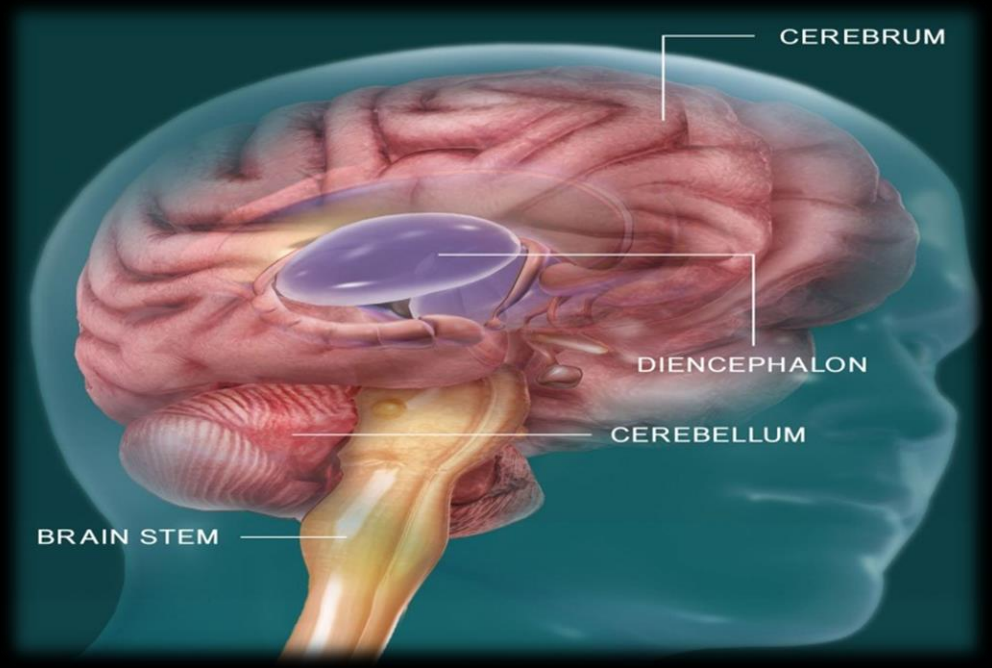
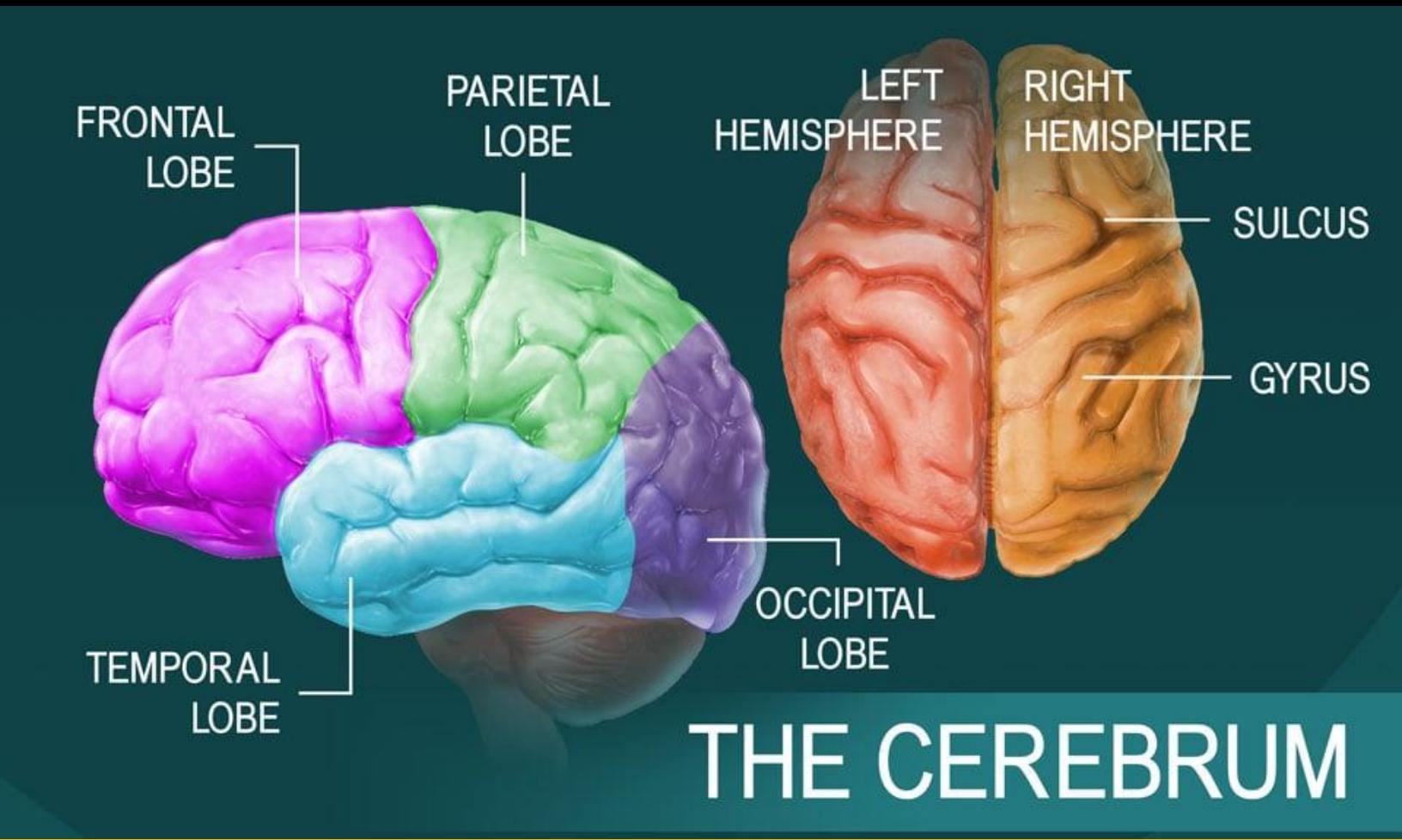
Study Guide – Second Year MBBS

