MGM INSTITUTE OF HEALTH SCIENCES

Accredited by NAAC with 'A' Grade
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Curriculum for MD ANATOMY

(With effect from 2018-19 Batches)

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Navi Mumbai- 410 209

MGMIHS, Navi Mumbai

VISION

By the year 2020, MGM Institute of Health Sciences aims to be a top-ranking Centre of Excellence in Medical Education and Research. Students graduating from the Institute will have all the required skills to deliver quality health care to all sections of the society with compassion and benevolence, without prejudice or discrimination, at affordable cost. As a Research Centre, it shall focus on finding better, safer and affordable ways of diagnosing, treating and preventing disease. In doing so, it will maintain highest ethical standards.

MISSION

To improve the quality of life, both at individual and community levels by imparting quality medical education to tomorrow's doctors and medical scientists and by advancing knowledge in all fields of Health Sciences through meaningful and ethical research.

SUBJECT SPECIFIC LEARNING OBJECTIVES

(As per new MCI Guidelines)

GOAL : To train a doctor to become a competent teacher and researcher in Anatomy who:

1. Is aware of contemporary advances and developments in the field of Anatomy.
2. Has acquired the competencies pertaining to the subject of Anatomy that are required to be practiced at all levels of health system.
3. Is able to discharge responsibilities and participate in National Health Education Programme.
4. Is oriented to the principles of research methodology.
5. Has acquired skills in educating medical and paramedical professionals.
6. Has acquired skills in effectively communicating with the students and colleagues from various medical and paramedical fields.
7. Has acquired skills of integrating anatomy with other disciplines as and when needed.
8. Has acquired qualities of a good teacher capable of innovations in teaching methodology**.**
9. Has been able to demonstrate adequate management skills to function as an effective leader of the team engaged in teaching and research.

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

1. Knowledge of Anatomy

1.1. Acquire competencies in gross and 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 preparation, staining and museum preparation.

3. Training skill 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 project and preparation of report.
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 honest 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.

5. Teaching Anatomy

5.1 Practicing different methods of teaching-learning.

5.2 Making presentations of the subject topics and research outputs.

6. Problem Solving

6.1 Demonstrate the ability to 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 Demonstrate the ability to correlate the clinical conditions to the anatomical/ embryological/hereditary factors.

6.3 Demonstrate the ability to evaluate scientific/clinical information and critically analyze conflicting data and hypothesis.

SUBJECT SPECIFIC COMPETENCIES

(As per new MCI Guidelines)

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

A. Cognitive domain

1. Describe gross anatomy of entire body including upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, brain and spinal cord.
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 its 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. Demonstrate knowledge about reproduction genetics, assisted reproduction, prenatal diagnosis, genetic counseling and ethics in genetics.
13. Explain principles of gene therapy and its applied knowledge.
14. Describe immune system and cell types involved in defense mechanisms of the body. Also explain gross features, cytoarchitecture, functions, 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 applications 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

A 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 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*)

C. Psychomotor domain

At the end of the course the student should be able to:

1. Identify, 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 & tissues under the microscope.
5. Identify important structures visualized by imaging techniques, specifically radiographs, computerized tomography (CT) scans, MRI and ultrasonography.
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.

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:

- Procurement, Embalming and Preservation of human cadavers
- Preparation of tanks for preserving bodies
- Dissection of cadaver
- Window dissection of important regions
- Preparation of specimens for museum with display
    - soft parts
    - models
    - charts
- Preparation and preservation of human bones / skeleton as assigned by the faculty

2.Histology

- Preparation of common fixatives embalming fluid 10% formalin, Bouin's fluid etc
- Making paraffin blocks and section cutting and mounting
- Preparation of staining set for H and E staining and staining paraffin sections with the stain
- Making celloidin, araldite, gelatin blocks and their section cutting
- Processing hard tissues, decalcification of bones, block making and sectioning, preparation of ground sections of calcified bones.
- Frozen section cutting on freezing microtome and cryostat
- Honing and Stropping of microtome knives, including sharpening by automatic knife sharpener
- Histology file in which LM and EM 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

