

SRI BALAJI VIDYAPEETH

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

Pillaiyarkuppam, Puducherry - 607 402

Mahatma Gandhi Medical College and Research Institute



COMPETENCY BASED POSTGRADUATE MEDICAL CURRICULUM

M.D. ANATOMY

(2020 Onwards)

(As approved at the 30th Academic Council Meeting held on 28th September 2020)

Preface

Following the promulgation of the much awaited Competency Based Medical Education (CBME) for post graduate by the Medical Council of India (MCI) (superseded by the Board of Governors), adoption of CBME for implementing post-graduate programs is a welcome move. Sri Balaji Vidyapeeth (SBV), Puducherry, Deemed to be University, declared u/s 3 of the UGC Act. and accredited by the NAAC with A grade, takes immense privilege in preparing such an unique document in a comprehensive manner and most importantly the onus is on the Indian setting for the first time, with regard to the Competency Based Medical Education for post graduate programs that are being offered in the broad specialty departments. SBV is committed to making cardinal contributions that would be realised by exploring newer vistas. Thus, post graduate medical education in the country could be made to scale greater heights and SBV is poised to show the way in this direction.

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Preface

Following roll out of much awaited Competency-Based Medical Education (CBME) for undergraduate by the Medical Council of India (MCI)(superseded by the Board of Governors) , adoption of CBME for post-graduate by it is welcome move.

The MCI has laid down the syllabus course wise, listing competency to some extent, teaching learning methods and the assessment methods as well. The MCI describes competencies in three domains (knowledge, skill, and attitude). However, the most significant problem in competency-based training is the development of appropriate assessment tools.

The salient feature of this document is defining the program educational objectives (PEO) for its postgraduate program as a whole, defining program outcomes (PO) based on the competencies to be practiced by the specialist, course outcomes (CO) and program specific sub-competencies and their progression in the form of milestones. The compilation of the milestone description leads to the formation of the required syllabus. This allows the mentors to monitor the progress in sub-competency milestone levels. It also defines milestone in five levels, for each sub-competency. Although MCI has described three domains of competencies, the domain 'Attitude' is elaborated into 4 more competencies for ease of assessment. The six competency model (ACGME) for residency education: Medical Knowledge, Patient Care, Practice Based Learning and Improvement, Systems Based Practice, Professionalism, Inter personal and Communication Skills gives better clarity and in-depth explanation. The sub-competency and their milestone levels are mapped into the entrustable professional activities (EPA) that are specific to the individual postgraduate program. To make the program more relevant, PEO, PO, CO and EPAs are mapped with each other. EPA's which are activity based are used for formative assessment and graded. EPA assessment is based on workplace based assessment (WPBA), multisource feedback (MSF) and e-portfolio. A great emphasis is given on monitoring the progress in acquisition of knowledge, skill and attitude through various appraisal forms including e-portfolios during three years of residency period.



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Foreword

This course book on Anatomy has been prepared for Postgraduate MD students. The purpose of this document is to lay down the clear guidelines for a postgraduate training program in Anatomy. The broad goal of MD Anatomy course aims at providing comprehensive training to postgraduate students for teaching and research in medical Anatomy. The training during the MD course in Anatomy should be broad based, hence Medical Council of India has revised its MD Anatomy curricula to the new Competency Based Medical Education method of instruction (CBME) so that the students can master the competencies pertaining to the speciality. The Competency Based Medical Education is an outcome based training model that concentrates on equipping the postgraduate with knowledge, skills & attitudes that are relevant to the host community. It has also restructured the old teaching and assessment methods, repackaging the old courses and adding new ones to ensure acquisition of the desired competencies. The practical schedule is also revamped and modern topics in practical Anatomy is retained.

We sincerely thank our external experts for the productive Board of Studies meeting. We also express our deep gratitude and appreciation to Dean of Academics Dr.M.Ravishankar and Vice-Principal of curriculum Dr. Seethesh Ghose for their constant support and guidance. I owe my sincere thanks to my faculty members who contributed for the successful completion of the work book.

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I owe my sincere thanks to External experts who took part in Board of studies meeting held on 15/05/2020 for their guidance and valuable opinion.

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This document named postgraduate curriculum for the MD Anatomy has been prepared in the accordance with the document notified by Board of Governors in suppression of MCI <https://www.mciindia.org/CMS/information-desk/for-colleges/pg-curricula-2>. This document has been prepared by the Department of Anatomy, MGMCRI, Puducherry, ratified by the Board of Studies approved by Academic Council of Sri Balaji Vidyapeeth, a deemed to be university, accredited 'A' Grade by NAAC

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Sri Balaji University
Mahatma Gandhi Medical College & Research Institute
Department of Anatomy
(Post- Graduate Program)

1. 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 and 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 medical community and should be competent to handle all problems related to the speciality of Anatomy and recent advances in the subject. The post graduate student should also acquire skills in teaching anatomy to medical and paramedical 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.

2. Program Educational Objectives (PEO)

- PEO 1:** Specialist who has acquired the competencies pertaining to the subject of Anatomy that are required to be practiced at all levels of health system and has acquired skills in educating medical & paramedical professions
- PEO 2:** Leader and team member who understands health care system and act to provide safe patient care with accountability and responsibility
- PEO 3:** Communicator possessing adequate communication skill to convey required information in an appropriate manner in various health care setting.
- PEO 4:** Lifelong learner keen on updating oneself regarding the advancement in the health care field and able to perform the role of researcher and teacher
- PEO 5:** Professional who understands and follows the principles of bioethics/ethics related to health care system.

3. Program Outcome (PO)

After three years of residency program postgraduate should be able to

- PO 1:** Acquire in depth knowledge of gross anatomy, histology, embryology, neuroanatomy, genetics, surface anatomy, radiological anatomy, comparative anatomy, applied aspects and recent advances of the above mentioned branches of anatomy to clinical practice.
- PO 2:** Comprehend the principles underlying the structural organization of body and correlate with its function
- PO 3:** Should obtain the necessary skills in organizing/delivering lectures by using different methods of teaching learning & using innovations to make presentations of the subject topics and research outputs. Should also get involved in integrated teaching and e-learning activities.

- PO 4:** Demonstrates knowledge about human bones, surface marking of clinically important structures, identifying important structures visualised by imaging techniques.
- PO 5:** Demonstrates anatomical basis of common clinical procedures expected to be performed by a basic medical doctor & acquire skills of integrating anatomy with other disciplines.
- PO 6:** Should acquire mastery in dissection skills, embalming, museum preparation, tissue preparation, staining, karyotyping.
- PO 7:** Should acquire knowledge in the basic aspects of Biostatistics and research methodology & recent advances.
- PO 8:** Communicate effectively with peers, students & teachers from various medical and paramedical fields.
- PO 9:** Ability to use computer applications like Microsoft office to develop & execute a protocol for a scientific research project, collect and analyse the data and scientifically communicate to the others
- PO 10:** Demonstrates honest work ethics & empathetic behaviour with students & colleagues. Due respect in handling cadaver during dissection. Human touch while demonstrating living surface marking.

4. Course Outcomes (CO)

4.1 Course 1 (C1): Gross Anatomy

Objectives: At the end of three years post graduate student should be able to

- C1.1** Should demonstrate knowledge in teaching Gross Anatomy i.e. upper limb, lower limb, thorax, abdomen, pelvis, head and neck to medical & Paramedical professions
- C1.2** Possess knowledge about normal disposition of gross structure, and their interrelationship in the human body and correlate it with function.
- C1.3** Should demonstrate knowledge about outline of comparative anatomy of whole body and basic human evolution & also on anthropological traits.
- C1.4** Should also has knowledge on cross-sectional anatomy, radiological, surface anatomy, Osteology
- C1.5** Should obtain the necessary skills in organizing/delivering lectures by using different methods of teaching and learning including power point presentation & should get involved in the integrated teaching programmes and e learning activities
- C1.6** Communicate effectively with peers, students and teachers in various teaching learning activities. Develop communication skills by participating in journal clubs and seminars
- C1.7** Humans touch while demonstrating living surface marking in subject/patient & Due respect in handling human body parts and cadavers during dissection
- C1.8** Should acquire mastery in dissection skills and guide first year MBBS students to dissect, identify, and demonstrate important structures in the cadaver and correlate it with living anatomy, knowledge on embalming museum preparation, preservation of bones
- C1.9** Demonstrate anatomical basis of common clinical procedures expected to be performed by a medical doctor.
- C1.10** Should be aware of “Anatomy Act’ and guidelines required to undertake and perform

embalming procedures and should also be aware of body donation program.