3rd March. – 26th April 2025

Duration: 7 weeks

Neuroscience-I Module





LIAQUAT NATIONAL HOSPITAL AND MEDICAL COLLEGE

Institute for Postgraduate Medical Studies & Health Science

Module name: ***Neurosciences -I*** *Year:* ***Two*** *Duration:* ***7 weeks*** *(3rd March to 16th April 2025)*

Timetable hours: **Interactive Lectures, Case-Based Learning (CBL), Practical, Skills, Self-Directed Learning**

MODULE INTEGRATED COMMITTEE

MODULE COORDINATOR		
Dr. Aitmad-Ud-Daulah (Pharmacology)		
CO-COORDINATOR		
Dr. Nimra Akhtar (Community Medicine)		
DEPARTMENTS' & RESOURCE PERSONS' FACILITATING LEARNING		
BASIC HEALTH SCIENCES		**CLINICAL SCIENCES**
ANATOMY		**NEUROMEDICINE**
Professor Zia-ul-Islam		Dr. Ahmed Asif
BIOCHEMISTRY		**RADIOLOGY**
Professor Faiza Waseem		Professor Muhammad Ayub Mansoor
PHYSIOLOGY		**FAMILY MEDICINE**
Professor Syed Hafeezul Hassan		Dr. Rabeeya Saeed
		RSDC
		Dr. Kehkashan Tahir
DEPARTMENT OF HEALTH PROFESSIONS EDUCATION		
Professor Sobia Ali	Professor Nighat Huda	Dr. Afifa Tabassum
Dr. Yusra Nasir	Dr. Haya Noor	
LNH&MC MANAGEMENT		
Professor KU Makki, Principal LNH&MC		
STUDY GUIDE COMPILED BY: Department of Health Professions Education		

INTRODUCTION

WHAT IS A STUDY GUIDE?

It is an aid to:

- Inform the students how the student learning program of the module has been organized
- Help students organize and manage their studies throughout the module
- Guide students on assessment methods, rules, and regulations

THE STUDY GUIDE:

- Communicates information on the organization and management of the module. This will help the student to contact the right person in case of any difficulty.
- Defines the objectives which are expected to be achieved at the end of the module.
- Identifies the learning strategies such as lectures, small group teachings, clinical skills, demonstration, tutorial, and case-based learning that will be implemented to achieve the module objectives.
- Provides a list of learning resources such as books, computer-assisted learning programs, web- links, and journals for students to consult to maximize their learning.
- Highlights information on the contribution of continuous examinations on the student's overall performance.
- Includes information on the assessment methods that will be held to determine every student's achievement of objectives.
- Focuses on information about examination policy, rules, and regulations.

CURRICULUM FRAMEWORK

Students will experience an integrated curriculum similar to previous modules**.**

INTEGRATED CURRICULUM comprises system-based modules such as Head and Neck, Nervous system Endocrinology, Reproductive and Renal which links basic science knowledge to clinical problems. Integrated teaching means that subjects are presented as a meaningful whole. Students will be able to have a better understanding of basic sciences when they repeatedly learn about clinical examples.

Case-based discussions, computer-based assignments, early exposure to clinics, wards, and skills acquisition in skills lab are characteristics of the integrated teaching program

LEARNING METHODOLOGIES

The following teaching/learning methods are used to promote better understanding:

- Interactive Lectures
- Small Group Discussion
- Case-Based Learning
- Practicals
- Skills session
- Self-Directed Learning

INTERACTIVE LECTURES

In the large group, the lecturer introduces a topic or common clinical conditions and explains the underlying phenomena through questions, pictures, and videos of patients' interviews, exercises, etc. Students are actively involved in the learning process.

SMALL GROUP DISCUSSION: This format helps students to clarify concepts and acquire skills or attitudes. Sessions are structured with the help of specific exercises such as patient cases, interviews, or discussion topics. Students exchange opinions and apply knowledge gained from lectures, tutorials, and self-study. The facilitator's role is to ask probing questions, summarize, or rephrase to help clarify concepts.

CASE-BASED LEARNING: A small group discussion format where learning is focused on a series of questions based on a clinical scenario. Students discuss and answer the questions by applying relevant knowledge gained in clinical and basic health sciences during the module.

PRACTICAL: Basic science practicals related to anatomy, biochemistry, pathology, pharmacology, and physiology are scheduled for student learning.
SKILLS SESSION: Skills relevant to the respective module are observed and practiced where applicable in the skills laboratory or Department of Physiotherapy.

