MAHATMA GANDHI UNIVERSITY
of
MEDICAL SCIENCES & TECHNOLOGY
JAIPUR

Syllabus

MD – ANATOMY

(3 Years Post Graduate Degree Course)

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.

RULES & REGULATIONS
MD ANATOMY (9120)
(3 Years Post Graduate degree course)

TITLE OF THE COURSE:
It shall be called Doctor of Medicine.

ELIGIBILITY FOR ADMISSION:
No candidate of any category (including NRI quota) shall be eligible for admission to MD/MS courses, if he or she has not qualified NEET PG (MD/MS) conducted by National Board of Examinations or any other Authority appointed by the Government of India for the purpose.

(1) General Seats

(a) Every student, selected for admission to postgraduate medical course shall possess recognized MBBS degree or equivalent qualification and should have obtained permanent Registration with the Medical Council of India, or any of the State Medical Councils or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled;

(b) Completed satisfactorily one year's rotatory internship or would be completing the same before the date announced by the University for that specific year as per MCI rules after passing 3rd professional MBBS Part II Examination satisfactorily.

(c) In the case of a foreign national, the Medical Council of India may, on payment of the prescribed fee for registration, grant temporary registration for the duration of the postgraduate training restricted to the medical college/institution to which he/she is admitted for the time being exclusively for postgraduate studies; however temporary registration to such foreign national shall be subject to the condition that such person is duly registered as medical practitioner in his/her own country from which he has obtained his basic medical qualification and that his degree is recognized by the corresponding Medical Council or concerned authority.

(2) NRI Seats

(a) Students from other countries should possess passport, visa and exchange permits valid for the period of their course of study in this Institution and should also observe the regulations of both central and state governments regarding residential permits and obtain no-objection certificate from the same.

(b) The candidate should have a provisional "Student Visa". If he comes on any other visa and is selected for admission, he will have to first obtain a student visa from his country and then only he will be allowed to join the course. Therefore it is imperative to obtain provisional student visa before coming for Counseling.

(c) This clause is applicable to NRI/Foreign Students only.

CRITERIA FOR SELECTION FOR ADMISSION:

(1) **NRI Quota**

15% of the total seats are earmarked for Foreign National / PIO / OCI/ NRI / Ward of NRI/NRI sponsored candidates who would be admitted on the basis of merit obtained in NEET PG or any other criteria laid down by Central Government/MCI.

(2) **Remaining Seats (Other than NRI Quota Seats)**

(a) Admissions to the remaining 85% of the seats shall be made on the basis of the merit obtained at the NEET conducted by the National Board of Examinations or any other Authority appointed by the Government of India for the purpose.
(b) The admission policy may be changed according to the law prevailing at the time of admission.

COUNSELING/INTERVIEW:

(1) Candidates in order of merit will be called for Counseling/Interview and for verification of original documents and identity by personal appearance.
(2) Counseling will be performed and the placement will be done on merit-cum-choice basis by the Admission Board appointed by the Government of Rajasthan.

RESERVATION:

Reservation shall be applicable as per policy of the State Government in terms of scheduled caste, scheduled tribe, back ward class, special back ward class, women and handicapped persons.

ELIGIBILITY AND ENROLMENT:

Every candidate who is admitted to MD/MS 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 after paying the prescribed eligibility and enrolment fees.

The candidate shall have to submit an application to the MGUMST for the enrolment/eligibility along with the following original documents with the prescribed fees (upto November 30 of the year of admission without late fees and upto December 31 of the year of admission with late fees) –

(a) MBBS pass Marks sheet/Degree certificate issued by the University (Ist MBBS to Final MBBS)
(b) Certificate regarding the recognition of medical college by the Medical Council of India.
(c) Completion of the Rotatory Internship certificate from a recognized college.
(d) Migration certificate issued by the concerned University.
(e) Date of Birth Certificate
(f) Certificate regarding registration with Rajasthan Medical Council / Medical Council of India / Other State Medical Council.

REGISTRATION

Every candidate who is admitted to MD/MS course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself registered with the Mahatma Gandhi University of Medical Sciences & Technology after paying the prescribed registration fees.

The candidate shall have to submit an application to the MGUMST for registration with the prescribed fees (upto November 30 of the year of admission without late fees upto December 31 of the year of admission with late fees).

