



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed to be University u/s 3 of UGC Act, 1956)

Grade 'A⁺⁺' Accredited by NAAC

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COMPETENCY BASED MEDICAL EDUCATION (CBME)

(with effect from 2022-23 Batch onwards)

Curriculum for Doctor of Medicine Anatomy

Approved as per AC-46/2023, Dated 28/04/2023

Amended History

1. Approved as per AC-46/2023, Resolution No.5.4; Dated 28/04/2023.

Resolution No. 5.4 of Academic Council (AC-46/2023): Resolved to approve revised MD Anatomy syllabus as per NMC guidelines from 2023-24 batch onwards [ANNEXURE-8].

MGMIHS, Navi Mumbai
Syllabus
Competency Based
Postgraduate Training Programme
MD – Human Anatomy

(As per **National Medical Commission - Postgraduate Medical Education Board**
D 11011/1/22/AC/Guidelines/Human Anatomy Dated 05-08-2022)

SUBJECT SPECIFIC LEARNING OBJECTIVES

The **Goal** of MD Anatomy is to train a doctor to become a competent teacher and researcher in Anatomy who has acquired competence / skills in –

1. Contemporary advances and developments in the field of Anatomy.
2. Competencies pertaining to the subject of Anatomy that are required to be practiced at all levels of the health system.
3. Educating medical and paramedical professionals.
4. Effectively communicating with the students and colleagues from various medical and paramedical fields.
5. Integrating anatomy with other disciplines as and when needed.
6. Being good teacher capable of innovations in teaching methodology.
7. Being effective leader of the team engaged in teaching and research.

After completing the three year course in MD in Human Anatomy, the student should have achieved competence in the following:

1. Knowledge of Anatomy

- **1.1** Acquire competencies in gross anatomy, surface anatomy, neuroanatomy, embryology, genetics, histology, radiological anatomy, applied aspects and recent advances of the above mentioned branches of anatomy to clinical practice. These are given in detail in subsequent sections.

2. Practical and Procedural skills

- **2.1** Acquire mastery in dissection skills, embalming, tissue processing, staining and museum preparation / techniques, bone procurement and its tissue preparation.

3. Acquire training skills in Research Methodology

- **3.1** Acquire skills in teaching, research methodology, epidemiology & basic information technology.
- **3.2** Acquire knowledge in the basic aspects of Biostatistics and research methodology.
- **3.3** Has knowledge to plan the protocol of a thesis, carry out review of literature, execution of research projects and preparation of reports.
- **3.4** Has ability to use computer applications, Microsoft office (Microsoft word, excel, power point), Internet, Searching scientific databases (e.g. PubMed, Medline, Cochrane reviews).
- **3.5** Acquire skills in paper & poster preparation, writing research papers and thesis.

4. Professionalism, attitude and communication skills:

- **4.1** Develop work ethics and empathetic behavior with students and colleagues.
- **4.2** Acquire capacity of not letting his/her personal beliefs, prejudices, and limitations come in the way of duty.
- **4.3** Acquire attitude and communication skills to interact with colleagues, teachers, and students, body donors and family members of the donors

5. Teaching Anatomy

- **5.1** Acquire skills in teaching undergraduate students, (Lecture, Small Group Discussion, SDL, assessment and feedback.
- **5.2** Making power point presentation of subject topics.

6. Problem solving: The post graduate students should be able to demonstrate the ability to:

- **6.1** Identify applied implications of the knowledge of anatomy and discuss information relevant to the problem, using consultation, texts, archival literature and electronic media.
- **6.2** Correlate the clinical conditions to the anatomical / embryological / hereditary factors and explain anatomical basis of diseases.
- **6.3** Evaluate scientific/ clinical information and critically analyze conflicting data and hypotheses.
- **6.4** Prepare Scenario-based MCQs.