SELF-DIRECTED LEARNING: Students assume responsibilities for their learning through individual study, sharing and discussing with peers, and seeking information from Learning Resource Center, teachers, and resource persons within and outside the college. Students can utilize the time within the college's scheduled hours of self-directed learning.

MODULE: NEUROSCIENCES -I

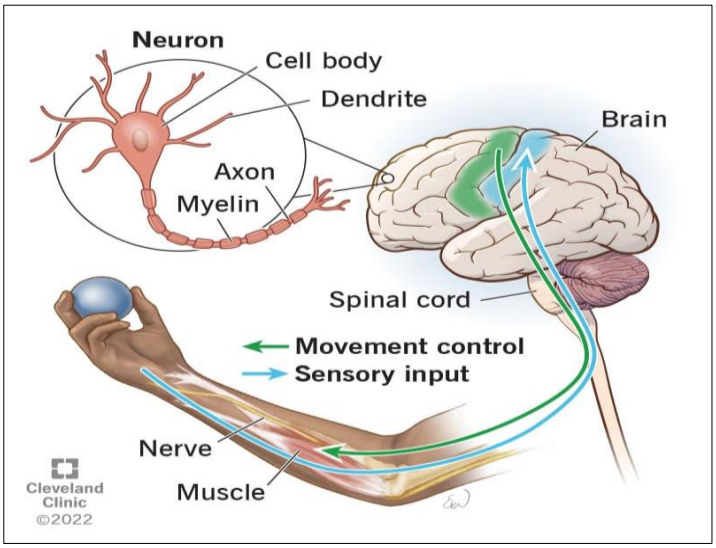
INTRODUCTION

Neuroscience is the study of the nervous system. It is a cross-disciplinary field that engages in investigating how the nervous system develops and functions on a cellular level as well as the mechanisms that underlie neurological disease. This module combines breadth of exposure to the field as a whole with the opportunity for depth of experience in one of three central domains of neuroscience: Cellular and Systems, Functional and Integration, and Clinical Neurosciences.

When someone in the neighborhood develops a stroke and the family wants to know what more can be done to improve the patient's lifestyle, or what are the chances his /her children will have a stroke, it is our primary responsibility as future doctors to know not just the treatment but also preventive strategies for a healthy living.

Importance of Neurosciences -I

Through this module, you will develop integrated, scientific knowledge that you can put into practice in a clinical setting, plus creative and problem-solving skills. These key skills will prepare you for a career helping to progress scientific discovery into clinical and medical practice, ultimately improving human health.



COURSE OBJECTIVES AND STRATEGIES

At the end of the module, the students will be able to:

ANATOMY	
1. General organization of the Nervous system, different types of nerve tissue cells (Neurons & Neuroglia)	Interactive Lecture/CBL/Tutorial
☐ Explain the general components of nervous system.	
☐ Discuss the division of the nervous system into CNS, ANS & PNS.	
☐ Discuss the structural/ cellular organization of the nervous system.	
☐ Classify the types of neuron & neuroglia.	
☐ Describe the structure of neuron & neuroglia.	
2. Development of Brain and Spinal cord & anomalies (Embryology)	
☐ Describe the formation of primary & secondary vesicles and flexures.	
☐ Relate the components of ventricular system with the cavities of secondary vesicles.	
☐ Describe the differentiation of the layers from neuroepithelium in primitive spinal cord.	
☐ Describe derivation of alar & basal plates, neuron and neuroglia cells.	
☐ Discuss positioning of spinal cord.	
☐ Describe the congenital anomalies of spinal cord viz. Spina bifida occulta, spinal bifida cystica, Myeloschisis.	
3. Gross External features of the spinal cord	
☐ Discuss the extent (starting & terminating point) of the spinal cord	
☐ Describe the gross features i.e. shape, length, regions, fissure &sulcus of the spinal cord	
☐ List the regional enlargements of the spinal cord.	
4. Histology of spinal cord	
☐ Discuss the microscopic structure of spinal cord.	
☐ Compare the sections at different segmental levels (cervical, thoracic)	
5. Internal features of spinal cord I- (Ascending tracts)	Interactive Lecture/Tutorial
☐ Discuss the internal features of the spinal cord, gray (groups) & white (columns) matter.	
☐ Discuss 1st, 2nd & 3rd order neurons of sensory pathway.	
☐ Discuss in detail the ascending (sensory) tracts of the spinal cord and their lesions.	
6. Internal features of spinal cord II- (Descending tracts)	
☐ Discuss in detail the descending (motor) tracts of the spinal cord.	
☐ Relate the lesions of descending tracts.	

