

Curriculum DM Neurology Course



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CURRICULUM
DM NEUROLOGY COURSE

DM Neurology course is designed to train the candidates in the principles and practice of advanced Neurology to equip them to function as faculty / consultants in Neurology.

1. **GOALS AND OBJECTIVES OF THE COURSE:** The aim of the course is to impart thorough and comprehensive training to the candidate in the various aspects of specialty to enable him/ her :
 1. To function as Faculty / Consultants in the speciality
 2. To plan and set up an independent Neurology unit catering to clinical and investigative Neurology.
 3. To carry out and help in conducting applied research in Neurosciences.

2. **ADMISSION REQUIREMENTS:** For admission to DM (Neurology) course, a candidate must possess MD degree in Internal Medicine / Pediatrics from an Institute / University recognized by the Medical Council of India.

3. **INTAKE OF STUDENTS:** The intake of students to the course shall be in accordance with the sanction by the MCI.

4. **DURATION OF STUDY:** The course of study shall be for a period of 3 academic years.

5. **METHOD OF SELECTION:** The selection of the candidate for admission to DM (Neurology) course is to be made on the basis of merit.

6. **METHOD OF TRAINING :** The training of postgraduate for degree shall be in the residency pattern with graded responsibilities in the management and treatment of patients entrusted to his / her care. The participation of the students in all facets of educational process is essential. Every candidate should take part

in seminars, group discussions, grand rounds, case demonstration, clinics, journal review meetings, CPC and clinical meetings. The candidate should participate in the teaching and training programme of undergraduate students. Training should include involvement in relevant laboratory and experimental work, and research studies. The students should be posted to the department of Neurology and allied speciality departments of institutions.

a. TEACHING PROGRAMME:

The following teaching schedule is prescribed for the course:

Out Patient Service (OPD)	- Thrice a week
Major Ward Rounds	- Thrice a week
Subject Seminars	- Twice a month
Clinical Case Presentation	- Once a week
Journal Club	- Twice a month
Neuroradiology	- Twice a month
Clinical Neurophysiology	- Once a month
Inter departmental meeting	- Once in 3 months
Mortality Meeting	- Once in 3 months
Clinico Pathological conference / Case discussion	- Once in 3 months

b. TEACHING SKILLS : Teaching by the DM students of undergraduate students, Medicine, Psychiatry, Pediatrics postgraduate students, if available, is part of the training. The student will actively take part in teaching the theoretical aspect of Neurology to the students. In addition, he/she will take active part in imparting and teaching the clinical skills to these students and undergraduate who are posted to the department.

c. PERIOD OF POSTINGS IN VARIOUS UNITS & DEPARTMENTS:

During the training period of three years, the student will be posted to various departments / sections as follows :

Clinical Neurology	- 2 ½ years
Clinical Neurophysiology	- 2 months
Neuropathology	- 15 days (minimum)
Neuroradiology	- 1 month
Neurosurgery	- 1 month
Neuropsychiatry	- 1 month

Clinical Neurology :

The Clinical Neurology postings of 2 ½ (two and half) years shall be structured so that the student shall have direct training in out patient department, ward work, consultations, EEG – ENMG – EP reporting. All the patients seen in out patient department or on consultations in ward are supervised by the faculty in order to plan the appropriate management.

The student may be posted to a different institute / facility of repute outside the parent institute for learning the allied specialties. This study period will be considered as on duty and the stipend paid to the student for this period.

Clinical Neurophysiology :

The student is imparted training in the basis and applied Clinical Neurophysiology. During the training period, he / she shall be posted to the Clinical Neurophysiology laboratory. During the training period, he / she shall learn the technique of electrode application for electroencephalography, nerve conductions, electromyography and evoked potentials. He / she shall learn to detect various facts and artifacts in clinical neurophysiology and shall learn to handle the EEG, ENMG – EP machines under the guidance of faculty and trained technicians. Training shall be imparted in the interpretation and reporting of EEG, nerve conductions, electromyography and evoked potentials. He / she shall perform these investigations independently after the initial training. He / she shall report these investigations under supervision initially and independently subsequently.

Neuropathology :

The trainee shall be posted to Neuropathology for learning the gross and microscopic pathology of the nervous system. He / she shall get exposed to the neuropathological techniques and interpretation of histopathology of common migraine neurological disorder.

