Pravara Institute of Medical Sciences
(Deemed University)

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Established Under Section 3 of UGC Act 1956, Vide Govt. of India Notification No. F.9-11/2000-U.3, dated 29th September, 2003

Syllabus
M.D. (Anatomy)

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.G. CURRICULUM IN THE SUBJECT OF ANATOMY

Goal: To prepare the postgraduate student to become agoodsubject teacher, to be able to integrate the knowledge and skills acquired during their study period to various clinical disciplines and a research scientist. To achieve this goal, the postgraduate student in Anatomy should be given an overall exposure to the, teaching methodologies and a sound grounding in research technologies.

B. **Learning objectives**: To achieve this goal, the following objectives must be fulfilled.

I. **Cognitive domain**:

At the end of three years of postgraduate training the student should be able to

1. History of anatomy

2. Describe the gross anatomy of the human body and correlate the knowledge of structure with the function by horizontal and vertical integration.

3. Describe the microanatomy including Principles and types of Electron microscopy.Identification of various cell organelles and their EM appearance of various structures of the human body and compare the knowledge of microstructure with function and interpret it accordingly.As a prerequisite to understanding the pathologic process in the production of diseases.

4. Describe the developmental aspects of human body and interpret the developmental basis of various congenital anomalies. Embryologyof Stem Cell.

5. Anatomy of various parts of CNS and the interpretation of basics of neurological lesions.Details of Limbic system and Reticular Systems.

6. Explain various aspects of genetics and describe genetic basis of disorders and principles of genetics counseling. Exposure to various DNA technologies, including cell culture, Karyotyping, Polymerase Chain Reaction (PCR) and Fluorescent-in-Situ-Hybridization (FISH)

7.Imaging Modalities.

i) Radiology.

ii)Ultrasonography (USG):- Principles of USG, Orientation of anatomical organs, in various USG plates. Structures as seen in 2-D echocardiography axes used and orientation of heart in various axes in 2-D echocardiography.

iii)PET scan: Principles

8. Comprehend surface and living anatomy of the human body.

9. Cross-sectional Anatomy and its correlation to C.T. scan images and MRI images.

10. Clinical Anatomy: Application of anatomical knowledge to explain the anatomical basis of various clinical symptoms and signs, diagnostic procedures and treatment modalities.

11. Forensic Anatomy: Estimation of age and sex

i) With reference to bones including ossification.

ii) With reference to radiology pictures.

13. Anthropology: Basic principles and anthropometry.

14. Embalmingtechnique.

15. Explain the general principles of Anatomy Act and Transplant of Human Organ Act.

12 Comprehend ethical aspects of biomedical research.

13. Comprehend the basis of disposal of biomedical waste.

14. Comprehend horizontal integration of various subdivisions of anatomy with relevant physiology and biochemistry.

II. Psychomotor domain:

At the end of the training, the student should be able to

1 Dissect and demonstrate various parts of adult human body

2. Demonstrate surface landmarks and living anatomy pertaining to musclepower, testing of nerves and palpating vessels.

4. To develop confidence and skill in various techniques like museum preparation,embalming technique and preparation of histology slide

5. Prepare and deliver lectures on various topics of human anatomy including histology and embryology using audio- visual aids.

6. Operate computers so as to prepare documents, tables, charts and projection slides. For-

a) Teaching purpose

b) Seminars

c) Presentation in conferences

7. Identify research topics; carry out research and prepare a dissertation on a topic.

8. Present paper / poster in conferences.

9. Training in preparation of MCQ and question banks and evaluation of students tabulate and calculate results including internal assessments

III. Affective domain: At the end training the students should be able to

1. Co-operate with and react and respond in a cordial manner in his /her interaction with peers, superiors and subordinates.

2. Should inspire the students to reach greater heights.

3. Arouse curiosity and wonder in the minds of students.

4. Maintain a log book (Appendix - I).

C. 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 P.G. student would be a resident in the department for 3 years.

The time-plan and the division of curriculum will be on the following lines.

1. FIRST YEAR OF COURSE

a. Orientation programme- Institutional and departmental orientation including duties and responsibilities of a postgraduate student.

b. Time Management - should be conducted within 3-6 month.

c. Research methodology workshop training within first six month

e. Gross anatomy: Dissection of one whole human body and study of gross anatomy and acquisition of embalming skills.

f. Microanatomy: Basic techniques in tissue processing, preparation of blocks, microtome sections and H & E and principles of the following special stains -silver nitrate, periodic acid Schiff, osmic acid, Masson's trichome, Verhoeff and Orcein stains.

g. To attend all undergraduate lectures held in the department of Anatomy colleges.

h.To actively participate in and present various topics in microanatomy sessions

i. To present the topic for dissertation and the research design in front of an ethical and research committee within first six months of registration. Thereafter periodic assessment of the progress of the dissertation (every 6 monthly) will be done by the concerned PG teacher.

I. Get trained to use computer for teaching and use the internet

j. To attend all the symposium/ seminars/ research society meetings of PIMS.

Presentation in research society meeting.

Attend and present papers and posters in regional /national conferences of the subject.

a.TEACHING

i. Microteaching sessions are essential before small group teaching. (Annexure II)

small group teaching(on dissection table and histology practical)

ii.Exposure to evaluation techniques

iii. Exposure to Medical Education Technology Workshops

vi. Presentation in Journal club.

v. Presentation in Seminars and symposia.

iv. Completion of Microanatomy and Developmental anatomy Journals.

b. RESEARCH

i. In consultation with and under the guidance of guide and head of the department the candidate, looking the feasibility aspect, should have selected the topic of dissertation within the stipulated period as announced by PIMS.

ii. To collect the literature from various sources, to prepare synopsis, which has to be submitted for approval with institutional ethical and research committee.

Collection of relevant literature for a given topic, carrying out research and collection of data.

Maintenance of proper observational records; periodical review of the work to be submitted to the principal, signed by head of the department of Anatomy, RMC.

iii. Exposure to computer for various applications.

iv.To methodologically develop the aptitude and skill required for undertaking research

c. Maintenance of Log book

II YEAR OF COURSE

a. TEACHING

i. Should actively participate in small group teaching.
ii. Should be conversant with the use of various audiovisual aids
iii. Presentation in Journal Club
iv. Presentation in Seminars / Symposia at the departmental and institutional level

b. RESEARCH

Starting the work on thesis by the beginning of first year of residency with the aim to complete the data collection.

c. Maintenance of Log book

III YEAR OF COURSE

a. TEACHING

i. Lectures,lecture-demonstration, small group teaching
ii. Seminars / Symposia
iii. Journal Club

b. RESEARCH

i. Interpretation of data obtained

ii. Application of biostatistics to know significance of finding
iii. Preparation and timely submission of dissertation as per the rules laid down by PIMS and MCI.
iv. Presentation in institutional research society, and national conferences.
v. Writing articles for publication
vi. During the tenure of three years as PG student the candidate is expected to attend at least two national conferences
vii. Present at least one oral presentation in the conference and if possible should have published one paper in national/international conferences.

c. Maintenance of Log book

Log book

A detail Log book should be maintained wherein the following should be regularly entered and got signed from HOD.

a. Details of seminars and journal club attended and presentations
b. Presentation in the Institutional Research Society, National conferences.
c. Attending the various CMEs, Seminars ,Symposia and workshop at institutional /state/national level
d. Record of practical work done in various subgroup of anatomy.
e. Contribution in the development of departmental laboratories/museum.

V. SYLLABUS

Theory Syllabus

General Anatomy:

1. Introduction, subdivisions of Anatomy, Anatomical position.
2. Anatomical terms
3. General Connective tissue – cartilage
4. Bones
5. Joints
6. Muscles
7. Blood vessels
8. Lymphoid tissue
9. Skin
10. Nervous system

Gross Anatomy:

Upper Extremity

1. Pectoral region
2. Axilla
3. Back
4. Scapular region
5. Front of arm

6. Cubital fossa
7. Back of arm
8. Front of forearm
9. Back of forearm
10. Hand : Palmar aspect
11. Hand : Dorsum
12. Joints of Upper Limb
13. Some Clinical Correlation of the Upper Limb

Lower Extremity:

1. Thigh
2. Gluteal region
3. Back of thigh
4. Popliteal fossa
5. Front of leg & dorsum of foot
6. Back of leg
7. Sole of foot
8. Joints of Lower Limb
9. Some Clinical Correlations of the Lower Limb.

Thorax:

1. Introduction to Thorax
2. Joints of Thorax, Intervertebral Joints.
3. Walls of Thorax
4. Trachea, Bronchi.
5. Lungs – Bronchopulmonary segments.
6. Heart and Pericardium
7. Blood vessels of Thorax
8. Oesophagus, Thymus. Lymphatics of Thorax. Nerves of Thorax.
9. Clinical Correlations of the Thorax.

Abdomen and Pelvis:

1. Introduction to Abdomen
2. Anterior abdominal wall
3. Perineum and Male and Female external Genital organs.
4. Oesophagus, Stomach, Intestines and Peritoneal reflections.
5. Liver, Pancreas and Spleen
6. Blood vessels of Stomach and Intestines, Liver, Pancreas & Spleen.
7. Kidney, Ureter, Suprarenal gland.
8. Posterior abdominal wall and some related structures.
9. Walls of Pelvis and Peritoneal reflections.
10. Pelvic viscera – Urinary bladder and Prostate, Rectum and Anal canal, Ovary: Uterus and Uterine tube.
11. Lymphatics and Autonomic nerves of Abdomen and Pelvis
12. Clinical Correlations of Abdomen and Pelvis

Head, Neck & Face:

1. Scalp
2. Face
3. Posterior triangle

4. Suboccipital triangle
5. Anterior triangle – Submental, Muscular, Carotid and Digastric.
6. Dural folds
7. Venous sinuses.
8. Pituitary, Trigeminal ganglion.
9. Thyroid gland and Parathyroid gland
10. Trachea and Oesophagus.
11. Subclavian artery
12. Vessels of the neck – Carotid arteries, internal jugular vein.
13. Cranial nerves.
14. Cervical sympathetic chain.
15. Cervical plexus
16. Pre & Paravertebral muscles
17. Parotid gland
18. Orbit, Lacrimal gland
19. Temporal &Infratemporal regions, maxillary artery &otic ganglion.
20. Temporomandibular joint.
21. Submandibular duct.
22. Oral cavity
23. Pharynx Subdivision – Nasopharynx, Oro(Palatine tonsil) & Laryngopharynx
24. Soft palate, mechanism of deglutition
25. Eustachian tube
26. Nasal Cavity
27. Paranasal air sinuses
28. Maxillary nerve, Pterygopalatine ganglion.
29. Larynx
30. Tongue
31. External ear, tympanic membrane
32. Middle ear cavity
33. Joints:Atlanto-occipital and joints of cervical part s of vertebral column.
34. Applied anatomy of each region.

Neuroanatomy

1. Introduction of nervous system
2. Spinal cord
3. Ascending tract
4. Descending tract
5. Medulla oblongata
6. Pons
7. Midbrain
8. Cerebellum
9. CSF Circulation
10. Ventricles of brain
11. Blood supply of brain
12. Sulci &gyri of cerebrum
13. Functional areas of cerebrum
14. White matter – Association, Commissural, Projection fibres

15. Internal capsule
16. Thalamus
17. Hypothalamus
18. Basal ganglion
19. Limbic system
20. Applied anatomy of CNS

Histology:

1. Cell
2. Epithelium
3. Glands
4. Connective tissue
5. Cartilage & Bone
6. Muscles
7. Blood vessels
8. Skin
9. Nervous tissue
10. Respiratory system
11. Endocrine glands
12. Lip, Tooth, Tongue
13. Salivary glands, Oesophagus
14. Stomach, Duodenum
15. Small intestine, large intestine, Appendix
16. Liver, Gall bladder, pancreas
17. Kidney, Ureter, Urinary bladder
18. Testis, Epididymis, Vas deferens
19. Prostate, Ovary, Uterus, Uterine tube
20. Breast, Placenta, Umbilical cord
21. Ganglion, Cerebellum, Cerebrum
22. Eyeball, Lacrimal gland.

Embryology:

General

1. Introduction, Oogenesis
2. Spermatogenesis
3. Ovary and uterine cycle
4. Fertilization
5. Bilaminar and trilaminar germ disc/primitive streak
6. Intraembryonic mesoderm/Coelom/Somites
7. Formation of Folds/Umbilical cord
8. Placenta and various anomalie
9. s

Systemic:

Head, neck & face region:

1. Branchial arches, Ectodermal cleft
2. Pharyngeal pouches and their derivatives
3. Development of tongue

Cardiovascular system

1. Cardiac tube and its division/formation of atrium and its septation
2. Development of ventricles
3. Aortic arches and their fate
4. Development of venous system/Cardiac anomalies

Alimentary Tract:

1. Oesophagus, Stomach, Pancreas, Spleen
2. Midgut and its derivatives
3. Hind gut /Cloaca and its fate

Urogenital System:

1. Mesonephros/Meso and paramesonephric duct
2. Development of kidney, gonads, urinary bladder.
3. Descent of Testis, Ovary.
4. Development of Female genital organs
5. Male and Female external genitalia

Development of vertebral column, diaphragm, tooth.

Development of eye.

Embryological basis of various anomalies.

Genetics

1. Introduction, Mendel's law of Inheritance.
2. Chromosomal/numerical/ structure/anomalies/Karyotyping
3. Replication / Transcription and translation
4. Genes and Genetic disorders
5. Techniques in genetics and prenatal diagnosis.

1. Curriculum for postgraduate teaching-training course in the subject of Anatomy shall include the entire syllabus for undergraduate Ist year MBBS Anatomy curriculum approved by PIMS (DU).

The syllabus for postgraduate education in the subject of Anatomy includes current trend and recent advances in the syllabus mentioned above and historical aspects.

2. **List of Additional topics to be covered during three and half year curriculum over and above the approved undergraduate syllabus is as follows:-**

   a. History of anatomy

   b. Embalming techniques

   c. Microanatomy

      i) Principles and types of Electron microscopy.

      ii) Identification of various cell organelles and their EM appearance

   d. Embryology: Stem Cell.

e. Genetic: Exposure to various DNA technologies, including cell culture, Karyotyping, Polymerase Chain Reaction (PCR) and Fluorescent-in-Situ-Hybridization (FISH). Gene therapy

f. Neuroanatomy: Details of Limbic system and Reticular Systems.

g. Clinical Anatomy: Application of anatomical knowledge to explain the anatomical basis of various clinical symptoms and signs, diagnostic procedures and treatment modalities.

h. Imaging Modalities

i) Radiology.

ii) Itrasonography (USG):- Principles of USG, Orientation of anatomical organs, in various USG plates. Structures as seen in 2-D echocardiography axes used and orientation of heart in various axes in 2-D echocardiography.

iii) PET scan: Principles.

i. Forensic Anatomy: Estimation of age and sex

iii) With reference to bones including ossification.

iv) With reference to radiology pictures.

j. Cross-sectional Anatomy and its correlation to C.T. scan images and MRI images.

k. Anthropology: Basic principles and anthropometry.