7. Development of forebrain, midbrain & hindbrain (Embryology)	
☐ Discuss the process of development of the forebrain, midbrain & hindbrain and their anomalies.	
8. Blood supply (arterial supply & venous drainage) of the spinal cord and clinical manifestation of ischemia	
☐ Describe the Vertebral Systems of arteries.	Interactive Lecture/Tutorial
☐ Describe the area of spinal cord supplied by different branches.	
☐ Discuss the role of radicular and feeder arteries.	
☐ Describe the venous drainage of spinal cord.	
☐ Describe the clinical consequences of ischemia of the spinal cord	
9. Spinal cord lesions, transection & spinal shock	
☐ Discuss the lesions of anterior & posterior nerve roots	
☐ Elaborate on the lesions of ascending & descending tracts	
☐ Discuss the mechanism & consequences of tabes dorsalis, spinal shock syndrome, Brown Sequard syndrome, poliomyelitis, syringomelia	
10. Brainstem I- Medulla Oblongata	
☐ Have a brief introduction about the brainstem.	
☐ Discuss the formation and parts of the brainstem.	
☐ Describe the gross anatomical features of Medulla Oblongata its blood supply.	
☐ Discuss in detail the internal features of Medulla Oblongata.	
☐ List the cranial nerves emerging from the medulla oblongata.	
☐ Discuss the clinical conditions associated with the medulla oblongata	
11. Brainstem II- Pons	Interactive Lecture/Tutorial
☐ Describe the location of Pons with respect to the brainstem	
☐ Discuss the external & internal features of Pons and its blood supply.	
☐ Discuss the relation of Pons with the 4th ventricle	
☐ List the cranial nerves emerging from Pons	
☐ Discuss the clinical conditions associated with Pons	
12. Brainstem III- Midbrain	
☐ Describe the location of the midbrain with respect to the brainstem	
☐ Discuss the external & internal features of the midbrain with its supply.	
☐ Discuss the relation of Pons with cerebral aqueduct	
☐ List the cranial nerves emerging from the midbrain	
☐ Discuss the clinical conditions associated with midbrain	
13. Gross anatomy of Cerebellum	

☐ Describe the gross anatomy of the cerebellum location, structural & functional division (lobes) and its blood supply.	
☐ Discuss various terms like folia, vermis, tracts, and nuclei of the cerebellum	
☐ Relate the clinical conditions associated with cerebellar dysfunction.	
Histology of Cerebellum	
☐ Describe the layers of cerebellar cortex.	
☐ Describe the cellular organization in each layer.	
14. Diencephalon I- Thalamus	Interactive Lecture
☐ Describe the gross features, boundaries and division of diencephalon and its blood supply.	
☐ Describe the gross features and relations of Thalamus.	
☐ Discuss the functions, nuclei, and connections of the thalamus.	
☐ Discuss the clinical conditions associated with the thalamus	
15. Diencephalon II- Sub thalamus, Hypothalamus & Epithalamus	
☐ Briefly describe the structure, division, and boundaries of the diencephalon	
☐ Discuss the functions, nuclei, and connections of the subthalamus, hypothalamus & Epithalamus.	
☐ Discuss the lesions of the subthalamus, hypothalamus & Epithalamus.	
16. Limbic system & Reticular formation	
☐ List the parts of the limbic system	
☐ Discuss the outer arc, middle arc & inner arc of the limbic system	
☐ Describe the hippocampus formation	
☐ Discuss the disorders of the limbic system	
17. Basal ganglia & its nuclei	
☐ Describe the location and components of basal ganglia	
☐ Discuss the connections and functions of basal ganglia and its nuclei	
☐ Discuss the lesions of basal ganglia & its nuclei	
18. Skull as whole, vault of skull + Anterior cranial fossa	Tutorial/Interactive lectures
☐ Describe the gross anatomy of skull.	
☐ Discuss the sutures of skull.	
☐ Discuss the sutures of the skull	
☐ Discuss different views (normal) of skull	
☐ Discuss the division of the cranial cavity	
☐ Describe the boundaries, bony prominences, and foramina of the anterior cranial fossa	
19. Middle & Posterior cranial fossa	

☐ Briefly discuss the division of the cranial cavity	
☐ Describe the boundaries, bony prominences, and foramina of the anterior cranial fossa	
20. Gross anatomy of Cerebrum (external features, surfaces, gyri & sulci)	
☐ Discuss the gross anatomical features of the cerebrum (surfaces, borders, poles, lobes, sulci& gyri)	
☐ Describe the blood supply of cerebrum.	
21. Functional cortical areas of the cerebrum & their lesions	
☐ Describe different functional areas of the cerebral cortex (motor, sensory, auditory, visual)	
☐ Discuss the lesions of the functional cortical areas of the cerebral cortex	
22. Histology of cerebrum	
☐ Describe the histology of various parts of the Cerebrum	
☐ Discuss the variation of layers in different cortical regions.	
☐ Describe the types of neurons and fibers distributed in different layers.	
23. Functional cortical area of Cerebrum	
☐ List the cortical areas	
☐ Explain the functions of each cortical area and associated relevant conditions	
24. White matter of cerebrum I- Projection fibers and Internal capsule	Interactive Lecture/Tutorial
☐ Discuss the basic concepts of the white matter of the cerebrum.	
☐ Describe the location, parts, connections, and relations of the internal capsule and its blood supply.	
☐ Discuss the common lesion associated with the internal capsule.	
25. White matter of cerebrum II- Commissural & Association fibers	
☐ Discuss the commissural fibers and their connections	
☐ Describe the corpus callosum and its parts.	
☐ Explain the association fibers and their connections	
☐ Discuss the common lesions associated with commissural and association fibers.	
26. Ventricular system I- Lateral ventricle	
☐ List the ventricles of the brain	
☐ Discuss the location, boundaries, and relations of lateral ventricles and its blood supply.	
☐ Discuss the clinical conditions associated with lateral ventricles	Interactive Lecture/Tutorial
27. Ventricular system II- 3rd& 4th ventricles and CSF circulation	
☐ List the ventricles of the brain along with their location	
☐ Describe the structure and location of the 3rd, and 4th ventricles and cerebral aqueduct	

