system

Introduction, central and peripheral nervous system, functions of nervous system

Reflexes-monosynaptic, polysynaptic, superficial, deep & withdrawal reflex Sense organ, receptors, electrical & chemical events in receptors.

Sensory pathways for touch, temperature, pain, proprioception & others.

Control of tone & posture: Integration at spinal, brain stem, cerebellar, basal ganglion levels, along with their functions.

Motor mechanism: motor cortex, motor pathway: the descending tracts -pyramidal & extrapyramidal tracts-origin, course, termination & functions. Upper motor neuron and lower motor neuron paralysis.

Special senses-eye, ear, nose, mouth

Water excretion, concentration of urine-regulation of Na⁺, Cl⁻, K⁺ excretion

Nerve Muscle Physiology

Muscles-classification, structure, properties, Excitation, contraction, coupling, Motor unit, EMG, factors affecting muscle tension, Muscle tone, fatigue, exercise .

Nerve – structure and function of neurons, classification, properties Resting membrane potential & Action potential their ionic basis, All or None phenomenon Neuromuscular transmission Ionic basis of nerve conduction.

Concept of nerve injury & Wallerian degeneration Synapses.

Electrical events in postsynaptic neurons Inhibition & facilitation at synapses .

Chemical transmission of synaptic activity Principal neurotransmitters. Chemical transmission of synaptic activity Principal neurotransmitters.

Text/ Reference Books:

1. Fundamentals of Neurophysiology | Robert F. Schmidt
2. Clinical Neurophysiology by UK Mishra
3. Physiology by AK Jain and Indu Khurana

HUMAN PHYSIOLOGY I-PRACTICAL

PAPER CODE-

B. Sc. Semester I (Neurophysiology Technology)

L	T	P	Credits	Examination:	30 Marks
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				Total:	50 Marks

1. Haemoglobinometry
2. WhiteBloodCellcount
3. RedBloodCellcount
4. DeterminationofBloodGroups
5. Leishman'sstainingandDifferentialWBCcount
6. DeterminationofpackedcellVolume
7. Erythrocytesedimentationrate[ESR]
8. CalculationofBloodindices
9. DeterminationofClottingTime,BleedingTime

BASIC BIOCHEMISTRY

PAPER CODE-

B. Sc. Semester I (Neurophysiology Technology)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Basic concept of metabolism and their applied aspects

Unit-I

Carbohydrates: Definition, function and classification of carbohydrate. Monosaccharide, glycoside formation, oligosaccharides and polysaccharides. Glycolysis, catabolic fates of pyruvate, metabolic fate of Acetyl-CoA and Citric acid cycle, gluconeogenesis, glycogen metabolism, pentose phosphate pathway.

Unit-II

Amino acids and proteins: Definition, structure, classification, essential & non essential amino acids. Proteins definition and classification. Primary, secondary, tertiary and quaternary of proteins of proteins

Unit-III

Vitamins: Definition and classification of vitamins, difference between fat soluble and water soluble vitamins. Water soluble vitamins and fat soluble vitamins

Unit-IV

Lipids: Definition, classification and function of lipids. Fatty Acids, Triacylglycerols or Triacylgcerides or neutral fat. Fatty acid metabolism. Ketone body metabolism.

Text/ Reference Books:

1. **Biochemistry by Freeman 5th edition**
2. Basic Neurochemistry - 8th Edition - Elsevier
3. Fundamental Neuroscience - 4th Edition - Elsevier

BASIC BIOCHEMISTRY-PRACTICAL

PAPER CODE-

B. Sc. Semester I (Neurophysiology Technology)

L T P Credits
- - 2

Examination: 30 Marks
Int. Assessment: 20 Marks
Total: 50 Marks

1. Identification of carbohydrates by Molisch's test.
2. Identification of reducing sugar by Benedict's test.
3. Identification of ketose sugars by Seliwanoff's test.
4. Identification of reducing sugar by Osazone test.
5. Identification of cholesterol by Salkowski's test.
6. Identification of protein by Biuret's test.
7. Identification of protein by Ninhydrin test.

Medical Electronics

Paper Code-

B. Sc. Semester I (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit I: -Basic Concepts.

Definition and Units of Basic Electrical Quantities: Voltage, Current, Charge, Power, Resistance, Capacitance, Impedance Reactance, AC and DC, Power Factor, RMS, Average and Maximum Value of AC. Waves Form: Sine Wave, Square Wave, Triangular Waves, Ramp Signals. Basic Circuit Elements: Resistors, Capacitors, Inductors-Types Symbol, Colour Code Representation Series and Parallel Combination and Their Equivalent. Transformer. Circuit Laws: Ohm's Law, Wheat Stone Bridge. Motors: Types and Uses. Thermocouples.