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

5. Neuroanatomy:

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

COURSE DESCRIPTION

I. **Eligibility** : As per the guidelines of Medical Council of India and affiliated university
II. **Duration** : 3 years
III. **Desirable qualities** : The student should have an aptitude for teaching and reasonable command over spoken and written English language
IV. **Details of training** : The PG student would be a resident in the department for three years. The time - plan and propose division of curriculum will be on the following lines.

1. **I YEAR OF RESIDENCY**
   a. **Orientation programme** – Institutional and departmental orientation including duties and responsibilities of a postgraduate student.
   b. **Time management** – should be conducted within 3 – 6 months
   c. **Stress management** – should be conducted within 3 – 6 months
   d. **Syllabus - (As per new MCI Guidelines)**

Gross anatomy

- History of Anatomy
- Gross Anatomy of entire body including upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, brain and spinal cord
- Acquisition of embalming skills and various embalming techniques

Histology and histochemistry

- **Cell Biology:**
  Cytoplasm - cytoplasmic matrix, cell membrane, cell organelles, cytoskeleton, cell inclusions, cilia and flagella.
  Nucleus - nuclear envelope, nuclear matrix, DNA and other components of chromatin, protein synthesis, nucleolus, nuclear changes indicating cell death.
  Cell cycle - mitosis, meiosis, cell renewal. Cellular differentiation and proliferation.
- **Microscopic structure of the body:**
- Principles of light, transmission and scanning, electron, fluorescent, confocal and virtual microscopy.
- General Histology
- Basic techniques in tissue processing, preparation of blocks, microtome sections and H & E
- Principles of the following special stains – silver nitrate, periodic acid Schiff, osmic acid, Masson's tricome, Verhoff and Orcein stains.

Developmental anatomy/embryology

- General embryology: gametogenesis, fertilization, implantation and placenta, early human embryonic development.

   e. To attend all undergraduate lectures held in the department of anatomy and all the lectures organized by the university be various PG teachers at different colleges.
   f. To present the topic for dissertation and research design in front of a dissertation committee comprising of all senior and PG teachers in the department within first 6 months of registration. There after periodic assessment of the progress of the dissertation (every 6 monthly) will be done by the concerned PG teacher and if required, by the dissertation committee.
   g. Get trained to use computer for teaching and use the internet
   h. Scan anatomy journals and periodicals

i. **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

j. **TEACHING**
   i. 70 hours of small group teaching with atleast 1/3 of these under supervision by a senior teacher.
   ii. Microteaching sections are mandatory before small group teaching for each and every session
   iii. Should be exposed to evaluation techniques
   iv. Exposure to Medical education Technology Workshops
   v. Presentation in journal club
   vi. Presentation in seminars and symposia.
   vii. Should complete gross and microanatomy journals

k. **RESEARCH**
   i. Basic techniques like review of literature for a given topic and collection of data
   ii. Exposure to computer for various applications.
   iii. Attend Research Methodology Teaching programme by MEU/ MGMIHS Research Unit for 1 Month.

2. II YEAR OF RESIDENCY

a. SPECIAL POSTING

Interaction with other pre and para and clinical specialities so as to prime the mind of PG students in the anatomy to the growing needs of application of anatomical knowledge to other branches of medicine.

Allied postings are as follows – (at the end of first year **During vacation)**

1. Pathology – 2 weeks
2. FMT – 2 weeks
3. Radiology – 4 weeks
4. Genetics – 2 weeks

This will be also achieved through **horizontal and vertical integration.**

i. Horizontal Integration
   (Selected topics should be taken as PG lectures by the concerned departments) eg. Physiology and Biochemistry

ii. Vertical Integration
   (Lectures to be arranged by the various departments for PG students)
   Radiology, Surgery, Orthopaedics, Medicine, Obs & Gynac, Genetic Laboratory, Pathology, Microbiology and Forensic.

b. Syllabus - (As per new MCI Guidelines)

Developmental anatomy/embryology

- Systemic embryology: development of organ systems and associated common congenital abnormalities with teratogenesis.
- Physiological correlations of congenital anomalies.