☐ Briefly discuss the normal CSF secretion, circulation & blood-brain barrier	
☐ Discuss the applied anatomy of ventricles of the brain and CSF flow	
28. Blood supply of the brain & clinical manifestations of ischemia	
☐ Discuss the carotid and vertebral systems of vessels.	
☐ List the branches arising from them.	
☐ Describe the formation of circle of Willis.	
☐ Discuss its branches.	
☐ Discuss the area of supply of the 3 cerebral arteries.	
☐ Discuss the veins of brain and their area of drainage.	
☐ Relate the clinical manifestations of ischemia of brain.	
29. Meninges of the brain & spinal cord	
☐ List the meninges of the brain & spinal cord	
☐ Describe the Dural layers, folds, extensions and spaces (subdural etc.)	
☐ Discuss pia mater and its modifications (ligamentum denticulatum, tela choroidea).	
☐ Describe the arachnoid mater, subarachnoid space and cisterns.	
☐ Describe the blood and nerve supply of meninges	
30. Dural venous sinuses	
☐ Describe the location, relations, and drainage of dural venous sinuses of the brain	
☐ Describe the contents of cavernous sinus and extra cranial communication.	
☐ Discuss the clinical importance of different sinuses.	
31. Autonomic nervous system	Interactive Lecture
☐ Describe the autonomic nervous system	
☐ Discuss the division of ANS into the sympathetic & parasympathetic nervous system	
☐ Discuss the components of the sympathetic part of the nervous system (thoracolumbar outflow: lateral gray horn, paravertebral sympathetic chain, prevertebral ganglia, and plexuses	
☐ Describe the different fate (destination) of white and gray rami (preganglionic and post-ganglionic fibers)	
☐ Discuss the components of the parasympathetic part of the nervous system (craniosacral outflow: parasympathetic cranial nerve nuclei and sacral spinal segments)	
☐ List the parasympathetic ganglia	
☐ Describe the pathways of pre and post-ganglionic parasympathetic fibers	
32. Cranial nerve nuclei and peripheral distribution with its lesions	Tutorial/Practical
☐ Name all the cranial nerves in sequence	
☐ List the location of the cranial nerve nuclei	
☐ Discuss their distribution and main effects of lesions	

33. Spinal cord and its cut sections (Demonstration on Sectra)	
Discuss the various cut sections of spinal cord and associated lesions.	
PRACTICAL	
1. Structure of neuron & neuroglia	
Describe the structure of a neuron & neuroglia	
List the types of neuron & neuroglia	
Functions of neuron & neuroglia	
Discuss the formation of the blood-brain barrier	
Observe the histological sections of a neuron & neuroglia under the light microscope	
2. Spinal cord, spinal nerve & ganglia	
Have a brief introduction about the spinal cord, spinal nerves, and ganglia	
Discuss the histological features of the spinal cord, spinal nerve &ganglia	
Observe & identify histological features of the spinal cord, spinal nerve& ganglia under the light microscope	
3. Cerebellar/Cerebllum cortex	
Discuss the histological features of the cerebellum in the form of layers, cells & nuclei	
Discuss the histological features of cerebrum in the form of layers, cells & nuclei Observe and identify the histological features of cerebral cortex under light microscope	

PHYSIOLOGY	
1. Neurons membrane, generation & propagation of nerve impulse	Interactive Lecture
Elaborate the structure and functions of neuron	
Discuss the classification & functions of nerve fibers	
Describe the threshold & initiation of action potential in neuronal cells	
Describe the propagation of nerve impulse/ saltatory conduction.	
2. Synapsis, properties of synapses	Quiz/CBL
Describe the properties of chemical and electrical synapses	
3. Sensory receptors and neuronal circuits	Interactive Lecture /Tutoral
Discuss the classification of sensory receptors	
Describe the functions & properties of different types of receptors	
Explain the properties of different types of neuronal circuit	
4. Somatic sensations	
Explain the general organization of somatic sensation: tactile and position senses	

Discuss the dorsal-column medial lemniscal pathway	
Discuss the anterolateral –pathway	
Describe the mechanism of thermal receptors & their excitation.	
5. Physiology of pain – I & headache	
Discuss the types of pain (slow & fast) and their characteristics	
Explain the mechanism of stimulation of pain receptors	
Discuss the clinical abnormalities of pain: hyperalgesia, headache & its causes.	
6. Physiology of pain II- Brain analgesic system	
Explain the brain analgesic system	
Discuss the brain's opiate system	
Discuss visceral & referred pains	
7. Spinal cord and reflexes	Quiz/CBL/SDL
Describe the motor function of spinal cord	
Explain the structure and function of muscle spindle.	
Discuss the muscle, stretch reflex and its clinical applications.	
8. Muscles proprioceptors (muscle spinal & Golgi tendon organ)	
Discuss the mechanism of flexor reflex, crossed extensor reflex, scratch reflex, postural and locomotive reflexes.	
Discuss spinal cord transection and spinal shock (Brown-Sequard syndrome)	
Explain the mechanism of Golgi tendon reflex& its significance in controlling motor activities.	
9. Somatosensory cortex	Interactive Lecture
Discuss the orientation of various areas of cortex and their associated function	
Describe the layers of somatic sensory cortex and their functions.	
10. Function of brain stem	Tutorial
Explain the role of brain stem nuclei in controlling motor functions	
Discuss the vital and non- vital functions of brain stem (respiratory, cardiac, vasomotor centers & coughing, sneezing & vomiting reflexes)	
11. Cerebellum and its functions	
Explain the functions of cerebellum & its associated disorders	
List the functions of Vermis, Intermediate zone and lateral zone of cerebellum.	
12. Neuronal circuits of cerebellum and associated disorders	
Discuss the afferent and efferent pathways of cerebellum.	Interactive Lecture