Unit II: - Elements of Electronics.

Material Classification According to their Conduction. Semi Conductors- Intrinsic, Extrinsic, P Type, N Type, Diodes, Transistors, Characteristics & Schematic Representation. Application of Diodes as a Switch & Rectifier, HWR – Half Wave Rectifier, FWR – Full Wave Rectifier, Bridge Rectifier. Application of Transistor, Amplifier. Power Supply Unit, Introduction to Integrated Circuit, Introduction To Operational Amplifiers - Adder, Subtractor Multiplier, Generator - Sine Wave, Square Wave, Triangular Wave.

Unit III: - Digital Circuits

Binary Number System, Bits, Bytes, Octal, Hexadecimal, Addition, Subtraction, 1'S Complement and 2'S Complement. Gates: Universal Gates Or and Not. Exor, Exnor. Truth Table and Boolean Expression. A-D Converter, D-A Converter.

Unit IV: – Electrical Safety and Medical Equipments

Physiological Effect of Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention. Classification of Medical Equipments According to the 1. Type of Protection 2. Mode of Protection.

Text/ Reference Books:

1. Basic Electronics By Debashion DE. -- Pearson.
2. Electronics Device & Circuit, By Robert Boylestad ,Louis Nashelsky.
3. Electronics Device Circuit By David.A.Bell -- Oxford

Communication Skill and Personality Development

Paper Code -

B. Sc. Semester I (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

UNIT 1

Listening Comprehension, Speeches, Interviews, audio-video clippings followed by exercises, Introduction to Communication, Importance of Communication, Barriers to Communication and ways to overcome them.

UNIT 2

Conversation Skills, Greetings and Introducing oneself, Framing questions and answers, Role play, Buying: asking details etc, Word formation strategies, Vocabulary building: Antonyms, Synonyms, Affixation, Suffixation, One word substitution

UNIT 3

Reading Comprehension, Simple narration and Stories, Newspaper and articles clippings, Sentence types, Note Making, Paragraph Writing, Comprehension, Report Writing: types, characteristics.

UNIT 4

Pronunciation, Pronunciation, Syllable and Stress, Intonation and Modulation.

UNIT 5

Writing Comprehension, Letters: types, format, style, Précis Writing, Paragraph: Order, Topic sentence, consistency, coherence, Report and Proposal, Project Writing: Features, Structure.

2nd

Semester

Basic concepts of Neuro Anatomy, Neuro Physiology and Neuro Biochemistry

Paper Code -

B. Sc. Semester II (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit 1 (Neuro Anatomy)

Basic anatomy, Basics of nervous system, Sub divisions of nervous system ,Central, Peripheral, Autonomic, Living anatomy of head and neck.

Thalamus, Introduction, Division of diencephalon, External features parts of thalamus, Nuclei of thalamus, Connections of thalamic nuclei, Uses/ functions

Hypothalamus, Introduction, Division and boundaries of hypothalamus, Hypothalamic nuclei , Connections of hypothalamic, Functions/uses.

Ventricular system, Introduction, Review of skull, Classification, Functions.

Cerebrospinal fluid, Introduction, Production, Circulation and absorption, Function.

Skull, Introduction, Bones of the skull, Joints of the skull, Anatomical position of skull, Features of the skull- exterior and interior

Cerebellum, Introduction, Arterial supply of the cerebellum, External features, Divisions of cerebellum, Internal structure (In brief), Boundaries and functions.

Motor and sensory tracts, Sensory receptors, Sensory and motor pathways, Pyramidal system, Upper and lower motor neuron

UNIT 2 (Neurophysiology)

Nervous system, Physiological structure of human brain, properties and function, **Cerebrum**, Introduction, physiological anatomy, cerebral cortex, cerebral hemisphere, functions, **Reflexes** : Introduction, types, reflexes, Involving, cranial nerves, Functions of cranial nerves, **Motor system**: Introduction, types of motor system, functions and application areas, **Sensory system**: Introduction, stimulus, sensors and receptors and its types, sensory cortex and its types, **Basic neurological examination**: Introduction, absence and presence of disease in nervous system, aspects of neurological examination

UNIT 3 (Neuro Biochemistry)

Introduction to Cell, Definition of the cell, Difference between prokaryotic & eukaryotic cell, Structure of cell, Structure of cell membrane, Structure of various cell organelles i.e. nucleus, mitochondria, golgi body, lysosomes, ribosomes, endoplasmic reticulum, centrioles etc, Detailed function of above mentioned cell organelles.

UNIT 4

Nervous Tissue, Introduction, Types and functions of neurotransmitters, Morphogenesis, Neurulation.