SUBJECT SPECIFIC COMPETENCIES

At the end of the course, the student should have acquired competencies with following predominant domains:

A. Predominant in Cognitive domain:

1. Describe gross anatomy of the entire body (including upper limb, lower limb, thorax, abdomen, head & neck and brain).
2. Explain the normal disposition of gross structure, and their interrelationship in the human body. She / He should be able to analyze the integrated functions of organs systems and locate the site of gross lesions according to deficits encountered.
3. Describe the process of gametogenesis, fertilization, implantation and placenta formation in early human embryonic development along with its variation and applied anatomy.
4. Demonstrate knowledge about the sequential development of organs and systems along with their clinical anatomy, recognize critical stages of development and effects of common teratogens, genetic mutations and environmental hazards. She / He should be able to explain developmental basis of variations and congenital anomalies.
5. Explain the principles of light, transmission and scanning, compound, electron, fluorescent and virtual microscopy.
6. Describe the microscopic structure of various tissues & organs and correlate structure with functions as a prerequisite for understanding the altered state in various disease processes.
7. Demonstrate knowledge about cell and its components, cell cycle, cellular differentiation and proliferation.
8. Describe structure, number, classification, abnormalities and syndromes related to human chromosomes.
9. Describe important procedures in cytogenetics and molecular genetics with its application.
10. Demonstrate knowledge about single gene pattern inheritance, intermediate pattern and multiple alleles, mutations, non-Mendelian inheritance, mitochondrial inheritance, genome imprinting and parental disomy.
11. Describe multifactorial pattern of inheritance, teratology, structure gene, molecular screening, cancer genetics and pharmacogenetics.
12. Explain the concept of reproduction genetics, infertility, assisted reproduction, prenatal diagnosis, genetic counseling and ethics in genetics.
13. Explain principles of gene therapy and its applied knowledge.
14. Describe the immune system and cell types involved in defense mechanisms of the body. Explain the gross features, cytoarchitecture, function, development and histogenesis of various primary and secondary lymphoid organs in the body.
15. Demonstrate knowledge about common techniques employed in cellular immunology and histocompatibility testing.
16. Demonstrate application of knowledge of structure & development of tissue-organ system to comprehend deviations from normal.
17. Demonstrate knowledge about recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.
18. Explain collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies.
19. Demonstrate knowledge about surface marking of all regions of the body.
20. Able to interpret various radiographs of the body, normal CT scan, ultrasound and MRI.
21. Demonstrate knowledge about different anthropological traits and use of related instruments.
22. Demonstrate knowledge about outline of comparative anatomy of whole body and basic human evolution.
23. Demonstrate knowledge about identification of human bones, determination of sex, age, and height for medico legal application of anatomy.

B. Predominant in Affective domain

1. Demonstrate self-awareness and personal development in routine conduct (Self-awareness).
2. Communicate effectively with peers, students and teachers in various teaching-learning activities (Communication).
3. Demonstrate -
 - a. Due respect in handling human body parts & cadavers during dissection (Ethics & Professionalism)
 - b. Humane touch while demonstrating living surface marking in subject/patient (Ethics & Professionalism).
4. Acquire the capacity of not letting his/her personal beliefs, prejudices and limitations come in the way of duty.
5. Appreciate the issues of equity and social accountability while exposing students to early clinical exposure (Equity and social accountability).
6. Ability to communicate with the registered body donors and family of donors.

C. Predominant in Psychomotor domain

1. Identify, dissect, locate and demonstrate surface marking of clinically important structures in the cadaver and correlate it with living anatomy.
2. Acquire mastery in dissection skills, embalming, tissue preparation, staining and museum preparation.
3. Locate and identify clinically relevant structures in dissected cadavers.
4. Locate and identify cells and tissues under the microscope.
5. Identify the anatomical structures visualized by imaging techniques, specifically radiographs, computerized tomography (CT) scans, MRI and ultrasonography in normal individuals.
6. Demonstrate various movements at the important joints and actions of various groups of muscles in the human body
7. Demonstrate anatomical basis of common clinical procedures expected to be performed by a basic medical doctor.
8. Demonstrate different methods of teaching-learning and make presentations of the subject topics and research outputs.

Specific practice based competencies

Name/Description of practice based competencies

1. **Gross anatomy:**
 - 1.1 Procurement, Embalming and Preservation of human cadavers
 - 1.2 Preparation of tanks for preserving bodies
 - 1.3 Dissection of cadaver
 - 1.4 Window dissection of important regions
 - 1.5 Preparation of specimens for museum with display
 - a) soft parts
 - b) Hard Parts
 - c) models
 - d) charts
 - 1.6 Preparation and preservation of human bones / skeleton as assigned by the faculty
 - 1.7 Gross anatomy file in which labelled diagrams of important structures of upper limb, lower limb, thorax, abdomen, head & neck and brain should be drawn.
2. **Histology**
 - 2.1 Preparation of common fixatives for embalming fluid, 10% formalin, Bouin's fluid etc.
 - 2.2 Making paraffin blocks and section cutting and mounting.
 - 2.3 Preparation of staining set for H and E staining and staining paraffin sections with the stain.