Describe the Functions of Purkinje cells and deep cerebellar nuclei.	
Explain the abnormalities associated with cerebellar lesion.	
13. Vestibular system and maintenance of equilibrium	
Name the parts of vestibular system	
Explain the functions of the vestibular system	
Discuss the role of utricle & saccule in static equilibrium	
Discuss the role of semicircular Ducts in Angular Acceleration	
14. Functions of diencephalon	
Discuss the function of thalamus and its nuclei.	
Explain the functions of various nuclei of epithalamus and hypothalamus.	Tutorial
15. Limbic system	
Describe the functions of limbic system	
Discuss the role of hypothalamus in Limbic system	
Discuss the importance of reward and punishment centers	Tutorial
Elaborate on the role of hippocampus and amygdala	
Discuss the effects of Kluver – Bucy syndrome	
16. Basal ganglia and its nuclei	
Explain the functions of caudate & putamen pathways	
List the functions of specific neurotransmitters of basal ganglial system	
Explain the disorders associated with basal ganglia (hypokinetic and hyperkinetic)	Tutorial
17. Motor cortex, pyramidal tract, Upper and lower Motor Neurons	
Explain the functions of pyramidal tract	
List the functions of specific cortical areas	
Differentiate between upper & lower motor neuron lesions (UMN & LMN).	
18. Physiology of sleep & sleep disorders	
Explain the physiology of slow-wave sleep & rapid eye movement (REM)sleep	
Explain the basic theories of sleep &origin of brain waves	
19. Learning and memory	
Determine the role of cerebral cortex in higher intellectual functions	Interactive Lecture
Classify the different types of memories	
20. CSF: formation, circulation & function	
Describe the mechanism of CSF formation, circulation & function	

21. Autonomic Nervous System-I	Interactive Lecture Tutorial/CBL
Explain the functional division of Autonomic Nervous System	
Discuss the organization of sympathetic & parasympathetic nervous system, their neurotransmitters and receptors in body systems.	
22. Autonomic Nervous System-I	
Explain the effect of sympathetic and parasympathetic nervous system on various organs.	
Discuss various abnormalities caused by activation of sympathetic and parasympathetic nervous system.	
23. Speech & its disorders	
Explain the physiology of speech and associated disorders	
Parkinsonism	
Reticular Activating system	
24. Regulation of body temperature and fever	
Distinguish between skin temperature and core temperature.	
Describe the following mechanisms of heat loss from the body; conduction, convention, radiation and evaporation.	
Explain the role of anterior and posterior hypothalamus in regulation of body temperature.	
Elaborate "set-point" of temperature control mechanisms and the role of pyrogens in altering the set point to cause fever.	
PRACTICAL	Practical
1. Examination of Superficial reflexes	
To perform superficial reflexes and emphasize its significance in different neurological disorders	
Corneal reflexes	
Abdominal reflexes	
Plantar reflexes	
	Practical
2. Examination of Deep reflexes	
Perform deep reflexes: Bicep reflex, tricep reflex, knee jerk, ankle jerk, brachioradialis reflex.	
Describe their significance in upper and lower motor neuron lesions.	
3. Cerebellar function tests	
Perform cerebellar function tests and identify associated disorders.	
4. Body temperature	
Determine body temperature by using an oral mercury thermometer	
Describe the significance of body temperature taken through oral, axillary and rectal route.	
5. EEG	
Interpret brain waves with the help of a power lab.	

6. Examination of Cranial Nerve (CN I – CN XII))	
Examine the cranial nerves by performing the different tests	

BIOCHEMISTRY	
1. Lipids of the nervous system: Chemistry of Brain Lipids	
Classify brain lipids with examples	
Explain the chemistry of brain lipids	
Describe the chemical composition and functions of myelin	
Discuss the clinical significance of lipid storage diseases	
2. Blood Brain Barrier	Tutorial/ Interactive Lecture
Define Blood Brain Barrier	
State the biochemical composition of the Blood Brain Barrier	
Explain the functions of the Blood Brain Barrier	
Explain the impact of Blood Brain Barrier disruption	
Discuss the clinical disorders associated with Blood Brain Barrier disruption	
3. Cerebrospinal fluid	
Describe the chemical composition of CSF and its functions	
Explain the mechanism of production, route of flow and reabsorption of CSF	
Explain the procedure of lumbar puncture	
Interpret the laboratory investigations of CSF in different diseases	
4. Introduction to Neurotransmitters	
Define Neurotransmitters	
Classify Neurotransmitters with examples	
Describe the mechanism of action and functions of Neurotransmitters	
Classify receptors of Neurotransmitters	
Explain the synthesis and degradation pathways of Neurotransmitters	
Discuss the disorders associated with Neurotransmitter	
5. Neurotransmitters-1 Acetylcholine & Dopamine	
Describe the chemical structure of Acetylcholine and Dopamine	
Describe the metabolism of Acetylcholine and Dopamine	
Explain the mechanism of action and functions of Acetylcholine & Dopamine	
Discuss the receptors of Acetylcholine and Dopamine	
Explain the clinical disorders associated with Acetylcholine and dopamine	

