

**ALLIED HEALTH SCIENCES**  
**B.Sc. Neuro Electrophysiology**  
 Curriculum and Syllabus  
 (2012-13)

**COURSE OVERVIEW**

**Course Description:** The three year B.Sc. Neuro Electrophysiology course will empower the candidate to carry out and interpret the various neurophysiological tests. Neurophysiological testing is an important component and an extension to the clinical evaluation in the diagnosis and management of neurological disorders in children and adults. This includes electroencephalography (EEG), nerve conduction studies (NCV), evoked potentials, autonomic function tests, transcranial magnetic stimulation, intraoperative monitoring, and polysomnography.

**Subjects to be covered (and hours of instruction)**

	FIRST YEAR	SECOND YEAR	THIRD YEAR
<b>University Exam Subjects</b>	<b>Anatomy (250)</b> <b>Physiology (150)</b> <b>Biochemistry (50)</b>	<b>Electroencephalography</b> including Lab Work (800) <b>Electronics (50)</b> <b>Evoked Potentials</b> including Lab Work (100) <b>Clinical Neurology</b> including ward and OPD exposure (300) [Introduction to Neurology, Neuropathology, Neuropharmacology, Microbiology (including sterilization)]	<b>Nerve Conduction Studies and Electromyography</b> including Lab Work (800) <b>Polysomnography, Transcranial magnetic stimulation, autonomic lab, intraoperative monitoring (300)</b> <b>Application of Clinical Neurophysiology and their assessment (300)</b>
<b>Internal Assessment alone</b>	<b>Computers (25)</b> <b>Basic Nursing and First Aid (25)</b> <b>English (25)</b> <b>Medical Terminology (25)</b> <b>Introduction to the Lab (1000)</b>	<b>Project (300)</b> <b>Statistics / Research Methodology (30)</b> <b>Basic Life Support and Emergencies (10)</b>	<b>Project (200)</b>

# First Year

## ANATOMY

### 1. GENERAL ANATOMY

- a. Introduction to anatomy, descriptive terms, anatomical planes, types of tissues
- b. Introduction to bones
- c. Introduction to joints
- d. Introduction to muscular system
- e. Introduction to cardiovascular system
- f. Introduction to nervous system

### 2. REGIONAL ANATOMY

#### a. Upper extremity

- i. Osteology: clavicle, scapula and humerus
- ii. Pectoral region, axilla and back
- iii. Shoulder region, axilla including brachial plexus
- iv. Shoulder joint
- v. Front of arm
- vi. Back of arm
- vii. Osteology: Radius, ulna, articulated hand
- viii. Front of forearm
- ix. Palm
- x. Back of forearm
- xi. Dorsum of hand
- xii. Elbow joint, radioulnar joints
- xiii. Wrist joint, joints of hand
- xiv. Nerve injuries, types of grip and dermatomes of upper limb

#### b. Lower extremity

- i. Osteology: hip bone, femur, patella
- ii. Front of thigh
- iii. Medial side of thigh
- iv. Gluteal region
- v. Back of thigh, popliteal fossa
- vi. Hip joint
- vii. Osteology: tibia, fibula, articulated foot
- viii. Front of leg, dorsum of foot
- ix. Back of leg
- x. Sole of foot
- xi. Knee joint
- xii. Ankle joint and joints of foot

#### c. Thorax

- i. Introduction to thorax, bony thorax, dorsal vertebrae, intercostal spaces
- ii. Joints of thorax and movements
- iii. Mediastinum: definition, boundaries, subdivisions and contents
- iv. Pleura, lungs
- v. Heart: external and internal features, blood and nerve supply
- vi. Arch of aorta, superior vena cava, brachiocephalic vein, trachea and thymus
- vii. Oesophagus, descending aorta, sympathetic trunk, azygos system