- 2.4 Making celloidin, araldite, gelatin blocks and their section cutting.
- 2.5 Processing hard tissues, decalcification of bones, block making and sectioning, preparation of ground sections of calcified bones.
- 2.6 Frozen section cutting on freezing microtome and cryostat.
- 2.7 Honing and stropping of microtome knives, including sharpening by automatic knife sharpener.
- 2.8 Histology file in which LM pictures of all the organs and tissues of the body should be drawn and a small description of salient features written.

3. **Histochemical Methods**

Practical classes for staining of glycogen, mucopolysaccharides, alkaline phosphatase, acid phosphatase and calcium

4. **Cytogenetics**

- 4.1 Preparation of media, different solutions, stains etc.
- 4.2 Preparation of buccal smear for sex chromatin
- 4.3 Human chromosome preparation from peripheral blood and karyotyping.
- 4.4 Banding techniques (G and C)
- 4.5 Making of Pedigree charts for study of patterns of inheritance.
- 4.6 Chromosomal analysis.

5. **Neuroanatomy**

- 5.1 Dissection of brain and spinal cord for teaching and learning purpose
- 5.2 Preparation of brain and spinal cord macroscopic and microscopic sections and identification of different parts in them.
- 5.3 Discussions on clinical problems related to neurological disorders and anatomical explanation for the same.

SYLLABUS:

(As per National Medical Commission - Postgraduate Medical Education Board
D 11011/1/22/AC/Guidelines/Human Anatomy Dated 05-08-2022)

A post graduate student, after three years of training in M.D. (Anatomy) should have acquired knowledge in the following aspects of anatomy:

Section - 1

Gross anatomy

1. Gross Anatomy of entire body including general anatomy, upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, osteology, cross sectional anatomy
2. Embalming procedures

Section - 2

Developmental anatomy/embryology

1. **General embryology:** gametogenesis, fertilization, implantation and placenta, early human embryonic development – 2nd to 8th week
2. **Systemic embryology:** development of organ systems (Respiratory system, GIT with accessory glands, urinary system, male reproductive system, female reproductive system, endocrine glands, salivary glands, central nervous system, eye, ear, Head, face and Neck) and associated common congenital abnormalities with teratogenesis.
3. Anatomical basis of congenital anomalies.

Section - 3

Histology and histochemistry

Cell Biology:

1. **Cytoplasm** - cytoplasmic matrix, cell membrane, cell organelles, cytoskeleton, cell inclusions, cilia and flagella.
2. **Nucleus** - nuclear envelope, nuclear matrix, DNA and other components of chromatin, protein synthesis, nucleolus, nuclear changes indicating cell death.
3. Cell cycle & mitosis, meiosis, cell renewal
4. Cellular differentiation and proliferation.

Microscopic structure of the body:

1. **Histo techniques:**
 - Principles of light, transmission and scanning, electron, fluorescent, confocal and virtual microscopy.
 - Basic techniques in tissue processing, preparation of blocks, microtome sections and H & E staining
 - Principles of the following special stains – silver nitrate, periodic acid Schiff, osmic acid, Masson's trichrome, Verhoff and Orcein stains.
2. Various museum techniques
3. **For all of the following general and systemic histology topics students should know** – Cellular organization, light and electron microscopic features, structure – functional correlations
 - A. **General Histology** – Tissues - Epithelium, connective tissue, muscular tissue, nervous tissue, Blood vessels, Lymphoid tissue and Skin

B. The systems/organs of body – Respiratory system, GIT with accessory glands, urinary system, male reproductive system, female reproductive system, endocrine glands, salivary glands, oral cavity, CNS, Special senses

Section - 4

Neuroanatomy:

1. Neuron and Neuroglia, Somatic sensory system
2. Development of the nervous system,
3. Detailed structure of the central nervous system – Brain (Cerebrum, Brain stem, Cerebellum) with Spinal cord and their environment, with blood supply
4. Ventricular system of brain with CSF
5. Pathways – Olfactory and optic pathways, Cochleovestibular and gustatory pathways, Motor pathways, Central autonomic pathways,
6. Hypothalamo-hypophyseal system, Limbic system, Basal ganglia, Reticular activating system
7. Cross Sectional anatomy of brain and spinal cord.
8. All spinal and cranial nerves
9. Functional correlation and clinical aspects with their anatomical basis .