Systematic and clinical Pathology

Paper Code -

B. Sc. Semester II (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

UNIT-I

Clinical Pathology

Routine urine examination—specimen, physical examination, chemical examination, microscopic examination, **routine** examination of CSF, semen analysis, routine examination of sputum, routine examination of body fluids- pleural, peritoneal, synovial.

UNIT-II

Haemodynamic Disorders-

Oedema, thrombosis, Embolism, Infarction, Shock, Hyperemia & congestion, Hemorrhage. **Neoplasm**- Definition, Classification, nomenclature and characteristics, Aetiology & agents causing neoplasm, Biology of neoplastic growth & neoplasm immunology.

UNIT-III

Cardiovascular System- Myocardial Infarction, Atherosclerosis, Pericardial Heart Disease, Ischemic Heart Disease, response of Vascular Walls to injury, Venous Diseases. **Respiratory system**-Restrictive lung disease, pulmonary infection, pleural disorders-pneumothorax, pleural effusion, carcinomas,

Digestive System- Disease of Oesophagus – Congenital, Muscular, Inflammatory and Tumors, Salivary tumors, Stomach - Peptic Ulcer, Gastritis, Neoplasm of Stomach, Intestine – Inflammatory - Ulcerative Colitis, Crohn's Disease, Infective – Enterocolitis, Colorectal cancer, Acute and Chronic Hepatitis, Cirrhosis of Liver, Hydronephrosis, Renal cell carcinoma– Carcinoma of the Breast, Vaginitis, Endometrial Hyperplasia, Ovarian Tumors. Testicular Tumors,

Unit VI:

Nervous system- Meningitis, Encephalitis, Cerebrovascular disease, Demyelinating Disease, Alzheimer's disease, Muscular Dystrophy, Disorder of Neuromuscular Junction, **Skeletal System**- Pyogenic Osteomyelitis, Tubercular Osteomyelitis, Tumors, Osteoporosis, Rickets, Osteoarthritis, Musculoskeletal system

Text/ Reference Books:

1. Diagnostic Pathology: Neuropathology - 2nd Edition - Elsevier
2. Diagnostic Neuropathology - Volume 1 | Julio H. Garcia | Springer
3. Greenfield's Neuropathology Eighth Edition 2-Volume Set

SYSTEMIC AND CLINICAL PATHOLOGY -PRACTICAL

PAPER CODE-

B. Sc. Semester II (Neurophysiology Tech.)

L T P Credits
- - 2 2

Examination: 30 Marks
Int. Assessment: 20 Marks
Total: 50 Marks

1. BT & CT determination
2. ABO/Rh blood grouping by slide methods- Forward & reverse grouping
3. Urine examination – complete (Physical & chemical examination for glucose, proteins, bile salts & ketone bodies).
4. Semen analysis – Physical, Chemical & Neubauer's chamber counting.

Introduction to Medical Electrophysiology

Paper Code -

B. Sc. Semester II (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit I: Cellular Neuroelectrophysiology: Structure of cell membrane, Transport of substances across cell membrane, Sodium and potassium ion channels, Voltage and chemical gating of ion channels, Nernst potential, Electrochemical equilibrium, Resting membrane potential, Postsynaptic potentials, Action potential, Compound action potential, Synaptic transmission, Structure of skeletal muscle, Neuromuscular junction, Motor unit, Motor unit action potential, Recruitment of motor units.

Unit II: Techniques in Neuroelectrophysiology: Noninvasive electrophysiological recording techniques: Advantages of noninvasive procedures, Recent clinical neuroelectrophysiological approaches i.e. Electroencephalography, Electromyography, Nerve conduction studies and Event-related potentials. Invasive electrophysiological recording techniques: Electroencephalography- definition, procedure and clinical application, Intramuscular Electromyography- uses, advantages and disadvantages.

Unit III: Basic Electromyography: Definition, Type of recording procedure, surface electromyography- silver/silver chloride disc electrodes, electrodes montages, Advantages of bipolar derivation, Differential amplification of signal, Frequency filters, Signal to noise ratio, Signal analysis for amplitude and frequency, recruitment of motor units during the voluntary activity. Needle electromyography- insertional and spontaneous activity, motor unit action potential, clinical application of the invasive procedures.

Unit IV: Basic Electroencephalography: Definition, Origin of electrical signal, Dendritic postsynaptic potential, Cortical organization and cortical dipole, brain waves- alpha, beta, theta and delta, Surface electrodes, 10-20 international system of electrode placement, Bipolar and referential montages, Sine wave calibration, Impedance, Amplification of signal, Frequency filters, Signal analysis, Research and clinical applications in sleep studies and epilepsy. Available invasive procedure and their applications.

