

Dow University of Health Sciences



NEUROSCIENCES 1 MODULE STUDY GUIDE 2023 Second Year MBBS

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INTRODUCTION

WHAT IS A STUDY GUIDE?

A study guide provides a focus for different educational activities in which the students are engaged. It equips students with information on the topic of study and assists in management of student learning. Furthermore, it imparts relevant information about the organization of the module and thus helps students organize their educational activities accordingly. Another important purpose of a study guide is the dissemination of information about rules and policies and teaching and assessment methods.

HOW DOES A STUDY GUIDE HELP LEARNERS?

- Includes information on organization and management of the module.
- Advises the learners about representatives who can be contacted in case of need.
- Defines the outcomes and objectives which are expected to be achieved at the end of the module.
- Elaborates the teaching and learning strategies which will be implemented during the module.
- Inform learners about the learning resources in order to maximize their learning.
- Provides information about the assessment methods that will be held to determine every student's achievement of objectives.

CURRICULUM MODEL:

Integrated modular curriculum is followed at Dow University of Health Sciences for MBBS program. This implies that instead of studying basic and clinical sciences separate and apart, students will experience a balanced and integrated combination of basic and clinical sciences in the form of a system –based modules.

The modular curriculum followed by Dow University of Health Sciences is integrated both in the vertical and the horizontal directions. However, in order to prepare the students for clinical teaching with a sound background knowledge of the basic sciences, the curriculum has been divided in three spirals.

The three spirals are:

1. Spiral -1 Basic Sciences
2. Spiral -2 Clinical Sciences
3. Spiral -3 Integrated Supervised Practical Training

The Basic Sciences Spiral is spread over the first two years and Clinical Sciences Spiral is distributed over the next two years. In the final year students are given practical hands-on training in the role similar to that of a shadow house officer. The whole curriculum is divided into modules, each module being related to a particular system. For example, Cardiovascular 1 module is in the Basic Sciences Spiral-1 and Cardiovascular 2 module is in the Clinical Sciences Spiral-2 and the relevant practical and clinical teaching/learning will be accomplished in Final year Spiral-3.

TEACHING & LEARNING METHODOLOGIES:

The following teaching/ learning methods may be used to facilitate the learning process:

1. **Interactive Lectures:** Lectures are considered as an efficient means of transferring knowledge to large audiences.
2. **Small Group Discussion:** Small group discussion such as Demonstrations, tutorials and case- based learning (CBL) sessions facilitate interactive learning which helps students develop discussion skills and critical thinking.
3. **Practicals:** Practical related to Basic Sciences are held to facilitate student learning.
4. **Skills:** Skills sessions are scheduled parallel with various modules at fully equipped Skills Lab and Simulation Lab in which students observe and learn skills relevant to the respective modules under guidance of Clinical Faculty.
5. **Self-Directed Learning (Self- Study):** Students have a measure of control over their own learning. They diagnose their needs, set objectives in accordance to their specific needs, identify resources and adjust their pace of learning

5YEAR CURRICULARORGANIZATION

Spiral	year	Modules				
First Spiral	I	FND1- Foundation Cell, Genetics & Cell Death (Basics of Anatomy, Physiology, Biochemistry, Gen. Pathology, Gen. Pharmacology, Community Medicine & Behavioral Sciences, 9 Weeks			HEM1- Blood Module Immunity, Inflammation, Tissue repair, Antimicrobials & Neoplasia 9 Week	
		LCM1- Locomotion Bones, Joints, Nerves & Muscles, 9weeks		RSP1- Respiratory System 6 weeks	CVS1- Cardiovascular System 4 weeks	
	II	NEU1- Nervous System 8 weeks		HNN1- Head & Neck & Special 6 weeks	END1- Endocrinology 5weeks	
		GIL 1-GIT and Liver 8 weeks		EXC1- Renal and Excretory System 5 weeks	REP1- Reproductive System 5 weeks	
Second Spiral	III	Foundation 2 2 wks	IDD 1- Infectious diseases 6 weeks	HEM2- Hematology 5 weeks	RSP2- Respiratory System 5 weeks	CVS2- Cardiovascular System 4 weeks
		GIL 2-GIT and Liver (including Nutritional Disorders) 8weeks			EXC2- Renal & Excretory System 4 weeks	END2- Endocrinology 5 weeks
	IV	ORT2- Orthopedics, Rheumatology, Trauma 7 weeks		PMR-Physical Medicine & Rehabilitation DPS-Dermatology Plastic Surgery / Burns GEN-Genetics 6 weeks		REP2- Reproductive System 8 Weeks
		NEU2- Neurosciences and Psychiatry 8 weeks			ENT* 4 weeks	OPHTHALMOLOGY/ EYE 4 weeks
Third Spiral	V	Clinical Rotation 9:45 to 3:00 (with Ambulatory, Emergency, Intensive care) In Medicine, Pediatrics, Cardiology and Neurology units <ul style="list-style-type: none"> ▪ Lecture on problem-based approach, twice a week ▪ Ward tutorial twice a week ▪ Student research presentation once a week 			Clinical Rotation 9:45 to 3:00 (Inpatient, Ambulatory, Emergency, Intensive care and Operation Theatres) In Surgery, Gynecology & Obstetrics, Orthopedics and Neurosurgery. <ul style="list-style-type: none"> ▪ Lecture on problem based approach, twice a week ▪ Ward tutorial twice a week ▪ Student research presentation once a week 	