Section - 5

Genetics

1. Human Chromosomes - Structure, number and classification, methods of chromosome preparation banding patterns. Chromosome abnormalities, Autosomal and Sex chromosomal abnormalities, syndromes, Molecular and Cytogenetics.
2. Single gene pattern inheritance: Autosomal and Sex chromosomal pattern of inheritance, Intermediate pattern and multiple alleles, Mutations, Non-Mendelian inheritance, Mitochondrial inheritance, Genome imprinting, parental disomy.
3. Multifactorial pattern of inheritance: Criteria for multifactorial inheritance, Teratology, Structure of gene, Molecular Screening, Cancer Genetics - Haematological malignancies, Pharmacogenetics.
4. Reproduction Genetics - Male and Female Infertility, Abortuses, Assisted reproduction, Preimplantation genetics, Prenatal diagnosis, Genetic Counseling and Ethics of Genetics.
5. Principles of Gene therapy and its applied knowledge.

Section - 6

Immunology

1. Immune system and the cell types involved in defense mechanisms of the body. Gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body.
2. Biological and clinical significance of the major histocompatibility complex of man including its role in transplantation, disease susceptibility/resistance and genetic control of the immune response.
3. Various techniques employed in cellular immunology and histocompatibility testing.
4. Principles of molecular hybridization and PCR technology in immunology research particularly mechanism of antigen presentation, structural and functional relevance of the T cell receptor, genetic control of the immune response. Molecular basis of susceptibility to disease.

Section - 7

Applied anatomy and recent advances

1. Clinical correlations of structure and functions of human body. Anatomical basis and explanations for clinical problems.

2. Applications of knowledge of developmental, structural (Gross & microscopy) and neuro anatomy to comprehend deviations from normal.
3. Recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.
4. Collection, maintenance and application of stem cells, cryo banking and principles of organ donation

Section - 8

Surface Marking and Radiology

1. Surface marking of all regions of the body.
2. Interpretation of normal radiographs of the body including special contrast procedures including barium studies, cholecystography, pyelography, hysterosalpingography.
3. Normal CT Scan, MRI and Ultrasound principles

Section – 9

Anthropology & comparative anatomy

1. Different anthropological traits, Identification and use of Anthropological instruments.
2. Outline of comparative anatomy of the whole body and basic human evolution

Section – 10

Forensic Medicine:

1. Identification of human bones from their remains and determination of sex, age, and height. for medico legal application of Anatomy.

Section – 11

Bioethics in Anatomy

1. Biomedical waste disposal, Laboratory quality assurance, Genetic counseling & cadaveric oath
2. General principles of Anatomy Act and body donation
3. Organ Transplantation Act.

Section – 12

Teaching learning Techniques

1. Higher education and adult learning, Challenges in higher education and effective medical education, Communication skills, Small group and large group teaching, SDL, Teaching resources, Microteaching, Integrated teaching, Assessments, Mentoring, Feedback

B - PSYCHOMOTOR DOMAIN:

Demonstrate following predominant Psychomotor domain competencies		
No	Competency	Perform under supervision / Independently/ Observation only
1	Identify, locate and demonstrate surface marking of clinically important structures in the cadaver and correlate it with living anatomy	Independently
2	Acquire mastery in dissection skills including window dissection of important regions	Independently
3	Acquire mastery in embalming the human body	Independently
4	Prepare tanks for preserving bodies	Observation
5	Tissue preparation for histology and staining techniques	Independently
6	Honing and Stropping of microtome knives, including sharpening by automatic knife sharpener	Independently
7	Preparation of common fixatives embalming fluid 10% formalin, Bouin's fluid etc.	Independently
8	Demonstrate the mounting of specimen in the museum	Independently
9	Locate and identify clinically relevant structures in dissected cadavers.	Independently
10	Locate, identify and demonstrate cells & tissues under the microscope.	Independently
11	Identify the anatomical structures visualized by imaging techniques, specifically radiographs, computerized tomography (CT) scans, MRI and ultrasonography in normal individuals	Independently
12	Demonstrate various movements at the important joints and actions of various groups of muscles in the human body.	Independently
13	Demonstrate anatomical basis of common clinical procedures expected to be performed by a basic medical doctor.	Under supervision
14	Demonstrate different methods of teaching-learning and assessments. Independently	Independently
15	Make presentations of the subject topics for teaching and research outputs.	Independently
16	Prepare buccal smear for sex chromatin. independently	Independently
17	Prepare Human chromosome from peripheral blood and karyotyping. Under supervision	Under supervision
18	Demonstrate Banding techniques (G and C) and Chromosomal Analysis Under supervision	Under supervision
19	Demonstrate use of different anthropological instruments	Under supervision