**d. Abdomen, pelvis and perineum**

- i. Osteology: hip bone, lumbar vertebrae, sacrum
- ii. Anterior abdominal wall, inguinal canal, male external genitalia
- iii. Muscles of posterior abdominal wall, peritoneal cavity
- iv. Stomach and spleen
- v. Duodenum and pancreas
- vi. Liver and extrahepatic biliary apparatus
- vii. Small and large intestines, portal vein
- viii. Kidneys and suprarenal glands
- ix. Aorta, inferior vena cava, lumbar plexus
- x. Diaphragm
- xi. Bony pelvis, joints and walls of pelvis
- xii. Rectum and anal canal
- xiii. Male pelvis: urinary bladder, prostate, seminal vesicles
- xiv. Female pelvis: vessels and nerves of pelvis, uterus, Fallopian tubes, ovary
- xv. Perineum

**e. Head and neck**

- i. Osteology: external features of skull, cervical vertebrae
- ii. Face and scalp
- iii. Posterior triangle
- iv. Main vessels of head and neck
- v. Main nerves of head and neck
- vi. Parotid region and infratemporal fossa
- vii. Cranium and meninges
- viii. Cranial nerves
- ix. Orbit and eye
- x. Ear
- xi. Mouth and pharynx
- xii. Palate, nose, larynx

**f. Neuroanatomy**

- i. Spinal cord: gross anatomy
- ii. Spinal cord: tracts
- iii. Brainstem
- iv. Cerebellum
- v. Cerebral hemispheres
- vi. Diencephalon
- vii. Basal ganglia
- viii. Cranial nerve nuclei

- ix. Ventricles of brain, CSF circulation
- x. Internal capsule, commissures of brain and visual pathway
- xi. Autonomic nervous system
- xii. Limbic system

## PHYSIOLOGY

1. Cell
  - a. Basic concepts of cell structure, components, functions and transport
2. Skin
  - a. Structure, functions, temperature regulation
3. Blood
  - a. Composition and function of blood
  - b. Red blood cells: morphology, formation, normal counts, functions
  - c. White blood cells: morphology, formation, normal counts, functions
  - d. Platelets: morphology, formation, normal counts, functions
  - e. Hemoglobin: basic chemistry, function and fate of hemoglobin
  - f. Blood clotting: definition, clotting factors, theories of clotting
  - g. Blood group: ABO system, Rh system
  - h. Blood volume and regulation
  - i. Blood transfusion
4. Cardiovascular
  - a. Structure and properties of cardiac muscle
  - b. Cardiac cycle, conductive system, ECG
  - c. Heart sounds
  - d. Heart rate and regulation
  - e. Cardiac output and regulation
  - f. Blood pressure and regulation
  - g. Regional circulation: cerebral, coronary, pulmonary, renal
  - h. Effect of exercise on cardiovascular system
5. Respiration
  - a. Structure and functions of respiratory system
  - b. Mechanics of respiration: muscles, lungs and chest wall compliance, V/Q ratio, surfactant
  - c. Transport of gases: O<sub>2</sub> and CO<sub>2</sub>
  - d. Nervous and chemical regulation of respiration
  - e. Hypoxia, cyanosis, and dyspnea
  - f. Acid base balance
  - g. Principles of lung function tests
  - h. Artificial respiration
  - i. Effect of exercise on respiratory system
  - j. Defense mechanisms
6. Digestion
  - a. Structure and function of gastrointestinal system
  - b. Mastication and deglutition
  - c. Saliva: composition, function, regulation

- d. Gastric secretion: composition, phases of secretion, function
  - e. Pancreatic secretion: composition, function, regulation
  - f. Bile: composition and function
  - g. Movements of small and large intestine
  - h. Digestion in mouth, stomach, intestine
  - i. Defecation
7. Excretion
- a. Structure and function of kidney
  - b. Structure and function of nephron
  - c. Formation of urine: filtration, reabsorption, secretion
  - d. Micturition
8. Endocrine
- a. General organization of endocrine glands
  - b. General metabolism: carbohydrate, fat, protein
  - c. Physiological actions, regulation and disorder of hormones: adrenal, pancreatic, parathyroid, thyroid
9. Reproduction
- a. Male reproductive system
  - b. Female reproductive system
  - c. Pregnancy, function of placenta, parturition, lactation, contraception
  - d. Puberty and menopause
  - e. Spermatogenesis and oogenesis
  - f. Menstrual cycle
10. Nervous system
- a. General organization of nervous system
  - b. Structure, type and function of neuron
  - c. Properties of neurons
  - d. Synapse and synaptic transmission
  - e. Neurotransmitters
  - f. Reflex: properties and types
  - g. Sensory: receptors, sensory pathway, pain pathway, referred pain, modulation of pain
  - h. Motor: basal ganglia, cerebellum, cortex – functions and effects of lesions
  - i. Ascending and descending pathways
  - j. Posture and equilibrium
  - k. Muscle tone
  - l. Autonomic nervous system: organization and functions of sympathetic and parasympathetic nervous systems
  - m. Cerebrospinal fluid: composition, formation, circulation and function
  - n. Lower motor neuron and upper motor neuron lesion
11. Special senses
- a. Vision: rods and cones, retina and its function, visual pathway
  - b. Hearing: organ of Corti, auditory pathway
  - c. Olfaction
  - d. Taste: taste buds
12. Muscle
- a. Structure of muscle: macroscopic and microscopic
  - b. Properties of skeletal muscle
  - c. Cardiac and smooth muscle

