

Dow University of Health Sciences



NEUROSCIENCE MODULE

8 weeks, 9 credit hours

Second Year MBBS

5 YEAR CURRICULAR ORGANIZATION

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) 6 Weeks		Foundation Sub Module Genetics, Microbiology, Bioethics 2 Weeks	HEM1- Blood Module Immunity, Inflammation, Tissue repair, Antimicrobials & Neoplasia 8 Week	
		LCM1- Locomotion Bones, Joints, Nerves & Muscles, 8 weeks		RSP1- Respiratory	CVS1- Cardiovascular System 4 weeks	
	II	NEU1- Nervous System 8 weeks		HNN1- Head & Neck &	END1- Endocrinology 4 weeks	
		GIL 1-GIT and Liver 8 weeks		EXC1- Renal and Excretory	REP1- Reproductive System 4 weeks	
Second Spiral	III	IDD 1- Infectious diseases 4 weeks	HEM2- Hematology 4 weeks		RSP2- Respiratory System 4 weeks	CVS2- Cardiovascular System 4 weeks
		GIL 2-GIT and Liver (including Nutritional Disorders) 8weeks		EXC2- Renal & Excretory	END2- Endocrinology 4 weeks	
	IV	ORT2 Orthopedics, Rheumatology, Trauma, 6 weeks PMR-		Physical Medicine & Rehabilitation 2 weeks	REP2- Reproductive System 8 Weeks	
		DPS- Dermatology Plastic Surgery / Burns 2 weeks	GEN- Genet ics 1 week	NEU2- Neurosciences and Psychiatry 8 weeks		OPH / ENT* 3 week
Third Spiral	V	Half of the class will cover Medicine & Allied and the other half will cover Surgery & Allied modules in first half of teaching session. The two halves will exchange in latter half of year.				
		Clinical Rotation 8:30 to 1:00 (with Ambulatory, Emergency, Intensive care) In Medicine, Pediatrics, Cardiology and Neurology units			Clinical Rotation 8:30 to 1:00 (Inpatient, Ambulatory, Emergency, Intensive care and Operation Theatres) In Surgery, Gynae & 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 			<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 	
PARALLEL THEMES: The following themes are not part of any individual module but shall run concurrently: Communication Skills, Clinical Skills, Writing and Presentation Skills, Article Writing, Ethics						

RATIONALE:

Diseases of the nervous system are common all over the world. Timely diagnosis and management of acute CNS problems like cerebrovascular accidents and infections prevents morbidity and mortality. Early diagnosis and prompt treatment of degenerative and demyelinating diseases like Parkinson's disease and multiple sclerosis is important to reduce the occurrence of disability burden on community. Understanding the structure and function of nervous system and its relationship with pathophysiology of diseases is essential for diagnosis and management. The neurosciences 1 module provides this basic understanding by integrating the teaching of anatomy, physiology, and function of different structures of the nervous system along with the biochemistry of neurotransmitters, and the basic pharmacology and pathology related to the disorders of the central and peripheral nervous system.

TERMINAL OBJECTIVE:

AT THE END OF THIS MODULE STUDENT WILL BE ABLE TO:

- Describe the anatomy of brain and spinal cord and the general organization of nervous system.
- Analyze the physiology of nervous system and biochemistry of neurotransmitters
- Understand the metabolism the brain of along with the composition of blood brain barrier
- Explain the Mechanism of Ischemia, Hypoxia, infarction and intracranial hemorrhage
- Summarize all the cranial nerves with their associated clinical correlates
- Elaborate the approach to a neurologic patient with its screening

MODULE OBJECTIVES:

1. Recognize the structure and function of major division and components of central, peripheral and autonomic nervous system
2. Recognize the structure and function of major division and components of central, peripheral and autonomic nervous system, with the role of hypothalamus
3. 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
4. Interpret the various clinical presentations of spinal cord disorders correlating with its organization, structure and function
5. Localize the common brain stem and cranial nerves lesions by recognizing the structure of brainstem and the associated cranial nerves.
6. Deduce the neuro-anatomic basis of ataxia and incoordination by applying the knowledge of cerebellar cortex, nuclei and peduncles.
7. Identify different modalities of sensation and correlate the lesion in sensory system with the organization of ascending pathways, receptors and thalamus along with the role of serotonin and other pain modulators.
8. Predict the clinical significance of the various superficial and deep reflexes by applying the knowledge of their path ways and functions.
9. 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.
10. Differentiate between pyramidal and extrapyramidal syndromes and upper and lower motor neuron lesions with the knowledge of structure and types of fiber bundles traversing the brain and their functions
11. Correlate the presentation of Parkinsons disease with the topographic anatomy and function of basal nuclei
12. Appreciate the changes in emotions, behavior and personality by recalling the structure and functions of limbic system.

13. 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.
14. Correlate between clinical presentations and pathogenic mechanisms involved in CNS infections and infestations
15. 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.
16. Recognize the effects of venous stasis and obstruction by applying the knowledge of venous drainage and dural venous sinuses
17. Assess the higher mental functions and appreciate their loss in dementia by recalling the mechanisms of cognition, memory, and retrieval, with special knowledge of neurotransmitters and papez circuit.
18. Identify electrical activity of brain and its different wave forms with the knowledge of sleep and awake states
19. Identify the energy needs and metabolism of Brain in well-fed, fasting, starvation and disease states

MODULE CONTENTS:

ANATOMY

Gross Anatomy:

1. Skull as a whole and vault of Skull + Anterior Cranial fossae
2. Skull :Middle Cranial fossae
3. General organization of Nervous system & Different types of nerve tissue- (Neurons and Neuroglia)
4. Skull :Posterior Cranial fossae
5. Meninges of brain and spinal cord
6. Spinal Cord I + (Arterial Supply and Venous Drainage)
7. Typical Spinal Nerve
8. Spinal Cord II
9. Spinal Cord Lesion
10. Anatomy of brain stem and associated lesions: Medulla Oblongata
11. Anatomy of brain stem and associated lesions: Pons
12. Anatomy of brain stem and associated lesions: Midbrain
13. Gross Features of Cerebellar Cortex
14. Skull as a whole and vault of Skull + Anterior Cranial fossae + Middle Cranial fossae + Posterior Cranial fossae (tutorial)
15. Fourth ventricle & cerebral aqueduct
16. Structure of Diencephalon I (Thalamus)
17. Structure of Diencephalon II (Epithalamus, subthalamus and third ventricle)
18. Structure of Diencephalon III (Hypothalamus)
19. Organization of Autonomic Nervous system
20. Gray matter of cerebral hemisphere: CEREBRAL CORTEX (Surfaces, lobes, sulci and gyri of cerebral hemisphere)
21. Functional areas of cerebral cortex Gray matter of cerebral hemisphere
Basal nuclei
22. Lesion of functional areas of cerebral cortex
23. Models Of Brain (Cerebellum and cerebrum) (practical)

24. White matter of cerebral hemisphere Projection fibers (Internal capsule and related anomalies)
25. White matter of cerebral hemisphere Commissural fibers and association fibers
26. Arterial Supply of Brain
27. Lateral Ventricles of Brain + Choroid Plexus
28. Venous drainage of brain and Dural venous sinuses of Brain
29. Limbic system
30. Summary of cranial nerve (1-6) nuclei + associated clinical correlates
31. Summary of cranial nerve (7-12) nuclei + associated clinical correlates

General Histology:

1. Microscopic anatomy of Cerebellar Cortex
2. Microscopic anatomy of Cerebral cortex
3. Structure of Neuron and neuroglia + Spinal Cord (tutorial)
4. Microscopic anatomy of cerebellar and cerebral cortex (Practical)

General Embryology:

1. Development of Nervous system and Neurulation
2. Development of Forebrain + Developmental Anomalies of CNS

PHYSIOLOGY

1. Neuron membrane potential: Generation and propagation of Nerve impulse
2. Sensory Receptors (including Muscle spindle) and Neuronal circuits
3. Types of nerve fibers, its regeneration and degeneration
4. Synapses including Properties Functions of neurotransmitters
5. Motor functions of Spinal cord+ Reflex arc
6. Organization, location and function of different ascending pathways
7. Organization, location and function of different descending pathways
8. Physiology of pain
9. Motor, Vital and non-vital functions of Brain Stem

10. Physiologic correlates of various parts of cerebellum and its function;
Effects of Cerebellar dysfunction
11. Overview of sensory Nervous system (Tutorial)
12. Functions of Diencephalon Part-I (Thalamus)
13. Functions of Diencephalon Part-II (Epithalamus, subthalamus,)
14. Functions of Hypothalamus
15. Examination of Superficial and deep reflexes (Practical)
16. Autonomic Nervous System
17. Basal ganglia and Disorders
18. Cerebellar function tests (Practical)
19. Organization, location and function of different ascending pathways
(Practical)
20. CSF formation, circulation and functions
21. Disorders Of Basal Ganglion (Tutorial)
22. Reticular Activating System and Sleep and its disorders
23. Limbic system I (Limbic System and role of hypothalamus)
24. Limbic system II (Behavioral Functions of Hypothalamus and associated
Limbic structure
25. Measurement of body temperature (PRACTICAL)
26. Learning and Memory
27. Speech and its disorders

BIOCHEMISTRY

1. Introduction and classification of Neurotransmitters
2. Chemistry of Neurolipids
3. Acetyl Choline
4. Serotonin and pain
5. Types of Neurotransmitters (tutorials)
6. Dopamine and parkinsonism
7. Biogenic amines
8. Chemical composition of BBB + Breach of BBB

9. CSF (Practical)

10. Brain needs in different metabolic states

GENERAL PHARMACOLOGY

1. Opioids analgesics
2. Anticoagulants

GENERAL PATHOLOGY

1. Patterns of nerve injury and Regeneration of Neurons
2. Cerebral edema, Hydrocephalus, Raised intracranial pressure and herniation
3. Mechanism of Ischemia Hypoxia, infarction and intracranial hemorrhage
4. Hypertensive cerebrovascular disease and intracranial hemorrhage
5. Meningitis
6. Encephalitis
7. Traumatic Injury of Brain
8. Developmental Anomalies of CNS

COMMUNITY MEDICINE

1. Endemic diseases involving Nervous System: Poliomyelitis, rabies, Diphtheria, Tetanus
2. Risk Factors Causing Stroke And Their Prevalence In Community

Ethics

1. Ethical Communication Skills
2. Doctor Patient Relationship
3. Consent and Confidentiality

Skill lab

- i. Arterial Puncture
- ii. Lumbar puncture

Neurology

1. Gross clinical effects of territorial blockage of arteries
2. Introduction and Approach to patients with Neurological Disorders
3. Anatomical Localization of Neurological Lesions
4. Investigations for Neurological disorders

Radiology

1. CT scan and MRI Anatomy of Spinal Cord
2. CT scan and MRI Anatomy of Brain

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

TEACHING STRATEGIES

LARGE CLASS FORMATS

- Lectures

SMALL GROUP DISCUSSION

- Demonstrations
- Tutorial
- Practical
- Skill labs
- Case based learning sessions

CASE BASED LEARNING

1. CBL :1

- Understand the pathways of different spinal tracts
- Evaluate different levels of dissuasion of the spinal tracts
- Describe pathologies related to the spinal tracts
- Correlate spinal tract pathologies with the presenting symptoms

2. CBL :2

- Define Parkinson's disease and its signs and symptoms
- Understand the pathophysiology of the given pathology
- Describe tremors and its types
- Differentiate between Parkinson disease and parkinsonism

3. CBL :3

- Describe the blood supply of the brain and its meninges
- Correlate different cortical areas according to motor functions
- Define stroke and its causes
- Correlate the clinical feature with the CT finding.
- Elaborate the management plans for the given pathology

4. CBL :4

- Identify the clinical signs & symptoms of raised intracranial pressure.
- Correlate the clinical feature with the MRI finding.
- Determine the type of lesion, primary or secondary.

LEARNING OBJECTIVES OF SKILL LAB

I. Arterial Puncture

• INTRODUCTION (RATIONALE)

Since an arterial blood sample is necessary for the blood gas analysis, the procedure of arterial puncture is one of the most important skills that health professionals should possess.

• LEARNING OBJECTIVES

After the sessions the students should be able to:

❖ Demonstrate the technique for performing an arterial puncture on a manikin. EQUIPMENTS

- i. Syringe
- ii. Sharp Container
- iii. Spirit Swab
- iv. Disposable Gloves
- v. Adhesive Tapes
- vi. Ice for transport

II. Lumbar Puncture

- INTRODUCTION/RATIONALE:

A procedure in which a hollow needle and style are introduced into the subarachnoid space of the lumbar part of the spinal canal, to obtain cerebrospinal fluid (CSF) for therapeutic and diagnostic purposes. Strict aseptic technique is used.

- LEARNING OBJECTIVES:

After the session the students should be able to:

- i. Enlist the instrument needed for the procedure
- ii. Demonstrate the correct aseptic technique of Lumbar Puncture.

ASSESSMENT PLAN

NEUROSCIENCES MODULE

	WEIGHTAGE
ANNUAL EXAM	80%
MODULE EXAM (Internal Evaluation)	
Theory	10%
Practical	10%

CREDIT HOURS

NEUROSCIENCES MODULE	9
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Contact HOURS (DISCIPLINE WISE)	
Discipline	Contact Hours
Gross Anatomy	33.5
Histology	5.5
Embryology	2
Biochemistry	11
Physiology	30
Pathology	8
Medical Ethics	3
Pharmacology	2
Community Medicine	2
Neurosciences	4
Radiology	2
CBL	6
Skill Lab	3
Total	112

BOOKS

ANATOMY

- **CLINICALLY ORIENTED ANATOMY**
KEITH.L.MOORE, Arthur F. Dalley, Anne M.R. Agur
7th or Latest EDITION
- **GRAY'S ANATOMY FOR STUDENTS**
Drake & Vogl & Mitchell
3rd or Latest EDITION
- **CLINICAL ANATOMY BY REGIONS (REFERENCE BOOK)**
Richard S. SNELL
9th EDITION
- **LAST'S ANATOMY: REGIONAL & APPLIED (REFERENCE BOOK)**
Chummy S. Sinnatamby
12th or Latest EDITION
- **ATLAS OF HUMAN ANATOMY**
FRANK H.NETTER
6th EDITION

EMBRYOLOGY

- **LANGMAN'S MEDICAL EMBRYOLOGY**
T.W.SADLER
13th EDITION
- **THE DEVELOPING HUMAN CLINICALLY ORIENTED EMBRYOLOGY (REFERENCE BOOK)**
MOORE & PERSAUD & TORCHIA
10th EDITION

HISTOLOGY

- **MEDICAL HISTOLOGY**
LAIQ HUSSAIN SIDDIQUI
5TH or Latest EDITION
- **WHEATERS FUNCTIONAL HISTOLOGY**
BARBARA YOUNG
5th EDITION
- **BASIC HISTOLOGY(TEXT AND ATLAS) (REFERENCE BOOK)**
LUIZ JUNQUEIRA, JOSE CARNEIRO
11th or Latest EDITION

PHYSIOLOGY

- **GUYTON AND HALL TEXTBOOK OF MEDICAL PHYSIOLOGY**
GUYTON AND HALL
13th EDITION

BIOCHEMISTRY

- **LIPPINCOTT'S ILLUSTRATED REVIEWS SERIES**
DENISE R. FERRIER
6th EDITION
- **HARPERS ILLUSTRATED BIOCHEMISTRY (REFERENCE BOOK)**
VICTOR RODWELL, DAVID BENDER, KATHLEEN M. BOTHAM, PETER J. KENNELLY,
P. ANTHONY WEIL
28th EDITION

PATHOLOGY

- **ROBBINS BASIC PATHOLOGY**
KUMAR & ABBAS
9TH EDITION
- **ROBBINS & COTRAN PATHOLOGIC BASIS OF DISEASE (REFERENCE BOOK)**
KUMAR & ABBAS & ASTER
9th 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 (REFERENCE BOOK)**
BERTRAM G. KATZUNG
11th EDITION

For Query

Chief Module Coordinator : Prof. Dr. Naheed Khan

(naheed.khan@duhs.edu.pk)

Module Coordinators

Dr. Sabahat Babar

(sabahat.babar@duhs.edu.pk)

Dr. Mehwish Sajjad

(mehwish.sajjad@duhs.edu.pk)