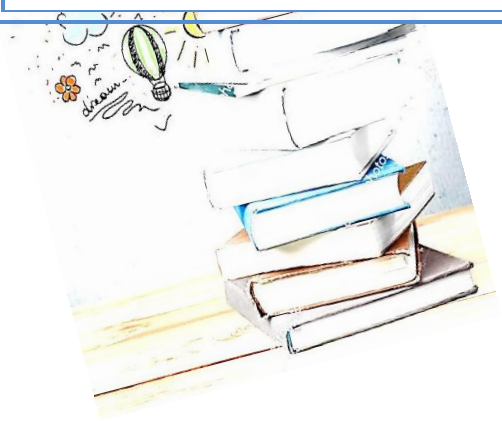
6. Neurotransmitters-2 Serotonin & GABA	Interactive Lecture/Tutorial
Describe the chemical structure of Serotonin and GABA	
Describe the metabolism of Serotonin and GABA	
Explain the mechanism of action and functions of Serotonin and GABA	
Discuss the receptors of Serotonin and GABA	
Explain the clinical disorders associated with Serotonin and GABA	
7. Neurodegenerative diseases of CNS	
List the common Neurodegenerative diseases	
Discuss the common mediators of Neurodegenerative diseases	
Discuss the biochemical changes in Neurodegenerative diseases	
Describe the biochemical phenomenon of ageing	
8. Role of free radicals & Vitamins in CNS disorders	
Explain the role of free radicals in Neurodegenerative diseases	
List the free radicals causing degenerative diseases	
List the sources of free radicals	
Explain the mechanism of free radical injury	
Describe the role of free radicals in diseases	
Classify the antioxidants with examples	
Discuss the process of oxidative stress response	
Discuss the biochemical importance of vitamins in neurological disorders	
Discuss the sources, biochemical role and daily requirements of vitamins B1, B6, B9, B12 and folic acid	
Explain the deficiency diseases related to these vitamins	
Practical	Practical
1. Lumbar Puncture	
Explain the procedure of Lumbar Puncture (LP)	
Identify the chemical tests and bio-techniques to detect analytes in CSF	
Identify the parts of LP needle	
Interpret the laboratory report in different CNS diseases Interpret clinical conditions correlated with their laboratory investigations	
2. CSF Glucose Estimation	
Identify the procedure & bio-technique to detect glucose in CSF	
Estimate glucose in CSF	
Interpret the laboratory report of glucose in CSF	
Interpret clinical conditions correlated with their laboratory investigations	

3. CSF Protein Estimation	
Identify the procedure & bio-technique to detect proteins in CSF	
Estimate proteins in CSF	
Interpret the laboratory report of proteins in CSF	
Interpret clinical conditions correlated with their laboratory investigations	
4. CSF Chloride Estimation	
Identify the procedure & bio-technique to detect chloride in CSF	
Estimate chloride in CSF	
Interpret the laboratory report of chloride in CSF	
Interpret clinical conditions correlated with their laboratory investigations	
NEUROMEDICINE	
1. Stroke	
1. Discuss the primarily focuses on how to restore blood flow of affected part of brain Summarize the latest treatment options for stroke induced neurological damage	
RADIOLOGY	
1. Brain and Spinal cord	
1. Differentiate between CT scan and MRI 2. Identify normal imaging of different areas of brain and spinal cord. 3. Recognize imaging features of common neurological disorders like Alzheimer's and Parkinsonism. 4. Identify CT scan and MRI findings in patients with stroke and hematoma	
1. Mechanical Thrombectomy: 1. Define Mechanical Thrombectomy 2. Briefly discuss the principle, procedure and application of Mechanical Thrombectomy 3. Explain the advantages and disadvantages of the above procedure.	
SKILL LAB	
1. Demonstrate Lumbar Puncture steps	Practical
Family Medicine	
Patient-centered care	Interactive Lecture
Family Medicine in Community care services	
Longitudinal Curriculum:	
Bioethics	
Bioethics Essentials: Key concepts and termonologies • Define dilemma, diversity, tolerance and pluralism, integrity with strong moral compasses like Truth telling, honesty, and respect	Interactive Lecture/Small Group Discussion