4.2 Course 2 (C2): Embryology, microscopic anatomy and genetics

Objectives: At the end of three years post graduate student should be able to

- C2.1.** Describe the process of gametogenesis, fertilization, implantation and placenta formation in early human embryonic development along with its variation and applied anatomy.
- C2.2** 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.

Histology

- C2.3** Demonstrate knowledge about cell and its components, cell cycle, cellular differentiation and proliferation.
- C2.4** Should acquire and acquaint the knowledge of various types of microscopes their configuration and application. Should assist and guide in identification of general & systemic histology slides of various tissues and organs.
- C2.5** Should possess knowledge about immune system both primary and secondary lymphoid organs and cell types involved in defence mechanisms of the body
- C2.6** Preparation of common fixatives, tissue preparation and staining

Genetics

- C2.7** Should demonstrate knowledge about human chromosome regarding structure, number, classification, abnormalities and different genetic syndromes.
- C2.8** Demonstrate knowledge about single gene pattern inheritance, intermediate pattern and multiple alleles, mutations, non-mendelian inheritance, mitochondrial inheritance, genome imprinting and parental disomy.
- C2.9** Should describe multifactorial pattern of inheritance, teratology, molecular screening, cancer genetics and pharmacogenetics.
- C2.10** Demonstrate knowledge about reproduction genetics, assisted reproduction, prenatal diagnosis, genetic counselling and ethics in genetics & should possess knowledge on principles of gene therapy and its applied knowledge

4.3 Course 3 (C3): Neuroanatomy

Objectives: At the end of three years post graduate student should be able to

- C3.1.** Should possess knowledge about 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.
- C3.2.** Dissection of brain and spinal cord for teaching and learning purpose & Preparation of brain and spinal cord macroscopic and microscopic sections and identification of different parts in them.

4.4 Course 4 (C4): Applied Human Anatomy and recent advances in anatomical sciences.

Objectives: At the end of three years post graduate student should be able to

- C4.1** Demonstrate the ability to correlate the clinical conditions to the anatomical /hereditary factors and explain the anatomical basis for clinical problems.
- C4.2.** Should acquire knowledge in Biostatistics & research methodology.
- C4.3.** Should possess knowledge on recent advances in medical sciences & should be aware of contemporary advances and developments in the field of Anatomy.

Should possess knowledge on Collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies

The PEO, PO and the CO are mapped with each other.(Table 1)

Table1. Mapping of PEO, PO and CO

	PEO1				PEO2		PEO3	PEO4		PEO5
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
C1	Y	Y	Y	Y	Y	Y		Y	Y	Y
C2	Y	Y	Y		Y	Y		Y	Y	Y
C3	Y	Y	Y	Y	Y	Y		Y	Y	Y
C4	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

All courses run concurrently for 3 years with a summative assessment at the end of 3 years. The program is competency based and the competencies, sub-competencies and milestones are detailed. These are mapped to the Entrustable professional activities (EPA) identified as essential for a specialist. Formative assessment is carried out every three months using appropriate tools, for identifying eligibility for transfer of trust.

5. Competencies, Sub-Competencies and Milestone

At the end of the MD course in Anatomy, the student should have acquired various competencies i.e. medical knowledge, patient care, interpersonal communication skill, system based practice, practice based learning & implementation and professionalism. Details of each with milestone as level is described below.

Table 2. Description of Competencies, Sub-competencies and Milestone

Medical Knowledge (MK):	Demonstrate	Level 1	Level 2	Level 3	Level 4	Level 5
<ul style="list-style-type: none"> MK1: Knowledge of gross anatomy of entire human body upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, and brain. 	<ul style="list-style-type: none"> Demonstrate the ability to identify important structures visualised by imaging techniques, specifically radiographs, computerised tomography (CT) scans, MRI and ultrasonography. Demonstrate ability to locate and identify clinically relevant structures in dissected cadavers. 	<ul style="list-style-type: none"> Demonstrates an understanding of normal disposition of gross structure, and their interrelationships in the human body and correlate with its functions. 	<ul style="list-style-type: none"> Demonstrates the ability to have acquired in-depth knowledge in gross anatomy and get involved in teaching gross anatomy to medical and paramedical professionals by dissecting cadavers. 	<ul style="list-style-type: none"> Demonstrate the ability to dissect brain and spinal cord. 	<ul style="list-style-type: none"> Demonstrate different methods of teaching and learning 	<ul style="list-style-type: none"> Has acquired qualities of a good teacher capable of using innovations in teaching gross anatomy. Should obtain the skills in delivering lectures in gross anatomy, using power point presentation and other teaching aids.

		<ul style="list-style-type: none"> • Demonstrate ability to identify, locate and demonstrate surface marking of clinically important structures in the cadaver and correlate it with living anatomy. • Demonstrate ability to identify human bones, determination of age, sex and height for medico legal application of anatomy. 	<ul style="list-style-type: none"> • Demonstrates the ability to do window dissection of important regions. 	<ul style="list-style-type: none"> • Demonstrate the procedure for procurement, embalming and preservation of human cadavers. • Demonstrate the procedure for preparation and preservation of human bones 	<ul style="list-style-type: none"> • And make presentations of the subject topic. 	<ul style="list-style-type: none"> • Demonstrates mastery in dissection skills, embalming, • Museum technique. • Demonstrate knowledge about outline of comparative anatomy of whole body and basic human evolution. • Demonstrate knowledge about different anthropological traits and use of related instruments.
			<ul style="list-style-type: none"> • Demonstrate the procedure for procurement, embalming and preservation of human cadavers. 	<ul style="list-style-type: none"> • Plan and conduct evaluation of undergraduate teaching • Demonstrate the procedure for preparation of specimens for museum with display • Soft parts • Models • charts 		

	<p>MIK 2 Knowledge of microscopic structure of various organs and tissues</p>	<ul style="list-style-type: none"> • Demonstrate knowledge about cell and its components ,cell cycle, cellular differentiation, and proliferation • Demonstrate the ability to explain the principles of 14 light, transmission and scanning, compound, electron, fluorescent and virtual microscopy. 	<ul style="list-style-type: none"> • Demonstrate in-depth knowledge of microscopic structure of various organs and tissues. • Demonstrate the procedure for preparation of common fixatives like 10% formalin, Bouin's fluid etc. 	<ul style="list-style-type: none"> • Educates medical and paramedical professionals regarding microscopic structure of various tissues and organs by involving in small group teaching. • Demonstrate ability to make paraffin blocks, section cutting and mounting, H&E staining. 	<ul style="list-style-type: none"> • Plan and implement teaching microscopic structure of various organs and tissues for undergraduate medical and paramedical professionals by using different teaching learning methods. • Demonstrate making celloidin, araldite,,gelatine blocks and their section cutting. • Preparation of ground sections of calcified bones. 	<ul style="list-style-type: none"> • Demonstrate ability to obtain the skills in delivering lectures in histology, using power point presentation and other teaching aids. • Demonstrate mastery in frozen section cutting on freezing microtome and cryostat. • Demonstrate mastery in Honing and stropping of microtome knives, including sharpening by automatic knife sharpener. • Completion of histology file in which microscopic pictures of all organs and tissues of the body should be drawn and a small description of salient features written.
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						<ul style="list-style-type: none"> Mastery in histo-chemical method like staining of glycogen, mucopolysaccharides alkaline phosphatase, acid phosphatase
	<p>MIK3- Knowledge about the sequential development of organs and systems of the body.</p>	<ul style="list-style-type: none"> Demonstrate knowledge about the process of gametogenesis, fertilization, implantation, and placental development along with its variation and applied anatomy. 	<ul style="list-style-type: none"> Demonstrate knowledge about the effects of teratogens, genetic mutations and environmental hazards. 	<ul style="list-style-type: none"> Demonstrate in-depth knowledge of development of organs and systems. Ability to explain developmental basis of variations and congenital anomalies. 	<ul style="list-style-type: none"> Educates medical and paramedical professionals regarding embryology models by small group teaching. 	<ul style="list-style-type: none"> Applies innovative approaches to take lecture classes in embryology.