OVERVIEW

Program	MBBS	
Year	Two	
Module Title	NEUROSCIENCES	
Module Code	NEU-1	
Duration	8 weeks	
	Anatomy	54
	Physiology	65
	Pathology	16.5
	Biochemistry	11.5
	Pharmacology	10.5
	Community medicine	8
	Behavioral Science	4
	Skill Lab	3
Total Hours	NEUROSCEINCES-I Module	172.5

INTEGRATED MODULE COMMITTEE

RESPONSIBILITIES	NAMES	DESIGNATION	EMAILS
Chairperson Curriculum Committee, DUHS Chief Module coordinator	Prof. Naheed Khan	Prof. and Chairperson Anatomy	naheed.khan@duhs.edu.pk
Coordinator DMC	Dr. Amna Mughal	Assistant Professor	amna.mughal@duhs.edu.pk
Co-coordinator DIMC	Dr. Tanzeela Khan	Assistant Professor	tanzeela.khan@duhs.edu.pk
	Dr. Aisha Hassan Brohi	Assistant Professor	aisha.hassan@duhs.edu.pk

MODULE DESCRIPTION:

This module has been designed for students to introduce them to the basic concepts of neurology. This module includes Anatomy, Physiology, Biochemistry, Pathology, Pharmacology, Community Medicine, Radiology and Behavioral sciences.

Lectures, tutorials, small group sessions including CBL and practical are important components of this module. The basic concepts of the nervous system and its related diseases will be thoroughly covered in this module. You will be able to apply your medical knowledge to practical situations by means of group and individual tasks. This study guide has been developed to assist you and keep you focused to achieve your goals.

Welcome to the Neurosciences module and it is hoped that students will be able to achieve the desired module learning outcomes.

RATIONALE:

The neurosciences module in the second year of medical studies serves as a pivotal component of the curriculum, providing students with a comprehensive understanding of the nervous system's structure, function, and clinical relevance. This module is strategically designed to equip aspiring medical professionals with essential knowledge and skills that are crucial for their future medical practice. The nervous system is the foundation of human anatomy & physiology and plays a central role in regulating bodily functions, including sensation, movement, cognition, and autonomic control along with the biochemistry of neurotransmitters. Furthermore, it serves as the basis for comprehending the pathophysiology of numerous neurological disorders such as stroke, epilepsy, Parkinson's disease, and multiple sclerosis, which are prevalent in clinical practice.

In modern medical practice, an integrated, patient-centered approach is paramount. This module equips students with the knowledge needed to understand the neurological aspects of various medical conditions. It enhances students' understanding of the nervous system, its clinical significance, and its role in holistic patient care. This module empowers students to become competent and compassionate physicians who can address the complex healthcare challenges of this time effectively.

LEARNING OUTCOMES

At the end of Five years MBBS program, student shall be able to:

- Apply their knowledge of neurosciences to solve clinical problems, including differential diagnosis and treatment planning for neurological disorders.
- Develop basic skills in performing a neurological examination, including assessing cranial nerve function, motor and sensory function, and reflexes.
- Recognize the neurological components of systemic illnesses and understanding the impact of neurological conditions on a patient's overall health and well-being.
- Identify & manage the common medical emergencies & common prevalent diseases in community.