Histology and histochemistry

- The systems/organs of body - Cellular organization, light and electron microscopic features, structure - function correlations, and cellular organization.

Neuroanatomy:

- Brain and its environment, Development of the nervous system, Neuron and Neuroglia, Somatic sensory system, Olfactory and optic pathways, Cochleovestibular and gustatory pathways, Motor pathways, Central autonomic pathways, Hypothalamo-hypophyseal system, Limbic system, Basal ganglia, Reticular system, Cross Sectional anatomy of brain and spinal cord.
- Detailed structure of the central nervous system and its applied aspect.

Surface Marking and Radiology

- Surface marking of all regions of the body. Interpretation of normal radiographs of the body including special contrast procedures including barium studies, cholicystrography, pylography, salphingography. Normal CT Scan, MRI and Ultrasound.
- *(As per MGMIHS) USG – principles of USG, orientationof anatomical organs in various USG plates. Structures as seen in 2D echocardiography. Axes usedand orientation of heart in various axes in 2D echocardiography. PET scan principles
- Cross sectional anatomy and its correlation to CT and MRI images

Anthropology

- Different anthropological traits, Identification and use of Anthropological instruments.

Forensic Medicine:

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

Bioethics Anatomy

- Biomedical waste disposal, Laboratory quality assurance & cadaveric oath

Teaching learning Techniques

- Higher education and adult learning
- Challenges in higher education and effective medical education.
- Communication skills
- Small group and large group teaching
- Teaching resources
- Microteaching
- Integrated teaching
- Assessments
- Mentoring systems

c. RESEARCH

Starting the work on thesis by the beginning of second year of residency with the aim to complete the data collection and analysis by the end of second year.

c. TEACHING

i. From middle of 2nd year, the PG students in Anatomy should be capable of giving lectures for the entire batch of students

ii. Start teaching embryology and genetics in small groups after microteaching sessions

iii. Should be conversant with the use of various audiovisual aids

d. Presentation in Journal Club
e. Presentation in seminars / symposia at departmental and institutional level
f. FETAL DISSECTION : should have dissected atleast one fetus

3. III YEAR OF RESIDENCY

a. Syllabus - (As per new MCI Guidelines)

Genetics

- Human Chromosomes - Structure, number and classification, methods of chromosome preparation banding patterns. Chromosome abnormalities, Autosomal and Sex chromosomal abnormalities syndromes, Molecular and Cytogenetics.
- 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.
- Multifactorial pattern of inheritance: Criteria for multifactorial inheritance, Teratology, Structure gene, Molecular Screening, Cancer Genetics - Haematological malignancies, Pharmacogenetics.
- Reproduction Genetics - Male and Female Infertility, Abortuses, Assisted reproduction, Preimplantation genetics, Prenatal diagnosis, Genetic Counseling and Ethics of Genetics.
- Principles of Gene therapy and its applied knowledge.

Bioethics Anatomy

- Genetic counseling

Immunology

- 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.
- 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.
- Common techniques employed in cellular immunology and histocompatibility testing.
- 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.

Applied anatomy and recent advances

- Clinical correlations of structure and functions of human body. Anatomical basis and explanations for clinical problems.
- Applications of knowledge of development, structural (microscopy), neuro anatomy to comprehend deviations from normal.
- Recent advances in medical sciences which facilitate comprehension of
- structure function correlations and applications in clinical problem solving.
- Collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies.