DURATION OF COURSE:

The course shall be of 3 years duration from the date of commencement of academic session.

PERIOD OF TRAINING:

The period of training for obtaining Post graduate degrees (MD/MS) shall be three completed years including the period of examination.

MIGRATION:
No application for migration to other Medical Colleges will be entertained from the students already admitted to the MD/MS course at this Institute.

METHODS OF TRAINING FOR MD/MS:
Method of training for MD/MS courses shall be as laid down by the Medical Council of India.

ONLINE COURSE IN RESEARCH METHODS

i. All postgraduate students shall complete an online course in Research Methods to be conducted by an Institute(s) that may be designated by the Medical Council of India by way of public notice, including on its website and by Circular to all Medical Colleges. The students shall have to register on the portal of the designated institution or any other institute as indicated in the public notice.
ii. The students have to complete the course by the end of their 2nd semester.
iii. The online certificate generated on successful completion of the course and examination thereafter, will be taken as proof of completion of this course
iv. The successful completion of the online research methods course with proof of its completion shall be essential before the candidate is allowed to appear for the final examination of the respective postgraduate course.
v. This requirement will be applicable for all postgraduate students admitted from the academic year 2019-20 onwards

ATTENDANCE, PROGRESS AND CONDUCT:

(1) **Attendance:**

(a) 80% attendance in each course is compulsory. Any one failing to achieve this, shall not be allowed to appear in the University examination.
(b) A candidate pursuing MD/MS course shall reside in the campus and work in the respective department of the institution for the full period as a full time student. No candidate is permitted to run a clinic/work in clinic/laboratory/ nursing home while studying postgraduate course. No candidate shall join any other course of study or appear for any other examination conducted by this university or any other university in India or abroad during the period of registration. Each year shall be taken as a unit for the purpose of calculating attendance.
(c) Every candidate shall attend symposia, seminars, conferences, journal review meetings, grand rounds, CPC, CCR, case presentation, clinics and lectures during each year as prescribed by the department and not absent himself / herself from work without valid reasons. Candidates should not be absent continuously as the course is a full time one.

(2) **Monitoring Progress of Studies- Work diary/Log Book:**

(a) Every candidate shall maintain a work diary in which his/her participation in the entire training program conducted by the department such as reviews, seminars, etc. has to be chronologically entered.
(b) The work scrutinized and certified by the Head of the Department and Head of the Institution is to be presented in the University practical/clinical examination.

(3) **Periodic tests:**

(a) There shall be periodic tests as prescribed by the Medical Council of India and/ or the Board of Management of the University, tests shall include written papers, practical/clinical and viva voce.

(4) **Records:**

(a) Records and marks obtained in tests will be maintained by the Head of the Department and will be made available to the University when called for.

THESIS:

(1) Every candidate pursuing MD/MS degree course is required to carry out work on research project under the guidance of a recognized post graduate teacher. Then such a work shall be submitted in the form of a Thesis.

(2) The Thesis is aimed to train a postgraduate student in research methods & techniques.

(3) It includes identification of a problem, formulation of a hypothesis, designing of a study, getting acquainted with recent advances, review of literature, collection of data, critical analysis, comparison of results and drawing conclusions.

(4) Every candidate shall submit to the Registrar of the University in the prescribed format a Plan of Thesis containing particulars of proposed Thesis work within six months of the date of commencement of the course on or before the dates notified by the University.

(5) The Plan of Thesis shall be sent through proper channel.

(6) Thesis topic and plan shall be approved by the Institutional Ethics Committee before sending the same to the University for registration.

(7) Synopsis will be reviewed and the Thesis topic will be registered by the University.

(8) No change in the thesis topic or guide shall be made without prior notice and permission from the University.

(9) The Guide, Head of the Department and head of the institution shall certify the thesis. Three printed copies and one soft copy of the thesis thus prepared shall be submitted by the candidate to the Principal. While retaining the soft copy in his office, the Principal shall send the three printed copies of the thesis to the Registrar six months before MD/MS University Examinations. Examiners appointed by the University shall evaluate the thesis. Approval of Thesis at least by two examiners is an essential pre-condition for a candidate to appear in the University Examination.