	<p>MK 4 Knowledge about structure, number, classification and chromosome abnormalities. Also should have knowledge on Immunology</p>	<ul style="list-style-type: none"> • Demonstrates knowledge about structure, number, and classification of chromosomes. • Demonstrates knowledge on cell types involved in the defence mechanism. • Knowledge on preparation of media, different solutions, stains etc. 	<ul style="list-style-type: none"> • Demonstrates knowledge of chromosomal abnormalities like autosomal and sex chromosomal abnormalities syndrome • Knowledge on gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs. • Knowledge on Preparation of buccal smear for sex chromatin 	<ul style="list-style-type: none"> • Demonstrates knowledge on single gene pattern inheritance: autosomal and sex chromosomal pattern of inheritance, intermediate pattern and multiple alleles, mutations, genome imprinting. • Knowledge on Banding techniques (G and C) • Knowledge on biological and clinical significance of the major histocompatibility complex of man including its role in transplantation. 	<ul style="list-style-type: none"> • Demonstrates knowledge on multifactorial pattern of inheritance, teratology, molecular screening, cancer genetics-haematological malignancies, pharmacogenetics. • Knowledge of making pedigree charts for study of patterns of inheritance. • Knowledge on common techniques employed in cellular immunology and histocompatibility testing 	<ul style="list-style-type: none"> • Demonstrates knowledge on Reproductive genetics- male and female infertility, abortions, assisted reproduction, prenatal diagnosis, genetic counselling, and ethics of genetics. • Knowledge on chromosomal analysis- human chromosome preparation from peripheral blood and karyotyping. • Knowledge on molecular hybridisation and PCR technology in immunology.
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	<p>MK5 Knowledge on applied anatomy and recent advances.</p>	<ul style="list-style-type: none"> • Demonstrate knowledge of clinical correlations of structure and functions of human body. Anatomical basis and explanations for clinical problems. 	<ul style="list-style-type: none"> • Analyze the applications of knowledge of development, gross anatomy, microscopic anatomy, neuroanatomy to comprehend deviations from normal 	<ul style="list-style-type: none"> • Demonstrate the skills of integrating anatomy with other disciplines as and when needed 	<ul style="list-style-type: none"> • Demonstrates knowledge on recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving. 	<ul style="list-style-type: none"> • Knowledge on collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies. • Knowledge on principles of research methodology.
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Patient Care (PC)	Provide patient-centered care that is compassionate, appropriate, and effective for the treatment of health problems and the promotion of health)	Perform diagnostic and surgical procedures considered essential for the area of practice.	Level 1	<ul style="list-style-type: none"> • Demonstrates anatomical basis of common clinical procedures expected to be performed by a basic medical doctor. 	Level 2	<ul style="list-style-type: none"> • Performs basic procedures like preparation of buccal smear for sex chromatin in various chromosomal disorders 	<ul style="list-style-type: none"> • Demonstrates a comprehensive understanding of making of pedigree charts to study patterns of inheritance for genetic counselling 	Level 3	Level 4	Level 5	<ul style="list-style-type: none"> • Perform diagnostic procedures like molecular hybridization and PCR technology in immunology research. • Able to discharge responsibilities and participate in National Health Education Program.
PC1											

<p>Interpersonal Communication Skills (ICS)</p>	<p>Demonstrate interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and health professionals</p>	<p>Level 1</p> <ul style="list-style-type: none"> • Demonstrates adequate listening skills • Uses appropriate and easy –to-understand language in all phases of communication 	<p>Level 2</p> <ul style="list-style-type: none"> • Communicates effectively with students, teachers and colleagues from various medical and paramedical fields 	<p>Level 3</p> <ul style="list-style-type: none"> • Communicate effectively with colleagues within specialty, other health professionals, and health-related agencies leading to team work. 	<p>Level 4</p> <ul style="list-style-type: none"> • Understands the importance of relationships development, information gathering and sharing, and team work 	<p>Level 5</p> <ul style="list-style-type: none"> • Capable of communication in the most challenging situations, and invites participation from all stakeholders • Role model in effective communication to junior colleagues. • Applies innovative approaches for leading the team • Works effectively in inter professional and interdisciplinary health care teams
<p>ICS 1</p>						

<p>System Based Practice (SBP)</p>	<p>Demonstrate the ability to follow the standard operating procedures relevant to practices of the organisations for patient care .</p>	<p>Level 1</p>	<p>Level 2</p>	<p>Level 3</p>	<p>Level 4</p>	<p>Level 5</p>
<p>SBP1</p>	<p>Participates in departmental and institutional quality improvement activities</p>	<ul style="list-style-type: none"> Recognizes limitations and failures of a team approach in teaching and learning activities 	<ul style="list-style-type: none"> Demonstrates knowledge of institutional surveillance systems in voluntary body donation programme. 	<ul style="list-style-type: none"> Participates in team drills Demonstrates knowledge of general principles of Anatomy and Organ transplantation 	<ul style="list-style-type: none"> Reports errors and near-misses to the institutional surveillance system and superiors. 	<ul style="list-style-type: none"> Contributes to peer-reviewed medical literature. Comprehend ethical aspects of biomedical research. Comprehend the basis of disposal of biomedical waste.

<p>Practice-based Learning and Improvement (PBL):</p>	<p>Demonstrate the commitment to learn by practice and improve upon their ability.</p>	<p>Level 1</p>	<p>Level 2</p>	<p>Level 3</p>	<p>Level 4</p>	<p>Level 5</p>
<p>PBL 1</p>	<p>Self-directed Learning/Critical Appraisal of Medical Literature</p>	<ul style="list-style-type: none"> Demonstrates an understanding of critical appraisal of the literature Demonstrates responsiveness to constructive feedback 	<ul style="list-style-type: none"> Identifies resources (e.g., texts, search engines) to answer questions in teaching learning activities. Recognizes limits of knowledge, expertise, and technical skills Describes commonly used study designs (e.g., randomized trial [RCT], cohort; case-control, cross-sectional) 	<ul style="list-style-type: none"> Applies appropriate evidence-based information from review articles or guidelines on common topics in practice Critically reviews and interprets the literature with the ability to identify study aims, hypotheses, design, and biases 	<ul style="list-style-type: none"> Reads and assesses strength of evidence in current literature and applies it to one's own practice Analyzes his or her own outcomes as compared to national standards 	<ul style="list-style-type: none"> Designs a hypothesis-driven or hypothesis-generating study Contributes to peer-reviewed medical literature
<p>PBL 2</p>	<p>Systematically analyze practice using quality improvement methods and implement changes with the goal of practice improvement</p>	<ul style="list-style-type: none"> Shows commitment to self-evaluation, lifelong learning, and learning principles of embalming 	<ul style="list-style-type: none"> Demonstrates understanding of the basic concepts of techniques of embalming Reads appropriate information, as assigned by the standard operating procedure 	<ul style="list-style-type: none"> References and utilizes standard operating procedures of embalming techniques 	<ul style="list-style-type: none"> Participates in departmental or institutional committees 	<ul style="list-style-type: none"> Analyzes departmental or institutional outcomes Contributes to peer-reviewed medical literature Organizes and leads effective institutional QI/patient safety projects

Professionalism(P)	Demonstrate a commitment to carrying out professional responsibilities and an adherence to ethical principles	Compassion, Integrity, and Respect for Others	Level 1	Level 2	Level 3	Level 4	Level 5
	<ul style="list-style-type: none"> Understands the importance of compassion, integrity, and respect for others Demonstrates sensitivity and responsiveness to students. 	<ul style="list-style-type: none"> Consistently shows compassion, integrity, and respect in typical situations with students, peers, and teachers. Consistently demonstrates sensitivity and responsiveness to diversity of students ages, cultures, races, religions, abilities, or sexual orientations Accepts constructive feedback to improve his or her ability to demonstrate compassion, integrity, and respect for others 	<ul style="list-style-type: none"> Consistently shows compassion, integrity, and respect for students who are slow at learning and for members in circumstances of conflict or high stress and modifies one's own behaviour based on feedback to improve his or her ability to demonstrate compassion, integrity, and respect for others 	<ul style="list-style-type: none"> Consistently models compassion, integrity, and respect for others Coaches others to improve compassion, integrity, and respect for peers, students and teachers. 	<ul style="list-style-type: none"> Assumes long-term or leadership role in activities engaged in teaching and research. Develop empathetic behaviour and honest work ethics with students and colleagues. 		

P 1

P2	<p>Accountability and Responsiveness to the Needs of students, Society, and the Profession</p>	<ul style="list-style-type: none"> Understands that physicians are accountable to patients, society, and the profession Acts with honesty and truthfulness 	<ul style="list-style-type: none"> Consistently punctual for practical assignments and responsive to requests for assistance. 	<ul style="list-style-type: none"> Serves as an example for others in punctuality, responsiveness, and timely completion of duties 	<ul style="list-style-type: none"> Coaches to improve punctuality and responsiveness; offers assistance to ensure students teaching learning activities are completed in a timely fashion 	<ul style="list-style-type: none"> Participates in institutional or community peer counseling related to professionalism Acquire capacity of not letting his/her personal beliefs, prejudices and limitations come in the way of duty.
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6. Syllabus

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

6.1 Gross Anatomy:

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

6.2 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.

