

# **ANATOMY — M D**

## **OBJECTIVES**

At the end of the three years post-graduate training programme in Anatomy the student should be able to:

1. Acquire in depth knowledge of structure of human body from the gross to the molecular level, and correlate it with the functions.
2. Comprehend the principles underlying the structural organization of body and provide anatomical explanations for disturbed functions.
3. Acquire knowledge of basic principles of normal growth and differentiation. Understand critical periods of human growth and development as well as ontogeny of all the organ systems of body. Analyze the congenital malformations, know the etiological factors including genetic mechanisms involved in abnormal development and their effects on functions.
4. Have comprehensive knowledge of the basic structure and correlated function of the nervous system in order to understand altered state in the various disease processes.
5. Plan and implement teaching programmes for under-graduate medical students. Be familiar with and be able to use different teaching methods and modern learning resources for under-graduate teaching. Plan and conduct evaluation of under-graduate teaching.
6. Develop/acquire an attitude of scientific enquiry and learn contemporary research techniques. Be familiar with recent scientific advances, identify lacunae in the existing knowledge in a given area and be able to plan investigative procedures for research, analyze data critically and derive logical conclusions.

## **LEARNING ACTIVITIES, TRAINING AND EVALUATION**

During the course students have formal teaching and are trained for teaching and research

### **I Didactic Teaching**

Topics in gross anatomy, microanatomy, embryology, neuroanatomy, histochemistry, and genetics, along with related practical sessions.

## II Training

Communication skills – journal club, seminars

Hands on experience — techniques in micro, neuro, gross anatomy, embryology, histochemistry, genetics, electron and confocal microscopy.

Teaching experience — taking UG classes : demonstrations and practicals for two semesters (one academic year)

Educational technology — preparation of AV aids for teaching, posters/manuscripts for presentation in conferences/workshops and publication in journals. Setting objective questions – SAQs, MCQs and OSPE. Prepare teaching modules & museum specimens, casts. Participation in organization of symposia/workshops.

## III Research

Thesis – progress monitoring every semester.

Presenting paper/poster at conferences/Preparing manuscripts for documentation.

Thesis work presentation.

Thesis submission at the end of 2&1/2 yrs.

## IV Evaluation of Training

Written/practical assessment every semester. Feedback on teaching/training programmes.

## M D ANATOMY EXAMINATIONS

Final examination at the end of the course has theory, practical and viva-voce.

### THEORY

Paper-I : Gross Anatomy with evolution and Comparative Anatomy. Gross Anatomy will include functional Anatomy. (Section-1)

Paper-II : Microscopic Anatomy, Developmental Anatomy and Genetics. (Section-2)

Paper-III : Neuroanatomy including development and microscopic structure (Section-3)

Paper-IV : Applied Anatomy. (Section-4)

### PRACTICAL AND VIVA

1. Histological techniques, identification light and electron microscopic structure of tissues of body.
2. Slides, specimens of developmental anatomy, genetics, neuroanatomy to assess comprehensive knowledge in these areas.
3. Viva voce on gross anatomy, living anatomy, sectional anatomy and neuroanatomy, developmental anatomy.

## SECTION –1

### GROSS ANATOMY

### COURSE CONTENT

Anatomy of entire body – Structure in detail and functional correlation.

Seminars, written assignments, group discussions on selected topics on regional anatomy.

**PRACTICALS**

1. Dissection of entire body
2. Anatomical techniques:

Fixation and preservation of dead bodies, preparation of museum specimens, preparation of bones, preparation of corrosion casts and plastination

**SECTION – 2****DEVELOPMENTAL ANATOMY****COURSE CONTENT**

Gametogenesis, fertilization, implantation and placenta, early human embryonic development, general embryology; development of organ systems and associated common congenital abnormalities, Physiological correlations of congenital anomalies.

**PRACTICAL**

Models, specimens of early human development and slides of chick and pig embryos to correlate avian and mammalian early development with human development. Specimens of congenital malformations.

**HISTOLOGY AND HITOCEMISTRY****COURSE CONTENT**

1. 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.
2. Tissues of Body: Light and electron microscopic details and structural basis of function, regeneration and degeneration. Confocal microscopy.
3. The systems/organs of body – Cellular organization, light and electron microscopic features, structure-function correlations, and cellular organization.

**PRACTICAL**

Preparation of tissues for histological sections, light microscopy and its applications, histological staining-routine & special, electron microscopy and its applications, identification of normal and abnormal organelles in electron micrographs, three dimensional interpretation, artifacts identification.

**IMMUNOLOGY****COURSE CONTENT**

Immune system and the cell types involved in defense mechanisms of the body. Gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body. Biological and clinical significance of the major histocompatibility complex of man including its role in transplantation, disease susceptibility/resistance and genetic control of the immune response. Common techniques employed in cellular immunology and histocompatibility testing. Molecular hybridization and PCR technology in immunology research particularly mechanism of antigen presentation, structural and functional relevance of the T cell receptor, genetic control of the immune response,

molecular basis of susceptibility to disease.

## **PRACTICAL**

Techniques of DNA preparation, electrophoresis and southern blot hybridization.

## **GENETICS**

### **COURSE CONTENT**

1. Human Chromosomes - Structure, number and classification, methods of chromosome preparation, banding patterns. Chromosome abnormalities, Autosomal & Sex chromosomal abnormalities – syndromes, Molecular and Cytogenetics.
2. Single gene pattern inheritance: Autosomal & Sex chromosomal pattern of inheritance, Intermediate pattern and multiple alleles, Mutations, Non Mendelian inheritance, Mitochondrial inheritance, Genomic imprinting, parental disomy.
3. Multifactorial pattern of inheritance: Criteria for multifactorial inheritance, Teratology, Structure of gene, