



MAHATMA GANDHI UNIVERSITY
of
MEDICAL SCIENCES & TECHNOLOGY
JAIPUR

Super Specialty Courses

SYLLABUS **DM - NEUROLOGY**

Notice

1. Amendment made by the Medical Council of India in Rules/Regulations of Post Graduate Medical Courses shall automatically apply to the Rules/Regulations of the Mahatma Gandhi University of Medical Sciences & Technology (MGUMST), Jaipur.
2. The University reserves the right to make changes in the syllabus/books/guidelines, fees-structure or any other information at any time without prior notice. The decision of the University shall be binding on all.
3. The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

**Syllabus of DM/M.Ch. Courses
DM –NEUROLOGY (9320)**

Selection of candidates:

There shall be a uniform entrance examination to all medical educational institutions at the Postgraduate level namely ‘National Eligibility-cum-Entrance Test’ for admission to postgraduate courses in each academic year and shall be conducted under the overall supervision of the Ministry of Health & Family Welfare, Government of India.

In order to be eligible for admission to Postgraduate Course for an academic year, it shall be necessary for a candidate to obtain minimum of marks at 50th percentile in the ‘National Eligibility-Cum-Entrance Test for Postgraduate courses’ held for the said academic year. However, in respect of candidates belonging to Scheduled Castes, Scheduled Tribes, and Other Backward Classes, the minimum marks shall be at 40th percentile. In respect of candidates with benchmark disabilities specified under the Rights of Persons with Disabilities Act, 2016, the minimum marks shall be at 45th percentile for General Category and 40th percentile for SC/ST/OBC.

The percentile shall be determined on the basis of highest marks secured in the All India Common merit list in National Eligibility-cum-Entrance Test for Postgraduate courses.

Provided when sufficient number of candidates in the respective categories fail to secure minimum marks as prescribed in National Eligibility-cum-Entrance Test held for any academic year for admission to Postgraduate Courses, the Central Government in consultation with Medical council of India may at its discretion lower the minimum marks required for admission to Post Graduate Course for candidates belonging to respective categories and marks so lowered by the Central Government shall be applicable for the academic year only.

The reservation of seats in Medical Colleges/institutions for respective categories shall be as per applicable laws prevailing in States/Union Territories. An all India merit list as well as State-wise merit list of the eligible candidates shall be prepared on the basis of the marks obtained in National Eligibility-cum-Entrance Test and candidates shall be admitted to Postgraduate Courses from the said merit lists only.

There shall be no admission of students in respect of any academic session beyond 31st August under any circumstances. The Universities shall not register any student admitted beyond the said date.

Eligibility:

S. No.	Area of Specialisation	Prior Requirement
1	DM Cardiology	MD (Medicine / Paediatrics)
2	DM Medical Gastroenterology	
3	DM Nephrology	
4	DM Neurology	
5	M.Ch. Cardio vascular & Thoracic Surgery	MS (Surgery)
6	M.Ch. Urology	
7	M.Ch. Neuro-Surgery	
8	M.Ch. Plastic Reconstructive Surgery	

Common Counseling:

There shall be a common counseling for admission to all Postgraduate Super specialty Courses (DM/ M.Ch.) in all Medical Educational Institutions on the basis of merit list of the National Eligibility-cum-Entrance Test.

Period of Training:

The period of training for obtaining DM/M.Ch Degrees shall be three completed years including the examination period.

Migration:

Under no circumstance, Migration/transfer of student undergoing any Super Specialty course shall be permitted by any University/ Authority.

Staff - Faculty:

Only those teachers who possess 6 years teaching experience out of which at least 2 years teaching experience as Assistant Professor gained after obtaining the higher specialty degree shall be recognized post graduate teacher.

No teacher shall be considered as a postgraduate teacher in any other institution during the period till the postgraduate course at the institute which has been granted permission considering him as a postgraduate teacher is recognized u/s 11(2) of the Indian Medical Council Act, 1956.

Minimum staff required (Super-speciality):

- 1- Professor
- 1- Associate Professor
- 1- Assistant Professor
- 1- Senior Resident
- 2- Junior Resident

Training Programme:

All the candidates joining the Post Graduate training programme shall work as 'Full Time Residents' during the period of training and shall attend not less than 80% (Eighty percent) of the imparted training during each academic year (Academic Term of 6 months) including assignments, assessed full time responsibilities and participation in all facets of the educational process.

No candidate shall be permitted to run a clinic/work in clinic/laboratory/nursing home while studying postgraduate super specialty course. No candidate shall join any other course or appear for any other examination conducted by this university or any other university in India or abroad during the period of registration.

Every institution undertaking Post Graduate training programme shall set up an Academic cell or a curriculum committee, under the chairmanship of a senior faculty member, which shall work out the details of the training programme in each speciality in consultation with other department faculty staff and also coordinate and monitor the implementation of these training Programmes.

The training programmes shall be updated as and when required. The structured training programme shall be written up and strictly followed, to enable the examiners to determine the

training undergone by the candidates and the Medical Council of India inspectors to assess the same at the time of inspection.

Post Graduate students shall maintain a record (log) book of the work carried out by them and the training programme undergone during the period of training including details of surgical operations assisted or done independently by M.Ch. candidates.

The Record (Log) Books shall be checked and assessed periodically by the faculty members imparting the training.

During the training for award of Degree / Superspecialty in clinical disciplines, there shall be proper training in Basic medical sciences related to the disciplines concerned; so also in the applied aspects of the subject; and allied subjects related to the disciplines concerned. In the Post Graduate training programmes including both Clinical and Basic medical sciences, emphasis has to be laid on Preventive and Social aspects. Emergency care, facilities for Autopsies, Biopsies, Cytopsies, Endoscopy and Imaging etc. shall also be made available for training purposes.

The Post Graduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.

Training in Medical Audit, Management, Health Economics, Health Information System, basics of statistics, exposure to human behaviour studies, knowledge of pharmaco – economics and introduction to nonlinear mathematics shall be imparted to the Post Graduate students.

The teaching and training of the students shall include graded responsibility in the management and treatment of patients entrusted to their care; participation in Seminars, Journal Clubs, Group Discussions, Clinical Meetings, Grand Rounds, and Clinico-Pathological Conferences; practical training in Diagnosis and Medical and Surgical treatment; training in the Basic Medical Sciences, as well as in allied clinical specialities.

The training programme shall be on the same pattern as for M.D. / M.S. in clinical disciplines; with practical training including advanced Diagnostic, Therapeutic and Laboratory techniques, relevant to the subject of specialization. Postgraduate Superspecialty Residents in Surgical Specialties shall participate in Surgical operations as well.

A postgraduate student of a postgraduate degree course in super specialities would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.

Enrolment and Registration:

Every candidate who is admitted to DM/MCh. course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself enrolled and registered with the Mahatma Gandhi University of Medical Sciences & Technology upto November 30 of the year of admission without late fees upto December 31 of the year of admission with late fees after paying the prescribed eligibility and enrolment fees.

The candidate shall have to submit an application for the enrolment/eligibility along with the following original documents with the prescribed fees –

1. MD/MS pass Marks sheet/Degree certificate issued by the University.

2. Migration certificate issued by the concerned University (in case the University is other than the MGUMST).
3. Date of Birth Certificate
4. Certificate regarding registration with Rajasthan Medical Council / Medical Council of India / Other State Medical Council.

Examinations:

The examination shall be held at the end of three academic years (six academic terms). The academic term shall mean six months training period. The examination shall consist of: Theory and Clinical/Practical and Oral.

The examinations shall be organised on the basis of 'Marking system' to evaluate and to certify candidate's level of knowledge, skill and competence.

For passing DM/M.Ch. examination as a whole, a candidate shall secure not less than 50% marks in each head of passing which shall include (1) Theory (2) Clinical / Practical and Oral examination.

(1) Theory:

There shall be four theory papers of 3 hours duration and 100 marks each. Out of the four theory papers, one Paper-I shall be on 'Basic Sciences', and another Paper-IV on 'Recent Advances'. The theory examination shall be held in advance before the Clinical and Practical examination, so that the answer books can be assessed and evaluated before the commencement of the clinical/Practical and Oral examination.

Paper I and II will be set by one external examiner from outside of the state and paper III and IV by another external examiner from outside of the state. The external examiner, who is paper setter for paper I & II shall evaluate the answer books of paper II. The external examiner, who is paper setter for paper III & IV shall evaluate the answer books of paper III. The answer books of paper I & IV shall be evaluated by internal examiners. The answer books of paper IV shall be evaluated by the Head of the Department and the answer books of paper I shall be evaluated by the second Internal Examiner.

Candidates will be required to attempt all the questions in every question paper. In Paper I, Paper II and Paper III there will be 10 questions. Each question shall carry 10 marks. In Paper IV there will be 5 questions of 20 marks each.

Obtaining a minimum of 40% marks in each theory paper and not less than 50% cumulatively in all the four papers shall be compulsory to pass the examination.

Nomenclature of Papers:

Paper-I : Basic Sciences as Related to Neurology

Paper-II : Clinical Neurology including Pediatric Neurology

Paper-III : Diagnostic and Therapeutic Neurology including Neuroinstrumentation

Paper-IV : Recent Advances in Neurology

(2) Clinical / Practical and Oral:

Clinical/Practical examination shall be conducted to test / aimed at assessing the knowledge and competence of the candidate for undertaking independent work as a specialist / teacher. Practical examination shall consist of carrying out special investigative techniques for Diagnosis and Therapy. M.Ch candidates shall also be examined in surgical procedures. Oral examination may be comprehensive enough to test

the candidate's overall knowledge and competence about the subject, investigative procedures, therapeutic technique and other aspects of the specialty, which shall form a part of the examination.

There shall be one long case of 150 marks, two short cases of 75 marks each and oral examination of 100 marks. Obtaining of 50% marks in Clinical / Practical and Oral examination shall be mandatory for passing the Clinical / Practical and Oral examination.

Result:

For passing DM/M.Ch. Examination, a candidate will be required to obtain at least 40% marks in each theory paper, 50% marks in the aggregate of all the four theory papers and 50% marks in the aggregate of Clinical / Practical and Oral examination separately. A candidate failing in any theory paper or in the aggregate of all four theory papers or Clinical / Practical and Oral examination shall have to repeat the whole DM/M.Ch. examination.

Grace Marks:

No grace marks will be provided in DM/M.Ch. examinations.

Revaluation / Scrutiny:

No Revaluation shall be permitted in the DM/M.Ch. examinations. However, the student can apply for scrutiny of the answer books as per University Rules

Examiners:

As per the Amendment Notification of the MCI dated June 5, 2017, no person shall be appointed as an internal examiner in any subject unless he/she has three years experience as recognized PG teacher in the concerned subject. For external examiners, he/she should have minimum six years of experience as recognized PG teacher in the concerned subject.

For all Post Graduate Super specialties examinations, the minimum number of Examiners shall be four, out of which at least two (50%) shall be External Examiners, who shall be invited from other recognised universities from outside the State.

Number of Candidates:

The maximum number of candidates to be examined in Clinical / practical and Oral on any day shall not exceed three for D.M./M.Ch examinations.

Number of Examinations:

The university shall conduct not more than two examinations in a year, for any subject, with an interval of not less than 4 and not more than 6 months between the two examinations.

DM – NEUROLOGY (9320)

Duration : 3 Years

Admission eligibility : MD (Medicine / Paediatrics)

GOALS

To produce specialists with necessary skills, judgement and sense of dedication to tackle all major and minor neurologic problems. The candidates will be trained in all aspects of Neurology starting from Basic Sciences to Recent Advances.

OBJECTIVES

At the end of the Postgraduate training in the discipline concerned the student shall be able to

- Recognise the importance of Neurology in the context of the health needs of the community and national priorities in the health sector.
- Practice Neurology ethically as per the Hippocratic oath and in step with the principles of primary health care, International GCP guidelines (Good Clinical Practice) .
- Demonstrate sufficient understanding of the basic sciences relevant to Neurology.
- Identify social, economic, environmental, biological and emotional determinants of health in a given case, and take them into account while planning therapeutic, rehabilitative, preventive, and promotive measures/strategies.
- Diagnose and manage majority of conditions in the specialty of Neurology on the basis of clinical assessment, and appropriately selected and conducted investigations.
- Plan and advice measures for the prevention and rehabilitation of patients suffering from disease and disability related to the specialty of Neurology.
- Demonstrate skills in documentation of individual case details as well as morbidity and mortality data relevant to the assigned situation.
- Demonstrate empathy and humane approach towards patients and their families and exhibit interpersonal behaviour in accordance with the societal norms and expectation.
- Play the assigned role in the implementation of National Health Programmes, effectively and responsibly.
- Organise and supervise the Neurological Health Care services demonstrating adequate managerial skills in the clinic/hospital in the field situation.
- Develop skills as a self-directed learner, recognise continuing educational needs: select and use appropriate learning resources.
- Demonstrate competence in basic concepts of research methodology and epidemiology and be able to critically analyse relevant published research literature.
- Develop skills in using educational methods and techniques as applicable to the teaching of medical/nursing students, general physicians and paramedical health workers.
- Function as an effective leader of a health team engaged in health care, research or training.

Components of the post graduate curriculum

The major components of our Post-Graduate Curriculum are according to the guidelines issued by the MCI

- Theoretical Knowledge
- Practical and Clinical skills
- Attitudes including Communication skills
- Knowledge about research methodology.

Training objectives in the higher specialty of neurology

Knowledge:

At the end of the course, upon successful completion of training and passing the examination the candidate is expected to

- Acquire comprehensive knowledge of the basics of Neurology including all allied specialities related to Neurology like Neuroanatomy, Neurophysiology, Neurochemistry, Neuropharmacology, Neuroimaging, Neuropathology, Neuroinfections, Neuroimmunology, Preventive Neurology, Neuroepidemiology, Paediatric Neurology and Neurosurgery.

Skills:

- Possess complete Clinical Diagnostic Skills for the recognition of common Nervous system diseases.
- Possess a complete knowledge of all the commonly used Neurophysiological diagnostic Tests like Electroencephalography, Electroneurography, Electromyography, Cerebral evoked potentials.
- Acquire skills in the performance and interpretation of special investigations such as Polysomnography, Video EEG monitoring, EEG-Telemetry, autonomic function tests, Transcranial Doppler tests
- Acquire skills in interpretation of common neuroimaging investigations such as CT scanning, MRI scanning, MR and Digital subtraction angiography, Myelography, MR spectroscopy and Single Photon Emission Computerised Tomography.
- Acquire skills in invasive procedures such as lumbar puncture, intrathecal drug administration, CSF manometry; assisting in digital subtraction angiography and intraarterial thrombolysis; and Nerve and muscle biopsy and their interpretation of relevant histopathology;
- Acquire exposure in sophisticated neuromodulation procedures such as planning of deep brain stimulation, vagal nerve stimulation;
- Able to apply sound clinical judgement and rational cost effective investigations for the diagnosis and management of Neurology Cases in the OPD, Wards, Emergency Room and Intensive Care unit.
- Possess some understanding of the recent advances in the subject of Neurology and all its allied specialities and working knowledge of the sophisticated and routine equipments, consumables used in Neurology especially with respect to Neurochemistry, Neurogenetic and molecular diagnostic techniques
- Possess knowledge of principles of research work in the field of Neurology in both the Clinical and experimental field with the ability to usefully analyse data.
- Be able to teach undergraduate students MBBS and Post Graduate Students MD Med or Pediatrics or Psychiatry as well as investigative Neurology.
- Be able to perform Clinical and Investigative studies and to present in Seminars, meetings and conferences etc.
- Have the ability to organise specific teaching and training programmes for para medical staff, associated professionals and patient education programmes. Should be able to develop good communication skills and give consultations to all other departments of the hospital.

Attitude and Values

Demonstrate empathy and humane approach towards patients and their families and exhibit interpersonal **skills and behaviour in accordance with the societal norms and expectation.**

National Objectives

- Should be able to work in any hospital in India with minimum of facilities and should be able to diagnose and treat Neurological disease swiftly and efficiently both on an elective and emergency basis.
- Should be able to start a Neurology Unit with effective functioning with minimum inputs.
- Should be able to work effectively in National Programmes for the Prevention or Eradication of Neurological Diseases as laid down under the goals of national mental health programme and ICMR programmes .

THEORY:

The study will cover the entire scope of Neurology.

PAPER – I: Basic Sciences as Related to Neurology

(1) Neuroanatomy

The Neuroanatomy with special emphasis on development of Neuraxis (brain, spinal cord and neurons and glia), autonomic nervous system and their maturation process in the post natal, childhood and adolescent states; the location and significance of stem cells, CSF pathways, Blood supply and sinovenous drainage of brain and spinal cord, the meninges, skull and vertebral column, the cranial nerves, spinal roots, plexuses, and their relation to neighbouring structures; anatomy of peripheral nerves, neuromuscular junction and muscles; histology of cerebrum, cerebellum, pituitary gland, brain stem and spinal cord, nerves and neuromuscular junction and muscle. Functional anatomy of lobes of cerebrum and white matter tracts of brain and spinal cord, craniovertebral junction, conus and epiconus and cauda equina, brachial and lumbosacral plexuses, cavernous and other venous sinuses; New developments in understanding of ultrastructural anatomy of neurons, axonal transport, neural networks and synapses and nerve cell function at molecular level.

(2) Neurophysiology

Neurophysiology will cover all the physiological changes in the nervous system during its normal function with special reference to nerve impulse transmission along myelinated fibres, neuromuscular junction and synaptic transmission, muscle contraction; visual, auditory and somatosensory and cognitive evoked potentials; regulation of secretions by glands, neural control of viscera such as heart, respiration, GI tract, bladder and sexual function; sleep-wake cycles; maintenance of consciousness, special senses, control of pituitary functions, control of autonomic functions, cerebellar functions, extrapyramidal functions, reflexes, upper and lower motor neuron concepts and sensory system.

(3) Molecular Biology

Brain is the one structure where maximum genes are expressed in the human body. Principles of molecular biology including Gene Structure, Expression and regulation; Recombinant DNA Technology; PCR Techniques, Molecular basis for neuronal and glial function, Molecular and cellular biology of the membranes and ion-channels, mitochondrial genome, role of RNA in normal neuronal growth and functional expression, receptors of neurotransmitters, molecular and cellular biology of muscles and neuromuscular junction, etc, The Human Genome and its future implications for Neurology including developmental and neurogenetic disorders, bioethical implications and genetic counselling, Nerve growth and other trophic factors and neuroprotectors, Neural Tissue modification by genetic approaches including Gene Transfer, stem cell therapy etc, Molecular Development of neural tissue in peripheral nerve repair are exciting areas where students need to have basic exposure..

(4) **Neurochemistry**

All aspects of normal and abnormal patterns of neurochemistry including neurotransmitters associated with different anatomical and functional areas of brain and spinal cord, especially with respect to dopaminergic, serotonergic, adrenergic and cholinergic systems, opioids, excitatory and inhibitory aminoacids; their role in pathogenesis of parkinsonism, depression, migraine, dementia, epilepsy; neuromuscular junction and muscle contractions; carbohydrate, aminoacid and lipid metabolism and the neural expression of disorders of their metabolism, electrolytes and their effect on encephalopathies and muscle membrane function, storage disorders, porphyrias;

(5) **Neuropharmacology**

Application of neuropharmacology is the mainstay of all medical therapy of epilepsy, parkinsonism, movement disorders, neuropsychiatric syndromes, spasticity, pain syndromes, disorders of sleep and dysautonomic syndromes. Their drug interactions with commonly used other drugs, usage during disorders of renal, hepatic function and in the demented, their adverse reactions etc. are part of basic curriculum for DM course in Neurology.

(6) **Neuropathology**

All pathological changes in various neurological diseases with special reference vascular, immune mediated, de/dysmyelinating, metabolic and nutritional, genetic and developmental, infectious and iatrogenic and neoplastic aetiologies to clinical correlation included. Special emphasis on pathological changes in nerve and muscle in neuropathies and myopathies. Ultrastructural pathologies such as apoptosis, ubiquitinopathies, mitochondrioses, channelopathies, peroxisomal disorders, inclusion bodies, prion diseases, disorders mediated by antibodies against various cell and nuclear components, paraneoplastic disorders etc.

(7) **Neuromicrobiology**

The various microbiological aspects of infectious neurologic diseases including encephalitis, meningitis, brain abscess, granulomas, myelitis, cold abscess, cerebral malaria, parasitic cysts of nervous system, rhinocerebral mycoses, leprous neuritis, neuroleptospirosis, Primary and secondary Neuro HIV infections, congenital TORCH infections of brain, slow virus infections such as JCD and SSPE, neurological complications of viral infections such as Polio, EBV, Chickenpox, Rabies, Herpez, Japanese encephalitis and other epidemic viral infections.

(8) **Neurotoxicology**

Organophosphorus poisoning, hydrocarbon poisoning, lead, arsenic, botulinumtoxin and tetanus toxicity, snake, scorpion, spider, wasp and bee stings are important tropical neurotoxic syndromes whose prompt diagnosis and effective therapy are crucial in life saving.

(9) **Neurogenetics and Proteomics**

Autosomal dominant and recessive and X-linked inheritance patterns, disorders of chromosomal anomalies, Gene mutations, trinucleotide repeats, dysregulation of gene expressions, enzyme deficiency syndromes, storage disorders, disorders of polygenic inheritance, and proteomics in health and disease.

(10) **Neuroepidemiology**

Basic methodologies in community and hospital based neuroepidemiological studies such as systematic data collection, analysis, derivation of logical conclusions, concepts of case-

control and cohort studies, correlations, regressions and survival analysis; basic principles of clinical trials.

PAPER – II: Clinical Neurology including Pediatric Neurology

(1) General Evaluation of the Patient

The science and art of history taking, Physical Examination including elements of accurate history taking, symptoms associated with neurological disease, The physical examination of adults, children, infants and neonates, syndromes associated with congenital and acquired neurological disease, cutaneous markers, examination of unconscious patients, examination of higher mental functions, cranial nerves, the ocular fundus, examination of tone, power of muscles, proper elicitation of superficial and deep reflexes including the alternate techniques and neonatal and released reflexes, neurodevelopmental assessment of children, sensory system, peripheral nerves, signs of Meningeal irritation, skull and spine examination including measurement of head circumference, shortness of neck and carotid pulsations .and vertebral bruits.

(2) COMA

Pathophysiology and diagnosis of COMA, Diagnosis and management of coma, delirium and acute confusional states, reversible and irreversible causes, persistent vegetative states and brain death, neurophysiological evaluation and confirmation of these states and mechanical ventilation and other supportive measures of comatose patient and prevention of complications of prolonged coma. The significance of timely brain death in organ donation and ICU resource utilization.

(3) Seizures and Epilepsy and Syncopes

Diagnosis of seizures, epilepsy and epileptic syndromes, Recognition, clinical assessment and management of seizures especially their electrodiagnosis, video monitoring with emphasize on phenomenology and their correlation with EEG and structural and functional brain imaging such as CT and MRI and fMRI and SPECT scan, Special situations such as epilepsy in pregnant and nursing mothers, driving, risky occupations, its social stigmas differentiation from pseudoseizures, use of conventional and newer antiepileptic drugs, their drug interactions and adverse effects etc., modern lines of management of intractable epilepsies, such as ketogenic diet, vagal nerve stimulation, epilepsy surgery and about presurgical evaluation of patients. Management of status epilepticus and refractory status epilepticus; Differentiation of seizures from syncopes, drop attacks, cataplexy, startles etc.

(4) Headaches And Other Cranial Neuralgias

Acquisition of skills in analysis of headaches of various causes such as those from raised intracranial pressures, migraines, cranial neuralgias, vascular malformations, Meningeal irritation, psychogenic etc. and their proper pharmacologic management.

(5) Cerebrovascular Diseases

Vascular anatomy of brain and spinal cord, various causes and types of cerebrovascular syndromes, ischemic and haemorrhagic types, arterial and venous types, anterior and posterior circulation strokes, OCSF and TOAST classifications, investigations of strokes including neuroimaging using dopplers, CT and MR imaging and angiography, acute stroke therapy including thrombolytic therapy, interventional therapy of cerebrovascular diseases, principles of management of subarachnoid haemorrhage etc. Special situations like strokes in the young, Strategies for primary and secondary prevention of stroke

(6) **Dementias**

Concept of minimal cognitive impairment, Reversible and irreversible dementias, causes such as Alzheimer's and other neurodegenerative diseases and vascular and nutritional and infectious dementias, their impact on individual, family and in society, Genetic and familial syndromes. Pharmacotherapy of dementias, Potential roles of cognitive rehabilitation and special care of the disabled.

(7) **Parkinsonism and Movement Disorders**

Disorders of extrapyramidal system such as parkinsonism, chorea, dystonias, athetosis, tics, their diagnosis and management, pharmacotherapy of parkinsonism and its complications, management of complications of parkinsonism therapy, including principles of deep brain stimulation and lesional surgeries. Use of EMG guided botulinum toxin therapy, management of spasticity using intrathecal baclofen and TENS.

(8) **Ataxic Syndromes**

Such as parainfectious demyelinations, cerebellar tumours, hereditary ataxias, vestibular disorders; Diagnosis and management of brainstem disorders, axial and extra-axial differentiation.

(9) **Cranial Neuropathies**

Disorders of smell, vision, visual pathways, pupillary pathways and reflexes, internuclear and supranuclear ophthalmoplegia; other oculomotor disorders, trigeminal nerve testing, Bell's palsy, differentiation from UMN facial lesions, brainstem reflexes, Investigations of vertigo and dizziness, differentiation between central and peripheral vertigo, Differential diagnosis of nystagmus, investigations of deafness, bulbar and pseudobulbar syndromes,

(10) **CNS Infections**

Diagnosis and management of viral encephalitis, meningitis-bacterial, tuberculous, fungal, parasitic infections such as cysticercosis, cerebral malaria, SSPE, Neuro HIV primary and secondary infections with exposure to gram stain and cultures, bactec, QBC, ELISA and PCR technologies

(11) **Neuroimmunologic Diseases**

Diagnosis and management of CNS conditions such as Multiple sclerosis, PNS conditions such as GBS, CIDP, Myasthenia gravis, polymyositis

(12) **Neurogenetic Disorders**

Various chromosomal diseases, single gene mutations such as enzyme deficiencies, autosomal dominant and recessive conditions and X-linked disorders, trinucleotide repeats, disorders of DNA repair. Genetics of Huntington's disease, familial dementias, other storage disorders, hereditary ataxias, hereditary spastic paraplegias, HMSN, muscular dystrophies, mitochondrial inheritance disorders,

(13) **Developmental Disorders of Nervous System**

Neuronal migration disorders, craniovertebral junction diseases, spinal dysraphisms, phacomatoses and other neurocutaneous syndromes- their recognition and management.

(14) **Myelopathies**

Clinical diagnosis of distinction between compressive and non-compressive myelopathies, spinal syndromes such as anterior cord, subacute combined degeneration, central cord syndrome, Brown-Sequard syndrome, tabetic syndrome, Elseberg phenomenon. Diagnosis of spinal cord and root compression syndromes, CV junction

lesions, syringomyelia, conus-cauda lesions, spinal AVMs, tropical and hereditary spastic [paraplegias, Fluorosis.

(15) Peripheral Neuropathies

Immune mediated, hereditary, toxic, nutritional and infectious type peripheral neuropathies; their clinical and electrophysiological diagnosis

(16) Myopathies and Neuromuscular Junction Disorders

Clinical evaluation of patients with known or suspected muscle diseases aided by EMG, muscle pathology, histochemistry, immunopathology and genetic studies. Dystrophies, polymyositis, channelopathies, congenital and mitochondrial myopathies.. Neuromuscular junction disorders such as myasthenia, botulism, Eaton-lambert syndrome and snake and organophosphorus poisoning, their electrophysiological diagnosis and management . Myotonia, stiff person syndrome. .

(17) Paediatric Neurology

Normal development of motor and mental milestones in a child, Cerebral palsy, Attention deficit disorder, Autism, developmental dyslexias, Intrauterine TORCH infections, Storage disorders, Inborn errors of metabolism affecting nervous system, developmental malformations, Child hood seizures and epilepsies, neurodegenerative diseases.

(18) Cognitive Neurology and Neuropsychiatry:

Detailed techniques of higher mental functions evaluation, basics of primary and secondary neuropsychiatric conditions such as anxiety, depression, schizophrenia, acute psychosis, acute confusional reactions (delirium), organic brain syndrome, primary and secondary dementias, differentiation from pseudodementia

(19) Tropical Neurology

Conditions which are specifically found in the tropics like neuro cysticercosis, cerebral malaria, tropical spastic paraplegia, Snake/scorpion/ Chandipura encephalitis, Madras Motor Neuron disease etc. will be dealt with in special detail in the curriculum

PAPER – III: Diagnostic and Therapeutic Neurology including Neuroinstrumentation

(1) Diagnostic Neurology

Performing and interpreting Digital Electroneurogram, Electromyogram, Evokedpotentials, Electroencephalography, Interpretation of skull and spine X rays, computerized tomography of brain and spine, Magnetic resonance images of brain including correct identification of various sequences, angiograms, MR spectroscopy, basics of functional MRI, Interpretation of digital subtraction imaging , SPECT scans of brain, subdural EEG recording, transphenoidal electrode EEG Techniques for temporal lobe seizures, video EEG interpretation of phenomenology and EEG-phenomenology correlations, EEG tapemetry, Transcranial Doppler diagnosis and monitoring of acute ischemic stroke, subarachnoid haemorrhage, detection of right-to-left shunts etc; Colour duplex scanning in Carotid and vertebral extracranial segment screening.

(2) Interventional Neurology and Neuroinstrumentations

To acquire skills in Procedures like

- a) intrathecal administration of antispasticity drugs, beta interferons in demyelination, opiates in intractable pain etc.,
- b) EMG guided Botox therapy for dystonias,
- c) subcutaneous administration of antimigraine and antiparkinsonian drugs

- d) Intrarterial thrombolysis in extended windows of thrombolysis in ischemic strokes,
- e) Transcranial Ultrasound clot-bust intervention in a registry in acute stroke care unit
- f) Planning in deep brain stimulation therapy in uncontrolled dyskinesias and on-off phenomena in long standing parkinsonism
- g) Planning in vagal nerve stimulation in intractable epilepsy

PAPER – IV: Recent Advances in Neurology

(1) Recent Advances in Clinical & Therapeutic Neurology

(2) Advances in Neuroimaging Techniques

Integration of CT, MR, SPECT images with each other and with EEG, EVOKED potentials based brain maps in structural and functional localization in neurological phenomena and diseases, Fluorescent ye tagged study of neurons in diseases in animal models in vivo and in tissue cultures in-vitro.

(3) Bionics in Neural Prosthesis and Rehabilitation

Advanced techniques in neurorehabilitation such as TENS, principles of man-machine interphase devices in cord, nerve and plexus injuries, cochlear implants, artificial vision.

(4) Neuroproteomics and Neurogenetics

Brain functions are regulated by proteomics and genomics linked to various proteins and genes relevant to the brain, body's maximum number of proteins and genes being expressed in brain as neurotransmitters or channel proteins and predisposing brain to a number of disorders of abnormal functioning of these proteins.

(5) Stem Cell and Gene Therapy

Principles of ongoing experiments on stem cell therapy for nervous system disorders such as foetal brain tissue transplants in parkinsonism; intrathecal marrow transplants in MND, MS, Spinal trauma; myoblasts infusion therapy in dystrophies

(6) Neuroepidemiological Studies and Clinical Trials

The students of the DM course will be trained in conducting sound neuroepidemiological studies on regionally and nationally important neurological conditions as well as on diseases of scientific and research interest to the department.

The Student should also be familiarized with Internet browsing for Journals, Special Articles, Review Articles and other recent recommendations of International Societies like the World Federation of Neurology, American academy of Neurology and World Stroke Association

TEACHING LEARNING EXPERIENCE

TRAINING

(1) Period of Training MCI Guidelines

The period of training for obtaining the degree of D.M in Neurology shall be three completed years (including the examination period) after obtaining M.D degree, or equivalent recognised qualification in the required subject.

(2) Training Programme MCI Guidelines

1. The training given with due care to the post graduate students in the recognised institutions for the award of D.M Neurology , shall determine the expertise of the

specialist and /or medical teachers produced as a result of the educational programme during the period of stay in the institution.

2. All the candidates joining the D.M Neurology training programme shall work as full time residents during the period of training, attending not less than 80%(Eighty percent) of the training during the calendar year, and given full time responsibility, assignments and participation in all facets of the educational process.
3. D.M Neurology students shall maintain a record (log book) of the work carried out by them and the training programme undergone including details of the Non-Invasive, Invasive Neuro Diagnostic and Interventional Work assisted or done independently by the D.M Candidates.
4. During training for the D.M Neurology there shall be proper training in basic medical sciences related to neurology. Emphasis to be laid on preventive and social aspects and emergency care services.
5. The D.M Neurology student shall be required to participate in the teaching and training programme of undergraduate and post graduate students in the departments of medicine, pediatrics etc.
6. Training in Medical Audit, management, health economics, health information system, basics of statistics, exposure to human behaviour studies, knowledge of pharmacoeconomics and introduction to non linear mathematics shall be imparted.
7. In Service training with the students being given graded responsibility in the management and treatment of patients entrusted to their care: participation in Seminars, Journal Clubs, Group Discussions, Clinical Meetings, Grand Rounds and Clinico-Pathological Conferences, Advanced Diagnostic, Therapeutic and Laboratory techniques in Neurology.