Neuroradiology :

The trainee is made conversant with the technique and interpretation of angiography, myelography, CT scan and Magnetic Resonance Imaging. All these investigations are taught under the guidance of a Radiologist / Neuroradiologist for a period of one month. The student may be posted to a specialized Neuroradiology facility if needed for this purpose.

Neurosurgery :

During the Neurosurgery posting which shall be for one month, the candidate is required to attend the Neurosurgery outpatient department and attend the surgical procedures. He / she witnesses the surgical techniques and get acquainted with preoperative and post operative care, complications and selection of the patients for the surgical procedures.

Neuropsychiatry :

The candidate shall be posted to the department of Psychiatry for a period of one month during which period he / she shall get acquainted with common psychiatric disorders. In addition, he / she would need exposure to child psychiatry. He / she shall work and get trained under the supervision of a full – fledged psychiatry department for this purpose.

7. ATTENDANCE, PROGRESS AND CONDUCT:

- a) A candidate pursuing degree course should work in the concerned department of the institution during the study period as a fulltime student. No candidate is permitted to run a clinic / laboratory / nursing home while studying postgraduate course.
- b) Each year shall be taken as a unit for the purpose of calculating attendance.
- c) Every student shall attend symposia, seminars, conferences, journal review meetings, grand rounds CPC, case presentation, clinics and lectures during each year as prescribed by the department and not absent himself/ herself from work without valid reasons.
- d) Every candidate is required to attend a minimum of 80% of the training during each academic year of the postgraduate course.
- e) Any student who fails to complete the course in the manner stated above shall not be permitted to appear for the University Examinations.
- f) Attitude and aptitude.
 - Caring attitude
 - Reliability, initiative and Organizational abilities
 - Ability to cope with stress and responsibilities
 - Professional relationship and team work.

8. MONITORING PROGRESS OF STUDIES

- a. *Work diary / Log book* : Every candidate shall maintain a log book and record of his / her participation in the training programmes conducted by the department such as journal reviews, seminars, etc. Special mention may be made of the presentations by the candidate as well as details of clinical or laboratory procedures, if any conducted by the candidate. The log book shall

be scrutinized and certified by the Head of the Department and Head of the Institution, and presented in the University practical / clinical examinations.

- b. **Periodic tests:** In case of degree courses of three year duration, the concerned departments may be conduct three tests, two of them be annual tests, one at the end of first and the other in the second year. The third test may be held three months before the final examination. The tests may include written papers, practical and marks obtained in such tests will be maintained by the Head of the Department and sent to the University, when called for.
- c. **Records:** Records and marks obtained in tests will be maintained by the Head of the Department and will be made available to the University or Medical Council India.

9. RESEARCH & PUBLICATIONS (Desirable)

- a. One poster presentation in a National / State conference
- b. One paper to be read in a National / State conference
- c. One Research paper should be published / accepted for publication / sent for publication in an indexed journal.

10. FINAL EXAMINATION

- A. **Eligibility :** The candidate shall be permitted to appear for the examinations provided he / she:
 - a. Has satisfactorily completed the training period and has no less than 80% attendance during the duration of the course.
 - b. The research work as stipulated has been submitted and approved as per schedule
 - c. Log Book is scrutinized and submitted.
- B. **Schedule of examination:** The examination for DM course shall be held at the end of three years. The University shall conduct two examinations in a

year at an interval of four to six months between the two examinations. Not more than two examinations shall be conducted in an academic year.

C. Scheme of examination.

The examination shall consist of theory, clinical / practical and viva voce examination.

a. Theory (written examination):

The theory examination shall consist of four questions papers, each of three hours duration. Each paper shall carry 100 marks and the total marks shall be 400.