Outline of comparative anatomy of the whole body and basic human evolution

b. RESEARCH

i. Completion of dissertation
ii. Presentation of paper in conference (optional but desirable)
iii. Writing articles for publication

c. TEACHING

i. Full fledged lectures, lecture – demonstration, small group teaching
ii. Seminars / Symposia
iii. Journal Club

d. DISSECTION – Exercise in window dissection of various regions.

SYLLABUS:

(As per MCI guidelines)

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

Section - I

Gross anatomy

Gross Anatomy of entire body including upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, brain and spinal cord

Section - 2

Developmental anatomy/embryology

General embryology: gametogenesis, fertilization, implantation and placenta, early human embryonic development.

Systemic embryology: development of organ systems and associated common congenital abnormalities with teratogenesis.

Physiological correlations of congenital anomalies.

Section - 3

Histology and histochemistry

Cell Biology:

Cytoplasm - cytoplasmic matrix, cell membrane, cell organelles, cytoskeleton, cell inclusions, cilia and flagella.

Nucleus - nuclear envelope, nuclear matrix, DNA and other components of chromatin, protein synthesis, nucleolus, nuclear changes indicating cell death.

Cell cycle - mitosis, meiosis, cell renewal.

Cellular differentiation and proliferation.

Microscopic structure of the body:

Principles of light, transmission and scanning, electron, fluorescent, confocal and virtual microscopy.

General Histology

The systems/organs of body - Cellular organization, light and electron microscopic features, structure - function correlations, and cellular organization.

Section - 4

Neuroanatomy:

Brain and its environment, Development of the nervous system, Neuron and Neuroglia, Somatic sensory system, Olfactory and optic pathways, Cochleovestibular and gustatory pathways, Motor pathways, Central autonomic pathways, Hypothalamo-hypophyseal system, Limbic system, Basal ganglia, Reticular system, Cross Sectional anatomy of brain and spinal cord.

Detailed structure of the central nervous system and its applied aspect.

Section - 5

Genetics

Human Chromosomes - Structure, number and classification, methods of chromosome preparation banding patterns. Chromosome abnormalities, Autosomal and Sex chromosomal abnormalities syndromes, Molecular and Cytogenetics.

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.

Multifactorial pattern of inheritance: Criteria for multifactorial inheritance, Teratology, Structure gene, Molecular Screening, Cancer Genetics - Haematological malignancies, Pharmacogenetics.

Reproduction Genetics - Male and Female Infertility, Abortuses, Assisted reproduction, Preimplantation genetics, Prenatal diagnosis, Genetic Counseling and Ethics of Genetics.

Principles of Gene therapy and its applied knowledge.

Section - 6

Immunology

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.

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.

Common techniques employed in cellular immunology and histocompatibility testing.

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

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

Applications of knowledge of development, structural (microscopy), neuro anatomy to comprehend deviations from normal.

Recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.

Collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies.

Section - 8

Surface Marking and Radiology

Surface marking of all regions of the body. Interpretation of normal radiographs of the body including special contrast procedures including barium studies, cholicystrography, pylography, salphingography. Normal CT Scan, MRI and Ultrasound.

Anthropology

Different anthropological traits, Identification and use of Anthropological instruments.

Forensic Medicine:

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

Outline of comparative anatomy of the whole body and basic human evolution

Section – 9

Bioethics Anatomy

Biomedical waste disposal, Laboratory quality assurance, Genetic counseling & cadaveric oath

Section – 10

Teaching learning Techniques

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

YEARWISE LIST OF P.G. TOPICS

Year	Topics covered	Hours
1st year	Gross with clinical aspect, Histotechniques, General Histology & Embryology, Bioethics	53
2nd year	Systemic Histology and embryology with clinical aspect, Neuroanatomy, Radiology, Medical education technology	50
3rd year	Gross with clinical aspect, Neuroanatomy, Genetics, Recent advances and others, Bioethics	50

1st year

I. Gross Anatomy

Upper limb (4)