- d. Chemical processes involved in muscle contraction
- e. Motor unit and electromyography
- f. Effect of exercise of muscular system, exercise metabolism, O<sub>2</sub> debt, respiratory quotient

## BIOCHEMISTRY

- 1. Enzymes
  - a) Definition – Nomenclature – Classification – Factors affecting enzyme activity – Active site – Coenzyme
  - b) Enzyme Inhibition – Units of enzyme – Isoenzymes – Enzyme pattern in diseases
- 2. Carbohydrates
  - a) Overview of glucose metabolism
  - b) Overview of glycogen metabolism, diabetes mellitus- clinical features, investigations
- 3. Proteins
  - a) Classification of proteins and functions
- 4. Lipids
  - a) Classification of lipids and functions
- 5. Vitamins
  - a) Fat soluble vitamins (A,D,E,K)
  - b) Water soluble vitamins – B-complex vitamins, vitamin C
- 6. Minerals
  - a) Major elements Calcium, Phosphorus,
  - b) Trace elements, Magnesium, Sodium, Potassium, Chlorine and sulphur
- 7. Nutrition
  - a) Calorific value of foods – Basal metabolic rate(BMR) – respiratory quotient(RQ) Specific dynamic action (SDA) – Balanced diet
  - b) Marasmus – Kwashiorkar, obesity, diet in DM, CVD, Kidney disease
- 8. Acids and bases
  - a) Definition, pH, Henderson – Hasselbalch equation, Buffers, Indicators, Normality, Molarity, Molality
  - b) Acid base balance in the body
- 9. Body fluids, hormones
  - a) Chemistry of the body fluids in health and diseases (Urine- normal and abnormal, blood/serum, CSF)
  - b) Hormones,
  - c) Clotting mechanisms of the blood
- 10. Practicals - Benedict's test, Heat coagulation tests

## COMPUTERS

Introduction to computers – Key board usage

**Hardware:**

- A) Knowledge of the following terminology -Micro processor(CPU), Memory, Monitor, Keyboard ,Storage device, hard discs, printers, Microcomputers.
- B) Switching on and switching off the computer and printer
- C) Accessory Management: Explorer and Outlook Express.
- D) Printers, Modem, CD.
- E) Simple trouble shooting.
- F) Simple Preventive Maintenance techniques (dust, Mouse pad maintenance, gentle use of keys)

**Software :**

Operating Systems: E.g. Windows, Linux, DOS. The student should know how to use any one.

Word processing Software: E.g. MS Word, Star Office, Word Perfect .The student should be able to use any one

Spread sheet software: E.g. MS Excel, Star Office, Lotus. The student should be able to use anyone

Application Software: Power Point, Graphics

Browser/ Mail: Netscape Communication, Internet.

Internet: searching Medline and related research –Key terms, Privacy issues and ethics.