Student Assessment& Evaluation

Evaluation:

Formative evaluation to be carried out with the help of internal assessment based on

1. Teaching: (Evaluated based on a proforma given for Microteaching) Annexure I
2. Dissection (Evaluated during routine Dissection hall assignments).
3. Completion of Microanatomy and Developmental anatomy Journals.
4. Completion of Log Book
5. Examinations: Students shall be evaluated as follows

a. Theory:

- First Year: They have to appear for all the part completion and theory Internal assessment examination (Terminal + Preliminary) that are conducted for undergraduate students of Ist MBBS.
- Second year end -two papers

  Paper I – Embryology and Genetics

  Paper II –Neuroanatomy and applied anatomy.
- During 6th Term (2 months before University examination)

  Preliminary examination as per the university examination pattern

b. Practical and viva

- First Year end

They have to appear for all the part completion and practical Internal assessment examination (Terminal + Preliminary) that are conducted for undergraduate students of Ist MBBS.

- Second Year end

  After the theory examination for second year end, a practical examination shall be held under following heads

  - Prepare a tissue block, stain and discuss + 10 microanatomy spots and discussion.
  - Window dissection
  - Viva on Osteology and soft parts.
  - Viva on embryology models
  - Viva on brain

- During last term (2 months before university exam) Preliminary examination as per the university examination pattern.

c. Head of Passing: A) Theory B) Practical + Viva

d. Standard of Passing: A candidate shall obtain minimum 50% in each of the head of the passing.

University Examination

Eligibility for appearing for university examination:

1. Candidate has to submit dissertation completed in all respects to the university within the stipulated time.
2. Candidate has to submit logbook completed in all respects to the university within the stipulated time.
3. Candidate has to secure minimum 35% marks separately in theory and practical (including viva) examinations conducted by the department.
4. It is mandatory to send six-monthly progress report (as per proforma) of the student to Principal RMC, signed by head of the department of Anatomy.

Theory Examination: Four papers, each of 100 marks, distribution of the course syllabus of these papers shall be as per PIMS guidelines

Duration of each paper: 3 hours (Each paper shall have 3 long questions (20 marks each) and 1 short note questions with 4 notes (10 marks) covering all topics included in the syllabus.) Paper wise distribution of syllabus is as given in the university syllabus.

Practical Examⁿ: Student shall be evaluated for 400 marks with the following exercises.

- Prepare a tissue block, stain and discuss + 10 microanatomy spots and discussion.
- Window dissection
- Viva on Osteology and soft parts.
- Viva on embryology models
- Viva on brain

Distribution of Marks (Practical) shall be as follows

- Window Dissection + Viva : 120
- Preparation of tissue block and staining + Viva : 60
- Microanatomy spots and Slide Discussion(10) : 60
- Micro teaching : 40
- Grand Viva : 120

Viva Examination: Duration –1 hour per student

(Combined viva by all examiners)

1. General Viva : 30 minutes
2. Viva on dissertation : 20 minutes
3. Micro teaching : 15 minutes

Head of Passing: A) Theory B) Practical + Viva

Standard of Passing: A candidate shall obtain minimum 50% in each of the head of the passing.

Book's Recommended

Gross Anatomy

1. Gray's Anatomy: The Anatomical Basis of Clinical Practice, Susan Standring, 40th ed., Elsevier(2008) .
2. Last's Anatomy : Regional and Applied, Chummy S. Sinnatamby, 11th ed. Elsevier, 2006.
3. Clinical Anatomy by Regions, Richard S Snell, 8th ed., Lippincott Williams & Wilkins, 2007.
4. Lee McGregor's Synopsis of Surgical Anatomy, G A G Decker, D J duPlessis, 12th ed., Butterworth-Heinemann, 1986.
5. Clinically Oriented Anatomy, K L Moore, 6th ed., Lippincott Williams & Wilkins, 2009.
6. Anatomy for Surgeons (Vol.I,II,III): W. Henry Hollinshead, 3rd ed., Lippincott Williams & Wilkins, 1982.
7. Clinical Anatomy: Applied anatomy, Harold Ellis, VishyMahadevan, 12th ed. 2010.
8. Cunningham Manual of Practical Anatomy: Vol. I, II, III, G J Romanes, 15th ed. Oxford Medical Publications, 1986. Reprint-2009.
9. Grant Atlas of Anatomy, Anne MR Agur, 12th ed. Lippincott Williams & Wilkins, 2008.
10. McMinn's Colour Atlas of Human Anatomy, Bari S Logan, Patricia A Reynolds, Ralph T Hutchings, 4th ed., 2010.