Communication Skills	
Basic elements of communication • Define the following with reference to professional behavior: Active listening Empathy Verbal and Non-verbal communication • Define the seven Cs of effective communication: clear, concise, concrete, correct, coherent, complete and courteous • Describe process, principles and models of communication skills in health care context (basic elements and group dynamics) • Describe the following: Two factors; Sender & receiver Four key components: Encoding, medium of transmission, decoding and feedback.	Forum Theatre
Models of communication skills • Describe the 3 models for communication: Linear, Interactional, and Transactional • Discuss the challenges and advantages in using the 4 models of physician-patient relationship (informative, interpretive, deliberative, paternalistic) in the local context	Small group Disucssion
Research	
Study design:Descriptive Studies	Interactive Lecture/Small group Disucssion/ Hands on demonstration
Analytical Study Design	
Study Design Experimental	
Sampling techniques for probability sampling	
Quasi Experimental Study Design	
Sampling Techniques for non-probability sampling	
Hypothesis, its types & errors in hypothesis testing	

LEARNING RESOURCES

SUBJECT	RESOURCES
ANATOMY	GROSS ANATOMY K.L. Moore, Clinically Oriented Anatomy Neuro Anatomy by Richard Snell HISTOLOGY B. Young J. W. Health Wheather's Functional Histology EMBRYOLOGY Keith L. Moore. The Developing Human Langman's Medical Embryology
BIOCHEMISTRY	TEXTBOOKS Harper's Illustrated Biochemistry Lehninger Principle of Biochemistry Lippincott's Illustrated Reviews of Biochemistry Biochemistry by Devlin
PHYSIOLOGY	TEXTBOOKS Textbook of Medical Physiology by Guyton And Hall Ganong 'S Review of Medical Physiology Human Physiology by Lauralee Sherwood Berne & Levy Physiology Best & Taylor Physiological Basis of Medical Practice REFERENCE BOOKS Guyton & Hall Physiological Review Essentials of Medical Physiology by Jaypee Textbook of Medical Physiology by InduKhurana Short Textbook of Physiology by Mrthur NMS Physiology



OTHER LEARNING RESOURCES

Web Link

http://www.who.int/mentalhealth/neurology/neurologicaldisorders/report.web.pdf

Hands-on activities/Practical

Students will be involved in Practical sessions and hands-on activities that link with the Nervous system I module to enhance learning.

Labs

Utilize the lab to relate the knowledge to the specimens and models available

Skill Labs

A skills lab provides the simulators to learn basic skills and procedures. This helps build the confidence to approach the patient

Videos

Video familiarizes the student with the procedures and protocols to assist patients.

Computer(Lab/CDs/DVDs/Internet Resources

To increase their knowledge, students should utilize the available internet resources and CDs/DVDs. This will be an added advantage to enhancing learning

Self-Study

Generally means studying without direct supervision. During this session, one learns by himself/herself to search for information to solve cases, read through different resources, and discuss among peers and with the faculty to clarify the concepts

ASSESSMENT METHODS:

- Best Choice Questions(BCQs) also known as MCQs (Multiple Choice Questions)
- Objective Structured Practical/Clinical Examination (OSPE or OSCE)

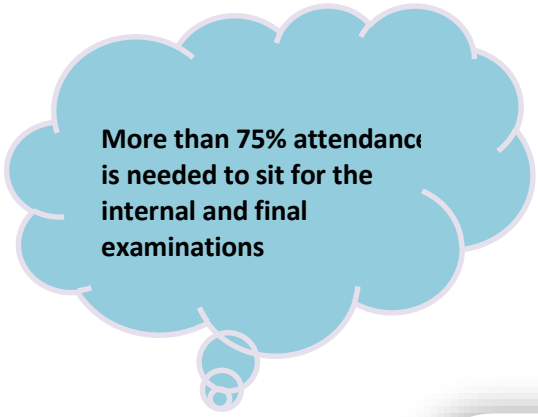
Internal Evaluation

- Students will be assessed comprehensively through multiple methods.
- 20% marks of internal evaluation will be added to JSMU final exam. That 20% may include class tests, assignments, practicals, and the internal exam which will all have specific marks allocation.

Formative Assessment

The individual department may hold a quiz or short answer questions to help students assess their learning. The marks obtained are not included in the internal evaluation

For JSMU Examination Policy, please consult JSMU website!



LNH&MC EXAMINATION RULES & REGULATIONS

- Students must report to the examination hall/venue, 30 minutes before the exam.
- **The exam will begin sharply at the given time.**
- No student will be allowed to enter the examination hall after 15 minutes of the scheduled examination time.
- Students must sit according to their roll numbers mentioned on the seats.
- **Cell phones are strictly not allowed in the examination hall.**
- If any student is found with a cell phone in any mode (silent, switched off, or on) he/she will not be allowed to continue their exam.
- No students will be allowed to sit in the exam without University Admit Card, LNMC College ID Card, and Lab Coat
- Students must bring the following stationary items for the exam: Pen, Pencil, Eraser, and Sharpener.
- Indiscipline in the exam hall/venue is not acceptable. Students must not possess any written material or communicate with their fellow students.

SCHEDULE:

WEEKS	2nd YEAR	MONTH
6 WEEKS	GIT & LIVER MODULE-I	20th January 2025
		1st March 2025
6 WEEKS	NEURO SCIENCE MODULE-I	3rd March 2025
		26th April 2025
6 WEEKS	HEAD AND NECK & SPECIAL SENSES MODULE	April 2025
		May 2025
Mid-Term Examination*		

*Final dates will be announced later.