MODULE OBJECTIVES:

The 2nd year MBBS student at the end of module shall be able to:

- Demonstrate a comprehensive understanding of Neuroanatomy, including the structures and functions of the brain, spinal cord, and peripheral nervous system.
- Explain the principles of neurophysiology, including the mechanisms of nerve cell communication, synaptic transmission, and neural integration.
- Understand the biochemistry of neurotransmitters
- Describe the clinical presentation, pathophysiology, and diagnostic criteria of common neurological disorders
- Understand the pharmacological principles underlying the treatment of neurological disorders and describe the mechanisms of action and side effects of common drugs.
- Conduct basic neurological examination, including assessing cranial nerve function, motor and sensory function, and reflexes.
- Safely use and interpret neurological diagnostic tools, such as reflex hammers, tuning fork & ophthalmoscope.
- Demonstrate empathy and professionalism when interacting with patients with neurological conditions
- Understand the ethical considerations in the care of patients with neurological disorders, including issues related to informed consent, end-of-life decisions, and confidentiality.
- Acquire the necessary knowledge, skills, and attitudes to become competent and compassionate healthcare professionals.

DISCIPLINE-WISE LEARNING OBJECTIVES AND CONTENTS**ANATOMY****Learning Objectives:**

- Recognize the structure and function of major division and components of central, peripheral and autonomic nervous system.
- Interpret the various clinical presentations of spinal cord disorders correlating with its organization, structure and function.
- Localize the common brain stem and cranial nerves lesions by recognizing the structure of brainstem and the associated cranial nerves.
- Interpret the effects of increased intracranial pressure with the structure of craniospinal meninges, ventricular system, and mechanism of formation, flow, drainage and chemistry of C.S.F in normal and in disease.
- Recognize the structure and function of diencephalon and hypothalamus.
- Differentiate between the functions of dominant and non - dominant cerebral hemispheres and between various parts of each hemisphere by identifying the surfaces, lobes, sulci & gyri of cerebral hemisphere.
- Correlate the presentation of Parkinson's disease with the topographic anatomy and function of basal nuclei.
- Differentiate between the functions of dominant and non - dominant cerebral hemispheres and between various parts of each hemisphere by identifying the surfaces, lobes, sulci & gyri of cerebral hemisphere.
- Relate the different syndromes of ischemia in anterior and posterior circulation of brain and ischemic myelopathy with the pattern of arterial supply of brain and spinal cord, together with knowledge of blood brain barrier.
- Interpret the effects of increased intracranial pressure with the structure of craniospinal meninges, ventricular system, and mechanism of formation, flow, drainage and chemistry of C.S.F in normal and in disease.
- Recognize the effects of venous stasis and obstruction by applying the knowledge of venous drainage and dural venous sinuses.
- Appreciate the changes in emotions, behavior and personality by recalling the structure and functions of limbic system.
- Localize the common brain stem and cranial nerves lesions by recognizing the structure of brainstem and the associated cranial nerves.
- Deduce the neuro - anatomic basis of ataxia and incoordination by applying the knowledge of cerebellar cortex, nuclei and peduncles.
- Identify various congenital malformations of brain and spinal cord by knowing the embryological basis of neurulation and transformation of neural tube into CNS and the anomalies in the process

Topics/ Contents:**Lectures: (1 hour each)**

- Skull as a whole and vault of Skull +Anterior Cranial fossae
- Skull: Middle Cranial fossae
- Skull: Posterior Cranial fossae

- General organization of Nervous system & Different types of nerve tissue-(Neurons and Neuroglia)
- Meninges of brain and spinal cord.
- Spinal Cord I+(Arterial Supply and Venous Drainage)
- Typical Spinal Nerve
- Spinal cord I & II
- Spinal Cord Lesion
- Anatomy of brain stem and associated lesions: Medulla Oblongata
- Anatomy of brain stem and associated lesions: Pons
- Anatomy of brain stem and associated lesions: Midbrain
- Gross Features of Cerebellum
- Fourth ventricle & cerebral aqueduct
- Structure of Diencephalon I(Thalamus)
- Structure of Diencephalon II (Epithalamus, subthalamus and third ventricle)
- Structure of Diencephalon III (Hypothalamus)
- Organization of Autonomic Nervous system
- Gray matter of cerebral hemisphere: CEREBRAL CORTEX (Surfaces, lobes,sulci and gyri of cerebral hemisphere)
- Functional areas of cerebral cortex Gray matter of cerebral hemisphere Basal nuclei
- Lesion of functional areas of cerebral cortex
- White matter of cerebral hemisphere Projection fibers (Internal capsule and related anomalies)
- White matter of cerebral hemisphere Commissural fibers and association fibers
- Arterial Supply of Brain,
- Venous drainage and Dural venous sinuses of Brain
- Lateral Ventricles of Brain+ Choroid Plexus
- Limbic system
- Summary of cranial nerve (1-6) nuclei +associated clinical correlates
- Summary of cranial nerve (7-12) nuclei +associated clinical correlates

