



**Amrita School of Medicine  
Amrita Institute of Medical  
Sciences (AIMS)  
Kochi-682041**

**Program  
MD ANATOMY**

**(Revised with effect from 2014-2015 onwards)**

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## GOAL:

The broad goal of postgraduate students in Anatomy aims at acquiring comprehensive knowledge in macroscopic and microscopic anatomy, surgical, embryological and radiological anatomy and research methodology in anatomy.

## **OBJECTIVES:**

### **a) KNOWLEDGE**

At the end of the course the postgraduate student shall be able to:

- 1. Comprehend normal disposition, interrelationships, functional and cross sectional anatomy of the various structures macroscopically.**
- 2. Identify the basic tissues and organs of the body microscopically and correlate their structure with functions in normal and diseased states.**
- 3. Interpret the basic principles and sequential development of organs and systems, recognize the critical stages of development and effects of the common teratogens, genetic mutations and environment hazards.**
- 4. Comprehend the need for research in order to aid and abet basic medical sciences.**

### **b) SKILLS**

At the end of the course, the postgraduate student shall be able to:

- 1. Identify and locate all the structures of the body and the topography of the living anatomy.**
- 2. Identify the organs and tissues microscopically.**
- 3. Identify and interpret normal karyograms, abnormal karyograms and clinical features of common genetic disorders.**
- 4. Identify the critical stages of embryonic development and interpret the effects of common teratogens, genetic mutations and environmental hazards on development.**
- 5. Understand the clinical basis of some important procedures like lumbar puncture, pleural tap, liver biopsy, drainage of abscesses etc., and impart knowledge on these aspects in teaching-learning activities of the department.**
- 6. Interpret the sectional anatomy of the human body and identify various structures which are commonly diseased, on x- ray plates, ultrasound, CT and MRI plates.**

### **c) Program Outcomes**

1. To be a competent specialist, teacher and researcher. At the end of the programme he should have mastered most of the competencies pertaining to the speciality and developed a scientific temperament oriented to principles of research methodology.
2. Develop the ability to integrate Anatomy with other specialities
3. Develop skills as a goal directed trainer , recognizing continuing educational needs and practicing the speciality ethically
4. Develop management skills to function as a team leader in teaching and research
5. Develop effective communication skills with students,parents and colleagues

**d) Program Specific Outcomes**

1. Competency in all subdivisions of anatomy , its applied aspects and recent advances
2. Demonstrate the ability to correlate clinical conditions and their anatomical basis
3. Chalk lesson plans and apply different methods of teaching and learning anatomy should be able to draw up assessment, and develop competence in evaluation techniques.
4. Acquire competency to dissect the entire body.
5. Develop skills in all types of embalming
6. Be competent to prepare and stain slides
7. Should acquire skills to curate a museum
8. Acquire basic skills in research methods, accessing scientific, database, information technology, thesis protocol, review of literature, execution and preparation of report.
9. Should know how to carry out documentation
10. Should have developed organizational skills to conduct symposia and group discussions.
11. Must have a reasonable knowledge of bio-waste management and infection control.
12. Identify socio-economic environmental and overall health of the student community and acquire capacity of not letting personal beliefs and limitations come in the way of duty.

**I) SYLLABUS:**

**1. HUMAN GENETICS**

**Elements of human genetics, cytogenetics, molecular genetics and tissue culture.**

**2. ANATOMICAL TECHNIQUES**

**Knowledge of embalming procedures, museum techniques, histological techniques, advanced neuro-anatomical staining and immuno-histochemical techniques.**

**3. GROSS ANATOMY (REGIONAL)**

**UPPER & LOWER EXTREMITIES**

**Nerves, muscles, vessels, bones and joints to be studied with a wholesome concept and with special reference to surface projections, applied anatomy. Their radiological and developmental significance also need to be studied.**

**ABDOMEN AND PELVIS**

**Regions of abdomen, abdominal wall with special reference to inguinal canal, rectus sheath, peritoneum and fascia. The abdominal viscera and their disposition, surface projections, blood supply, nerve supply, lymphatic drainage and applied aspects.**