<b>BASIC NURSING AND FIRST AID</b>
------------------------------------

1. Introduction to Nursing, patient positioning and safety
2. Bandaging including practical work
3. Lifting and transporting patients
4. Providing for patients elimination
5. Methods of giving nourishment
6. Surgical dressing (aseptic technique) including demonstration
7. Parenteral administration of medicine
8. Vital signs including practical work
9. First aid for Burns and Scalds, degrees of burns
10. Poisoning: Irritants, acids, alkali, narcotics
11. Trauma due to foreign body: eye ear, nose, throat, stomach and lung
12. Bites: insects, dog and snake
13. Skeletal injuries
14. Respiratory emergencies: Ventilators, monitors including demonstration
15. Transportation of the injured
16. Community emergencies
17. Community resources
18. Cardio pulmonary resuscitation (practical)

<b>ENGLISH</b>
----------------

**Communication:**

- i) Role of communication
- ii) Defining Communication

- iii) Classification of communication
- iv) Purpose of communication
- v) Major difficulties in communication
- vi) Barriers to communication
- vii) Characteristics of successful communication – The seven Cs
- viii) Communication at the work place
- ix) Human needs and communication “Mind mapping”
- x) Information communication

**Comprehension passage:**

- i) Reading purposefully
- ii) Understanding what is read
- iii) Drawing conclusion
- iv) Finding and analysis

**Explaining:**

- i) How to explain clearly
- ii) Defining and giving reasons
- iii) Explaining differences
- iv) Explaining procedures
- v) Giving directions

**Writing business letters:**

- i) How to construct correctly
- ii) Formal language
- iii) Address
- iv) Salutation
- v) Body
- vi) Conclusion

**Report writing:**

- i) Reporting an accident
- ii) Reporting what happened at a session
- iii) Reporting what happened at a meeting

<b>MEDICAL TERMINOLOGY</b>
----------------------------

**Introduction to Medical Terminology**

1. Definition and Origin of Medical Terms.
2. Components of Medical Terms
3. Prefixes
4. Suffixes
5. Roots and Combining forms
6. External Anatomy and Internal Anatomy
7. Additional Lists and their combining forms grouped as:
  - Verbs
  - Adjectives
  - Body Fluids
  - Body Substances



- Chemicals
- Colours
- Phobias

### **The Nervous System**

#### (A). Neurological Disorders

1. Pathologic conditions
2. Hereditary Congenital and Developmental Disorders
3. Circulatory Disturbances
4. Other Organic Abnormalities
5. Oncology
6. Diagnostic Terms
7. Surgical and other Procedures
8. Laboratory Tests and Procedures

#### (B). Psychiatric Disorders

1. Psychiatric Disorders
2. Other Descriptive and Diagnostic Terms
3. Various Tests
4. Treatment Methods for Psychiatric Conditions

### **The Sensory Organs**

#### (A). Sense of Vision

1. Pathologic conditions
2. Hereditary, Congenital and Developmental Disorders
3. Diagnostic Terms
4. Operative terms
5. Oncology
6. Vision Tests and Procedures

#### (B). Sense of Hearing

1. Pathologic condition
2. Hereditary, Congenital and Developmental Disorders
3. Oncology
4. Surgical Procedures
5. Hearing Tests.

#### (C ). Sense of Smell

1. Pathologic and Other terms
2. Laboratory Tests

#### (D). Sense of Taste

1. Pathologic and Other terms

#### (E). Touch and Other Cutaneous Senses

1. Terms referring to these senses

<b>INTRODUCTION TO LABORATORY</b>
-----------------------------------

### **Orientation to Lab**

1. Glossary of terms
2. Lab etiquette
3. Reception area
4. Requisition slips
5. Lab procedures overview
6. Electroencephalography laboratory
7. Electroneuromyography laboratory
8. Evoked potentials laboratory
9. Transcranial magnetic stimulation laboratory
10. Autonomic functions tests laboratory
11. Observing procedures

### **Orientation to Hospital**

1. Wards – Neurology, General Medicine and Pediatrics
2. Outpatient Department, including Epilepsy Clinic, Neuromuscular Clinic
3. Accident and Emergency (Casualty)
4. Intensive Care Units – Neurology, Medicine and Pediatrics  
Central Sterile Supply Department