1. Brachial plexus and its lesion
2. Wrist complex
3. Surgical spaces of hand
4. Cutaneous nerve supply of UL and LL

Lower limb(3)

1. Knee joint.
2. Inversion & Eversion, Subtalar joint
3. Arches of foot

Thorax (4)

1. Thoracic cage and mechanism of respiration.
2. Bronchopulmonary segments and histological correlation with histology of respiratory tree.
3. Coronary circulation Angiography techniques and images
4. Bronchoscopy procedure

Abdomen(12)

1. Dynamics of anterior abdominal wall and incisions
2. Peritoneum and lesser sac
3. Liver and its segments
4. Hepatobiliary apparatus
5. Rectum and anal canal and anal sphincter
6. Kidney and section of kidney and blood supply
7. Uterus with peritoneum and broad ligament
8. Ovary with its functional correlation.
9. Nerve supply of bladder
10. Urethra
11. Vertebral column and its dynamics.
12. Abdominal aorta and branches

Head face neck(12)

1. Evolutionary role of HNF
2. Extra ocular muscles of eyeball

3. Temporomandibular joint with muscles of mastication
4. Muscles of facial expression unique and role.
5. Parasympathetic ganglion in HNF
6. Submandibular gland
7. Thyroid gland Parathyroid gland.
8. Parotid gland
9. Middle ear
10. Pituitary gland
11. Larynx and phonation
12. Pharynx

*Histotechniques for 20 hrs including practicals and Special stains

II. General Embryology with clinical aspect (8)

1. Spermatogenesis and clinical importance
2. Oogenesis and folliculogensis its clinical importance
3. Fertilization and its clinical importance
4. Implantation and placenta formation its cellular and molecular development
5. Twinning and Teratology
6. Body plan and three germ layer (Primitive streak as primary organizer)
7. Notochord and neurulation.
8. Folding of embryo and cylindrical form and body axis.

III. General histology with clinical aspect(8)

1. Cell and cell membrane with cell junctions
2. Epithelium and glands
3. Connective tissue
4. Cartilage and bone
5. Muscle
6. Vascular system
7. Lymphoid system and immune system
8. Skin

IV. Bioethics Anatomy(2)

1. Biomedical waste disposal
2. Laboratory quality assurance

* PG students should attend cadaveric oath with UG students

2nd year

I. Systemic Embryology with clinical aspect(13)

1. Development and Molecular regulation of CVS
2. Development and Molecular regulation of RS
3. Development and Molecular regulation of Male reproductive system
4. Development and Molecular regulation of female reproductive system
5. Development and Molecular regulation of nervous system
6. Development and Molecular regulation of eyeear
7. Development and Molecular regulation of limbsvertebral column
8. Development and Molecular regulation of GIT
9. Development of body cavities
10. Development of venous system
11. Development of arterial system

II. Systemic histology(8)

1. GIT 1, 2 ,3
2. RS
3. Urinary system
4. Male reproductive
5. Female reproductive
6. Nervous system
7. Endocrine system
8. Special senses

III. Neuroanatomy(12)

1. Neurobiosciences and changing concepts.
2. Spinal cord (Tracts)
3. Hind brain overview and divisions
4. Cranial nerve nuclei
5. Ventricular system.
6. Lateral ventricle
7. Functional areas of brain
8. Spinal cord lesions
9. Internal capsule
10. White fiber of cerebrum
11. Connections of cerebellum
12. Craniotomy

IV. Radiology (8)

1. Chest X ray and other imaging modalities.
2. Plain and contrast radiography of abdomen and pelvis with other imaging modalities
3. Plain and contrast radiography of HFN with other imaging modalities
4. Study of nervous system with different imaging modalities
5. USG
6. Colour Doppler
7. Endoscopy
8. Radio imaging: CT, MRI and PET with tensor imaging.