1. 1st YEAR OF RESIDENCY

- a. **Orientation / induction programme** – Institutional and departmental orientation including duties and responsibilities of a postgraduate student.
- b. **Gross anatomy**
As per Section 1 (Sub headings - 1,2)
- c. **Histology and histochemistry**
As per Section 3
 - Cell Biology
 - Microscopic structure of the body – (Sub headings – 1,2 & 3A – General histology)
- d. **Developmental anatomy/embryology**
As per Section 2 (Sub heading – 1 with relevant part from 3)
- e. To attend all undergraduate lectures held in the department of anatomy and all the lectures organized by the university & by various PG teachers at different colleges.
- f. To work on the topic for dissertation and research design as per timeline provided by MGMIHS. There after periodic assessment of the progress of the dissertation (every 6 monthly) will be done by the concerned PG teacher
- g. Get trained to use computer for teaching and use the internet
- h. **Optional yet Desirable** – To attend all orations / seminars / workshops held for the subject in the city colleges, attend general orations held in the institution and attend regional / national conferences
- i. **TEACHING**
 - i. Conduct small group teaching with prior microteaching sessions with at least 1/3 of these under supervision by a senior teacher.
 - ii. Exposure to evaluation techniques
 - iii. Exposure to Medical education Technology Workshops
 - iv. Presentation in journal club, seminars, symposia etc as per guidelines under Teaching-learning Methods
 - v. Should complete microanatomy journal
- j. **RESEARCH**
 - i. Basic techniques like review of literature for a given topic and collection of data
 - ii. Exposure to computer for various applications.
 - iii. Completion of **Basic research methodology certificate course**

2. II YEAR OF RESIDENCY

- a. **A compulsory rotation of three months in District Hospitals / District Health System** - as per the Postgraduate Medical Education (Amendment) Regulations (2020). Should take place In the 3rd Sem as “District Residency Programme”
- b. **Rotational postings** – in 3rd / 4th Sem
 - **Surgery** – 2 weeks
 - **Radiology** – 2 weeks
 - **Pathology** – 2 weeks
 - **ENT** – 1 week
 - **Ophthalmology** – 1 week
 - **Obs & Gyne** – 1 week
 - **Pediatrics** – 1 week
 - **MEU** – 1 week (Optional)

- c. **PG interaction through horizontal and vertical integration.**
Horizontal Integration - with Physiology and Biochemistry
Vertical Integration – Integrated lectures for PG students – with Radiology, Surgery, Orthopaedics, Medicine, Obs & Gynac, Genetic Laboratory, Pathology, Microbiology and Forensic medicine etc.
- d. **Developmental anatomy/embryology** - As per section 2 (sub headings 2 & 3)
- e. **Histology and histochemistry** - As per section 3 (sub headings 2 B)
- f. **Neuroanatomy** - As per section 4 (sub headings 1 to 6)
- g. **Surface Marking and Radiology** - As per section 8 (sub headings 1 & 2)
- h. **Anthropology** - As per section 9
- i. **Forensic Medicine** - As per section 10
- j. **Bioethics in Anatomy** - As per section 11 except genetic counselling
- k. **Teaching learning Techniques** - As per section 12
- l. **RESEARCH**
Dissertation work by the beginning of second year of residency with the aim to complete the data collection and analysis by the end of second year.
- m. **TEACHING**
 - From middle of 2nd year, the PG students in Anatomy should be capable of giving lectures for the entire batch of students
 - Start teaching embryology and genetics in small groups after microteaching sessions
 - Should be conversant with the use of various audio-visual aids
 - Presentation in journal club, seminars, symposia etc as per guidelines under Teaching-learning Methods
 - Foetal dissection – Desirable to have dissected at least one fetus

3. III YEAR OF RESIDENCY

- a. **Genetics** - As per section 5
- b. **Bioethics Anatomy** - As per section 11 – only Genetic counseling
- c. **Immunology** - As per section 6
- d. **Applied anatomy and recent advances** - As per section 7
- e. **RESEARCH**
 - i. Completion of dissertation
 - ii. Presentation of papers (Minimum 2 / 3 years) at National level conference
 - iii. 1 research publication – accepted / published in indexed journal
- f. **DISSECTION** – Exercise in window dissection of various regions.
- g. **TEACHING** –
 - Take Lecture, lecture – demonstration, small group teaching,
 - Presentation in journal club, seminars, symposia etc as per guidelines under Teaching-learning Methods