## **THORAX**

**Thoracic cage, anatomical and clinical land marks, mediastinum and its subdivisions, pleura, lungs, pericardium and heart.**

## **BRAIN**

**Coverings, subdivisions, external and internal features including nuclei and their connections and blood supply.**

## **SPINAL CORD**

**Coverings, blood supply, external features and internal structure including arrangement of various ascending and descending tracts.**

## **HEAD AND NECK**

**Knowledge of blood vessels, nerves, muscles, glands and viscera.**

**Neuro anatomy, embryological anatomy, microscopic anatomy, osteology and surgical anatomy pertaining to various regions of the body are to be thoroughly studied.**

### **4. GENERAL AND SPECIAL EMBRYOLOGY INCLUDING TERATOLOGY**

### **5. GENERAL AND SPECIAL HISTOLOGY**

### **6. RADIOLOGICAL ANATOMY**

**Identification of normal anatomical features in commonly used Skiagrams (Plain and contrast), CT Scan, Ultra Sound, MRI and Endoscopy.**

### **7. SURFACE ANATOMY**

**Surface marking of those structures, organs and viscera of the body which are commonly affected in various disease processes.**

### **8. SECTIONAL ANATOMY**

**Knowledge of gross / sagittal / coronal sections of thorax, abdomen, pelvis and limbs, head and neck and brain. To understand interrelations of organs and interpret CTs and MRIs.**

## **9. COMPUTER APPLICATION**

**Computer in medicine and introduction to use of computer is essential.**

## **10. RESEARCH METHODOLOGY**

**Research methodology and biostatistics**

## **II) PRACTICAL TRAINING – Includes dissection of all 6 regions of the human body including-Head & Neck, Brain and Spinal cord. Upperlimb, Lower limbs, Thorax and abdomen noting variations if any and their significance.**

**Pedagogical training through lectures and demonstrations for the undergraduate students in the fields of osteology, radiology, surface anatomy, histology, embryology, clinical anatomy.**

**Participation and presentation in the departmental seminars and journal club. Training in preparation of tissue mounts using Heamatoxylin and Eosin and specialized staining techniques, working knowledge of other types of microscopes.**

**Training in cytogenetic and karyotyping.**

**Training in embalming of human adult and foetal cadavers.**

**Encouraged to make scientific presentations at regional, national and international scientific fora.**

**Encouraged to publish original scientific data in peer reviewed national and international indexed journals.**

**Encouraged to attend the workshops to update skills and knowledge.**

## **III) THESIS\DISSERTATION**

**Every student will prepare a thesis\ dissertation as per the rules laid down by the university.**

- 1. Last date for the submission of thesis plan will be within 3 months of joining PG course.**

2. Authority to evaluate and accept thesis plan :Amrita Vishwa vidya peetham, Ettimedai, Coimbatore.
3. Guide: The academic qualification and teaching experience required for recognition as guide for dissertation work is as per Medical Council of India, Minimum Qualification for Teachers in Medical Institutions: Regulations 1998. i.e. recognized post graduate teacher in anatomy having 8 years teaching experience after obtaining postgraduate degree.
4. Co-Guide – May be included provided the work requires substantial contribution from a sister department. The co-guide shall be a recognized post graduate teacher.
5. The last date for submission of thesis: six months prior to the date of university exams.
6. Thesis examiners – Same set of examiners appointed by university as per MCI norms.

The details of the dissertation work to be carried out is given in the “Regulations and Curriculum common to all Post Graduate Courses” by Amrita Vishwa Vidhya Peetham University .

## **LOG BOOK**

Every candidate shall maintain a log book and record his /her participation in the training programme conducted by the department. All the presentations and procedures carried out by the candidate should be detailed in this and certified by the teacher concerned. The log book shall be scrutinized and certified by the Head of the Department and the Head of the Institution and presented in the university examination.