POSTINGS

(1) Ward / OPD

These would be the first posting of the D.M Candidate. The candidate would first familiarize himself/herself with the general working of the hospital, the Wards, admission norms, sending of investigations, geography of the hospital, location of the various services, consent forms, blood availability, discharge protocol, medical records section etc. In addition the candidate would examine all the cardiac cases in the wards and give consultation to all other departments of the hospital with the help of the consultant.

If there are undergraduate MBBS or Post Graduate MD students from Medicine, Pediatrics or other specialties posted then he would impart relevant clinical examination and diagnostic skills to them.

The candidate would also be working in the OPD and assessing the suitability of the patients for admission, making an OPD diagnosis, planning the relevant investigations etc. In addition the candidate would manage the special clinics like Post Intervention Clinic and the Special Clinics of the Department

The DM candidate would be put on regular round the clock duties and would take the call from the Casualty and other department of the hospital. He/she would relieve the ICU person for Lunch etc.

(2) Intensive Care Unit

This posting is essential for the candidate to learn all the aspects of NeuroIntensive Care like Thrombolytic Therapy in Acute stroke, Hemodynamic Monitoring in Acute stroke especially massive infarcts and subarachnoid haemorrhages, comatose patients, Ventilator

therapy in neuroparalytic diseases such as GBS, Myasthenic crisis, ADEM, Organophosphorus and other CNS poisoning, management of acute CNS infections such as encephalitis and meningitis; status epilepticus, delirium, coma and confusional states, periodic paralysis. The candidate should familiarize himself/herself with all the monitoring gadgets in the ICU like Monitors, ventilators, blood gas analyzer, infusion pumps, alpha beds, TEDS, continuous Transcranial Doppler, EEG and CSF manometry monitoring of comatose patients, confirmation of brain death etc.

The candidate would be on duty in the Intensive Care Unit from 9 A.M to 9 P.M and 24 hours by rotation. He / she would also attend the teaching programmes of the department when free from patient care. He/she would be relieved for lunch by the ward resident. The candidate would also be taking calls from the casualty and giving consultations to all department of the hospital.

(3) Neurophysiology Laboratory Posting

The candidate would be posted in the Non-Invasive Laboratory wherein he/she would receive training and independently perform Computerised EEG, ENMG, EP Recording and reporting, Transcranial and Colour Duplex neurosonographic Examination and reporting, autonomic function testing, neuro-otology, language and speech therapy exposure, neurophthalmology

ACADEMIC PROGRAMME

(1) Departmental Academic Programmes

- **Journal Clubs:** Critical analysis of original research articles in Indian and International Journals, Journals from the Internet, recommendations of various committees like the American Academy of Neurology, American College of Neurology etc. regarding indications of various procedures.
- **Short Reviews:** Short review of the literature on a simple specified topic based upon the various theory papers in the examination like Basic Sciences applied to Neurology, Clinical Neurology including Pediatrics, Diagnostic Neurology, Intervention and Neuro Instrumentation and recent advances in Neurology, Preventive Neurology, Neuroepidemiology and Neurosurgery.
- **Long Reviews:** Complete updated review of literature with critical analysis of major topics in Neurology e.g. Risk factors of stroke, dementia etc. These should be presented with slides and should be bound in the form of a book. Minimum number of Long reviews to be done is three during the entire course.
- **Bed-Side Clinics:** Both short cases and long cases to be taken by the candidate and presented to the consultants in the same pattern as examination.
- **EEG, VIDEO EEG/ NCV/EMG/EVOKED POTENTIALS/ ELECTROPHYSIOLOGY CLINIC:** Complete work up of each case with EEG, Video EEG/ NCV/EMG/ Evoked Potentials presented to the consultants and reviewed. All diagnostic and interventional cases done in one week reviewed.
- **DBS, TENS and Vagal stimulation planning conferences**

(2) Inter Departmental Programmes

- **Neuroradiology Conference:** A fortnightly inter departmental programmes between the departments of Neurology and Radiodiagnosis Departments.
- **Neuropsychiatry conference:** Monthly meetings between the departments of Psychiatry and Neurology.
- **Neuropathology conference:** Monthly meetings between Neurology, Neurosurgery and pathology departments

- Modular Teaching: Participation in Undergraduate Modular Teaching in the subjects of Neurology.
- Bed-side Clinics for Undergraduates in the Neurology OPD.
- Bed-side Clinics for Post Graduates i.e. M.D (Med), MD (Psychiatry) students.

(3) Central Academic Programmes

- Clinico-Pathological Exercise.
- PG Seminar
- CCR weekly

Log Book

The candidate is expected to maintain a Log Book of all his/her activities with respect to

- Bio-data
- Complete List of Postings with periods and dates
- Interesting cases seen and worked up during the period of posting
- List of Short Reviews presented
- List of Long Reviews presented
- List of Journals reviewed
- List of Cases presented and discussed in Bed-side clinics
- Topics presented CCR regularly held on Wednesday
- List of ENG, EMG, EEG, EP, TCD, Carotid duplex etc. performed and analysed.
- List of TENS, DBS and Vagal nerve stimulations observed.
- List of nerve and muscle biopsies performed and interpreted
- Samples of NCV , ENG, EMG, EEG, EP, TCD, Carotid duplex etc performed to be pasted in the Log Book.
- Abstracts and lists of papers published or sent for publication.
- Any other research projects undertaken.
- Any other interesting detail.

This Log Book would be scrutinised and certified by the Head of Department and other Consultants and presented to the external examiners at the time of the final examination.