- First Paper – Basic science (Neuroanatomy, Neurophysiology, Neurochemistry, Neuropathology, Neuropharmacology)
- Second Paper - Clinical Neurology
- Third Paper - Clinical Neurology and Investigative Neurology
- Fourth Paper - Recent Advances

b. Practical / clinical examination:

- The clinical examination should aim at examining clinical skills and competence of candidates for undertaking independent work as a specialist. Each candidate will be evaluated based on the examination of one long case and two short cases.
- The practical examination should be aimed at assessing competence, skills of technique and procedures as well as testing student's ability to make relevant and valid observations, interpretations and experimental work relevant to his / her subject.
- Practical examination shall consist of interpretation of
 - Gross Pathological specimens and Histopathological slides
 - Neuroradiology
 - Clinical neurophysiology graphs / recordings

(The maximum marks for the practical and clinical examination will be 200)

c. Viva voce examination: will be conducted after the clinical case presentation and will be directed to the evaluation of the breadth and depth of the candidate's knowledge of neurology and pertinent allied specialties. The maximum marks for the viva voce examination is 100.

- **Number of candidates per day:** The maximum number of candidates for practical / clinical and viva - voce examination shall be maximum of 3 per day.
- **The practical and clinical examinations will be performed on the same day.**

d. Passing: The candidate will be considered to have passed the examination provided he / she obtains 50% marks overall in all the spheres i.e theory (≥ 200 marks), clinical + practical and viva voce (≥ 150 marks) examinations.

e. Examiners: The panel of examiners shall consist of four examiners all whom shall be having postdoctoral degree in Neurology (DM Neurology or equivalent). Examiners are selected as per RGHHS / MCI guidelines.

Note: Neurology at the present time shall include the areas of general Neurology, Epileptology, Cerebrovascular Disorders, Cognitive Neurology, Behavioral Neurology, Neuro- Endocrinology, Movement Disorders, Pediatric Neurology, Geriatric Neurology, Neuro-Ophthalmology, Neuro-Otology, Neurogenetic Disorders, Neuro- degenerative disorders, Neurochemistry, Neurophysiology, Neuropathology, Neurogenetics, Electrophysiology, Neuroradiology, and any other related fields that form the speciality of Neurology.

NEUROLOGY

- Disorders of consciousness
- Disorders due to localized dysfunction of cerebral cortex
- Language disorders
- Cerebrovascular disorders
- Epilepsies
- Primary and secondary Headaches
- Movement disorders
- Ataxias & disorders of cerebellum
- Gait disorders
- Cranial Neuropathies
- Demyelinating diseases of the central nervous system
- Demyelinating diseases of the peripheral nervous system
- Dysmyelinating disorders
- Infections of central nervous system
- Infections of peripheral nervous system
- Neuromuscular junction disorders
- Disease of muscles
- Metabolic disorders of nervous system
- Degenerative disorders of central nervous system
- Degenerative disorders of peripheral nervous system
- Diseases due to toxins, chemicals & drugs
- Congenital and development disorders of Nervous system
- Neoplasia of nervous system
- Cranio – spinal trauma
- Cerebrospinal fluid disorders
- Hydrocephalus
- Mental retardation
- Cerebral palsy
- Neuropsychology and Neuropsychiatry

BASIC SCIENCES

1. Detailed Neuroanatomy and Neurophysiology

- Neuroanatomy of central, peripheral and autonomic nervous system
- Neuromuscular junction & muscles
- Histology of central and peripheral nervous system
- Functional Neuroanatomy
- Cerebrospinal fluid & blood brain barrier
- Development for Nervous system
- Cerebral circulation
- Neuronal signaling and synaptic transmission
- Somatosensory physiology
- Visual perception
- Auditory perception
- Motor programme & movement generation
- Higher cerebral functions
- Sleep
- Neuro-endocrinology
- Autonomic nervous system

2. Neuro – Genetics

3. Neuroradiology

- Plain radiology of skull & spine
- Myelography
- Angiography
- Computerized Tomographic (CT) scan
- Magnetic resonance imaging (MRI)
- Doppler study of cerebral circulation
- Functional cerebral imaging (PET,SPECT)

4. Neuropathology

- Interpretation of gross specimens of cerebral pathology
- Histopathology of common disorders of nerve and muscle
- Principles and application of Histochemistry and immunohistochemistry