Details of the log book is given in APPENDIX -1

## **V) COURSE OBJECTIVES**

Paper - I General Anatomy, Gross Anatomy, Radiological Anatomy, Surface Anatomy and Cross sectional Anatomy. (MDAT1)

**CO1.** Should know the fundamentals of general anatomy and apply it to all subdivisions of anatomy.

**CO2.** Should have mastered the nerves muscles vessels, joints and viscera of the entire human body.

**CO3.** Should have a basic understanding of the radiological principles in visualizing the structures of the body and correlate it with cross sectional

**anatomy.**

**CO4. Should be able to mark and project clinically important structures on the surface of the body.**

**CO5. Communicate effectively using correct discipline specific terminology.**

## **GROSS ANATOMY (REGIONAL)**

### **UPPER & LOWER EXTREMITIES**

**Nerves, muscles, vessels, bones and joints to be studied with a wholesome concept and with special reference to surface projections, applied anatomy. Their radiological and developmental significance also need to be studied.**

### **ABDOMEN AND PELVIS**

**Regions of abdomen, abdominal wall with special reference to inguinal canal, rectus sheath, peritoneum and fascia. The abdominal viscera and their disposition, surface projections, blood supply, nerve supply, lymphatic drainage and applied aspects.**

**Mesentery – anatomy and clinical application**

**Surface anatomy of all the viscera and its clinical importance**

### **THORAX**

**Thoracic cage, anatomical and clinical land marks, mediastinum and its subdivisions, pleura, lungs, pericardium and heart.**

### **BRAIN**

**Coverings, subdivisions, external and internal features including nuclei and their connections and blood supply.**

### **SPINAL CORD**

**Coverings, blood supply, external features and internal structure including arrangement of various ascending and descending tracts.**

**Anatomy of spinal nerves and its distribution**

### **HEAD AND NECK**

**Knowledge of blood vessels, nerves, muscles, glands and viscera.**

**Neuro anatomy, embryological anatomy, microscopic anatomy, osteology and surgical anatomy pertaining to various regions of the body are to be thoroughly studied.**

**Paper - II Genetics, Embryology, Histology & Anatomical techniques. (MDAT2)**



**CO 1. Should have a basic understanding of human genetics, cytogenetics, molecular genetics and tissue culture.**

**CO 2. Should have substantial knowledge of the development of embryo, and systems and should be able to correlate it to congenital anomalies.**

**CO 3. Should have developed in depth knowledge of cellular structures and specific features of organs and other structures of the body.**

**CO 4. Knowledge of embalming procedures**

**CO 5. Should have attained knowledge to mount specimens for the museum and basic model making skills.**

**CO 6. Should know how to procure, process and stain a tissue**

### **HUMAN GENETICS**

**Elements of human genetics, cytogenetics, molecular genetics and tissue culture.  
Anatomical variants and genetics**

### **ANATOMICAL TECHNIQUES**

**Knowledge of embalming procedures, museum techniques.  
Ethical aspects in the embalming of bodies  
Forensic importance of embalming of bodies**

### **MDAT3 Paper - III Neuro Anatomy including embryology and histology**

**CO 1. Should have an understanding of the external and internal features of all parts of the brain and spinal cord and their interconnections.**

**CO 2. Should have basic understanding of the developmental sequence of the nervous system and awareness of common congenital conditions.**

**CO 3. Should have working knowledge of histological techniques of neuro anatomy.**

**CO 4. Develop vocabulary of appropriate terminology.**

**General and Special Embryology including teratology.**

### **MDAT4 Paper - IV Clinical Anatomy, Recent Advances in Anatomy, History of Anatomy**

**CO 1. Should be able to define the anatomical basis of signs and symptoms of disease.**

**CO 2. Should be able to demonstrate an understanding of clinical presentations and strategies for health maintenance.**

**CO 3. Use the clinical anatomical knowledge and correlate it with invasive procedure.**

**CO 4. Demonstrate information literacy skills to access, evaluate, and stay abreast with current trends in management.**

**CO 5. Trace the historical development of anatomy as a medical subject**

**Training in cytogenetic and karyotyping.**

**Knowledge of gross / sagittal / coronal sections of thorax, abdomen, pelvis and limbs, head and neck and brain. To understand interrelations of organs and interpret CTs and MRIs.**