6.3 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.

6.4 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.

6.5 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, Pre-implantation genetics, prenatal diagnosis, Genetic Counselling and Ethics of Genetics.
- Principles of Gene therapy and its applied knowledge.

6.6 Immunology:

- Immune system and the cell types involved in defence 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.

6.7 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.

6.8 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, cholecystography, pyelography, salpingography. Normal CT Scan, MRI and Ultrasound.

6.9 Anthropology:

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

6.10 Forensic Medicine:

- Identification of human bones from their remains and determination of sex, age, and height. For medico legal application of Anatomy.
- **Outline of comparative anatomy of the whole body and basic human evolution**

7. 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. 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 specialties/super specialties 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/sent for 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.

Month	1st Mon	2nd Mon	3rd Mon	4th Mon	5th Mon	6th Mon	7th Mon	8th Mon	9th Mon	10th Mon	11th Mon	12th Mon
I-Year	General Anatomy, General Histology, General Embryology, Introduction Genetics			Upper Limb, Lower Limb, Related Embryology, Histology, Osteology			Thorax, Related Embryology, Histology, Osteology			Abdomen, Related Embryology, Histology, Osteology		
II-Year	Abdomen, Related Embryology, Histology, Osteology			Pelvis, Related Embryology, Histology, Osteology			Head & Neck, Related Embryology, Histology, Osteology					
III-Year	Neuroanatomy						Preparation for University Examination					

Rotations:

- Details of 3 years posting in the PG programme

Year	1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month	7th Month	8th Month	9th Month	10th Month	11th Month	12th Month
1st year	D	D	D	D	H	H	H	H	G	G	G	G
2nd year	F	F	P	P	M	M	D	D	D	D	D	D
3rd year	H	H	H	H	H	H	D	D	D	D	D	D

D – Dissection hall, **H**-Histology lab, **G**- Genetic lab, **F**- Forensic medicine, **P**-Pathology,

M-Museum

Allied posting should be done during the course :

- Radiology - 2 Months
- Obstetrics - 2 Months
- Paediatric surgery - 1 Month
- Surgery - 2 Months

Suggestions made by Board of studies members - Elective posting either in Immunohistochemistry or radiology as 30 hours module.

Entrusted Professional Activities:

EPAs are listed as below (Table 3) with description of each EPA (Table 4). Progress of the students is recorded after discussion with the student in Entrustable Professional Activity (EPA) assessment form Annexure-1. These EPAs are also mapped with PO and CO. (Table 5)

7.1. Table 3. List of Entrustable Professional Activity

EPA No.	Entrustable Professional Activity
GROSS ANATOMY	
1	Identify and describe the gross structures in various regions of the human body
2	Perform gross and fine dissection in all regions of the body and the viscera and demonstrate to students
3	Teach, demonstrate and assess the students
HISTOLOGY, HISTOTECHNIQUES AND EMBALMING	
4	Prepare and demonstrate and illustrate the histology slides of various tissues
5	Perform embalming technique of adult cadavers and fetus
6	Acquire administrative skills to set up Histology lab/museum/Embalming lab for helping in the process of learning anatomy
EMBRYOLOGY AND GENETICS	
7	Understand the basic embryology and teach the students by making models and charts
8	Acquire administrative skills to set up Genetic lab for helping in the process of learning genetics
9	Perform basic techniques in genetics
NEUROANATOMY	
10	Perform gross sections of different regions of brain and spinal cord and correlate with its relations, applied aspects and demonstrate to students
APPLIED ANATOMY, RECENT ADVANCES, MEDICAL EDUCATION	
11	Assist and help the clinicians in updating and reinforcing their basic anatomical knowledge
12	Interact with the clinical departments and demonstrate the basic anatomical knowledge to the postgraduates by dissection
13	Should be able to serve the community as competent anatomists by imparting basic anatomical knowledge to the common health problems

Table: 4 Description of Entrustable Professional Activity with relevant domains of competence, domain critical behaviour

EPA 1: Identify and describe the gross structures in various regions of the human body	
1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to identify and describe the gross structure of entire human body including the upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, and brain. Demonstrate ability to locate, identify and describe clinically relevant structures in dissected cadavers. Demonstrate ability to identify, locate and demonstrate surface marking of clinically important structures in the cadaver and correlate it with living anatomy.
2. Most relevant domains of competence:	MK, P
3. Competencies within each domain critical to entrustment decisions:	MK1 P1

4. Methods of assessment	<ol style="list-style-type: none"> 1. Periodic written exam (Every 3 months) 2. Dissection hall assessment by Faculty 3. Multisource feedback <ol style="list-style-type: none"> a. Students b. Faculty
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Competency	Pre-Entrustable	Entrustable
MK 1	<p>Lack of knowledge to demonstrate and identify clinically relevant structures in dissected cadavers.</p> <p>Failed to identify, locate and demonstrate surface marking of clinically important structures in the cadaver and correlate it with living anatomy.</p> <p>Unable to identify human bones, determination of age, sex and height for medicolegal application of anatomy.</p> <p>Unable to identify fine and deep structures in the cavities and head and neck region</p>	<p>Demonstrate and explain the knowledge of identifying clinically relevant structures in dissected cadavers.</p> <p>Able to identify, locate and demonstrate surface marking of clinically important structures in the cadaver and correlate it with living anatomy.</p> <p>Able to identify human bones, determination of age, sex and height for medicolegal application of anatomy.</p> <p>Able to identify fine and deep structures in the cavities and head and neck region</p>
P1	Failed to assume long-term or leadership role in activities engaged in teaching and research.	Assumes long-term or leadership role in activities engaged in teaching and research.

EPA 2: Perform gross and fine dissection in all regions of the body and the viscera and demonstrate to students	
1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to perform gross and fine dissection in all regions of the body and the viscera and hereby demonstrate to students.
2. Most relevant domains of competence:	MK, ICS, P
3. Competencies within each domain critical to entrustment decisions:	MK1 ICS1 P1
4. Methods of assessment	<ol style="list-style-type: none"> 1. Practical examination (every 3 months) 2. Dissection hall assessment by Faculty 3. Multisource feedback <ol style="list-style-type: none"> a. students b. Faculty

Competency	Pre-Entrustable	Entrustable
MK 1	<p>Failed to demonstrate an understanding of normal disposition of gross structure, and their interrelationship in the human body and correlate with its functions.</p> <p>Demonstrates ability to get involved in small group teaching session- teaching of bones, radiology, and surface marking.</p> <p>Inability to demonstrate the ability to do window dissection of important regions.</p> <p>Failed to demonstrate the ability to have acquired in-depth knowledge in gross anatomy and get involved in teaching gross anatomy to medical and paramedical professionals by dissecting cadavers.</p> <p>Difficulty in demonstrating dissection of brain and spinal cord.</p>	<p>Demonstrates an understanding of normal disposition of gross structure, and their interrelationship in the human body and correlate with its functions.</p> <p>Demonstrates ability to get involved in small group teaching session- teaching of bones, radiology, and surface marking.</p> <p>Able to demonstrate the ability to do window dissection of important regions.</p> <p>Demonstrates the ability to have acquired in-depth knowledge in gross anatomy and get involved in teaching gross anatomy to medical and paramedical professionals by dissecting cadavers.</p> <p>Effectively demonstrating dissection of brain and spinal cord.</p>
ICS1	Unable to communicate effectively with students while demonstrating the structures	Able to communicate effectively with students while demonstrating the structures
P 1	<p>Failed to acquire qualities of a good teacher capable of using innovations in teaching gross anatomy.</p> <p>Unable to obtain the skills in delivering lectures in gross anatomy</p>	<p>Acquiring qualities of a good teacher capable of using innovations in teaching gross anatomy.</p> <p>Unable to obtain the skills in delivering lectures in gross anatomy</p>

EPA 3: Teach, demonstrate and assess the students

1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to effectively teach using the audio-visual aids, dissect and demonstrate to the students in dissection. Assessing the students' performance by written and practical examinations.
2. Most relevant domains of competence:	MK1, ICS1, P1
3. Competencies within each domain critical to entrustment decisions:	MK1 ICS1 P1
4. Methods of assessment	1. Pedagogy (Every 6 months) 2. Workplace assessment by Faculty 3. Multisource feedback a. Students b. Peers

Competency	Pre-Entrustable	Entrustable
MK 1	Inability to get involved in small group teaching session- teaching of bones, radiology, surface marking. Inability to do window dissection of important regions. Failed to demonstrate the ability to have acquired in-depth knowledge in gross anatomy and get involved in teaching gross anatomy to medical and paramedical professionals by dissecting cadavers.	Demonstrates ability to get involved in small group teaching session- teaching of bones, radiology, surface marking. Demonstrates the ability to do window dissection of important regions. Demonstrates the ability to have acquired in-depth knowledge in gross anatomy and get involved in teaching gross anatomy to medical and paramedical professionals by dissecting cadavers.
ICS1	Failed to demonstrate adequate listening skills Failed to use appropriate and easy –to-understand language in all phases of communication	Demonstrates adequate listening skills Uses appropriate and easy –to-understand language in all phases of communication
P 1	Unable to acquire qualities of a good teacher capable of using innovations in teaching gross anatomy. Inability to obtain the skills in delivering lectures in gross anatomy, using power point presentation and other teaching aids.	Has acquired qualities of a good teacher capable of using innovations in teaching gross anatomy. Should obtain the skills in delivering lectures in gross anatomy, using power point presentation and other teaching aids.