Neuro- Pharmacology

Paper Code -

B. Sc. Semester II (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit 1

Introduction to Pharmacology, Pharmaco-kinetics, Pharmaco-dynamics

Unit 2

Drugs:

- Adverse effects of drugs
- Classification of drugs
- Antibiotics
- Neuro tonic
- Anti-inflammatory
- Analgesic and antipyretic
- Muscle relaxant etc.

Unit 3

Effects of drugs, Classification of disease, effects, mechanism of action, Indication and contra indication

Fundamentals of Computer Science

Paper Code -

B. Sc. Semester II (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

UNIT-I

Introduction:

What are computers, Application areas, Characteristics & limitations, Evolution of computers, Classification & generations of computers, Data representation in computer memory (numbering system)

Computers Architecture /Organization:

Basic architecture, Functional Block diagram, Types of computers on the basis of purpose, Signal and Portability.

UNIT-II

Hardware:

CPU their generations and performance parameters, Input, output and storage devices. Primary (Main) Memories (RAM, ROM, Types of RAM and ROM, Cache Memory, Registers and types of registers, Storage Evaluation Criteria, Memory Capacity), Secondary Storage Devices: (Magnetic Disk, Floppy and Hard Disk, USBs, Optical Disks CD-ROMs)

Software:

Types: System Software (Machine Level Languages, Operating Systems, Device Specific Drivers), Higher Level Languages, and Applications

UNIT-III

Languages: Machine Language, Assembly Languages, Programming Languages. Use of Compilers, Assemblers, Linkers, Loaders and interpreters in programming languages

Operating System: Booting/Start Up Procedure of machines, Introduction to Operating System, Functions and Classification of Operating Systems, Basic introduction to DOS, UNIX/LINUX OS, Windows

HTML, Use of Multimedia, Computer aided teaching and testing
Application Software MS office (Word, Excel and Powerpoint)

UNIT-IV

Basic Introduction to Computer Networks:

Data Communication, Network devices (Hub, Switches, Modems, and Routers etc), LAN, LAN topologies, WAN, MAN, Internet: Introduction, Basics of E-mail, Web browsers (IE, Google Chrome, and Mozilla Firefox),

Structure of Universal Resource Locator, Domains (.com, .in, .country specific, .org and rationale behind them), IP address, Backbone network, Network connecting devices, HTTP, DNS, Network Security and Search Engine.

Text/ Reference Books:

1. Computer Fundamentals by Pradeep K. Sinha & Priti Sinha
2. Data communication and networking by Behrouz A. Forouzan
3. Computer basics by Bittu Kumar
4. Principles of operating system by Peter Baer Galvin

3rd

Semester

Basics of Electrocardiography

Paper Code -

B. Sc. Semester III (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit I :- Basic & Bedside Cardiology

Physiological Anatomy of Heart, General Principal of Circulation and Regulation, Coronary Circulation, Cardiovascular Regulatory Mechanism, Heart Rate & Cardiac Output, Apical Impulse, Arterial Pulse, Jugular Venous Pulse, Heart Sounds (S1, S2, S3 & S4), Murmurs (Systolic/Diastolic), Ejection Sounds, Non Ejection Sounds, Blood Pressure & Its Regulation.

Unit II : – Circulatory & Functional Cardio Pathology

Concept of Hper / Hypotention, Secondary Hypertention, Low Volume and Absent Pulse in Lower Limbs, Basic Concept of Peripheral Vascular Disease, Coronary Artery Disease – Atherosclerosis, Ischemic Heart Disease, Angina Pectoris and Acute Myocardial Infarction, Heart Block – Sino-Atrial, Atrio – Ventricular, Bundle Branch Block, New Rhythm Centre – A. Extra systole – Atrial/ Ventricular, B. Cardiac Arrhythmia – Atrial, Ventricular & Paroxysmal Tachycardia, WPW Syndrome

Unit III : -- Clinical Electrocardiography

Fundamentals of Electrocardiography, Einthovin theory of Electrical Activity, Electrode & Lead System, Electrocardiography – Procedure of Recording of ECG, Unipolar Recording, Bipolar Recording, Cardiac Vector & the Electrical Axis, The Electrical Rotation of Heart, Normal ECG, Normal Electrocardiographic Variants in Adults

Unit IV : – Abnormal ECG

Disorders of Cardiac Rhythm, Electrolyte Disturbances, Coronary Artery Disease – Myocardial Ischemia, Myocardial Infarction

Basics of Electrocardiography- Practical

PAPER CODE-

B. Sc. Semester III (Neurophysiology Tech.)

L T P Credits
- - 2 2

Examination: 30 Marks
Int. Assessment: 20 Marks
Total: 50 Marks

1. Study the features of ECG machine (Single/ multichannel), ECG paper (Calibration), Gel & Electrodes.
2. Placement of chest and limb electrodes
3. Study the concept of 12 leads ECG (standard, augmented & chest leads)
4. Study the normal features of ECG waves
5. Study the normal features of intervals & segments
6. Determination of cardiac rhythm, Rate & axis

Electromyography & Nerve Conduction Studies

Paper Code -

B. Sc. Semester III (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit I: Neuromuscular physiology: Anatomy of nerve and muscle, Normal neuromuscular function, Motor function, Sensory function, Neuron cell body dysfunction, Peripheral nerve axon dysfunction, Peripheral nerve myelin dysfunction, Neuromuscular junction dysfunction, Muscle dysfunction, Motor units.