(10) Guide: The academic qualification and teaching experience required for recognition by this University as a guide for thesis work is as laid down by Medical Council of India/Mahatma Gandhi University of Medical Sciences & Technology, Jaipur.

(11) Co-guide: A co-guide may be included provided the work requires substantial contribution from a sister department or from another institution recognized for teaching/training by Mahatma Gandhi University of Medical Sciences & Technology, Jaipur/Medical Council of India. The co-guide shall be a recognized postgraduate teacher.

(12) Change of guide: In the event of a registered guide leaving the college for any reason or in the event of death of guide, guide may be changed with prior permission from the University.

ELIGIBILITY TO APPEAR FOR UNIVERSITY EXAMINATION:

The following requirements shall be fulfilled by every candidate to become eligible to appear for the final examination:

(1) Attendance: Every candidate shall have fulfilled the requirement of 80% attendance prescribed by the University during each academic year of the postgraduate course. (as per MCI rules)

(2) Progress and Conduct: Every candidate shall have participated in seminars, journal review meetings, symposia, conferences, case presentations, clinics and didactic lectures during each year as designed by the department.
(3) Work diary and Logbook: Every candidate shall maintain a work diary for recording his/her participation in the training program conducted in the department. The work diary and logbook shall be verified and certified by the Department Head and Head of the Institution.
(4) Every student would be required to present one poster presentation, to read one paper at a National/State Conference and to have one research paper which should be published/accepted for publication/ sent for publication to an indexed journal during the period of his/her post graduate studies so as to make him/her eligible to appear at the Post Graduate Degree Examination.
(5) Every student would be required to appear in and qualify the Pre-University Post graduate degree Mock examination. Post graduate students who fail to appear in or do not qualify the Pre-University Post graduate degree Mock examination shall not be permitted to appear in the final examination of the University.

The certification of satisfactory progress by the Head of the Department/ Institution shall be based on (1), (2), (3), (4) and (5) criteria mentioned above.

ASSESSMENT:

(1) The progress of work of the candidates shall be assessed periodically by the respective guides and report submitted to the Head of the Institution through the Head of the Department at the end of every six months. The assessment report may also be conveyed in writing to the candidate who may also be advised of his/her shortcomings, if any.
(2) In case the report indicate that a candidate is incapable of continuing to do the work of the desired standard and complete it within the prescribed period, the Head of the Institution may recommend cancellation of his/her registration at any time to the University.
(3) Formative Assessment:
    (a) General Principles
        i. The assessment is valid, objective, constructive and reliable.
        ii. It covers cognitive, psychomotor and affective domains.
        iii. Formative, continuing and summative (final) assessment is also conducted.
        iv. Thesis is also assessed separately.
    (b) Internal Assessment
        i. The internal assessment is continuous as well as periodical. The former is based on the feedback from the senior residents and the consultants concerned. Assessment is held periodically.
        ii. Internal assessment will not count towards pass/fail at the end of the program, but will provide feedback to the candidate.
        iii. The performance of the Postgraduate student during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student.
        iv. Marks should be allotted out of 100 as under
            1) Personal Attributes - 20 marks
                a. Behavior and Emotional Stability: Dependable, disciplined, dedicated, stable in emergency situations, shows positive approach.
                b. Motivation and Initiative: Takes on responsibility, innovative, enterprising, does not shirk duties or leave any work pending.

c. Honesty and Integrity: Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.

2) Clinical Work - 20 marks
   a Availability: Punctual, available continuously on duty, responds promptly on calls and takes proper permission for leave.
   b Diligence: Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.
   c Academic Ability: Intelligent, shows sound knowledge and skills, participates adequately in academic activities and performs well in oral presentation and departmental tests.
   d Clinical Performance: Proficient in clinical presentations and case discussion during rounds and OPD work up. Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management) Skill of performing bed side procedures and handling emergencies.
3) Academic Activities - 20 marks
   Performance during presentation at Journal club/ Seminar/Case discussion/Stat meeting and other academic sessions. Proficiency in skills as mentioned in job responsibilities.
4) End of term theory examination - 20 marks
   End of term theory examination conducted at end of 1st, 2nd year and after 2 years 9 months.
5) End of term practical examination - 20 marks
   a. End of term practical/oral examinations after 2 years 9 months.
   b. Marks for personal attributes and clinical work should be given annually by all the consultants under whom the resident was posted during the year. Average of the three years should be put as the final marks out of 20.
   c. Marks for academic activity should be given by the all consultants who have attended the session presented by the resident.
   d. The Internal assessment should be presented to the Board of examiners for due consideration at the time of Final Examinations.
   e. Yearly (end of 1st, 2nd & 3rd year) theory and practical examination will be conducted by internal examiners and each candidate will enter details of theory paper, cases allotted (2 long & 2 short) and viva.
   f. Log book to be brought at the time of final practical examination.