EPA 4: Prepare, demonstrate and illustrate histology slides of various tissues	
1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to prepare the slides with the techniques framed. They should be able to demonstrate the identification of the slide and show the students how to draw a neat labelled diagram
2. Most relevant domains of competence:	MK, ICS, P
3. Competencies within each domain critical to entrustment decisions:	MK2 ICS
4. Methods of assessment	1. Pedagogy (Every 3 months) 2. Seminars 3. Workplace assessment by Faculty 4. 4. Multisource feedback a. students b. Peers

Competency	Pre-Entrustable	Entrustable
MK 2	<p>Failed to demonstrate knowledge about cell and its components, cell cycle, cellular differentiation, and proliferation</p> <p>Failed to demonstrate the ability to explain the principles of light, transmission and scanning, compound, electron, fluorescent and virtual microscopy.</p> <p>Inability to demonstrate in-depth knowledge of microscopic structure of various organs and tissues.</p> <p>Lack of knowledge to demonstrate the procedure for preparation of common fixatives like 10% formalin, Bouin's fluid etc. Educates medical and paramedical professionals regarding microscopic structure of various tissues and organs by involving in small group teaching.</p> <p>Failed to demonstrate ability to make paraffin blocks, section cutting and mounting, H&E staining.</p>	<p>Demonstrate knowledge about cell and its components, cell cycle, cellular differentiation, and proliferation</p> <p>Demonstrate the ability to explain the principles of light, transmission and scanning, compound, electron, fluorescent and virtual microscopy.</p> <p>Demonstrate in-depth knowledge of microscopic structure of various organs and tissues.</p> <p>Demonstrate the procedure for preparation of common fixatives like 10% formalin, Bouin's fluid etc. Educates medical and paramedical professionals regarding microscopic structure of various tissues and organs by involving in small group teaching.</p> <p>Demonstrate ability to make paraffin blocks, section cutting and mounting, H&E staining.</p> <p>Demonstrate mastery in Frozen section cutting on freezing microtome and cryostat.</p>
	<p>Demonstrate mastery in Frozen section cutting on freezing microtome and cryostat. Inability to demonstrate mastery in Honing and stropping of microtome knives, including sharpening by automatic knife sharpener.</p> <p>Inability to complete the histology file in which microscopic pictures of all organs and tissues of the body should be drawn and a small description of salient features written. Mastery in histochemical method like staining of glycogen, mucopolysaccharides alkaline phosphatase, acid phosphatase</p>	<p>Demonstrate mastery in Honing and stropping of microtome knives, including sharpening by automatic knife sharpener. Completion of histology file in which microscopic pictures of all organs and tissues of the body should be drawn and a small description of salient features written.</p> <p>Mastery in histochemical method like staining of glycogen, mucopolysaccharides alkaline phosphatase, acid phosphatase</p>
ICS2	<p>Failed to plan and implement teaching microscopic structure of various organs and tissues for undergraduate medical and paramedical professionals by using different teaching learning methods.</p> <p>Failed to Demonstrate ability to obtain the skills in delivering lectures in histology, using power point presentation and other teaching aids.</p>	<p>Plan and implement teaching microscopic structure of various organs and tissues for undergraduate medical and paramedical professionals by using different teaching learning methods.</p> <p>Demonstrate ability to obtain the skills in delivering lectures in histology, using power point presentation and other teaching aids.</p>

EPA 5: Perform embalming technique of adult cadavers and fetus

1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able perform embalming procedure of the voluntary dead body received by MOKSHA, voluntary body donation program, service available in the anatomy department. Also should be able to perform embalming technique in foetuses received from the college.
2. Most relevant domains of competence:	MK, PBL, P
3. Competencies within each domain critical to entrustment decisions:	MK1 PBL2 P2
4. Methods of assessment	1. Practical demonstration (Every 6 months) 2. Workplace assessment by Faculty 3. Multisource feedback a. Health care workers b. Peers

Competency	Pre-Entrustable	Entrustable
MK 1	Failed to demonstrate the procedure for procurement, embalming and preservation of human cadavers. Failed to demonstrates mastery in dissection skills, embalming, museum techniques	Demonstrate the procedure for procurement, embalming and preservation of human cadavers. Demonstrates mastery in dissection skills, embalming, museum techniques
PBL2	Failed to Demonstrates understanding of the basic concepts of techniques of embalming Inability to Reads appropriate information, as assigned by the standard operating procedure Lack of References and utilizes standard operating procedures of embalming techniques	Demonstrates understanding of the basic concepts of techniques of embalming Reads appropriate information, as assigned by the standard operating procedure References and utilizes standard operating procedures of embalming techniques

P 2	<p>Lack of Responsiveness and practice to the Needs of embalming techniques</p> <p>Understands the process of embalming technique according to the standard operating protocol</p> <p>Inability to guide the health workers in proper preparation of donated bodies for embalming</p> <p>Coaches the embalming technician and helping him in preparation of embalming fluid</p> <p>Lack of knowledge to follow the guidelines and coaches in proper care and sanctity of the embalming cadavers</p> <p>Inability to participates in institutional or community peer counselling related to professionalism</p>	<p>Responsiveness and practice to the Needs of embalming techniques</p> <p>Understands the process of embalming technique according to the standard operating protocol</p> <p>Guide the health workers in proper preparation of donated bodies for embalming</p> <p>Coaches the embalming technician and helping him in preparation of embalming fluid</p> <p>Follow the guidelines and coaches in proper care and sanctity of the embalming cadavers</p> <p>Participates in institutional or community peer counselling related to professionalism</p>
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EPA 6: Acquire administrative skills to set up Histology lab/museum/Embalming lab for helping in the process of learning anatomy

1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to acquire administrative skills to set up Histology lab/museum/Embalming lab for helping in the process of learning anatomy
2. Most relevant domains of competence:	MK, ICS, P
3. Competencies within each domain critical to entrustment decisions:	MK1 ICS1 P2
4. Methods of assessment	<ol style="list-style-type: none"> 1. Practical examination 2. Workplace assessment by Faculty 3. Multisource feedback <ol style="list-style-type: none"> a. Health care workers

Competency	Pre-Entrustable	Entrustable
MK 1	<p>Inability to prepare and guide the equipment's needed for setting up of Histology Lab</p> <p>Inability to Demonstrate the procedure for preparation of tanks for preserving bodies for the purpose of setting embalming room</p> <p>Inability to Demonstrate the procedure for preparation of specimens for museum with display</p> <ol style="list-style-type: none"> a) Soft parts b) Models c) charts <p>for museum lab preparation</p>	<p>Demonstrate the procedure for procurement, embalming and preservation of human cadavers.</p> <p>Demonstrate the procedure for preparation of tanks for preserving bodies</p> <p>Demonstrate the procedure for preparation of specimens for museum with display</p> <ol style="list-style-type: none"> d) Soft parts e) Models f) charts