Unit II: Nerve Conduction Basics: Motor nerve conduction study, Sensory nerve conduction study, Electrodes, Electrode Position, Stimulus Characteristics, Procedure, Measurements, Types of abnormalities, Late responses, F-wave study, H-reflex, Blink reflex, Tests for neuromuscular junctions, Repetitive nerve stimulation.

Unit III: Electromyography Basics: Conventional needle EMG, Macro EMG, Surface EMG, Single-fiber EMG, Electrodes, Filters, Amplifier, Display, Averager, Gain and Sweep time, Electrode position, Procedures, Rest, Insertion, Single motor unit activation, Maximal contraction, Normal and abnormal responses.

Unit IV: Approach to Clinical Questions: Common clinical presentations, Evaluation of individual nerves, Evaluation of individual muscles, Evaluation of neuromuscular transmission, Electromyographic findings in myopathic, neurogenic and neuromuscular disorders, Clinical correlations of nerve conduction and EMG.

Electromyography & Nerve Conduction Studies- Practical

PAPER CODE-

B. Sc. Semester III (Neurophysiology Tech.)

L	T	P	Credits	Examination:	30 Marks
-	-	2	2	Int. Assessment:	20 Marks
Total:					50 Marks

1. To introduce different component and connections of EMG machine
2. To introduce the optimum settings and calibration of EMG machine
3. To record normal electrical activity of particular muscle
4. To record and analyse electromyography from proximal and distal muscles
5. To record and analyse motor nerve conduction study of peripheral nerve
6. To record and analyse sensory nerve conduction study of peripheral nerve
7. To record and analyse F-wave in normal Subject from of peripheral nerve
8. To record and analyse H- reflex in normal Subject from of peripheral nerve
9. To record and analyse repetitive nerves stimulation from peripheral nerve

Neuromuscular Disorder

Paper Code -

B. Sc. Semester III (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit I: Polyneuropathies: Diabetic neuropathy, Acute inflammatory demyelinating polyradiculoneuropathy, Chronic inflammatory demyelinating polyneuropathy, Multifocal motor neuropathy, axonal neuropathies, Hereditary neuropathies.

Unit II: Mononeuropathies: Entrapment Neuropathies of Median nerve, Ulnar neuropathy, Radial neuropathy, Brachial plexus lesion, Peroneal neuropathy, Tibial neuropathy, Sciatic neuropathy, Radiculopathy, Mononeuropathy multiplex.

Unit III: Muscular dystrophies: Duchenne and Becker's muscular dystrophy, Limb-girdle dystrophy, Myotonic dystrophy, Tetanus, Stiff-man syndrome, Schwartz-Jampel syndrome, Neuromyotonic, Myotonia congenital, Periodic paralysis.

Unit IV: Inflammatory and metabolic myopathies: Polymyositis, Dermatomyositis, Inclusion body myositis, Viral myositis, endocrine myopathies, Mitochondrial myopathies, Hypokalemic periodic paralysis, Hyperkalemic periodic paralysis.

Medical Emergencies & Patient Care

Paper Code -

B. Sc. Semester III (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit – I: Introduction to Emergency Services

Organization of Emergency Department, Guidelines in Emergency, Clinical Monitoring, Fluid Therapy and Blood Transfusion, Airway Management, Cardiopulmonary Resuscitation, Principal of Mechanical Ventilation, Injection – An Infusion Method, Acid Base and Electrolyte Imbalance

Unit – II: Handling of Different Emergencies

Cardiogenic Shock, Congestive Cardiac Failure, Myocardial Infarction, Head Injuries, Vasovagal Syncope, Seizer, Epilepsy, Conjunctival and Corneal Foreign Body, Foreign Body in Nose & in Ear, Epistaxis, Asthma, COPD, Haemoptysis, Rib Fracture, Tear Gas Exposure, Food Poisoning, Diarrhea, Urine Retention, Blunt Scrotal Trauma, Hypo & Hyperthermia

Unit – III: Fundamentals of Patient Care

Concept of health & Illness, Health Determinants, Concept of Patients & Their Types, Patient Centred Care & Fundamentals of Communications, Reporting & Recording of Patients, Rights of Patients , Concepts of Disease & Its Types, General Concept, Care & Prevention of Accident, Trauma & Infections