V. Teaching learning Techniques (9)

1. Higher education and adult learning
2. Challenges in higher education and effective medical education.
3. Communication skills

4. Small group and large group teaching
5. Teaching resources
6. Microteaching
7. Integrated teaching
8. Assessments
9. Mentoring systems

3rd year

I. Gross Anatomy

Upper limb(3)
1. Shoulder girdle
2. Grips of hand
3. Evolutional aspect of upper limb.

Lower limb(3)
1. Inversion & Eversion, Subtalar joint
2. Walking cycle and center of gravity.
3. Arches of foot

Thorax (3)
1. Thoracic cage and mechanism of respiration.
2. Mediastinum superior and posterior
3. Fibrous skeleton of heart

Abdomen(6)
1. Dynamics of anterior abdominal wall and incisions
2. Perineum
3. Nerve supply of bladder
4. Urogenital diaphragm
5. Low backache
6. Enteric nervous system

Head face neck(9)
1. Extra ocular muscles of eyeball and Eye ball and reflexes
2. Facial nerve
3. Trigeminal nerve
4. Accessory nerve Glossopharyngeal nerve
5. Oculomotor nerve
6. Middle ear
7. Inner ear and mechanism of balance and hearing.
8. Larynx and phonation
9. Pharynx and Mechanism of deglutition

II. Neuroanatomy(9)

1. Spinal cord (Spinal Lamina)
2. Cranial nerve nuclei
3. Thalamus
4. Limbic system
5. Basal ganglia
6. White fiber of cerebrum
7. Pathway of hearing and balance
8. Pathway of taste
9. Visual pathway

III. Genetics (8)

1. Mendel's law and implication in human genetics
2. Molecular genetics basis for role of gene
3. Chromosomal abrasion
4. Genetics and cell cycle with cancer genetics
5. Developmental genetics
6. Prenatal diagnosis and role in treatment
7. Human genome project and ethics
8. FISH

IV. Recent advances and others (8)

1. Cross section of anatomy
2. Grafting – Nerve, tendon etc.
3. Research and need of the day.
4. Research design
5. Thesis writing
6. Research ethics and Publication ethics
7. Museum techniques
8. Medicolegal importance

V. Bioethics Anatomy(1)

1. Genetic counselling

EVALUATION

(As per MCI guidelines)

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 three year training period,

A record of all theoretical, practical and experimental work done by the post graduate student and its assessment will be kept and shall be available for examiners at the time of the final practical and viva voce examination and

There will be periodical examinations during the course of training. The pre-final theory and practical examination will be conducted by the faculty of the concerned college. During last six months the post graduate student will have weekly assessment tutorials conducted by the faculty. All activities will be evaluated.

General Principles
Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and practical/clinical examination.

Quarterly assessment during the MD training should be based on:

1. **Journal based / recent advances learning**
2. **Patient based /Laboratory or Skill based learning**
3. **Self directed learning and teaching**
4. **Departmental and interdepartmental learning activity**
5. **External and Outreach Activities / CMEs**

The student to be assessed periodically as per categories listed in postgraduate student appraisal form

Exams (As per MGMIHS)

- Assessment will be based on regular evaluation of
  - ✓ Dissection
  - ✓ Teaching
- Students will keep logbook
- Students will maintain journals
- Regular internal examination will be conducted

- ✓ **At the end of the 1st year** – (syllabus of paper I)
  - 1 Paper of 100 marks
  - Practical will be conducted as per MGMIHS guidelines –
    - Histotechniques
    - General histology 10 slides
    - Window dissection
    - Viva osteology and soft parts

- ✓ **At the end of the 2nd year** (syllabus of paper II & III)
  - 2 papers each of 100 marks
  - Practical will be conducted as per MGMIHS guidelines -
    - Viva on embryology and Neuroanatomy
    - Systemic histology 10 slides
- ✓ **At the end of the 3rd year**
  - Preliminary examination will be conducted similar to university exam pattern

(As per MCI guidelines)

SUMMATIVE ASSESSMENT:
The summative examination would be carried out as per the Rules given in **POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000.**