ICS1	<p>Lack to Communicates effectively with students, teachers and colleagues from various medical and paramedical fields</p> <p>Inability to Communicate effectively with colleagues within specialty, other health professionals, and health-related agencies leading to setting up of Histology lab.</p> <p>Inability to Understands the importance of relationship development, information gathering and sharing, and team work</p>	<p>Communicates effectively with students, teachers and colleagues from various medical and paramedical fields</p> <p>Communicate effectively with colleagues within specialty, other health professionals, and health-related agencies leading to setting up of Histology lab.</p> <p>Understands the importance of relationship development, information gathering and sharing, and team work</p>
P 2	<p>Fail to Capable of communication in the most challenging situations, and invites participation from all stakeholders</p> <p>Fails to Role model in effective communication to junior colleagues.</p> <p>Inability to Apply innovative approaches for leading the team</p> <p>Inability to Works effectively in inter professional and interdisciplinary health care teams</p>	<p>Capable of communication in the most challenging situations, and invites participation from all stakeholders</p> <p>Role model in effective communication to junior colleagues.</p> <p>Applies innovative approaches for leading the team</p> <p>Works effectively in inter professional and interdisciplinary health care teams</p>

EPA 7: Understand the basic embryology and teach the students by making models and charts	
1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to understand the basic embryology and teach the students by making models and charts
2. Most relevant domains of competence:	MK, ICS,
3. Competencies within each domain critical to entrustment decisions:	MK3 ICS2
4. Methods of assessment	<ol style="list-style-type: none"> 1. Written exam (Every 3 months) 2. Practical examination 3. Workplace assessment by Faculty 4. Multisource feedback <ol style="list-style-type: none"> a. students b. faculty c. Peers

Competency	Pre-Entrustable	Entrustable
MK 3	<p>Fail to Demonstrate knowledge about the Process of gametogenesis, fertilization, implantation, and placenta along with its variation and applied anatomy.</p> <p>Failed to Demonstrate knowledge about the effects of teratogens, genetic mutations and environmental hazards Demonstrate indepth knowledge of development of organs and systems.</p> <p>Inability to explain developmental basis of variations and congenital anomalies.</p> <p>Inability to Educates medical and paramedical professionals regarding embryology</p> <p>Models by small group teaching.</p> <p>Fail to Applies innovative approaches to take lecture classes in embryology.</p>	<p>Demonstrate knowledge about the Process of gametogenesis, fertilization, implantation, and placenta along with its variation and applied anatomy.</p> <p>Demonstrate knowledge about the effects of terratogens, genetic mutations and environmental hazards Demonstrate in-depth knowledge of development of organs and systems.</p> <p>Ability to explain developmental basis of variations and congenital anomalies.</p> <p>Educates medical and paramedical professionals regarding embryology</p> <p>Models by small group teaching.</p> <p>Applies innovative approaches to take lecture classes in embryology.</p>
ICS2	Inability to communicate to students for making models and charts	Ability to communicate to students for making models and charts

EPA 8: Acquire administrative skills to set up Genetic lab for helping in the process of learning genetics

1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to acquire administrative skills to set up Genetic lab for helping in the process of learning genetics
2. Most relevant domains of competence:	MK, ICS, P
3. Competencies within each domain critical to entrustment decisions:	MK4 ICS P
4. Methods of assessment	<ol style="list-style-type: none"> 1. Practical examination (Every 6 months) 2. Workplace assessment by Faculty 3. Multisource feedback <ol style="list-style-type: none"> a. Health care workers b. Peers

Competency	Pre-Entrustable	Entrustable
MK 1	<p>Inability to prepare and guide the equipments needed for setting up of Genetic lab</p> <p>Inability to explain the procedure and guidelines in setting up of genetic lab</p>	<p>Inability to prepare and guide the equipments needed for setting up of Genetic lab</p> <p>Inability to explain the procedure and guidelines in setting up of genetic lab</p>

ICS1	<p>Lack to Communicates effectively with colleagues from various medical and paramedical fields</p> <p>Inability to Communicate effectively with colleagues within specialty, other health professionals, and health-related agencies leading to setting up of Genetic lab</p> <p>Inability to Understands the importance of relationship development, information gathering and sharing, and team work</p>	<p>Communicates effectively with colleagues from various medical and paramedical fields</p> <p>Communicate effectively with colleagues within specialty, other health professionals, and health-related agencies leading to setting up of Genetic lab</p> <p>Understands the importance of relationship development, information gathering and sharing, and team work</p>
P 2	<p>Fail to Capable of communication in the most challenging situations, and invites participation from all stakeholders</p> <p>Fails to Role model in effective communication to junior colleagues.</p> <p>Inability to Apply innovative approaches for leading the team</p> <p>Inability to Works effectively in inter professional and interdisciplinary health care teams</p>	<p>Capable of communication in the most challenging situations, and invites participation from all stakeholders</p> <p>Role model in effective communication to junior colleagues.</p> <p>Applies innovative approaches for leading the team</p> <p>Works effectively in inter professional and interdisciplinary health care teams</p>

EPA 9: Perform basic techniques in genetics	
1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to perform basic techniques in genetics routinely requested in the clinics. Able to interpret the basic genetic techniques like karyotyping and PCR. Knowledge about structure, number, classification and chromosome abnormalities. Also should have knowledge on Immunology
2. Most relevant domains of competence:	MK, PC, P
3. Competencies within each domain critical to entrustment decisions:	MK4 PC1
4. Methods of assessment	<ol style="list-style-type: none"> 1. Written exam (Every 6 months) 2. Practical assessment 3. Workplace assessment by Faculty 4. Multisource feedback <ol style="list-style-type: none"> a. Health care workers

Competency	Pre-Entrustable	Entrustable
MK 1	<p>Failed to Demonstrates knowledge about structure, number, and classification of chromosomes.</p> <p>Demonstrates knowledge on cell types involved in the defence mechanism.</p> <p>Knowledge on preparation of media, different solutions, stains etc.</p> <p>Inability to Demonstrates knowledge of chromosomal abnormalities like autosomal and sex chromosomal abnormalities syndrome</p> <p>Lack of Knowledge on gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs.</p> <p>Knowledge on Preparation of baccal smear for sex chromatin</p> <p>Inability to Demonstrates knowledge on single gene pattern inheritance: autosomal and sex chromosomal pattern of inheritance , intermediate pattern and multiple alleles, mutations, genome imprinting.</p> <p>Lack of Knowledge on Banding techniques (G and C)</p> <p>Knowledge on biological and clinical significance of the major histocompatibility complex of man including its role in transplantation.</p> <p>Inability to Demonstrates knowledge on multifactorial pattern of inheritance, teratology, molecular screening, cancer genetics- haematological malignancies, pharmacogenetics.</p> <p>Lack of Knowledge of making pedigree charts for study of patterns of inheritance.</p> <p>Lack of Knowledge on common techniques employed in cellular immunology and histocompatibility testing</p>	<p>Demonstrates knowledge about structure, number, and classification of chromosomes.</p> <p>Demonstrates knowledge on cell types involved in the defence mechanism.</p> <p>Knowledge on preparation of media, different solutions, stains etc.</p> <p>Demonstrates knowledge of chromosomal abnormalities like autosomal and sex chromosomal abnormalities syndrome</p> <p>Knowledge on gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs.</p> <p>Knowledge on Preparation of buccal smear for sex chromatin</p> <p>Demonstrates knowledge on single gene pattern inheritance: autosomal and sex chromosomal pattern of inheritance, intermediate pattern and multiple alleles, mutations, genome imprinting.</p> <p>Knowledge on Banding techniques (G and C)</p> <p>Knowledge on biological and clinical significance of the major histocompatibility complex of man including its role in transplantation.</p> <p>Demonstrates knowledge on multifactorial pattern of inheritance, teratology, molecular screening, cancer genetics- haematological malignancies, pharmacogenetics.</p> <p>Knowledge of making pedigree charts for study of patterns of inheritance.</p> <p>Knowledge on common techniques employed in cellular immunology and histocompatibility testing</p> <p>Demonstrates knowledge on Reproduction genetics- male and female infertility, abortuses, assisted reproduction, prenatal diagnosis, genetic counselling, and ethics of genetics.</p> <p>Knowledge on chromosomal analysis- human chromosome preparation from peripheral blood and karyotyping.</p> <p>Knowledge on molecular hybridisation and PCR technology in immunology.</p>
	<p>Failed to Demonstrates knowledge on Reproduction genetics- male and female infertility, abortuses, assisted reproduction, prenatal diagnosis, genetic counselling, and ethics of genetics.</p> <p>Lack of Knowledge on chromosomal analysis- human chromosome preparation from peripheral blood and karyotyping.</p> <p>Lack of Knowledge on molecular hybridisation and PCR technology in immunology.</p>	