Unit – IV: Patient Care, Associated Units & Departments

Ambulatory Units, Critical Care Units ,Paediatric, Neonatal Intensive Care Unit (NICU), Emergency Department, Inpatient Units, Haematology/Oncology and Immunology Unit , Orthopaedic Unit, Psychiatry Unit ,Neurology and Neurosurgical Unit, Renal, Dialysis Unit, Gastroenterology/Endocrinology Unit, Life Flight Critical Care Transport Program, Radiology Department, Surgical Units, Cardiac Catheterization Lab, Operating Room, Post Anaesthesia Care Unit, Managing patients with disabilities, Geriatric Care, Care of Critically Ill Patients, Tracheotomise Patients. Nutritional Support in ICU

Environmental Studies

B. Sc. Semester III (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit 1

The Multidisciplinary nature of environmental studies, Definition, scope and importance. Need for public awareness. Natural Resources :Renewable and non-renewable resources: Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Unit 2

Ecosystems: Concept of an ecosystem. Structure and function of an ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Biodiversity and its conservation, Hot-spots of biodiversity, Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

Unit 3

Environmental Pollution : Definition, causes, effects and control measures of:- air pollution, water pollution, soil pollution, marine pollution, noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Fireworks, their impacts and hazards, Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

Unit 4 : Social Issues and the Environment, From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Case studies , Environmental ethics: Issues and possible solutions. Consumerism and waste products. Environmental Legislation (Acts and Laws). Issues involved in enforcement of environmental legislation, Human Population and the Environment, Population growth, variation among nations with case studies, Population explosion – Family Welfare Programmes and Family Planning Programmes, Human Rights, Value Education, Women and Child Welfare.

4th

Semester

Brain Waves & Electroencephalography

B. Sc. Semester IV (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit I: EEG Basics: Generation of EEG rhythms, Cortical potentials, Scalp potentials, Basic EEG rhythms, Alpha rhythm, Beta rhythms, Theta rhythms, Delta rhythms, Generation of Epileptiform activity, Spikes and sharp waves. Technical aspects of EE, EEG equipment, Electrodes, Montages, Routine EEG, Calibration, Sensitivity, Duration, Filters, Activation methods, Photic stimulation, Hyperventilation.

Unit II: Normal EEG: EEG in adults, Anterior cerebral activity, Posterior cerebral activity, EEG in children, Maturation of the posterior rhythm, Normal transient and variants, Lambda waves, Mu rhythm, Wicket spikes, Slow alpha variant, Rhythmic mid-temporal theta, Subclinical rhythmic electrographic discharges, Noncerebral potentials, Eye and muscle artifacts, Movement and machine artifacts, Electrocardiogram and pulse artifacts.

Unit III: Abnormal EEG: Slow activity, Diffuse slowing, Focal slowing and polymorphic delta activity, Intermittent rhythmic delta activity, Slow activity as a seizure discharge, Spike and sharp waves, Focal sharp activity, Generalized sharp activity, Periodic patterns, Periodic lateralized epileptiform discharges. Normal photic response, Photomyoclonic response, Photoconvulsive response.

Unit IV: Special EEG studies: Neonatal EEG, Recording procedures, Guidelines for interpretation, Maturation of the EEG, Abnormality of maturation, Epileptiform activity, Background abnormality. Brain death, Guidelines for determination of brain death in adult and children, EEG monitoring, Methods and interpretation, Quantitative EEG, Spike detection, Power spectral analysis, Brain mapping.

Brain Waves & Electroencephalography- Practical

B. Sc. Semester IV (Neurophysiology Tech.)

L T P Credits
- - 2 2

Examination:

30 Marks

Int. Assessment:

20 Marks

Total:

50 Marks

1. To introduce different component and connections of EEG machine
2. To introduce the optimum settings and calibration of EEG machine
3. To record normal electrical activity of brain the scalp
4. To study the 10-20 electrode placement system
5. To study the different montages used during EEG recording
6. To record single/multi-channel EEG in normal subject
7. To demonstrate various artifacts during routine EEG recording in normal healthy patients

Neurological Disorders

B. Sc. Semester IV (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit I: Stroke: Definition, Classification of stroke by etiology, Pathophysiology, Diagnosis, Management of acute stroke, Primary Prevention, Secondary Prevention of ischemic stroke and Secondary Prevention of cerebral hemorrhage.

Unit II: Seizures: Clinical characteristics of seizures, Seizures vs Epilepsy, Epilepsy syndrome, Pathophysiology, Diagnosis, Determining the cause of seizures, Management of seizures and epilepsy, Special clinical problems, Status Epilepticus.