Long Reviews

The long reviews presented during the period of the course should be compiled and bound in the form of a book incorporating any diagrams, flow charts, algorithms etc. and a complete list of up to date references and this along with the CD containing slides of these reviews should be submitted for scrutiny before the examination.

Publications

All Residents have to present 1 poster presentation, 1 platform presentation and 1 paper published / sent for publication in National / International Journals should be submitted to the department before the examination.

RECOMMENDED BOOKS AND JOURNALS

Books (latest edition)

- DeJong's The Neurological Examination, Stephanie Lessig, MD edited - William Campbell, 671 pp., illus., Philadelphia, 6th Edition. Lippincott Williams & Wilkins, latest edition.
- 2. Localization in Clinical Neurology - Brazis, Paul W, Masdeu, Joseph, Biller, Jose ; 6th edition Lippincott and Williams, latest edition.

- Neurology in Clinical Practice - Bradley. 2 volumes; 5th edition Gerald M. Fenichel, Robert B. Daroff, Joseph Jankovic, Butterworth, latest edition.
- Adams & Victor's Principles of Neurology - Allan H. Ropper, Martin A. Samuels. 9th Edition McGraw Hill, latest edition.
- Clinical Neurology - Michael J. Aminoff, David A. Greenberg, Roger P. Simon. 5th Edition Elsevier, latest edition.
- Parkinson's disease and movement disorders. By Joseph Jankovic, Eduardo Tolosa. 5th Edition Lippincott, latest edition.
- Caplan's Stroke: A Clinical Approach - Louis Caplan. 4th Edition Saunders, latest edition.
- Clinical Neurophysiology - UK. Mishra, J. Kalita. BI Publication, latest edition.

Journals

- Annals of Indian Academy of Neurology
- Neurology India
- Neurology
- Annals of Neurology.
- Journal of the Neurological Sciences.
- Journal of Neurology, Neurosurgery and Psychiatry.
- Brain
- Stroke 24
- Neurology Clinics of North America
- Current opinion in Neurology
- The Lancet
- Journal of the Association of Physicians of India.
- Journal of the Indian Medical Association.
- Bulletin of the ICMR
- Bulletin of the WHO
- Journal of the American Medical Association.
- Medical Clinics of North America.

The Student should also be familiarized with Internet browsing for Journals, Special Articles, Review Articles and other recent recommendations of International Societies like the World Federation of Neurology, American academy of Neurology and World Stroke Association. Failure is a success if we learn from it - Macolmb S Forbes

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MODEL PAPER

Neuro.-I

**DM Examination Month, Year
NEUROLOGY**

Paper I
Basic Sciences as related to Neurology

Time : Three Hours
Maximum Marks : 100

Attempt all questions
All questions carry equal marks.
Draw diagrams wherever necessary

Write Briefly on

- Q.1 Neural control of consciousness.
- Q.2 International system of electrode placement in EEG recording.
- Q.3 Cerebrospinal fluid pathways and dynamics
- Q.4 Approach towards 25 years old patient presenting with rapid onset quadriparesis
- Q.5 Neurophysiology and regulation of sleep.
- Q.6 Innervation and neurophysiology of bladder
- Q.7 Origin and function of pyramidal tracts
- Q.8 Brain death and its histopathology
- Q.9 Draw a neuron and synapse. Explain axonal transport, salutatory conduction and synaptic transmission.
- Q.10 Physiology of ocular movements.

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MODEL PAPER

Neuro.-II

**DM Examination Month, Year
NEUROLOGY**

**Paper II
Clinical Neurology including Pediatric Neurology**

Time : Three Hours
Maximum Marks : 100

Attempt all questions
All questions carry equal marks.
Draw diagrams wherever necessary

Write Briefly on:

- Q.1 Management of status epilepticus.
- Q.2 Neurogenic dysphagia
- Q.3 Paraplegia and spinal cord syndromes.
- Q.4 Episodic ataxias.
- Q.5 Paraneoplastic syndromes
- Q.6 Management of myasthenic crisis.
- Q.7 Delirium
- Q.8 Idiopathic intracranial hypertension.
- Q.9 Diabetes, malaria and syphilis – neurological manifestations
- Q.10 Treatable causes of peripheral neuropathy.

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MODEL PAPER

Neuro.-III

**DM Examination Month, Year
NEUROLOGY**

Paper III

Diagnostic and Therapeutic Neurology including NeuroInstrumentation

Time : Three Hours

Maximum Marks : 100

Attempt all questions
All questions carry equal marks.
Draw diagrams wherever necessary

Write Briefly on:

- Q.1 Explain the phenomena Silent period and collision in Nerve conduction studies
- Q.2 Transcranial Doppler study.
- Q.3 Compare and contrast Digital EEG with paper EEG.
- Q.4 Diagnosis of demyelination in Neurology.
- Q.5 Polysomnography.
- Q.6 Second generation antiepileptic drugs .
- Q.7 Indications and contraindications of thrombolytic therapy in stroke.
- Q.8 Debate on L-Dopa versus dopamine agonists in early parkinsonism.
- Q.9 Debate on Wada test vs. fMRI in evaluation of cerebral dominance in presurgical evaluation.
- Q.10 Mitochondrioses in Neurology.

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MODEL PAPER

Neuro.-IV

**DM Examination Month, Year
NEUROLOGY**

**Paper IV
Recent advances in Neurology**

Time : Three Hours
Maximum Marks : 100

Attempt all questions
All questions carry equal marks.
Draw diagrams wherever necessary

Write On:

- Q.1 Principles of governing conduction of Phase III clinical trials.
- Q.2 Deep Brain stimulation.
- Q.3 Channelopathies in Neurology.
- Q.4 Ubiquitinopathies in Neurology.
- Q.5 Discuss carotid stent vs. carotid endarterectomy in secondary prevention of stroke.