## **Second Year**

<b>ELECTROENCEPHALOGRAPHY (EEG)</b>
-------------------------------------

1. Historical aspects of EEG
2. Neurophysiologic basis of EEG and DC potentials
3. Analog signal recording principles
4. Digital EEG
5. Polarity and field determination – electrode placement, montages, ten-twenty system
6. Normal EEG and sleep in preterm and term neonates
7. Normal EEG and sleep from infancy to adolescents
8. Normal EEG and sleep in adults and elderly
9. Activation methods
10. Artefacts of recording
11. Epileptiform and non-epileptiform paroxysmal EEG abnormalities
12. Clinical EEG in seizures and epilepsies in the preterm and term neonate
13. Clinical EEG in seizures and epilepsy in infants to adolescents
14. Clinical EEG in epilepsy in adults and the elderly
15. EEG in status epilepticus and nonconvulsive status epilepticus
16. Special techniques in recording – depth electrodes, intracranial monitoring, electrocorticography
17. Techniques for Long term EEG recording – video EEG, ambulatory EEG, ICU recordings
18. Polysomnography
19. Magnetoencephalography
20. EEG in brain tumors and strokes
21. EEG in Central nervous system infections and infestations

22. EEG in dementia and degenerative diseases
23. EEG in metabolic disorders
24. EEG in coma and brain death
25. EEG in psychiatric diseases
26. Role of EEG in presurgical evaluation of epilepsy

## ELECTRONICS

### **I Basic Electronics**

Conductors, Insulators, Semiconductors, Energy band diagram of semiconductors, Ohm's Law, Kirchhoff's voltage and current law, Resistors, Capacitors, Inductors, Resistors in serial and parallel combination, transformer.

P-N junction diode, forward and reverse bias characteristics, PNP and NPN transistors, Half wave rectifier, Full wave rectifier, filters, voltage regulator.

### **II Neurology Equipments**

Bio potentials electrodes, Transducers, Differential amplifiers, Filters (Hi-pass, low-pass, band-pass), Analog to digital convertor, recording devices – CRO, PMMC. Computers in neurology equipments, calibration.

EEG machine – Block diagram

EMG machine – Block diagram

### **III Overview of all Medical Electronic Equipment**

1. Types of medical equipment – Diagnostic, Therapeutic, Analytical
2. Hazards and safety measures in medical equipments
3. Classification of equipment based on electrical safety
4. International standards and certification of medical equipment
5. Various symbols, color coding, controls and their meaning pertaining to medical equipment
6. Dos and don'ts for users of medical equipment.
7. Calibration - for different medical equipment and their importance

### **REFERENCE:**

1. Bio medical Instrumentation and measurements - Leslie Corniwell, Fred J Weibell, Erich A Pfeiffer
2. Medical Devices – use and safety – Bertil Jacobson and Alan Murray
3. Biomedical Instrumentation – Dr. M. Arumugam
4. Hand book of Biomedical Instrumentation –R.S. Khadpur

## EVOKED POTENTIALS

1. Event-related potentials (ERP): general aspects and quantification
2. Visual evoked potential (VEP)
  - a. Anatomical basis of VEP

- b. Method of recording VEP
  - c. Normal VEP and waveforms
  - d. Variables influencing VEP
  - e. Clinical applications of VEP
- 3. Brainstem auditory evoked potentials (BAEP)
  - a. Anatomical basis of BAEP
  - b. Method of recording BAEP
  - c. Variables influencing BAEP
  - d. Normal BAEP, potential field distribution, waveforms
  - e. Clinical applications of BAEP
- 4. Somatosensory evoked potentials (SEP)
  - a. Anatomical basis of SEP
  - b. Stimulation and recording procedures
  - c. Median somatosensory evoked potential
  - d. Tibial somatosensory evoked potential
  - e. Clinical applications of SEP

<b>CLINICAL NEUROLOGY</b>
---------------------------

1. Introduction to Neurology
  - i) Neurological diseases – a basic approach
  - ii) Episodic impairment of consciousness
  - iii) Delirium and altered sensorium
  - iv) Stupor and Coma
  - v) Memory Impairment
  - vi) Child with developmental delay
  - vii) Behavioral disorders
  - viii) Apraxia, agnosia and aphasia
  - ix) Disorders of vision
  - x) Hearing impairment and vertigo
  - xi) Cranial and facial pain
  - xii) Brainstem syndromes
  - xiii) Ataxic disorders
  - xiv) Movement disorders
  - xv) Gait disorders
  - xvi) Hemiplegia and monoplegia
  - xvii) Paraplegia
  - xviii) Proximal and distal weakness
  - xix) Floppy infant
  - xx) Sensory abnormalities of face, trunk and limbs
  - xxi) Neurological causes of bladder, bowel and sexual dysfunction
  - xxii) The Epilepsies
2. Neuropathology
  - i) General pathology
  - ii) Disorders of muscle