Unit III: Dementing Illnesses: Primary Dementing Illnesses, Alzheimer's Disease, Dementia with Lewy Bodies, Frontotemporal Dementia, Vascular Dementia, Normal Pressure Hydrocephalus, Creutzfeldt Jakob Disease, Other neurological diseases that produces dementia.

Unit IV: Movement Disorder: Classification of Movement disorder, Specific movement disorder, Essential Tremor, Parkinson's disease, Parkinsonian Syndromes, Hereditary Ataxia, Huntington's Disease, Tardive Dyskinesia, Dystonias, Wilson's Disease Gilles de la Tourette's Syndrome.

Unit V: Multifocal CNS Disorder: Approach to Multifocal Disorder, Focal disease with multiple progressions, Metastatic cancer, CNS infection, Inherently Multifocal diseases, Multiple Sclerosis, Connective tissue disease, Sarcoidosis, Coagulation disorders.

Polysomnography & Sleep Sciences

B. Sc. Semester IV (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit I: Sleep Physiology

Normal sleep wake cycle, Sleep stages, Waking state, Non REM sleep, Sleep stage 2, Sleep stage 3, Sleep stage 4, REM sleep, Neurophysiologic mechanisms of Non REM and REM sleep, Sleep wake regulation, Neurotransmitter involved, Indications for sleep studies.

Unit II: Polysomnography

Physiological measurements EEG, Electro-oculogram (EOG), Submental EMG, ECG, Respiration, Blood oxygen saturation, Expired CO₂, Body and limb movement, Audiovisual monitoring, Time, Recording protocol for a standard nocturnal study, Interpretation.

Unit III: Sleep disorders

Classification of sleep disorders, Epidemiology of sleep disorders, Non-REM, or isolated, narcolepsy, REM, or compound, narcolepsy, Obstructive sleep apnea (OSA), Central or non-obstructive sleep apnea, Mixed sleep apnea. Treatment and preventive measures.

Unit IV: Sleep studies

Multiple sleep latency tests, Maintenance of wakefulness test, Out of Sleep Center Test, Subjective evaluation of sleepiness, Sleep scoring, Actigraphy, Methods, Interpretation, Sleep deprivation, Clinical application of sleep studies.

5th

Semester

Sensory Physiology & Evoked Potential

B. Sc. Semester V (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit – I: Basic Sensory Physiology, Taste & Olfaction

Sensory receptors- Touch, Pressure, Pain and Temperature, Somatic and Visceral Senses, Exteroreceptors, Viseroreceptor, Proprioceptors. Taste Receptors, Taste Pathway, Physiology of Taste, Applied – Ageusea, Hyogeusia & Dysgeusia. Olfactory Receptors, Physiology of Olfaction, Olfactory Pathway, Applied – Anosmia, Parosmia & Hyposmia.

Unit – II: Physiology of Eye & Ear

Visual Pathway, Image Forming Mechanism, Photochemistry of Vision, Electrophysiology of Vision, Photopic and Scotopic Vision, Adaptation, Colour Vision, Colour Blindness, Nystagmus. Auditory Pathway, Physical Properties of Sound, Mechanism of Hearing, Electrophysiology of Hearing, Auditory Cortex, Applied Aspect – Deafness, Tinnitus. Audiometry.

Unit III: Visual and Auditory Evoked Potentials

Neural generators, General principles, Methods, Electrode placement and montages, Recording parameters, Interpretation, waveform identification, Variant waveform, Clinical correlations, Optic neuritis, Multiple sclerosis, Tumors, Ocular disorders, Acoustic neuroma, Brainstem tumor, Stroke, Multiple sclerosis, Coma and brain death.

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Unit IV: Somatosensory Evoked Potentials

Neural generators, General principles, Median SEP Tibial SEP Methods, Acquisition of signal, Waveform identification and interpretation, Clinical correlations, Normal and abnormal responses. Transverse myelitis, Multiple sclerosis, Peripheral neuropathy, B12 deficiency Spinal cord injury, Brain death and Stroke.

Biopotentials Signals and report writing

B. Sc. Semester V (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

UNIT 1

Introduction of biopotential signals their frequency and amplitude, Evoked Potential, Introduction, Types, Visual pathways, Late Response, Blink Reflex, Clinical significance

UNIT 2

BERA, Introduction, auditory pathways, electrode (shielded electrodes), Repetitive Nerve Stimulation, Clinical significance.

UNIT 3

Pattern reversal, Introduction, working principle, partial field stimulation, check board, Clinical significance

Stroboscope, Introduction, working principle, factual report writing

UNIT 4

Instrumentation of EMG/NCV and EEG machines- Block diagram, working, waveform analysis, differential amplifiers, operational amplifiers, filters

Recording technique and parameter, Source of artefacts & methods of elimination, Activation procedure; Hyperventilation, Photic stimulation, Electrode , Types, Electrode Impedance.