Recommended reading (As per NMC Guidelines)

All Books (latest edition)

Gross Anatomy:

- Susan Standing – Gray’s Anatomy: The anatomical basis of clinical practice, Churchill Livingstone Elsevier.
- Keith and Moore Clinically Oriented Anatomy. Lippincot Williams and Wilkins.
- R.J. Last. Anatomy Regional and Applied. Churchill Livingston.
- Frank H. Netter. Atlas of Human Anatomy. Saunders Elsevier.
- ML Ajmani. Embalming: Principles and Legal Aspects. Jaypee Brothers.

Histology

- Young B. and Heath J. Wheater’s Functional Histology. Churchill Livingstone.
- M.H. E Ross. Histology: A textbook and atlas. Williams and Wilkins.
- Harold A Davenport. Histological and Histochemical Techniques. W.B Saunders Company.
- Di Fiore’s Atlas of histology, 13th edition

Genetics

- J.S Thompson and Thompson. Genetics in medicine. W.B. Saunders and Co. Philadelphia, London.
- Emery's Elements Of Medical Genetics And Genomics: 16th Edition
Peter Turnpenny

Embryology

- TW Sadler. Langman’s Medical Embryology. Lippincotts, Williams and Wilkins
- Keith L Moore and T.V.N. Persaud. The Developing Human. Saunders.

Neuroanatomy

- Richard S. Snell. Clinical Neuroanatomy for Medical Students. Williams and Wilkins
- Barr's the Human Nervous System: An Anatomical Viewpoint - John Alan Kiernan, Murray Llewellyn Barr, Lippincott Williams & Wilkins, 2009
- Clinical Neuroanatomy and Neuroscience - Estomih Mtui, Gregory Gruener, Maurice J. T. Fitzgerald · 2015
- Core Text of Neuroanatomy - Malcolm B. Carpenter · 1996

Statistics

- David E. Matthews and Vernon T. Farewell. Using and Understanding Medical Statistics. Karger.

Radiology

- J.B. Walter et.al. Basic Atlas of Sectional Anatomy with correlated imaging. Saunders Elsevier.

Surface anatomy

- SP John, Lumley editors. Surface Anatomy, The Anatomical basis of clinical examination. London: Churchill Livingstone.

Journals

03-05 international Journals and 02 national (all indexed) journals

TEACHING AND LEARNING METHODS

(As per NMC guidelines)

Teaching methodology

During the course, students should have formal training in teaching and research. The sessions should be in the form of:

- a. **Didactic Teaching – Minimum 10/year – to be taught by faculty.**
 - Topics in gross, surface and cross sectional anatomy, microanatomy, embryology, neuroanatomy, histochemistry, genetics, recent advances,
 - Research methodology, Biostatistics.
 - Salient features of UG & PG curriculum.
 - Teaching and assessment methodology
- b. **Hands-on experience** - techniques in microanatomy, neuroanatomy, gross anatomy, dissection, embryology, histochemistry, genetics, microscopy. Embalming and preservation of cadavers
Practical performance assessment – Twice a week
- c. **Training in communication skills** through journal club, seminars, demonstrations, tutorials, lectures, quizzing etc
 - **Journal club** – Minimum of 1 / week – to be assessed and graded by faculty
 - **Seminars** – Minimum of 1 / 2 weeks – to be assessed and graded by faculty
 - **Symposium** – Minimum of 1 / 3 months – to be assessed and graded by faculty
 - **Laboratory work** – Minimum of 2 / week – to be assessed and graded by faculty – Through DOAP, Skill lab simulations, case based discussions etc. All topics under Hands-on experience can be graded
 - **Inter departmental colloquium** – Attending monthly inter departmental meetings on topics of current interest⁴
- d. **Rotational postings** – in 3rd / 4th Sem
 - **Surgery** – 2 weeks
 - **Radiology** – 2 weeks
 - **Pathology** – 2 weeks
 - **ENT** – 1 week
 - **Ophthalmology** – 1 week
 - **Obs & Gyne** – 1 week
 - **Pediatrics** – 1 week
 - **MEU** – 1 week (Optional)
- e. **A compulsory rotation of three months in District Hospitals / District Health System** - as per the Postgraduate Medical Education (Amendment) Regulations (2020). Should take place In the 3rd Sem as “District Residency Programme”
- f. The Postgraduate trainees should undergo **training in Basic Cardiac Life Support (BCLS) and Advanced Cardiac Life Support (ACLS).**
- g. **Training in Teaching skills** –
 - MEU should train PG students in education methodologies and assessment techniques.
 - Student should then participate in teaching sessions for undergraduate students
 - The Postgraduate trainees must undergo training in information technology and use of computers (E.g. through preparation of Audio Visual aids for teaching, posters / manuscripts for presentation in conferences / workshops and publication in journals)

