Department of Paramedical Sciences

Faculty of Allied Health Sciences

SGT UNIVERSITY

Shree Guru Gobind Singh Tercentenary University

Gurgaon-122505

Syllabus

B.Sc. Neurophysiology Technology (NPT)

Duration: 3 years (6 Semester)

W.e.f. Academic Session 2020-21

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PREAMBLE:

To be recognized as an excellent neuro physiology Technologist center in education, clinico Laboratory service, Innovations and research by promoting a climate of teamwork and collaboration with renowned national and International such centers.

GOALS:

To provide well trained professionals for neuro physiology Technology and allied industries to meet the well trained men power requirements.

To provide quality teaching and skill development to the students of neuro physiology technology and inculcate in them the research aptitude leading to innovation simultaneously providing better patient care.

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PROGRAM EDUCATION OBJECTIVES:

(1) Promote the acquisition of knowledge and provide experience in laboratory direction and management and encourage students to assume a leadership role in the education of other physicians and allied health professionals

(2) Promote the development of investigative skills to better understand neurophysiologic processes as they apply to both individual patients and the general patient population.

(3) The graduates will get hands on experience in various aspects of neurophysiology technology viz. electrophysiology equipments, medical program developers, software testing for EEG, EMG/NCV machines.

(4) To gain experience and skill in interpreting emergency portable EMG/NCV, EEG in patient and intensive care setting.

(5) The program will help the graduates to take up responsibilities in testing, Identifying and analyze complex epilepsy and neurological diseases.

(6) Promote effective communication and sharing of expertise with peers and colleagues.

Program Education Outcomes

- Explain the processes involved in neural communication that allow for cell-cell signaling, muscle force production, involuntary and voluntary movement, and locomotion.
- To become proficient in interpreting adult, pediatric and neonatal electroencephalograms.
- Professionally work as a neurophysiology technologists in hospitals/labs.
- Setup their own electrophysiology labs, Ability and skills to perform and interpret electrophysiology procedures.
- Work as a fitness coach for athletes who examine their nerve and muscles.
- Apply the knowledge gained during the course of the program from human neuro anatomy and neurophysiology, Basics of pharmacology and computing in particular to identify, formulate and solve real life problems faced in laboratories during test, in industries and/or during research work.
- Understand relationship with patients and patient care. Able to work with different kinds of machines used in different organization and laboratories with their working.

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1st

Semester

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HUMAN ANATOMY-I (Theory)

PAPER CODE- 05310101

B. Sc. Semester I (Neurophysiology Technology)

L	T	P	Credits
3	1	0	4

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

Course Outcomes:

On successful completion of this course, students will able to:

1. Knowledge of general anatomy and subdivisions.
2. Knowledge of basic human anatomy and histology of lower and upper extremities.
3. Knowledge of basic human anatomy and histology of spine and thorax.
4. Knowledge of basic human anatomy and histology of cardiovascular system.
5. Knowledge of basic anatomy and histology of GI and respiratory systems.

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 extrimities)
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

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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 Inderbirsingh
3. Neuroanatomy by B.D. Chaursia

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HUMAN ANATOMY I-PRACTICAL

PAPER CODE- 05310102

B. Sc. Semester I (Neurophysiology Technology)

L	T	P	Credits		
				Examination:	30 Marks
0	0	2		Int. Assessment:	20 Marks
				Total:	50 Marks

Course Outcomes:

On successful completion of this course, students will able to:

1. To identify the anatomical structures of brain.
2. Able to differentiate between lobes of brain.
3. Basic knowledge of skeletal muscles and their innervations.

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.

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HUMAN PHYSIOLOGY-I (Theory)

PAPER CODE- 05310103

B. Sc. Semester I (Neurophysiology Technology)

L	T	P	Credits
3	1	0	4

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

Course Outcomes:

On successful completion of this course, students will able to:

1. Knowledge of general physiology and nerve-muscle physiology.
2. Knowledge of basic human physiology with respect to CVS and GI system.
3. Knowledge of basic human physiology with respect to Respiratory system
4. Knowledge of basic human physiology of excretion and CNS.

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

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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 SystemDigestion& 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

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HUMAN PHYSIOLOGY I-PRACTICAL

PAPER CODE- 05310104

B. Sc. Semester I (Neurophysiology Technology)

L	T	P	Credits		
0	0	2		Examination:	30 Marks
				Int. Assessment:	20 Marks
				Total:	50 Marks

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge of blood cells.
2. Able to differentiate between blood groups.
3. Basic knowledge of staining methods for blood count.