HISTOLOGY

- Microscopic anatomy of Cerebellar Cortex
- Microscopic anatomy of Cerebral Cortex

EMBRYOLOGY

- Development of Nervous system and Neurulation + Spinal Cord
- Development of fore brain, mid, and hind
- Developmental Anomalies of CNS.

Practicals & Museum model study: (1.5 Hour each)

- Spinal cord

- Microscopic anatomy of cerebellum
- Microscopic anatomy of cerebrum
- Models of Brain
- Model of brain stem & spinal cord

Simulation (Digital Dissection 1.5 Hour)

- Dissection of brain & spinal cord

PHYSIOLOGY**Learning Objectives:**

- Describe the organization of the nervous system including cells of the nervous system and their excitability
- Understand how neurons in the nervous system transmit signals through electrical and chemical synapses, and distinguish between excitatory and inhibitory potentials in the context of complex information processing.
- Explain cerebrospinal fluid production, circulation, and functions; describe the blood-brain barrier and its differences from the blood-CSF barrier; and show aseptic lumbar puncture.
- Differentiate membrane and resting potentials, compare ion channels in graded and action potentials, explain resting potential factors, list action potential events and its propagation, and define the refractory period in neural signaling.
- Learn about signal transmission at synapses, differentiate EPSPs from IPSPs, explain the "all-or-none" nature of action potentials, and distinguish spatial from temporal summation.
- Learn about neurotransmitter classes and functions, including excitatory and inhibitory types, and understand the unique role of nitric oxide.
- Learn about reflex action, including its functional components, classifications based on appearance and physiology, and the properties that define its nature and significance.
- Define sensation, distinguish it from perception, list sensory receptors and afferent fibers, classify receptors, and differentiate rapidly and slowly adapting sensory reception and generator potentials.
- Understand nerve fiber classification by histology and function, explore Gasser and Erlanger's diameter-velocity system, and identify vulnerable nerve fibers to anesthesia, hypoxia, and pressure.
- Learn the spinal cord's functional anatomy, including the location of lower motor neurons, and understand the major ascending (anterolateral and DCML) and descending (cortico-spinal) tracts, including midline crossings.
- Explore muscle spindles, Golgi tendon organs, reflexes (stretch, tendon, flexor, and crossed extensor), and neural control terms (ipsilateral, intersegmental, contralateral, reciprocal innervation).
- Explore sensory pathway components, compare DCML, ALS, and trigeminothalamic functions, and understand the role of spinocerebellar tracts in sensorimotor coordination.
- Learn about the primary somatosensory cortex, its body part representation, and how it collaborates with the motor system for complex movements.
- Learn to locate neurons in motor pathways, trace impulses from upper motor neurons to the final pathway, and understand body part representation in the motor cortex.