- Participation in formulating evaluation methods: Setting objective questions, Short Answer Questions, Multiple Choice Questions and Objective Structured Practical Examination (OSPE).
 - Prepare teaching modules and museum specimens.
- h. Teaching research skills –**
- To inculcate research knowledge and skills - Writing a dissertation
 Conduct a research project of sufficient depth to be presented to the University under the supervision of an eligible faculty member of the department as guide and one or more co-guides who may be from the same or other departments.
 Students should do dissertation presentation – once a week
 In addition to this project, students should be involved in at least one additional research project that may be started or already ongoing in the department. (It is preferable that this project will be in an area different from the thesis work.)
- Research methodology course - All shall complete an online course in Research Methodology and get its certificate within six months** of the commencement of the batch
- i.** Learn general principles of Anatomy Act and Organ Transplantation Act. Comprehend the basis of disposal of biomedical waste
- j.** Should attend Subject related Conferences, workshops, CMEs etc minimum 1/ year
- k. Histology Journal / File –** diagrams and descriptions of all histology syllabus – regularly assessed by faculty
- l. Log Book**
- Every student should maintain a logbook - Indicating the duration of the postings/work done in labs, dissection hall, skill labs and other areas of posting.
 The log book is thus a record of various activities like:
- Practical performed and the teaching sessions attended.
 - Participation in sessions
 - Record of completion of pre-determined activities,
 - Acquisition of selected competencies.
 - Reflection writing
 - Minimum two sessions for assessment & grading of teaching skills of student / year
 - Feedback given by faculty
- The Log Book will be part of internal assessment of the student.
 At the time of final practical examination. Students will be required to produce
- completed log book signed by the Head of the Department in original
 - A proficiency certificate from the Head of Department regarding the skillful performance of practicals
- m.** Department shall encourage e-learning activities.

ASSESSMENT

FORMATIVE ASSESSMENT

Formative assessment should be continual and should assess medical knowledge, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system.

During the 3 year training period -

- Logbook - A record of all theoretical, practical and experimental work done by the post graduate student and its assessment will be made available during University examination
- **Histology Journal / File**
- There will be periodical examinations during the course of training.
- The pre-final (Prelim) theory and practical examination will be conducted by the faculty of the concerned college.

Quarterly assessment during the MD training should be based on:

- Dissection presentation – 1 / week
- Laboratory performance – 2 / week
- Journal club – 1 / week
- Seminar – 1 / 2 weeks
- Case discussions – 1 or 2 / month
- Interdepartmental case or seminar – 1 / month
- Microteaching – 1 / month

Attendance at Scientific meetings / CME programmes / conferences / workshops (at least 01 / year)

Internal Exams

- Regular internal examination will be conducted
 - ✓ **At the end of the 1st year** – (syllabus of paper I)
 - Paper will be of 100 marks
 - Practical will be conducted – 100 marks
 - ✓ **At the end of the 2nd year** (syllabus of paper II & III)
 - 2 papers each of 100 marks
 - Practical will be conducted – 100 marks
 - ✓ **At the end of the 3rd year** (Entire Syllabus)
 - Preliminary examination will be conducted similar to university exam pattern

SUMMATIVE ASSESSMENT

Eligibility / Prerequisite for University examination –

- Completed **log book**
- **Record of Internal assessments**
- **Accepted Dissertation work**
- **Presentation of papers** (Minimum 2 / 3 years) at National level conference
- **Minimum 1 research publication** – accepted / published in indexed journal

The Post Graduate examination will be in three parts:

1. **Dissertation**

Thesis shall be submitted at least six months before the University examination.

It will be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and practical examination.