- iii) Disorders of nerve
- iv) Disorders of brain
- 3. Neuropharmacology
  - i) General pharmacology: definitions, routes of drug administration, pharmacokinetics, pharmacodynamics
  - ii) Drugs acting on the autonomic nervous system
  - iii) General and local anesthetics, skeletal muscle relaxants
  - iv) Sedative hypnotics, ethyl alcohol
  - v) Antiepileptic drugs
  - vi) Antiparkinsonian drugs
  - vii) Drugs used in mental illness
  - viii) CNS stimulants and cerebroactive drugs
  - ix) Drugs affecting coagulation, bleeding and thrombosis
  - x) Antiseptics, disinfectants
- 4. Microbiology (including sterilization)
  - i) Morphology and physiology of bacteria
  - ii) Sterilization and disinfection
  - iii) Infection and immunity
  - iv) Important bacteria, viruses, and parasites
  - v) Normal microbial flora of body, bacteriology of water and air, hospital infection

## **BASIC LIFE SUPPORT**

1. Basic Life Support
2. Airway Management
3. Anaphylaxis
4. Approach to Shock
5. Initial Management of Shock
6. Approach to Seizures
7. Approach to Syncope
8. Approach to Restless Patient
9. Approach to Pediatric Patients
10. Safe transfer of patients to definitive care areas
11. Approach to Trauma Patients
12. Spinal Injuries

## **RESEARCH METHODOLOGY AND BIostatISTICS**

### Research Methodology

1. Stages of research process
2. Developing ideas and defining a research question
3. Literature review
4. Errors in measurement and their control,

5. Reliability and validity
6. Epidemiological measures of disease frequency
7. Research design:
  - I. Quantitative (epidemiological)
    - a. Experiment (clinical, field, community)
    - b. Observational
      - i. Cohort
      - ii. Case control
      - iii. Cross sectional study
      - iv. Ecological study
  - II. Qualitative Research Method (Sociological)
    - i. Developing instruments (Delphi technique)
    - ii. Focus groups
    - iii. Indepth interview
    - iv. Key informant interview
8. Ethical issues
9. Critical Appraisal of a research report

#### Biostatistics

1. Data Collection, basic statistics and graphs
2. Probability and Probability distribution (Binominal and normal)
3. Sampling and sampling techniques.
4. Confidence interval
5. Tests of significance (for large sample and small sample)
  - T Test
  - Z Test
  - Chi square test
6. Non-parametric tests (where to use, sign test and Mann –Whitney U test)
7. Correlation and Regression
8. Epi info

## Third Year

<b>NERVE CONDUCTION AND ELECTROMYOGRAPHY</b>
--

1. History of nerve conduction studies
2. Electro diagnostic signals and their measurements
  - a. Principles of motor nerve conduction
  - b. Principles of sensory nerve conduction
3. Basic components of electromyography instruments
4. Nerve conduction techniques
5. Anatomical guide and normative data for common nerve conduction studies
  - a. Brachial plexus and branches

- b. Lumbar plexus and branches
- c. Sacral plexus and branches
- 6. Required tests for specific problems like carpal tunnel syndrome
- 7. Pediatric nerve conduction study
- 8. Artefacts in NCS
- 9. Nerve conduction of non limb nerves – techniques and normal values
- 10. Physiological and non physiological factors affecting NCS
- 11. Anomalous innervations of extremities
- 12. Late responses
- 13. Autonomic nervous system testing
- 14. Introduction to EMG
- 15. Technique of EMG
- 16. Clinical applications of EMG and NCV in neurological disorders
- 17. Repetitive nerve stimulation
- 18. Single fibre and macro electromyography