- Acquire the ability to differentiate between the direct and indirect motor pathways, elucidate their nomenclature, and comprehend the crucial role of the reticulospinal tract in controlling lower motor neurons.
- Identify spinal cord tracts, define hemiplegia and paraplegia, discuss motor neuron lesion causes and signs, and describe Brown-Sequard syndrome clinically.
- Learn the brainstem's components, functions, and the significance of its parts, as well as locate essential centers and nuclei within it.
- Learn about reticular formation divisions, RAS functions in consciousness, sleep, and muscle tone regulation, understand NREM sleep stages, and distinguish NREM from REM sleep.
- Describe the basal ganglia's role in movement initiation and regulation, the neurotransmitters involved, and the system's interconnections.
- Discuss basal ganglia lesion effects, list movement disorder signs, associate lesions with syndromes, and explain L-DOPA treatment for Parkinson's disease.
- Define the cerebellum's location and components, elucidate its function in precise, coordinated movements, and outline the pathophysiology of cerebellar dysfunction.
- Understand otolith organs and vestibular receptors, explain equilibrium processes, differentiate static from dynamic equilibrium, and outline neural pathways controlling balance.
- Define the thalamus as a relay center, outline thalamic nuclei functions in sensory information processing, and describe thalamic pain syndrome features.
- Define hypothalamic nucleus organization, emphasize its role in homeostasis, and explore causes of hypothalamic disorders.
- Describe skin and hypothalamus roles in temperature regulation, explain body responses to temperature changes, and emphasize the importance of thermoregulation for enzyme activity.
- Identify major cerebral cortex areas and their Brodmann numbers, differentiate the precentral and postcentral gyrus, and understand the importance of hemispheric lateralization.
- Differentiate fast and slow pain, describe their neural pathways, discuss pain sensation generation, modulation, and types, and list common painful clinical conditions.
- Define proprioception and recognize signs of dysfunction, identify activities providing proprioceptive input, and describe posture control pathways.
- Describe voice and speech organs, demonstrate competence in communication assessment and intervention, exhibit effective professional communication skills, and list communication disorder causes.
- Explain the link between sleep-wake cycles and the reticular activating system, discuss sleep's impact on obesity, and describe symptoms of sleep disorders.
- Learn about limbic system functions and anatomical structures, the limbic system-autonomic nervous system relationship in emotional and homeostatic responses, and limbic system lesion symptoms.
- Define memory and outline its three types, elucidate memory consolidation and long-term potentiation, evaluate memory functions in individuals, and identify memory abnormalities.
- Describe EEG rhythms, list clinical uses, note the influence of cerebral activity on EEG frequency, and recognize EEG variations during different wake and sleep stages.
- Discuss somatic and autonomic nervous system differences, organs supplied by sympathetic and parasympathetic ganglia, and three autonomic reflexes that maintain homeostasis.

- Describe autonomic neurotransmitters, understand cholinergic and adrenergic neuron names, identify substances for adrenergic receptors, and define agonists and antagonists.
- Describe ANS neurons, compare sympathetic and parasympathetic divisions, explain sympathetic's thoracolumbar naming, contrast widespread sympathetic effects with localized parasympathetic effects, and define enteric ANS functions.

Topics/Contents:

Lectures: (1 hour each)

- Organization and levels of Nervous System
- Cells of nervous system and synapse
- Cerebrospinal fluid & blood brain barrier
- Neuron membrane potential: Generation & propagation of nerve impulse
- Synaptic transmission
- Neurotransmitters and neuropeptides
- Reflex action
- Sensory modalities and types of receptors
- Classification of nerve fibers
- Functions of spinal cord and tracts
- Spinal cord reflexes
- Sensory pathways DCML & ALS
- Somatosensory cortex
- Motor cortex (pyramidal tracts, UMN / LMN)
- Motor cortex (extra pyramidal tracts)
- Hemiplegia / Paraplegia, Upper and Lower motor neuron lesions
- Functions of brainstem
- Reticular formation Sleep-wake cycle
- Basal ganglia, connections & functions
- Lesions of Basal ganglia
- Functions of cerebellum
- Vestibular apparatus/regulate on of posture and equilibrium
- Functions of Thalamus /Thalamic syndrome
- Functions of Hypothalamus
- Temperature regulation
- Functions of Cerebral cortex
- Perception and modulation of pain
- Proprioceptors and postural reflexes
- Physiology of Speech, speech abnormalities
- Physiology of Sleep, sleep abnormalities
- Functions of Limbic system
- Learning and memory

- Brain waves and EEG
- Organization of ANS
- ANS neurotransmitters and receptors
- Sympathetic & Parasympathetic responses

Practicals: (1.5 hour each)

- To examine the sensory system of a human subject.
- To test the superficial reflexes in a human subject.
- To test deep reflexes in a human subject.
- To examine the motor system of a human subject.
- To test the cerebellar functions of a human subject.
- To measure the human body temperature, oral, axillary and rectal by using digital / mercury thermometer.
- To study electroencephalogram (EEG) in a human subject by using Power Lab.