CLINICAL NEUROPHYSIOLOGY

- **Electroencephalography (EEG)**
 - Neurophysiological basis of EEG
 - Normal EEG including maturation of EEG
 - Abnormal EEG
 - Video EEG and long term EEG
 - Brain death
- **Magnetoencephalography (MEG)**
- **Nerve Conductions**
 - Principles and clinical application of nerve conductions in neurological disorders
 - Late responses including reflex studies
 - Repetitive nerve stimulation
- **Electromyography (EMG)**
 - Principles of needle EMG
 - Clinical application of EMG
 - Qualitative & Quantitative EMG
 - Single Fiber EMG
- **Evoked potentials**
 - Visual evoked potentials
 - Somatosensory evoked potentials
 - Brainstem auditory evoked potentials
 - Event related potentials

ESSENTIAL SKILLS

A. Emergency Neurology

- The student should be able to take independent valid and rational decision in the evaluation and management of neurological emergencies.
- The student should be able to interpret emergency laboratory data including Neuroradiological investigations.
- The student should be proficient in the evaluation and management of all neurological emergencies including strokes, neuromuscular paralysis, disorder of consciousness, epilepsies, neuroinfections, etc.

B. Procedures to be performed independently (with supervision as needed)

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|----------------------------|---|----|
| ○ Lumbar puncture | - | 25 |
| ○ Nerve biopsy | - | 3 |
| ○ Muscle biopsy | - | 3 |
| ○ Nerve conduction studies | - | 25 |
| ○ Needle electromyography | - | 10 |
| ○ Evoked-potential studies | - | 10 |

C. Interpretation and reporting of Clinical Neurophysiological investigations

- | | | |
|--------------------------|---|----|
| ○ Electroencephalography | - | 50 |
| ○ Nerve conductions | - | 25 |
| ○ Electromyography | - | 10 |
| ○ Evoked potentials | - | 10 |

RECOMMENDED BOOKS AND JOURNALS

1. ESSENTIAL BOOKS (LATEST EDITIONS)

Sl.No	Title	Author
1	Neurology in Clinical Practice (volume 1 & 2)	Bradley W G, Daroff R B
2	Merritt's Textbook of Neurology	Rowland L .P
3	Pediatric Neurology Principles & Practice	Swaiman, Ashwal, Ferriero
4	Adams and Victor's Principles of Neurology	Ropper AH, Brown RH
5	Localization in Clinical Neurology	Brazis P W, Masdeu JC
6	De Jong's Neurological Examinations	William W, Campbell
7	Carpenter's Human Neuroanatomy	Andre Parent
8	Greenfield's Neuropathology (vol. 1&2)	Graham DI, Lanton P
9	Brain's Diseases of the Nervous system	Donaghy M

2. REFERENCES (LATEST EDITIONS)

Sl.No	Title	Author
1	Current Therapy in Neurologic Disease	Johnson RT, Griffn J W
2	Text Book of Clinical Neurology	Goetz C G
3	Current practice of Clinical Electroencephalography	Ebersole J S, Pedley T A
4	Atlas and Classification of Electroencephalography	Luders H O, Hoachtar S
5	Epilepsy – A Comprehensive Textbook	Engel J, Pedley T A
6	Electrodiagnosis in Clinical Neurology	Aminof M A
7	Peripheral Neuropathy Vol I & II	Dyck P J, Thomas P K
8	Diabetic Neuropathy	Dyck P J, Thomas P K
9	Dementias	Mendez MF, Cummings JL
10	Stroke Pathophysiology, Diagnosis and Management	Barnett H J M
11	Caplan's Stroke: A Clinical Approach	Caplan L R
12	Disorders of Voluntary Muscles	Waston
13	Neurological Surgery	Youmans
14	Mechanism and Management of Headache	Lance J W, Goadsby PJ
15	Neurological Practice in Indian Perspective	N H Wadia

INDEXED JOURNALS

1. Neurology
2. Journal of Neurological Sciences
3. Journal of Neurology, Neurosurgery and Psychiatry
4. Brain
5. Annals of Neurology
6. Stroke
7. Epilepsia
8. Muscle and Nerve
9. Clinical Neurophysiology
10. Acta Neurologica Scandinavica
11. Neurology India
12. Annals of Indian Academy of Neurology

REFERENCES SERIES

1. Handbook of Clinical Neurology – Vinken PT, Bruyn GW
2. Advances in Neurology (Raven Press)
3. Annual Review of Neurosciences
4. Neurology Clinics
5. Year Book of Neurology and Neurosurgery
6. Butterworth's International Medical Reviews in Neurology