1. Haemoglobinometry
2. White Blood Cellcount
3. Red Blood Cellcount
4. Determination of Blood Groups
5. Leishman's staining and Differential WBC count
6. Determination of packed cell Volume
7. Erythrocyte sedimentation rate[ESR]
8. Calculation of Blood indices
9. Determination of Clotting Time, Bleeding Time

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BASIC BIOCHEMISTRY (Theory)

PAPER CODE- 05310105

B. Sc. Semester I (Neurophysiology Technology)

L	T	P	Credits
3	1	0	4

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

Course Outcomes:

On successful completion of this course, students will able to:

1. Knowledge of biochemistry of carbohydrates.
2. Knowledge of biochemistry of cell structure, functions, digestion, enzymes and proteins.
3. Knowledge of biochemistry of minerals and vitamins.
4. Knowledge of biochemistry of liver and renal function tests, specialized laboratory investigations and lipids.

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

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BASIC BIOCHEMISTRY-PRACTICAL

PAPER CODE- 05310106

B. Sc. Semester I (Neurophysiology Technology)

L	T	P	Credits		
0	0	2		Examination:	30 Marks
				Int. Assessment:	20 Marks
				Total:	50 Marks

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge of carbohydrates, cholesterol and tests.
2. Able to identify protein by different tests.

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.

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Medical Electronics (Theory)

Paper Code- 05310107

B. Sc. Semester I (Neurophysiology Tech.)

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge in Physics and Electronics.
2. Basics of elements of electronics- amplifier.
3. Basics of digital circuits.
4. Basic knowledge in electrical safety and medical equipments.

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

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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 Convertor, D-A Converter.

Unit IV: – Electrical Saftey and Medical Equipements

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 ByDebashion DE. – Pearson.
2. Electronics Device & Circuit, By Robert Boylestad ,LouisNashelsky.
3. Electronics Device Circuit By David.A.Bell – Oxford

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Communication Skill and Personality Development (Theory)

Paper Code - 05310108

B. Sc. Semester I (Neurophysiology Tech.)

L	T	P	Credits
3	1	0	4

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

Course Outcomes:

On successful completion of this course, students will able to:

1. Develop their intellectual, personal and professional abilities.
2. Acquire basic language skills (listening, speaking, reading and writing) in order to communication with speakers of English language.
3. Acquire the linguistic competence necessarily required in various life situations
4. Basic knowledge of pronunciation.

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.

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2nd

Semester

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Basic concepts of Neuro Anatomy, Neuro Physiology and Neuro Biochemistry (Theory)

Paper Code - 05310201

B. Sc. Semester II (Neurophysiology Tech.)

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Knowledge of neuro anatomy and anatomical positions in skull.
2. Knowledge of neuro physiology and basic neurological examinations.
3. Knowledge of neuro biochemistry and structure of various cell organelles
4. Knowledge of nervous tissue and neuro transmitters.

Unit I (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.

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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.

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Systematic and clinical Pathology (Theory)

Paper Code - 05310202

B. Sc. Semester II (Neurophysiology Tech.)

L	T	P	Credits
3	1	0	4

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

Course Outcomes:

On successful completion of this course, students will able to:

1. Knowledge of general and clinical pathology.
2. Knowledge of pathology of hemodynamic disorders.
3. Knowledge of basics of cardiovascular system.
4. Knowledge of basics of nervous system.

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-

Odema,thrombosis, Embolism, Infarction, Shock, Hyperemia& congestion, Heomorrhage. Neoplasm- Definition, Classification, nomenclature and charatteristics, Ateiology& agents causing neoplasm, Biology of neoplastic growth & neoplasm immunology.

UNIT-III

Cardiovascular System- Myocardial Infraction, 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 – Cngenital, Muscular, Infflamatory and Tumors, Salivary tumors, Stomach - Peptic Ulcer,Gastritis, Neoplasm of Stomach, Intestine – Inflammatory - Ulcerative Colitis, CrohnsDisease,Infective – Entrocolitis, Colorectal cancer, Acute and Chronic Hepatitis, Cirrhosis of Liver, Hydronephrosis, Real cell carcinoma- Carcinoma of the Breast, Vaginitis, Endometrial Hyperplasia,OvarianTumors, Testicular Tumors.