PC 1	<p>Failed to Demonstrates anatomical basis of common genetic procedures expected to be performed by a basic medical doctor.</p> <p>Inability to Performs basic procedures like preparation of buccal smear for sex chromatin in various chromosomal disorders</p> <p>Failed to Demonstrates a comprehensive understanding of making of pedigree charts to study patterns of inheritance for genetic counselling</p> <p>Inability to Perform diagnostic procedures like human chromosomal preparation from peripheral blood and karyotyping.</p> <p>Inability to Perform diagnostic procedures like molecular hybridization and PCR technology in immunology research.</p>	<p>Demonstrates anatomical basis of common genetic procedures expected to be performed by a basic medical doctor.</p> <p>Performs basic procedures like preparation of buccal smear for sex chromatin in various chromosomal disorders</p> <p>Demonstrates a comprehensive understanding of making of pedigree charts to study patterns of inheritance for genetic counselling</p> <p>Perform diagnostic procedures like human chromosomal preparation from peripheral blood and karyotyping.</p> <p>Perform diagnostic procedures like molecular hybridization and PCR technology in immunology research.</p>
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EPA 10: Perform gross sections of differece regions of brain and Spinal cord and correlate with its relations, applied aspects and demonstrate to students	
1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able Perform gross sections of different regions of brain and spinal cord and correlate with its relations and applied anatomy
2. Most relevant domains of competence:	MK, ICS,
3. Competencies within each domain critical to entrustment decisions:	MK1 ICS1
4. Methods of assessment	<ol style="list-style-type: none"> 1. Written exam (Every 6 months) 2. Practical examination 3. Workplace assessment by Faculty 4. Multisource feedback <ol style="list-style-type: none"> a. students

Competency	Pre-Entrustable	Entrustable
MK 1	<p>Inability to Demonstrates an understanding of normal disposition of gross structure of brain, and their interrelationship in the human body and correlate with its functions.</p> <p>Demonstrates ability to get involved in small group teaching</p> <p>Inability to Demonstrates the ability to do cross section of different regions of brain and spinal cord.</p>	<p>Demonstrates an understanding of normal disposition of gross structure of brain, and their interrelationship in the human body and correlate with its functions.</p> <p>Demonstrates ability to get involved in small group teaching</p> <p>Demonstrates the ability to do cross section of different regions of brain and spinal cord.</p>
ICS 1	Inability to demonstrate to students for doing gross and cross sections	Demonstrate to students for doing gross and cross sections

EPA 11: Assist and help the clinicians in updating and reinforcing their basic anatomical knowledge	
1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to Assist and help the clinicians in updating and reinforcing their basic anatomical knowledge
2. Most relevant domains of competence:	MK, PC, ICS, PBLI, P
3. Competencies within each domain critical to entrustment decisions:	MK1 ICS1 P1
4. Methods of assessment	1. Workplace assessment by Faculty 2. Multisource feedback 3. Clinicians b. Peers

Competency	Pre-Entrustable	Entrustable
MK 1	Fail to Helps the clinician in updating their basic anatomical knowledge by demonstrating the structures by dissection. Giving them reference to museum specimens, charts and bone models	Helps the clinician in updating their basic anatomical knowledge by demonstrating the structures by dissection. Giving them reference to museum specimens, charts and bone models
ICS1	Inability to Communicates effectively with colleagues from various medical and paramedical fields	Communicates effectively with colleagues from various medical and paramedical fields
P 1	Fail to Communicates effectively with colleagues from various medical and paramedical fields Communicate effectively with colleagues within specialty, other health professionals, and health-related agencies leading to setting up of Genetic lab Inability to Understands the importance of relationship development, information gathering and sharing, and team work	Communicates effectively with colleagues from various medical and paramedical fields Communicate effectively with colleagues within specialty, other health professionals, and health-related agencies leading to setting up of Genetic lab Understands the importance of relationship development, information gathering and sharing, and team work

EPA 12: Interact with the clinical departments and demonstrate the basic anatomical knowledge to the postgraduates by dissection	
1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to integrate patient data to formulate an assessment, developing a list of potential diagnoses that can be prioritized and lead to selection of a working diagnosis
2. Most relevant domains of competence:	MK, ICS, P
3. Competencies within each domain critical to entrustment decisions:	MK1 ICS2 P2

4. Methods of assessment	<ol style="list-style-type: none"> 1. Demonstration (Every month) 2. Workplace assessment by Faculty 3. Multisource feedback <ol style="list-style-type: none"> a. Clinician b. Health care workers c. Peers
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Competency	Pre-Entrustable	Entrustable
MK 1	Fail to Helps the postgraduates to reinforce their basic anatomical knowledge by demonstrating the structures by dissection. Giving them reference to museum specimens, charts and bone models	Helps the postgraduates to reinforce their basic anatomical knowledge by demonstrating the structures by dissection. Giving them reference to museum specimens, charts and bone models
ICS2	Inability to interact effectively with clinical departments	Inability to interact effectively with clinical departments
P2	Inability to Understands the importance of relationship development, information gathering and sharing, and team work	Understands the importance of relationship development, information gathering and sharing, and team work

EPA 13: Should be able to serve the community as competent anatomists by imparting basic anatomical knowledge to the common health problems	
1. Description of the activity: This included a brief rationale and a list of the functions required for the EPA.	Residents should be able to serve the community as competent anatomists by imparting basic anatomical knowledge to the common health problems
2. Most relevant domains of competence:	MK, ICS, P
3. Competencies within each domain critical to entrustment decisions:	MK1 ICS2 P2
4. Methods of assessment	<ol style="list-style-type: none"> 1. Workplace assessment by Faculty 2. Multisource feedback

Competency	Pre-Entrustable	Entrustable
MK 1	Fail to Helps the community by imparting their knowledge in common health problems Inability to explain the basis of certain common health problems	Helps the community by imparting their knowledge in common health problems Inability to explain the basis of certain common health problems
ICS2	Inability to interact effectively with community	Able to interact effectively with community
P2	Inability to Understands the importance of relationship development, information gathering and sharing, and team work	Able to Understands the importance of relationship development, information gathering and sharing, and team work

Table 5. Mapping of PO, CO, EPA, Competency and Sub-competency with level

General											
EPA		Program outcomes									Domains and levels of competency
1	Identify and describe the gross structures in various regions of the human body	1	2	3	4						MK1 P1
2	Perform gross and fine dissection in all regions of the body and the viscera and demonstrate to students	1	2	3	4						MK1, ICS1, P1
3	Teach, demonstrate and assess the students	1	2	3	4						MK1,ICS1,P1
4	Prepare and demonstrate and illustrate the histology slides of various tissues	1	2	3	4						MK2,ICS1
5	Perform embalming technique of adult cadavers and fetus	1	2	3	4	5	6				MK1, PBL2, P2
6	Acquire administrative skills to set up Histology lab/museum/Embalming lab for helping in the process of learning anatomy	1	2	3	4	5	6				MK1,ICS1,P2
7	Understand the basic embryology and teach the students by making models and charts	1	2	3	4	5					MK3, ICS2
8	Acquire administrative skills to set up Genetic lab for helping in the process of learning genetics								8		MK4, ICS, P2
9	Perform basic techniques in genetics						6				MK4, PC1
10	Perform gross sections of different regions of brain and spinal cord and correlate with its relations, applied aspects and demonstrate to students	1	2	3	4	5	6	7			MK1, ICS1
11	Assist and help the clinicians in updating and reinforcing their basic anatomical knowledge								8		MK1, ICS1, P1
12	Interact with the clinical departments and demonstrate the basic anatomical knowledge to the postgraduates by dissection								8		MK1, ICS1, P2
13	Should be able to serve the community as competent anatomists by imparting basic anatomical knowledge to the common health problems								8	9	MK1, ICS2, P2

8. Assessment

8.1 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.

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

Suggestions by Board of examiners- One formative assessment every week, One internal assessment every three months.

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

8.2 Summative Assessment

The summative examination would be carried out as per the Rules given in Postgraduate Medical Education Regulations, 2000.

Suggestion made by Board of studies members- One paper publication One oral or poster presentation should be made mandatory before appearing for summative examination.

The Post Graduate examination will be in three parts:

Thesis:

Every post graduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination.

The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.

Theory:

The examinations shall be organised on the basis of 'Grading' or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D./ MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

There shall be four theory papers. (As per suggestions made by BOS members)

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

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, genetherapy.
- 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

- a) 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.