APPOINTMENT OF EXAMINERS:

Appointment of paper setters, thesis evaluators, answer books evaluators and practical & viva voce examiners shall be made as per regulations of the Medical Council of India.

SCHEME OF EXAMINATION:

Scheme of examination in respect of all the subjects of MD/MS shall be as under :

(1) The examination for MD/MS shall be held at the end of three Academic Years.
(2) Examinations shall be organized on the basis of marking system.
(3) The period of training for obtaining MD/MS degrees shall be three completed years including the period of examination.

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

(5) The examinations shall consist of:

(a) Thesis :

i. Thesis shall be submitted at least six months before the main Theory examinations.

ii. 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/Practical.

iii. In departments where besides the two earmarked practical/clinical examiners no one else is a qualified P.G. teacher, in that case the Thesis shall be sent to the third external examiner who shall actually be in place of the internal examiner.

iv. Only on the acceptance of the thesis by any two examiners, the candidate shall be eligible to appear for the final examination.

v. A candidate whose thesis has been once approved by the examiners will not be required to submit the Thesis afresh, even if he/she fails in theory and/or practical of the examination of the same branch.

vi. In case the Thesis submitted by a candidate is rejected, he/she should be required to submit a fresh Thesis.

(b) Theory papers:

i. There shall be four theory papers.
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

ii. Each theory paper examination shall be of three hours duration.

iii. Each theory paper shall carry maximum 100 marks.

iv. The question papers shall be set by the External Examiners.

v. There will be a set pattern of question papers.
Every question paper shall contain three questions. All the questions shall be compulsory, having no choice.
Question No. 1 shall be of long answer type carrying 20 marks.
Question No. 2 shall have two parts of 15 marks each. Each part will be required to be answered in detail.
Question No. 3 shall be of five short notes carrying 10 marks each.

vi. The answer books of theory paper examination shall be evaluated by two External and two internal examiners. Out of the four paper setters, the two paper setters will be given answer books pertaining to their papers and the answer books of the remaining two papers will be evaluated by two Internal Examiners. It will be decided by the President as to which paper is to be assigned to which Internal Examiner for evaluation.

vii. A candidate will be required to pass theory and practical examinations separately in terms of the governing provisions pertaining to the scheme of examination in the post graduate regulations. The examinee should obtain minimum 40% marks in each theory paper and not less than 50% marks cumulatively in all the four papers for degree examination to be cleared as “passed” at the said Degree examination.

(c) Clinical/ Practical & Oral examinations:

i. Clinical/Practical and Oral Examination of 400 marks will be conducted by at least four examiners, out of which two (50%) shall be External Examiners.
ii. A candidate will be required to secure at least 50% (viz. 200/400) marks in the Practical including clinical and viva voce examinations.

(6) If a candidate fails in one or more theory paper(s) or practical, he/she shall have to reappear in the whole examination i.e. in all theory papers as well as practical.

GRACE MARKS

No grace marks will be provided in MD/MS examinations.

REVALUATION / SCRUTINY:

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

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MD IN ANATOMY (9120)

Preamble:
The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research & training.

These guidelines would help to achieve a uniform level of training of MD Anatomy to post graduate students throughout the country. The student, after undergoing the training, should be able to deal effectively with the needs of the medical community and should be competent to handle all problems related to the specialty of Anatomy and recent advances in the subject. The post graduate student should also acquire skills in teaching anatomy to medical and para-medical students and be able to integrate teaching of Anatomy with other relevant subjects, while being aware of her/his limitations.

The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document was prepared by various subject-content specialists. The Reconciliation Board of the Academic Committee has attempted to render uniformity without compromise to purpose and content of the document. Compromise in purity of syntax has been made in order to preserve the purpose and content. This has necessitated retention of "domains of learning" under the heading "competencies".