**Identification of normal anatomical features in commonly used Skiagrams (Plain and contrast), CT Scan, Ultra Sound, MRI and Endoscopy.**

**Knowledge of histological techniques, advanced neuro-anatomical staining and immuno-histochemical techniques.**

#### **MDAT5 SOFT SKILLS (Elective)**

**CO 1. Should know how to carry out documentation**

**CO 2. Should have developed organizational skills to conduct symposia and group discussions.**

**CO 3. Identify socio-economic environmental and overall health of the student community and acquire capacity of not letting personal beliefs and limitations come in the way of duty.**

**The candidate can chose to attend soft skills teaching sessions. There will be no written assessment. The candidate will be evaluated throughout the program by the peers.**

#### **VI) SCHEME OF EXAMINATION**

**100 Marks for each Paper (4 Papers) = 400 Marks (Total)**

##### **THEORY**

**Paper-I Gross Anatomy: Including Radiological anatomy**

**Paper-II Embryology including Teratology, Histology and Genetics**

**Paper-III Neuroanatomy**

**Paper-IV Clinical anatomy and Recent advances in anatomy.**

##### **PRACTICALS**

**(DAY-1) PRACTICAL – 1 (3 hours) Total = 100 marks**

**Dissection and discussion of a given region within - 3 hours.**

**(DAY-II) PRACTICAL-2 (3 hours) Total = 100 marks**

**Identification and discussion of histology, embryology and neuroanatomy slides = 50 marks  
Preparation of a stained tissue mount from the given block of tissue = 50 marks**

**ORAL (VIVA VOCE) – gross anatomy, related osteology, embryology, radiology and neuro anatomy.**

**Microteaching = 20 marks**

**Grand Viva including Surface Anatomy = 80 marks**

**Note:** Minimum of 40 marks must be obtained in each paper. However, the passing minimum aggregate marks of all theory papers will be 200 out of 400 marks.

## **MODEL QUESTION PAPER**

**Time: 3 hours**

**Maximum: 100 marks**

Q1 Essay 25 marks  
Q2 Essay 25 marks  
Q3 Brief essays-5 (10 X 5) 50 marks

**Total = 100 marks**

### **VII) BOOKS RECOMMENDED**

1) **Gray's Anatomy – 39<sup>th</sup> edition**

<b>Examination</b>	<b>Max. Marks</b>	<b>Min. Marks</b>	<b>No. of Papers</b>	<b>Paper Max.</b>
Theory	400	200	4	100
Practical	200	100	-	-
Oral	100	-	-	-

2) **Grant's Dissector, 14e, 39<sup>th</sup> edition – Dr. Patrick W. Tank**

3) **Di Fiore's Atlas of Histology – Victor P. Eroschenko-Lippincott Williams & Wilkins.**

- 4) **Clinical Anatomy by regions –Richard S. Snell- 8<sup>th</sup> edition**
- 5) **Clinically Oriented Anatomy-Keith L Moore – 5<sup>th</sup> edition**
- 6) **Cunningham’s Manual of Practical Anatomy – 3 Volumes- 15<sup>th</sup> edition**
- 7) **The Developing Human-Clinically Oriented Embryology –Keith L Moore**
- 8) **Lang Man’s Medical Embryology –Thomas W. Sadler – 8<sup>th</sup> edition**
- 9) **Human embryology – Inderbir Singh, G P Pal - 8<sup>th</sup> edition**
- 10) **Hamilton, Boyd and Mossman's Human Embryology – 2<sup>nd</sup> edition**
- 11) **Neuro Anatomy – Truex and Carpenter**
- 12) **Clinical Neuro Anatomy-Richard S. Snell**
- 13) **Histological Techniques –John D. Bancroft, 5<sup>th</sup> edition**
- 14) **Histology: A Text and Atlas – 3<sup>rd</sup> edition – Michael H Ross, Edward J Reith.**
- 15) **Hans Histology-David Cormack**
- 16) **Cell and Molecular Biology-EDP De Robertis, EMF De Robertis Jr.**
- 17) **Emery’s Elements of Medical Genetics-Robert F Mueller and De Young**
- 18) **Frazer’s Osteology and Anthropometry.**