The Post Graduate examination will be in three parts:

1. Thesis:
Every post graduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.
Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

2. Theory
The examinations shall be organised on the basis of 'Grading'or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. 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./ MS 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 MCI guidelines
- **Paper I:** Gross Anatomy
- **Paper II:** Embryology, Microscopic Anatomy and Genetics
- **Paper III:** Neuroanatomy
- **Paper IV:** Applied Human Anatomy and recent advances in anatomical Sciences

Theory Papers

Paper I: Gross Anatomy

a). Gross Anatomy of whole human body i.e. upper limb, lower limb thorax, abdomen, pelvis, head and neck
b). Method of preservation of human body and its parts, radiological anatomy, sectional anatomy

Paper II: Embryology, Microscopic Anatomy and genetics

a). General Principles of genetics, Cytogenetic as applicable to medicine and different genetic disorders, gene therapy.
b). General Embryology, Systemic Embryology, methods of experimental embryology, clinically oriented embryology and teratology
c). Histology (including fine structure) of tissues and organs of the body.
d) Principles of light, transmission and scanning electron microscopy, confocal, virtual microscopy.

Paper III: Neuroanatomy

Neuroanatomy - gross and applied aspects

Paper IV: Applied Human Anatomy and recent advances in medical sciences

(a) Clinical and applied aspect of Anatomy
(b) Recent advances in the application of knowledge of anatomy on human body
(c) Collection, maintenance and uses of stem cells
(d) Cryobanking
(e) Basics of principles of organ donation from recently dead bodies.

Each paper will be of following pattern

Question No.	Type	Marks
1	1 – LAQ	25 X 1 = 25
2	1 – LAQ	25 X 1 = 25
3	SAQ – Any 5 out of 6	10 X 5 = 50
Total		**100**

3. Practicals: spread over a minimum of 2 days

First Day Practical:

(a): Gross Anatomy

Dissection and related viva voce

(b): Histology

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

Second Day Practical:

a) Microteaching of a short topic to assess teaching skills
b) A short synopsis of the thesis work should be presented by the post graduate student
c) 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 & ultrasonographs.

Practical mark distribution
Day – 1

Dissection	**Microanatomy**	**Neuroanatomy**	**Genetics**	**Histology Techniques**	**Total**
	Spots	Spots	Chart		
100 marks	8 X 5 = 40 M	2 X 5 = 10 M	1 X 10 = 10 M	50 M	210 M

Day – 2

A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**Total**	**Grand total**
30 M	25 M	20 M	30 M	15 M	15 M	15 M	40 M	190 M	210 + 190 = 400 M

Key for day 2

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

RECOMMENDED READING
(As per MCI Guidelines)

Gross Anatomy:

1. Susan Strandring: Gray's Anatomy: The anatomical basis of clinical practice, Churchill Livingstone Elsevier.
2. Dutta A.K. Human Anatomy vol. I-III Current Publisher.
3. Dutta A.K. Principle of General Anatomy. Current Publisher.
4. Romanes. Cunningham's Manual of Practical Anatomy vol. I-III, Oxford.
5. Keith and Moore Clinical Oriented Anatomy. Lippincot Williams and Willkins.
6. R.S Snell. Clinical Anatomy by regions. Lippincot Williams and Wilkins.
7. J.V. Basmajin. Grant's Method of Anatomy. Williams and Wilkins.
8. R.J. Last. Anatomy Regional and Applied. Churchill Livingston.
10. Lee McGregar. Surgical Anatomy. K.M. Varghese.
11. A.G. R Deckeg, D.J du Pless Lee. Mc Gregor's Synopsis of Surgical Anatomy. Varghese Publishing House.
12. Snell. Clinical anatomy by regions. Lippincotts, Williams and Wilkins.
13. S. Chummy Sinnatanmy. Last's Anatomy Regional and Applied. Churchill Livingston.
14. Hollinshed W Henry. Anatomy for surgeons. Vol. I-III Lippincotts, Williams and Wilkins.
15. Vishram Singh. Clinical and Surgical Anatomy. Elsevier.
16. Vishram Singh. Textbook of general anatomy. Elsevier.
17. Frank H. Netter. Atlas of Human Anatomy. Saunders Elsevier.