SUBJECT SPECIFIC LEARNING OBJECTIVES

The **Goal** of MD Anatomy is 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**
   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**
   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

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

B. **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.
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) Models
     c) Charts
   - 1.6 Preparation and preservation of human bones / skeleton as assigned by the faculty
2. **Histology**
   - 2.1 Preparation of common fixatives 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 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**
   - 3.1 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 Human chromosome preparation from peripheral blood and karyotyping.
4.3 Banding techniques (G and C)
4.4 Making of Pedigree charts for study of patterns of inheritance.
4.5 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

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

Gross anatomy

Section - I
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.
- 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, ag e, and height. for medico legal application of Anatomy.

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

Departmental Resources:

It is mandatory for the department of Anatomy to develop at least three of the following laboratories, in addition to the other facilities. The laboratory should be involved in active research in at least one well defined field.

1. Histology
2. Immunology
3. Electronmicroscopy/ Fluorescence microscopy/ confocal and other forms of microscopy laboratories
4. Developmental anatomy
5. Anthropometry
6. Neuroanatomy
7. Cytogenetics
8. Imaging technique for Radiological Anatomy

TEACHING AND LEARNING METHODS

Teaching methodology

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

1. **Didactic Teaching**
   Topics in gross, surface and cross sectional anatomy, microanatomy, embryology, neuroanatomy, histochemistry, and genetics taught by faculty members.
2. **Training** in communication skills - journal club, seminars, demonstrations, tutorials, lectures, quizzing.
3. Hands-on experience - techniques in microanatomy, neuroanatomy, gross anatomy, embryology, histochemistry, genetics, microscopy. Embalming and preservation of cadavers
4. Teaching: participate in the teaching and training programme of undergraduate students and interns.
5. Participate in seminars, symposia, group-discussions and Journal clubs.
6. Educational technology - preparation of Audio Visual aids for teaching, posters/manuscripts for presentation in conferences/workshops and publication in journals.
7. Participation in formulating evaluation methods: Setting objective questions, Short Answer Questions, Multiple Choice Questions and Objective Structured Practical Examination (OSPE).

8. Prepare teaching modules and museum specimens.
9. Participation in organization of symposia/workshops
10. Explain and interpret normal radiological anatomy and sectional anatomy of the human body as studied by various imaging techniques.
11. Comprehend and demonstrate surface and living anatomy of the human body.
12. Relate forensic anatomy to the study with medico-legal aspects of bone in particular.
13. Explain the general principles of Anatomy Act and Organ Transplantation Act.
14. Comprehend ethical aspects of biomedical research.
15. Comprehend the basis of disposal of biomedical waste.
16. Comprehend horizontal integration of various subdivisions of anatomy with relevant physiology and biochemistry.
17. **Log Book:** Every student should maintain a logbook in which a record of the practical exercises completed should be entered. The Log books shall be checked and assessed periodically by the faculty members imparting the training.
18. A postgraduate student of a postgraduate degree course in broad specialities/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/sentfor publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
19. Department should 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 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 (**Annexure I**).

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.

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. 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.
   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.

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.

Recommended reading:
Books (latest edition)

Gross Anatomy:

- Susan Strandring: Gray's Anatomy: The anatomical basis of clinical practice, Churchill Livingstone Elsevier.
- Dutta A.K. Human Anatomy vol. I-III Current Publisher.
- Dutta A.K. Principle of General Anatomy. Current Publisher.
- Romanes. Cunningham's Manual of Practical Anatomy vol. I-III, Oxford.
- Keith and Moore Clinical Oriented Anatomy. Lippincot Williams and Willkins.
- R.S Snell. Clinical Anatomy by regions. Lippincot Williams and Wilkins.
- J.V. Basmajin. Grant's Method of Anatomy. Williams and Wilkins.
- R.J. Last. Anatomy Regional and Applied. Churchill Livingston.
- Lee McGregar. Surgical Anatomy. K.M. Varghese.
- A.G. R Deckeg, D.J du Pless Lee. Mc Gregor's Synopsis of Surgical Anatomy. Varghese Publishing House.
- Snell. Clinical anatomy by regions. Lippincotts, Williams and Wilkins.
- S. Chummy Sinnatanmy. Last's Anatomy Regional and Applied. Churchill Livingston.