Practicals:

Spread over a minimum of 2 days - As per suggestions made by the external experts in BOS meeting held on 15/5/2020

First Day Practical: Total – 150 marks**Morning:****Gross Anatomy**

1. Dissection skill and discussion: 75 marks

Afternoon:**Histology**

1. Spotters -10 slides with discussion: 50 marks
2. Histology techniques- paraffin block making, section cutting, staining (H and E stain) with related viva:25 marks

Second Day Practical: Total – 150 marks**Morning:**

1. Microteaching of a short topic to assess teaching skills: 50 marks
2. Viva on dissertation topic: 10 marks
3. Embryology and Neuroanatomy slide discussion: 10 marks

Afternoon:

4. Grand viva- On dissected parts of the whole human body including nervous system, embryology models, teratology, skeletal system, embalming techniques, genetics, radiographs, MRI, CT, Ultrasonographs and surface marking: 80 marks

9. Blue Print of Weight of the System

Paper I: Gross Anatomy

Sl.No	Regions	Weightage	Marks Allotted	No. of Question
1	Head and Neck	20%	20	2
2	Thorax	10%	10	1
3	Abdomen, pelvis and perineum	30%	30	3
4	Upper limb	10%	10	1
5	Lower limb	10%	10	1
6	General Anatomy, Radiological anatomy, Cross sectional anatomy, Embalming	20%	20	2

Paper II: Embryology, Histology and Genetics

Sl.No	Section	Weightage	Marks Allotted	No. of Question
1	General Embryology	10%	10	1
2	Systemic Embryology, Teratology	30%	30	3

3	General Histology, Principles and different types of microscopy, Histo-techniques	20%	20	2
4	Systemic Histology	20%	20	2
5	Genetics	20%	20	2

Paper III: Neuroanatomy

Sl.No	Section	Weightage	Marks Allotted	No. of Question
1	Vertebral canal and its contents	20%	20	1
2	Cranial nerves	10%	10	1
3	Brain stem	30%	30	1
4	Cerebellum	10%	10	1
5	Diencephalon	10%	10	1
6	Cerebrum	20%	20	2
7	Basal nuclei, Reticular activating system and Limbic system	10%	10	1
8	Ventricular system of the brain, CSF Autonomic nervous system, Special senses and neural pathways	20%	20	2

Paper IV: Applied anatomy, Recent Advances

Sl.No	Section	Weightage	Marks Allotted	No. of Question
1	Surgical Anatomy – all regions	50%	50	5
2	Stem cell, Cryobanking, principles of organ donation	30%	30	3
3	Recent advances in Anatomical review	20%	20	2

10. Model Question Paper

Paper I : Gross Anatomy

Duration : 3 Hours

Max. Marks: 10×10=100

i. Answer all questions

ii. Draw labelled diagram wherever required

- Describe the internal features, blood supply and nerve supply of Larynx. Add a note on the movements of vocal cord and mechanism of speech.
- State the classification of dural venous sinuses. Discuss the relations, tributaries, communications, and applied aspects of cavernous sinus.
- Discuss the Fascial spaces of the hand and its clinical significance.
- Discuss the principles, advantages and disadvantages of Computed Tomography scan versus Magnetic resonance imaging?
- Discuss the various methods of preservation of human body and its parts
- Discuss the arterial supply and the venous drainage of heart.
- Discuss the functions, formation and maintenance of arches of foot.

8. Describe the boundaries and contents of Ischioanal fossa.
9. Describe uterus under the following headings- normal axis, relations, supports, blood supply, nerve supply and lymphatic drainage.
10. Describe pancreas under the following headings – location, parts, relations and blood supply.

Paper II: Embryology, Microscopic anatomy and Genetics

Duration: 3 Hours

Max. Marks: 10×10=100

i. Answer all questions

ii. Draw labelled diagram wherever required

1. Discuss the development of body cavities.
2. Discuss the microscopic structure of kidneys. Add a note on juxtaglomerular apparatus.
3. Discuss autosomal inheritance with examples.
4. Discuss rotation of midgut and associated congenital anomalies.
5. Give an account of gene therapy.
6. Discuss the principles of teratology and state the classification of teratogens.
7. Describe the microscopic structure of retina.
8. Enumerate the types of microscope. Discuss the basic structure and principles of microscope.
9. Discuss the formation of chorionic villi and state the classification of placenta.
10. Discuss the histology of spleen along with a labelled diagram.
- 11.

Paper III: Neuroanatomy

Duration: 3 Hours

Max. Marks: 10×10=100

i. Answer all questions

ii. Draw labelled diagram wherever required

1. Describe the connections and functions of reticular formation.
2. Discuss the cross section of the midbrain at the level of superior colliculus and supplement it with a labelled diagram.
3. Discuss the ascending tracts of spinal cord. Add a note on blood supply.
4. Describe the cerebellum under- fissures and lobes, nuclei and their connections, functions and applied anatomy.
5. Classify white fibres of cerebrum. Describe the internal capsule under- location, relations, and parts with specific fibres passing through them.
6. Describe the arterial supply to the different surfaces of the cerebrum with its clinical relevance. With the help of a diagram explain the formation, branches and functions of “Circle of willis”
7. Describe the thalamus under, location, relations, nuclei and their major connections, functions and effect of vascular lesions.

8. Discuss the parts of basal nuclei, state their relations, connections, functions and the effect of vascular lesions.
9. Discuss CSF circulation. Describe the lateral ventricle under parts, relations of each part.
10. Describe facial nerve under- nuclei of origin, course, and distribution.

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

Duration: 3 Hours

Max. Marks: 10×10=100

i. Answer all questions

ii. Draw labelled diagram wherever required

11. 1. Describe the sources of human stem cells. Mention its therapeutic relevance and ethical issues.
12. 2. Discuss the anatomy of anterior abdominal wall in relation to surgical incisions.
13. 3. Discuss the basic principles of organ donation in relation from recently dead bodies.
14. 4. Discuss the role of cryobanking in artificial insemination.
15. 5. Discuss the surgical anatomy of bronchopulmonary segments.
16. 6. Describe the surgical anatomy of venous drainage of lower limb.
17. 7. Discuss Fluorescent in situ hybridisation (FISH)
18. 8. Discuss the nerve injuries of upper limb.
19. 9. Discuss the surgical anatomy of thyroid gland.
20. 10. Discuss the surgical anatomy of internal capsule.

11. Recommended Reading

Books (Latest Edition)

Gross Anatomy:

1. Susan Strandring: Gray's Anatomy: The anatomical basis of clinical practice, Churchill LivingstoneElsevier.
2. DuttaA.K. Human Anatomy vol. I-III CurrentPublisher.
3. DuttaA.K. Principle of General Anatomy. CurrentPublisher.
4. Romanes. Cunningham's Manual of Practical Anatomy vol. I-III,Oxford.
5. Keith and Moore Clinical Oriented Anatomy. Lippincot Williamsand Wilkins.
6. R.S Snell. Clinical Anatomy by regions. Lippincot Williams andWilkins.
7. J.V. Basmajin. Grant's Method of Anatomy. Williams andWilkins.
8. R.J. Last. Anatomy Regional and Applied. ChurchillLivingston.
9. Lee McGregor. Surgical Anatomy. K.M.Varghese.
10. A.G. R Deckeg, D.J du Pless Lee. McGregor's Synopsis of Surgical Anatomy. Varghese PublishingHouse.
11. Snell. Clinical anatomy by regions. Lippincotts, Williams andWilkins.

12. S. Chummy Sinnatanmy. Last's Anatomy Regional and Applied. Churchill Livingstone.
13. Hollinshed W Henry. Anatomy for surgeons. Vol. I-III Lippincotts, Williams and Wilkins.
14. Vishram Singh. Clinical and Surgical Anatomy. Elsevier.
15. Vishram Singh. Textbook of general anatomy. Elsevier.
16. Frank H. Netter. Atlas of Human Anatomy. Saunders Elsevier.

Histology

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

Genetics

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

Embryology

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

Neuroanatomy

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

Statistics

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

Radiology

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

Surface anatomy

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

Journals

1. Anatomical sciences education
2. Frontiers in Neuroanatomy
3. Journal of Anatomy
4. Annals of Anatomy
5. Advances in Anatomy Embryology and Cell Biology
6. Clinical Anatomy
7. Anatomical science international
8. Anatomical record
9. Anatomy and Cell Biology
10. Surgical and Radiological Anatomy
11. Translational research in Anatomy
12. European journal of Anatomy
13. Italian journal of Anatomy and Embryology
14. Journal of Anatomical Society of India
15. American Journal of Anatomy

12. Annexure

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 inter-departmental learning activity				
5.	External and Outreach Activities / CMEs				
6.	Thesis / Research work				
7.	Log Book Maintenance				

Publications

Yes/No

Remarks*

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

SIGNATURE OF ASSESSEE

SIGNATURE OF CONSULTANT

SIGNATURE OF HOD