Unit VI:

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Nervous system- Meningitis, Encephalitis, Cerebrovascular disease, Demylenating Disease, Alzheimres 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

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SYSTEMIC AND CLINICAL PATHOLOGY -PRACTICAL

PAPER CODE- 05310203

B. Sc. Semester II (Neurophysiology Tech.)

L	T	P	Credits		
0	0	2	2	Examination:	30 Marks
				Int. Assessment:	20 Marks
				Total:	50 Marks

Course Outcomes:

On successful completion of this course, students will able to:

1. Blood grouping by different methods.
2. Basic knowledge of urine examination.

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.

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Introduction to Medical Electrophysiology (Theory)
Paper Code - 05310204

B. Sc. Semester II (Neurophysiology Tech.)

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge in cellular neuro electrophysiology.
2. Techniques in neuro lector physiology.
3. Basic knowledge in electromyography.
4. Basic knowledge in electroencephalography.

Unit I: Cellular Neuro electrophysiology: 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 Neuroelectrophysiolgy: 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: Electrocorticorticography- 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.

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Neuro- Pharmacology (Theory)

Paper Code - 05310206

B. Sc. Semester II (Neurophysiology Tech.)

L	T	P	Credits
3	1	0	4

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

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge in pharmacology
2. Detailed systemic pharmacology
3. Detailed knowledge of drugs and groups of drug

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

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Fundamentals of Computer Science (Theory)

Paper Code - 05310207

B. Sc. Semester II (Neurophysiology Tech.)

L	T	P	Credits
3	1	0	4

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

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic under-standing of use of computer.
2. Basics of hardware and software of computer.
3. Detailed knowledge of language and operating system of computer.
4. Basic Introduction to Computer Networks.

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:

Basicarchitecture, 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

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Basics of Electrocardiography (Theory)

Paper Code - 05310301

B. Sc. Semester III (Neurophysiology Tech.)

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge of Basic & Bedside Cardiology.
2. Basics knowledge of Circulatory & Functional Cardio Pathology.
3. Technique and basic knowledge of Procedure of Recording of ECG.
4. Interpretation of abnormal ECGs.

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, SecondaryHypertention, 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,

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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

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Basics of Electrocardiography- Practical

PAPER CODE- 05310302

B. Sc. Semester III (Neurophysiology Tech.)

L	T	P	Credits		
0	0	2	2	Examination:	30 Marks
				Int. Assessment:	20 Marks
				Total:	50 Marks

Course Outcomes:

On successful completion of this course, students will able to:

1. Able to perform 12 lead ECG.
2. Interpret of ECG waves.
3. Basic knowledge of cardiac rhythms.

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 (Theory)

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Paper Code - 05310303

B. Sc. Semester III (Neurophysiology Tech.)

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge in neuromuscular physiology.
2. Basics of Nerve conductions.
3. Basics of EMG.
4. Basic knowledge in evaluation of nerves and muscles.

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, StimulusCharacteristics,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

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transmission, Electromyographic findings in myopathic, neurogenic and neuromuscular disorders, Clinical correlations of nerve conduction and EMG.

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Electromyography & Nerve Conduction Studies- Practical

PAPER CODE- 05310304

B. Sc. Semester III (Neurophysiology Tech.)

L	T	P	Credits		
0	0	2	2	Examination:	30 Marks
				Int. Assessment:	20 Marks
				Total:	50 Marks

Course Outcomes:

On successful completion of this course, students will able to:

1. Identification of components of EMG
2. Advanced knowledge of late responses.
3. Differentiate between all types of nerve stimulation.

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

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Neuromuscular Disorder (Theory)

Paper Code - 05310305

B. Sc. Semester III (Neurophysiology Tech.)

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge in polyneuropathies and its types.
2. Basics knowledge of mononeuropathies and its types.
3. Basics knowledge of muscular dystrophies.
4. Basic knowledge in Inflammatory and metabolic myopathies.

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.

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Medical Emergencies & Patient Care (Theory)

Paper Code - 05310306

B. Sc. Semester III (Neurophysiology Tech.)

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge of emergency services.
2. Techniques for handling different emergencies.
3. Basics knowledge of patient care.
4. Basic knowledge in ambulatory units and departments.

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

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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

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Environmental Studies (Theory)

B. Sc. Semester III (Neurophysiology Tech.)

Paper Code- 05310307

L	T	P	Credits
3	1	0	4

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

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge of multidisciplinary nature of environmental studies.
2. Basic knowledge of ecosystems.
3. Basics knowledge of environmental Pollution.
4. Basic knowledge of Social Issues and the Environment.

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

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Brain Waves & Electroencephalography (Theory)

B. Sc. Semester IV (Neurophysiology Tech.)

Paper Code- 05310401

L	T	P	Credits
3	1	0	4

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

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge in principles of EEG
2. Principles of EEG recording
3. Basic knowledge in Recording techniques, Electrodes placement
4. Basic knowledge in Normal Adult EEG.
5. Basic knowledge in special EEG studies.