- Hollinshed W Henry. Anatomy for surgeons. Vol. I-III Lippincotts, Williams and Wilkins.
- Vishram Singh. Clinical and Surgical Anatomy. Elsevier.
- Vishram Singh. Textbook of general anatomy. Elsevier.
- Frank H. Netter. Atlas of Human Anatomy. Saunders Elsevier.

Histology

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

Genetics

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

Embryology

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

Neuroanatomy

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

Statistics

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

Radiology

- T.B. Moeller et.al. Sectional Anatomy CT and MRI Vol. I, II, III New York. Theme Stuttgart.
- 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.
- Halim. and A.C. Das. Surface Anatomy Lucknow. ASI, KGMC.

Journals

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

Annexure - I

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*_____
_____
_____

*__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.

SIGNATURE OF ASSESSEE | SIGNATURE OF CONSULTANT | SIGNATURE OF HOD

MODEL PAPER

MD-9121 **Anatomy-I**

MD Examination Month, Year
ANATOMY

Paper – I
Gross Anatomy

Time : Three Hours
Maximum Marks : 100

Attempt all questions
All the parts of one question should be answered at one place in sequential order.
Draw diagrams wherever necessary

Q1. Describe Parotid gland under the following headings: 20

a) Relations
b) Structures passing through the gland
c) Nerve supply
d) Applied anatomy
e) Surface marking

Q2. Write on: 2 x15= 30

a) Classify joints. Describe synovial joints with examples
b) Pterygo-palatine Ganglion

Q3. Write short notes on: 5 x 10=50

a) Supports of Uterus
b) Formation of brachial plexus and its applied anatomy
c) Course, distribution and applied anatomy of Right Coronary Artery
d) Locking & unlocking of knee joint
e) Lymphatic drainage of Breast & its applied anatomy

MODEL PAPER

MD-9122 **Anatomy-II**

MD Examination Month, Year
ANATOMY

Paper – II
Embryology, Microscopic Anatomy and Genetics

Time : Three Hours
Maximum Marks : 100

Attempt all questions
All the parts of one question should be answered at one place in sequential order.
Draw diagrams wherever necessary

Q1. Describe the microanatomy of Tongue. 20
Add a note on its development and applied aspect

Q2. Write on: 2 x 15=30

a) What is decalcification of bone? What are the various methods used to decalcify bone? How is the determination of the end point of decalcification process achieved?

b) Telomeres

Q3. Write short notes on : 5 x 10=50

a) Fate of Neural crest cells

b) FISH technique and its applications

c) Microanatomy of Duodenum

d) Polygenic Inheritance

e) Rotation of gut & its developmental anomalies

MODEL PAPER

MD-9123 **Anatomy-III**

MD Examination Month, Year
ANATOMY

Paper – III
Neuroanatomy

Time : Three Hours
Maximum Marks : 100

Attempt all questions
All the parts of one question should be answered at one place in sequential order.
Draw diagrams wherever necessary

Q1. Describe the composition , blood supply and applied anatomy of Internal Capsule. 20

Q2. Write on: 2 x15=30

a) Classify & give details of afferent and efferent functional nuclear components

b) Fourth ventricle

Q3. Write short notes on : 5 x 10=50

a) Medial longitudinal fasciculus

b) Lateral spinothalamic tract

c) Cerebral dominance

d) Wallenberg syndrome

e) Lateral geniculate body

MODEL PAPER

MD-9124 **Anatomy-IV**

MD Examination Month, Year
ANATOMY

Paper – IV
Applied Human Anatomy and recent advances in anatomical Sciences

Time : Three Hours
Maximum Marks : 100

Attempt all questions
All the parts of one question should be answered at one place in sequential order.
Draw diagrams wherever necessary

Q1. Describe Deep cervical fascia and its applied anatomy 20

Q2. Write on : 2 x 15=30

a) Principle of the working of Electron microscope

b) Cross- sectional Anatomy seen at the level of first lumbar vertebra

Q3. Write short notes on : 10 x 5=50

a) Artificial Cadaver

b) Varicose veins

c) Foot drop

d) Positron Emission Tomography

e) Applied anatomy of Palmar spaces