BIOCHEMISTRY

Learning Objectives:

- Define neurotransmitters
- Enlist the neurotransmitter of locomotor system. Give their structure.
- Enlist different neurotransmitter receptors
- Describe the synthesis of these neurotransmitters.
- State and explain that acetylcholine has sympathetic & parasympathetic functions.
- Explain the mechanism of action of acetylcholine in modulating muscle contraction.
- Define Biogenic amines, Clinical & Biochemical significance of biogenic amines
- Describe the chemical properties of Neuropeptides and Neuro-Lipids
- Interpret the clinical correlation of Neuropeptides and Neuro-Lipids
- Describe the dietary sources and absorption of vitamin.(B1,B6 & B12).
- Explain the structure of .(B1,B6 & B12)
- Discuss the various functions of (B1,B6 & B12)
- Describe the manifestation of deficiency of vitamin A.
- Describe the properties of vitamin B1,B6 and B12
- Discuss the symptoms of vitamin deficiency
- Enlist the sources of vitamin
- Correlate the clinical significance of neurological manifestations of vitamin B1,,B6 and B12 deficiency.
- Illustrate Structure of acetylcholine
- Describe Synthesis, transport and degradation of acetylcholine
- Describe Acetylcholine Receptors& its functions
- Explain functions of Acetylcholine
- Describe disorders underlying acetylcholine receptor dysfunction

- Explain composition of BBB (Blood Brain Barrier).
- Define BBB break.
- Identify Diseases effecting BBB.
- Enlist Drugs targeting brain.
- Describe drug delivery across BBB
- Appreciate the metabolic difference of brain compared to other organs
- Identify the principal fuel of the brain
- Explain the mechanism and mode of metabolism in a well-fed state.
- Discuss the mechanism and mode of metabolism in a fasting state.
- Explain the removal of ammonia and glutamate from the brain.
- Describe metabolism of Dopamine
- Explain the distribution of Dopamine in CNS
- Explain the role of Dopamine in central CNS pathways
- Describe dopamine relation with Parkinson's disease
- Describe clinical features of Parkinsonism
- Discuss the treatment of Parkinson's disease
- Explain Chemistry of serotonin.
- Describe the role of serotonin in CNS.
- Describe the relationship of serotonin and pain.
- Give serum Levels of serotonin.
- Define Serotonin toxicity& describe its clinical presentation.
- Define cerebrospinal fluid.
- Give Composition, characteristics of CSF.
- Enumerate Changes in CSF in diseases states.

Topics/Contents:

Lectures: (1 hour each)

- Introduction & Classification of neurotransmitters
- Sources & biochemical importance of Neurotropic Vitamins .(B1,B6 & B12)
- Acetyl Choline and its related disorders
- Chemical composition of BBB & Breach of BBB
- Brain needs in different metabolic states
- Dopamine & Parkinsonism
- Serotonin and pain

Practicals: (1.5 hour)

- Chemical analysis of CSF and clinical significance

Tutorials: (1.5 hour each)

- Biogenic amines, Neuropeptides and Neuro-Lipids
- Neurological manifestations of Vit.B1, B6 and Vit.B12 deficiency

PATHOLOGY**Learning Objectives:**

- Describe the pattern of nerve injury & regeneration of neuron.
- Enlist the causes & types of cerebral edema & Hydrocephalus.
- Describe the pathogenesis of ischemia, Hypoxia, Infarction and hypertensive cerebral hemorrhage.
- Describe disorders of Neuromuscular Junction.
- Describe infective disorders of CNS
- Enlist developmental Anomalies of CNS
- Describe diseases of myelin
- Describe pathogenesis of traumatic brain injuries.

Topics/Contents:**Lectures: (1 hour each)**

- Patterns of Nerve Injury and Regeneration of Neurons
- Cerebral Edema, Hydrocephalus, Raised Intracranial Pressure and Herniation
- Mechanism of Ischemia, Hypoxia, Infarction and Intracranial Hemorrhage
- Disorders of Neuromuscular Junction
- Hypertensive Cerebrovascular Disease and Intracranial Hemorrhage
- Meningitis
- Encephalitis
- Revisit Infectious Diseases of the Nervous System
- Diseases of Myelin
- Traumatic Injury of CNS
- Revisit Patterns of Nerve Injury and Regeneration of Neurons
- Developmental Anomalies of CNS

Practicals: (1.5 hour each)

- Encephalitis: Causative Organisms and Lab Findings
- Examination of the CSF
- Gross Pathology: Brain Hemorrhage (museum)