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.

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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.

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Brain Waves & Electroencephalography- Practical

B. Sc. Semester IV (Neurophysiology Tech.)

Paper Code- 05310402

L	T	P	Credits		
0	0	2	2	Examination:	30 Marks
				Int. Assessment:	20 Marks
				Total:	50 Marks

Course Outcomes:

1. On successful completion of this course, students will able to:
2. Able to explain block diagram of EEG machine.
3. Performing electrode placement system.
4. Able to understand different montages of EEG.
5. Able to remove artifacts from the EEG.

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

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Neurological Disorders (Theory)

B. Sc. Semester IV (Neurophysiology Tech.)

Paper Code- 05310403

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge of stroke.
2. Detailed knowledge in Recording epilepsy and seizures.
3. Basic knowledge in dementia illness.
4. Basic knowledge in movement disorders.
5. Detailed knowledge in multifocal CNS disorders.

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 characterstics of siezures, Siezures 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 Tremer, Parkinson's disease, Parkinsonians Syndromes, Hereditary

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Ataxia, Huntington's Disease, Tardive Dyskinesia, Dystonias, Wilsons Disease Gilles de la Tauretle's Syndrome.

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

Polysomnography & Sleep Sciences (Theory)

B. Sc. Semester IV (Neurophysiology Tech.)

Paper Code- 05310404

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge in sleep physiology.
2. Detailed knowledge of Polysomnography.
3. Basic knowledge in classification of sleep disorders.
4. Basic knowledge in types of sleep studies.

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 CO_2, Body and limb movement, Audiovisual monitoring, Time, Recording protocol for a standard nocturnal study, Interpretation.

Unit III: Sleep disorders

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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.

UnitIV- 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 (Theory)

B. Sc. Semester V (Neurophysiology Tech.)

Paper Code- 05310501

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge in sensory physiology, taste and olfaction.
2. Detailed knowledge of physiology of eye and ear.
3. Advanced knowledge in evoked potentials.
4. Detailed knowledge in SSEP.

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,

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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.

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.

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Biopotentials Signals and report writing (Theory)

B. Sc. Semester V (Neurophysiology Tech.)

Paper Code- 05310502

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge in biopotential signals.
2. Detailed knowledge of auditory pathway and repetitive nerve conduction.
3. Basic knowledge in working principle of pattern reversal.
4. Detailed knowledge in instrumentation of EEG and NCV/EMG machines.

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

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RESEARCH METHODOLOGY & BIOSTATISTICS (Theory)

B. Sc. Semester V (Neurophysiology Tech.)

Paper Code- 05310503

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

*******Same as all courses******

Unit I

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.

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Hospital Management& medical ethics (Theory)

B. Sc. Semester V

Paper Code- 05310504

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

******same as all courses******

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 threading 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.

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6th Semester

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Neuro Imaging and Intra Operative Neuro Monitoring (Theory)

B. Sc. Semester VI (Neurophysiology Tech.)

Paper Code- 53106001

L	T	P	Credits		
3	1	0	4	Examination:	60 Marks
				Int. Assessment:	40 Marks
				Total:	100 Marks
				Duration of Examination:	3 Hours

Course Outcomes:

On successful completion of this course, students will able to:

1. Basic knowledge of IONM and common modalities.
2. Detailed knowledge and principles of IONM.
3. Basic knowledge in neuro imaging techniques- ECT, MRI and BCI.

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.
RequirementsforIONMinaHospitalOrganization:Challenges&IntegrationinMedicalCare, Programs,Financing,EducationprogramsandCredentialing, FeaturesandLimitations.

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

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Nuclear Medicine & PET Scan (DSE)

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 Nuclear Medicine

- Applications and Apparatus for nuclear medicine
- Introduction of Radioactivity & its decay type
- Electromagnetic spectrum
- Law of radioactivity

UNIT 2 Gamma Camera

- Application, Function and instrumentation

UNIT 3 SPECT

- Definition, Equipment's & handling
- Applications
- Clinical uses, advantages & disadvantages

UNIT 4 PET Scan

- Instrumentation of PET, Application & its uses
- Benefits vs risk
- PET-CT
- PET-MRI

UNIT 5 Radionuclides

- Handling of radionuclide
- Characteristics and half-life of Radionuclides
- Commonly used Radionuclides
- Protocols- Routine protocols
- Bone, Thyroid

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