2. **Theory**

Obtaining a **minimum of 50% marks** in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D shall be held at the end of 3rd academic year. An academic term shall mean six month's training period

There shall be four theory papers. (As per NMC guidelines) –

Each paper 100 marks – total 400 marks

- **Paper I** – Gross Anatomy, Embryology, Microscopic Anatomy of human body above the diaphragm with Radiological Anatomy & Body Preservation
- **Paper II** – Gross Anatomy, Embryology, Microscopic Anatomy of human body below the diaphragm with General (Embryology & Microscopic) Anatomy
- **Paper III:** Neuroanatomy & Genetics
- **Paper IV:** Recent advances and applied Anatomy in medical sciences

Theory Papers

Paper I

- a. Gross Anatomy of human body above the diaphragm i.e. upper limb, thorax, head and neck.
- b. Embryology & Microscopic anatomy of tissues and organs above the diaphragm.
- c. Methods of preservation of human body and its parts,
- d. Radiological anatomy, sectional anatomy

Paper II

- a. Gross Anatomy of human body below the diaphragm i.e. lower limb, abdomen, pelvis.
- b. Embryology & Microscopic anatomy of tissues and organs below the diaphragm.
- c. General Histology, General Embryology
- d. Principles of light, transmission and scanning electron microscopy, confocal, virtual microscopy.

Paper III:

- a. Neuroanatomy - gross and applied aspects.
- b. General principles of genetics, cytogenetics as applicable to medicine and different genetic disorders, gene therapy.

Paper IV

- a. Comparative and evolutionary anatomy
- b. Clinical and applied aspect of Anatomy
- c. Recent advances in the application of knowledge of anatomy on human body
- d. Basics of principles of organ donation from recently dead bodies.

3. Practicals:

Spread over a minimum of 2 days.

Focusing on psychomotor domain

First Day Practical

a. Gross Anatomy

Dissection (Major & Minor) and related viva voce

b. Histology

- Spotting (10 spots) and viva voce
- Techniques of tissue processing, paraffin block making, section cutting. Staining (H and E stain) with related viva

Second Day Practical

- Microteaching of a short topic to assess teaching skills
- A short synopsis of the dissertation work should be presented by the post graduate student
- Grand viva including Gross anatomy, cross sectional anatomy, radiological Anatomy, Surface Anatomy, Embryology

Practical and Oral / Viva-Voce Examination

Practical Examination to be organized as per details given below:

- Dissection on cadaver
- Histology spotting
- Histological techniques
- Surface Marking
- Radiology
- Teaching ability
- Thesis presentation

Oral/Viva-voce Examination

Grand viva

On dissected parts of the whole human body including nervous system, and Embryology models, teratology, skeletal system including short bones, embalming techniques and genetics, radiographs, MRI, CT & ultra sonography

Practical mark distribution – Total 400 marks

Day – 1

Dissection	Microanatomy	Neuroanatomy (under dissection microscope)	Histology Techniques	Total
	Spots	Spots		
100 marks	8 X 5 = 40 M	2 X 5 = 10 M	50 M	200 M

Day – 2

A	B	C	D	E	F	G	H	I	Total
30 M	25 M	20 M	30 M	15 M	15 M	15 M	40 M	10 M	200 M

Key for day 2

A	Micro teaching	F	Radiology and surface marking
B	Upper Limb Lower Limb (Soft + Osteology)	G	Embryology
C	HFN (Soft + Osteology)	H	Dissertation viva
D	Thorax abdomen pelvis (Soft + Osteology)	I	Genetics
E	Neuroanatomy		

Student appraisal form for MD in Human Anatomy											
	Elements	Less than Satisfactory			Satisfactory			More than satisfactory			Comments
		1	2	3	4	5	6	7	8	9	
1	Scholastic aptitude and learning										
1.1	Has knowledge appropriate for level of training										
1.2	Participation and contribution to learning activity (e.g., Journal Club, Seminars, CME etc)										
1.3	Conduct of research and other scholarly activity assigned (e.g Posters, publications etc)										
1.4	Documentation of acquisition of competence (eg Log book)										
1.5	Performance in work based assessments										
1.6	Self-directed Learning										
2	Work related to training										
2.1	Practical skills that are appropriate for the level of training										
2.2	Respect for processes and procedures in the work space										
2.3	Ability to work with other members of the team										
2.4	Participation and compliance with the quality improvement process at the work environment										

2.5	Ability to record and document work accurately and appropriate for level of training										
3	Professional attributes										
3.1	Responsibility and accountability										
3.2	Contribution to growth of learning of the team										
3.3	Conduct that is ethically appropriate and respectful at all										
4	Space for additional comments										
5	Disposition										
	Has this assessment pattern been discussed with the trainee?	Yes	No								
	If not explain.										
	Name and Signature of the assesse										
	Name and Signature of the assessor										
	Date										