<p><b>POLYSOMNOGRAPHY, TRANSCRANIAL MAGNETIC STIMULATION, AUTONOMIC LAB, INTRAOPERATIVE MONITORING</b></p>
--

### **I] SLEEP MEDICINE AND POLYSOMNOGRAPHY**

- 1. Anatomy of Sleep
- 2. Medical Disorders of Sleep
  - a) Insomnia
  - b) Obstructive Sleep Apnea
  - c) Central Sleep Apnea
  - d) Sleep disorders in elderly
  - e) Narcolepsy and related disorders
- 3. Polysomnography
- 4. Median Sleep Latency (MSLT)
- 5. Actigraphy

### **II] TRANSCRANIAL MAGNETIC STIMULATION (TMS) AND AUTONOMIC LABORATORY**

#### Transcranial Magnetic Stimulation

- a) Anatomical basis of TMS
- b) Recording procedures
- c) Clinical application

#### Autonomic Laboratory

- a. Cardiovascular autonomic functions
- b. Using head up tilt test and beat to beat recording
- c. Assessment of other cardiac physiology and dysfunction (Finopres)

### **III] INTRA-OPERATIVE MONITORING**

1. Instrumentation for Intraoperative monitoring (IOM)
2. Precautions to be taken during IOM
3. Electrode placement, stimulation parameters for tethered cords, brachial plexus, dorsal column, cranial nerves, peripheral nerves and brainstem nuclei
4. Brainstem auditory evoked potentials for cerebello-pontine angle tumors, microvascular decompression cases
5. Somatosensory evoked potentials for aneurysm surgery, spinal cord surgery
6. Motor evoked potentials using transcranial electrical stimulation for spinal cord monitoring, monitoring of cases with intramedullary tumors, intradural extramedullary tumors and scoliosis correction
7. Electrocorticography

## **APPLICATION OF CLINICAL NEUROPHYSIOLOGY AND ASSESSMENT**

### **CLINICAL NEUROLOGY**

1. Neurological complications of systemic disease
2. Trauma and the nervous system
3. Vascular diseases of the nervous system
4. Cancer and the nervous system
5. Infections of the nervous system
6. Multiple sclerosis and other white matter diseases
7. Hypoxic, toxic and metabolic encephalopathies
8. Nutritional diseases of the nervous system
9. Disorders of cerebrospinal fluid circulation and brain edema
10. Inborn errors of metabolism, mitochondrial disorders, channelopathies
11. The Dementias
12. Sleep and its disorders
13. Headache and other cranio-facial pain
14. Cranial neuropathies
15. Parkinsonism and related movement disorders
16. Disorders of cerebellum and tracts
17. Disorders of bones, joints, ligaments, and meninges
18. Disorders of upper and lower motor neurons
19. Disorders of nerve roots and plexuses
20. Disorders of peripheral nerves
21. Disorders of autonomic nervous system
22. Disorders of neuromuscular transmission
23. Disorders of skeletal muscle
24. Neurological problems of the newborn



# SCHEME OF EXAMINATION

## FIRST YEAR

S.No.	Subject	Internal Examination		UNIVERSITY			
				Theory		Practical	
		Max	Min	Max	Min	Max	Min
1	Anatomy	50	25	100	50	50	25
2	Physiology & Biochemistry	50	25	100	50	50	25

## INTERNAL EXAMINATION ONLY

		Internal Assessment		IP Theory	
		Max	Min	Max	Min
		1	Computers	50	25
2	Basic Nursing	50	25	100	50
3	English	50	25	100	50
4	Medical Terminology	50	25	100	50
5	Introduction to Lab	50	25	100	50

\*IP = Internal Paper

## SECOND YEAR

S.No.	Subject	Internal Examination		University			
				Theory		Practical	
		Max	Min	Max	Min	Max	Min
1	EEG	50	25	100	50	50	25
2	Electronics	50	25	100	50	50	25
3	Evoked Potentials and Clinical Neurology	50	25	100	50	50	25

## THIRD YEAR

S.No.	Subject	Internal Examination		University			
				Theory		Practical	
		Max	Min	Max	Min	Max	Min
1	Nerve Conduction Studies and Electromyography	50	25	100	50	50	25
2	Polysomnography, transcranial magnetic stimulation, autonomic lab, intraoperative monitoring	50	25	100	50	50	25
3	Application of Clinical Neurophysiology and assessment	50	25	100	50	50	25