#### **JOURNALS**

1. **Journal of Anatomy London**
2. **Journal of Anatomical Society of India**
3. **Anatomical record.**
4. **Developmental dynamics**

## APPENDIX -1

<b>S.No.</b>	<b>Date</b>	<b>Time</b>	<b>PARTICULARS</b>	<b>Page No.</b>
			<b>LECTURES ATTENDED</b>	
			<b>DEMONSTRATIONS ATTENDED</b>	
			<b>DISSECTIONS PERFORMED</b>	
			<b>MICROANATOMY PRACTICALS</b>	
			<b>ACTIVITIES</b>	
			<b>1) LECTURES CONDUCTED</b>	
			<b>2) DEMONSTRATIONS CONDUCTED</b>	
			<b>3) SEMINARS PRESENTED</b>	
			<b>4) JOURNAL CLUB</b>	
			<b>5) CONFERENCES /WORKSHOPS ATTENDED</b>	
			<b>6) PAPERS PRESENTED</b>	
			<b>7) PAPERS PUBLISHED</b>	
			<b>8) MISCELLANEOUS</b>	

**DEPARTMENT OF ANATOMY, AMRITA SCHOOL OF MEDICINE**  
**M.D.ANATOMY DEGREE EXAMINATION**

**ANATOMY PAPER – I (Gross Anatomy and Applied Anatomy)**

**Date:**

**Time:**

**Max. Marks = 100.**

1) Draw the boundaries of middle ear cavity. Discuss the applied aspects of each boundary.

18+7 = 25 marks

2) Describe the blood supply and lymphatic drainage of mammary gland. Discuss the anatomical basis of findings in carcinoma breast.

17+8 = 25 marks

3) Write briefly on :  
50 marks

5 X 10 =

- a) Coronary angiogram
- b) Fibromuscular skeleton of heart
- c) Supports of uterus and their applied aspects
- d) Varicose veins of lower limb
- e) Types of grip.

**DEPARTMENT OF ANATOMY, AMRITA SCHOOL OF MEDICINE**  
**M.D.ANATOMY DEGREE EXAMINATION**

**ANATOMY PAPER – II (Embryology, genetics and recent advances)**

**Date:**

**Time:**

**Max. Marks = 100.**

1) Describe the development of face and discuss the developmental anomalies.

30

marks

2) Write briefly on :

7 X 10 = 70 marks

- a) Stem cells
- b) Development of inter ventricular septum
- c) Gene therapy
- d) Development of tooth
- e) Neural crest
- f) Mid gut rotation
- g) Karyotyping

**DEPARTMENT OF ANATOMY, AMRITA SCHOOL OF MEDICINE**  
**M.D.ANATOMY DEGREE EXAMINATION**

**ANATOMY PAPER – III (Neuro anatomy)**

**Date:**

**Time:**

**Max. Marks = 100.**

1) Draw neat labelled diagrams of midbrain at the level of superior colliculus. Discuss the

grey and white matter seen at this level.

10+ 15 = 25 marks

2) Describe the basal ganglia .

15 marks

Discuss its clinical aspects

10 marks

3) Write briefly on :

10 X 5 = 50 marks

- a) Neuroglia
- b) Cerebral angiography
- c) Speech areas of brain
- d) Neocerebellum
- e) Development of cerebrum



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**M.D.ANATOMY DEGREE EXAMINATION**

**ANATOMY PAPER – IV**  
**Histology, Histological and anatomical techniques, history of anatomy.**

**Date:**

**Time:**

**Max. Marks = 100.**

1) Classify lymphoid organs. Describe the histology of lymph node in detail.  
Add a note on diffuse lymphoid tissue. 5+15+5= 25  
marks

2) Correlate the histology of uterus with ovarian cycle. 25  
marks

3) Write short notes on : 5 X 10 = 50  
marks

- a) Audiovisual aids in teaching anatomy
- b) PAS stain
- c) Medico legal aspects of body donation
- d) Henry Gray
- e) Technique of plastination.