General Anatomy

11. Handbook of General Anatomy, B D Chaurasia 4th ed. CBS Publisher & Distributers, 2009.
12. Principles of General Anatomy, A K Datta, 6th Reprint, Current Books International, 2007.

Neuroanatomy

13. Clinical Neuroanatomy, Richard S Snell, 7th ed. Lippincott Williams & Wilkins, 2010.
14. Essentials of Neuroanatomy, A K Datta, 3rd ed. Current Book International, 2007.

Histology

15. Wheater's Functional Histology, Barbara Young, 5th ed. Elsevier, 2006.
16. A Textbook of Histology : Bloom and Fawcett, 12th ed. Hodder Arnold Publication, 1997.
17. Ham's Histology, Ham, A.W. and Cormack, D.H. , 9th ed. Philadelphia: Lippincott, 1987.
18. Textbook of Human Histology with Colour Atlas, Inderbir Singh 5th ed. Jaypee, 2008.
19. di Fiore's Atlas of Histology with Functional Correlation, Victor P Croshenko 11th ed. Lippincott Williams & Wilkins, 2007.

Embryology

20. The Developing Human: Clinically Oriented Embryology, Keith L. Moore, T.V.N. Persaud, 8th ed. Saunders, 2007.
21. Hamilton, Boyd and Mossman's Human Embryology: Prenatal Development of Form and Function, William James Hamilton, Harland W. Mossman, J. D. Boyd, London: The MacMillan Press Ltd., 1978.

Genetics

22. Elements of Medical Genetics, Alan.H.Emery, 11 ed. Churchill Livingstone, 2001.
23. Human Genetics, S D Gangane, 3rd ed. Elsevier, 2008.

Appendix II
(Microteaching assessment proforma)

Direction to the Observers- Please tick the statement which most closely corresponds to your observation

Name of the Teacher/Observer: _____

Topic: _____

Date: _____

S.No	Skill	Teacher action	Yes	Partially	No
1	Set induction	Aroused the interest at the beginning			
		Specified objectives of presentation			
2	Planning	Organized material in logical sequence			
		Used relevant content matter			
3	Presentation	Fluency in language			
		Used non verbal cues, eye contact etc			
4	Interaction	Allowed questions from the students			
		Asked questions			
		Rewarded pupil effort			
		Clarified doubts			
5	Use of audiovisual aids	Used proper AV aids			
		Used the aid effectively			
6	Summarization	Reviewed important points in the end			
		Check that all the students understand the points			
		Lesson on the whole was effective			
7	Any suggestions for the speaker to improve the Teaching – learning exercise				

Antropometry
24. Krogman

Appendix I : (Logbook)

S.No	Date	Time	Topic/ Activity	Teacher	Remarks & Signature of PG teacher

Topic- topic of lecture / demonstration attended

Topic of lecture / Demonstration taught

Activity- Dissection- Part
Microanatomy- Practical
Special posting if any – department

Monthly submission of log book to the concerned PG teacher for signature

Weekly Time Table for PG students

	9-10am	10-11am	11-12n	12-1pm		2-3pm	3-5pm
Monday	Embryology Lecture	Self-Study	Histology Practical		Lunch Break	Demonstration	Museum Techniques
Tuesday	Self Study	Gross Anat. Lecture	Dissection			Teaching Methodology Training	Dissection
Wednesday	Journal Club /Seminar		Gross Anat. Lecture	Histology Practical		Demonstration	Dissection
Thursday	Self Study	Gross Anat. Lecture	Dissection			Self Study	Dissection
Friday	Self Study	Gross Anat. Lecture	Dissection			Demonstration	Dissection
Saturday	Histology Techniques	Histology Techniques	Gross Anat. Lecture	Gross Anat. Lecture		-	