RESEARCH METHODOLOGY & BIOSTATISTICS

B. Sc. Semester V (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

Unit 1

Introduction-Definition and characteristics of statistics Importance of the study of statistics, Branches of Statistics, Statistics of and health sciences including nursing, Parameters and estimates, Descriptive and inferential statistics, Variables and their types Measurement scales.

UNIT 2

Tabulation of Data, Raw Data, the array, frequency distribution, Basic principles of graphical representation, Types of diagrams – histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, normal probability curve.

UNIT 3

Measures of Central Tendency, Introduction: Uses, applications and practical approach, Definition and calculation of mean for ungrouped and grouped data Meaning, interpretation and calculation of ungrouped and grouped data, Meaning and calculation of mode, Comparison of mean and mode, Guidelines for the use of various measures of central tendency.

UNIT 4

Measures of Variability, Introduction: Uses, applications and practical approach, The range, average deviation or mean deviation, The variance and standard variation, Calculation of Variance and standard variation for ungrouped and grouped data, Properties and uses of variance and standard deviation.

UNIT 5

Sampling Techniques, Introduction: Uses, applications and practical approach, Criteria for good samples, Application of Sampling in Community, Sampling Methods, Sampling and Non- Sampling errors, Sampling variation and tests of significance

Hospital Management & medical ethics (Theory)

B. Sc. Semester V

L T P Credits
3 1 - 4

Examination: 60 Marks

Int. Assessment: 40 Marks

Total: 100 Marks

Duration of Examination: 3 Hours

UNIT-1 Introduction to hospital staffing- Hospital staffing, administration, PACS, HIS, RIS, DICOM. Medical records and documentation.

UNIT-2 Legal & medical issues- Legal and Ethical issues towards patient rights, patient responsibility, legal concerns, History taking, patient monitoring, inform consent, mal-practice, patient privacy issues. Professional ethics and Code of conduct of radiographer. Medical legal issues (MLC).

UNIT-3 Handling of patients Seriously ill and traumatized patients, visually impaired, hearing and speech impaired patients, mentally impaired patients/ psychologically issues, infectious patients, critical/trauma patients, pregnant patient, patient with implant. Handling of patient with life threatening diseases like HIV, STD, HBsAG, etc.

UNIT-4 Departmental Safety & Infection Control Safety and hazards from material and electricity etc. Biomedical waste management and control. **Infection control** Skin care, donning of gowns, gloves, face masks, head caps, shoe covers. **Vitals signs-** Vital signs. How to measure vital signs. **Body mechanics and transferring & shifting of patient** Draw sheet lift, use of slide boards, wheelchair to couch, couch to wheelchair, couch to table, three men lift and four men lift Orthodox & Austrian method etc. **First aid-** Artificial respiration, hemostasis, first aid techniques, ABCD management.

UNIT-5 Anesthesia- Local anesthesia and general anesthesia, uses in hospital, Facilities regarding general Anesthesia in different department of hospital. Management of adverse.

6th

Semester

Neuro Imaging and Intra Operative Neuro Monitoring

B. Sc. Semester VI (Neurophysiology Tech.)

L T P Credits
3 1 - 4

Examination: 60 Marks
Int. Assessment: 40 Marks
Total: 100 Marks
Duration of Examination: 3 Hours

UNIT 1

IONM Basics and Common Modalities, Introduction to IONM and Basics of Recording Somatosensory Evoked Potentials (SSEPs) Electromyograms (EMGs) and Transcranial Electrical Motor Evoked Potentials (TceMEPs) Brainstem Auditory Evoked Responses (BAERs) Electroencephalograms (EEGs) and Other IONM Modalities, Factors Affecting Daily Job Performance of IONM Personnel.

UNIT 2

Fundamentals and principles of IONM,

Requirements for IONM in a Hospital Organization: Challenges & Integration in Medical Care, Programs, Financing, Education programs and Credentialing, Features and Limitations.

UNIT 3

Introduction to neuro- imaging techniques, Principles, Advantages & Disadvantages, Recent advances.

Introduction to Emission Computed Tomography (ECT) systems. Principles and applications of SPECT, Principles and applications of PET, Principles and applications of CT, System components of CT, Contrast Scale for different neuro- imaging techniques.

Introduction to MRI system, Principles of MRI and fMRI, Basic MR components, Biological Effect on MR Imaging, Advantage of MR Imaging system.

Introduction to BCI, Applications of BCI, Introduction to MEG, Applications of MEG, Advantage and disadvantage of MEG.

Text/ Reference Books:

1. Intraoperative Monitoring of Neural Function by Marc R. Nuwer
2. Intraoperative Neuromonitoring Hardcover by Christopher Loftus