Histology

1. Young B. and Heath J. Wheater's Functional Histology.Churchill Livingstone.
2. M.H.E Ross. Histology: A textbook and atlas. Williams and Wilkins.
3. V. Bharihoke. Text book of human histology. Delhi AITBS.
4. Difiore's. Atlas of histology with functional co-relation.
5. Bloom and Fawcett. Text book of histology.
6. Carlton's. Histology Technique.
7. E.C. Clayden. Practical of section cutting and staining.
8. D W Cormack. Ham's Histology. Lippincotts, Williams and Wilikins.
9. Bloom and Fawcett. Textbook of Histology.

Genetics

1. J.S Thompson and Thompson. Genetics in medicine. W.B. Saunders and Co. Philadelphia, London.
2. George Fraser and Oliver Mayo. Text book of Human Genetics. Blackwell Scientific Publications London, Oxford Edinburg, Melbourne.
3. Hann Sellwerger and Jame Simpson. Chromosomes of Man. Sparsher's International Medical Publications.

Embryology

1. Hamilton, Boyd. and Mossman. Human Embryology.
2. TW Sadler. Langman's Medical Embryology. Lippincotts, Williams and Wilikins.
3. Keith L Moore and T.V.N. Persaud. The Developing Human. Saunders.
4. Rani Kumar. Text book of embryology. I.K. International New Delhi

Neuroanatomy

1. Richard S. Snell. Clinical Neuroanatomy for Medical Students. Williams and Wilkins.
2. A. Parent. Carpenter's Human neuroanatomy. Williams and Wilkins.
3. Vishram Singh. Clinical Neuroanatomy. Elsevier.
4. A. K. Dutta. Essentials of Neuroanatomy. Current books international.
5. John A. Kiernan. Barr's the human nervous system, Lippincott, Williams and Wilkins.

Statistics

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

Radiology

1. T.B. Moeller et.al. Sectional Anatomy CT and MRI Vol. I, II, III New York. Theme Stuttgart.
2. J.B. Walter et.al. Basic Atlas of Sectional Anatomy with correlated imaging. Saunders Elsevier.

Surface anatomy

1. SP John, Lumley editors. Surface Anatomy, The Anatomical basis of clinical examination. London: Churchill Livingstone.
2. A. Halim. and A.C. Das. Surface Anatomy Lucknow. ASI, KGMC.

Journals

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

All books should be latest edition*

Postgraduate Students Appraisal Form
Pre / Para /Clinical Disciplines
Name of the Department/Unit
Name of the PG Student

Period of Training FROM……TO……

Sr. No.	PARTICULARS	Not Satisfactory			Satisfactory			More Than Satisfactory			Remarks
		1	2	3	4	5	6	7	8	9	
1.	Journal based / recent										
	advances learning										
2.	Patient based										
	/Laboratory or Skill										
	based learning										
3.	Self directed learning										
	and teaching										
4.	Departmental and										
	interdepartmental										
	learning activity										
5.	External and Outreach										
	Activities / CMEs										
6.	Thesis / Research work										
7.	Log Book Maintenance										

Publications **Yes/ No**

Remarks*_____

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***REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.**

SIGN of ASSESSEE **SIGN OF CONSULTANT** **SIGN OF HOD**

Resolution No. 4.5.4.2 of BOM-55/2018: Resolved to have 10 short notes out of 11 (10 marks each) in all the papers in university examination for PG courses including superspeciality. To be implemented from batch appearing in April/May 2019 examination onwards for MD/MS/Diploma and August/September 2019 examination onwards for superspeciality.