COMMUNITY MEDICINE**Learning Objectives:**

- Assess Endemic Diseases Involving Nervous System; Diphtheria, Tetanus
- Elucidate Stroke risk factors and prevention strategies.
- Formulate strategies for prevention and control of snake bite in Pakistan.
- Define the etiology, epidemiology, prevention and control of Poliomyelitis
- Analyze Polio eradication in the context of Pakistan
- Identify prevention and control strategies for Rabies
- Evaluate common mental health problems, their causes and prevention
- Recognize the multifactorial etiology and control strategies for Drug abuse, addiction, and alcoholism
- Enlist hazards of substance abuse and apply its prevention and control strategies
- Appreciate the hazards unsafe injection use

Topics/Contents:**Lectures: (1 hour each)**

- Endemic, Diseases Involving Nervous System: Diphtheria, Tetanus
- Stroke risk factors and prevention
- Snake bite
- Poliomyelitis
- Rabies
- Common mental health problems, causes, prevention and control
- Drug abuse, addiction, and alcoholism
- Polio eradication in Pakistan

PHARMACOLOGY**Learning Objectives:**

- Classify important neurotransmitter
- Explain the bases of diseases either due to deficiency/excess of neurotransmitters
- Identify the clinical importance of different opioid analgesics as well as its possible drawbacks
- Explain role of anti-coagulants & thrombolytic towards the treatment of TIA(transient ischemic attack)

Topics/Contents:**Lectures: (1 hour each)**

- Clinical Pharmacology of important neurotransmitters
- Pharmacology of opioid analgesics
- Anticoagulants & Antithrombotics

Tutorials: (1.5 hour each)

- Neurotransmitters related CNS disorders
- Opioid analgesics
- Role of anticoagulants & thrombolytics transient ischemic attack(TIA)

CBL (1.5 hour each)

- Stroke
- Parkinson's disease

BEHAVIORAL SCIENCES

Learning Objectives:

- Understand cognitive and emotional domains of human functioning in a particular setting such as ethical principles, managing emotions and crisis intervention and conflict resolution.

Topics/ Contents:

Lectures (1 hour each)

- Principles of Medical Ethics
- Emotional Intelligence: Understanding emotional intelligence- EQ, Managing Emotions
- conflict Resolution
- crisis Intervention

STUDY SKILLS

Learning Objectives:

- Familiar with the correct method of nervous system examination
- Enlist the instrument needed for lumber puncture
- Demonstrate correct aseptic technique of lumber puncture

Topics/ Contents: (1.5 hour each)

- Introduction to CNS examination
- Lumber puncture

The contents are subjected to be altered according to requirement of academic calendar

LEARNING RESOURCES**ANATOMY**

- Clinically Oriented Anatomy Textbook by Anne MR Agur, Arthur F Dalley, and Keith L. Moore
- Gray's Anatomy for Students by Richard L. Drake, A. Wayne Vogl, Adam W. M. Mitchell 4th Edition
- B. Young J. W. Health Wheater's Functional Histology
- Langman's Medical Embryology

BIOCHEMISTRY

- Harper's Illustrated Biochemistry
- Lippincott's Illustrated reviews of Biochemistry
- Lehninger's Principles of Biochemistry
- Biochemistry by Devlin

PHYSIOLOGY

- Textbook Of Medical Physiology by Guyton And Hall
- Ganong's Review of Medical Physiology
- Human Physiology by Lauralee Sherwood

PATHOLOGY

- Robbins Basic Pathology Kumar & Abbas 10th Edition
- Robbins & Cotran Pathologic Basis Of Disease Kumar & Abbas & Aster 10th Edition

COMMUNITY MEDICINE

- Public Health And Community Medicine Shah, Ilyas, Ansari 7th Edition

PHARMACOLOGY

- Lippincott's Illustrated Review Pharmacology Karen Whalen 6th Or Latest Edition
- Basic And Clinical Pharmacology Bertram G. Katzung 11th Edition

BEHAVIORAL SCIENCES

- Asma Humayun, Introduction to Behavioral Sciences
- Atkinson, Hilgard Introduction to Psychology
- Haider A Naqvi, Psychology in Practice
- Mowadat Hussain Rana, Handbook of Behavioral Sciences

ASSESSMENT

Assessment will be done in two parts:

At the end of module

- Module Exam (Theory) -20%
- Module Exam Practical Internal Evaluation- 20%

At the end of Year

- Annual Exam (Theory) -80%
- Annual Exam (OSPE, Viva)-80%

MCQs (Multiple choice questions), OSPE (Objective Structured Practical Exam) and structured vivas will be the main assessment tool.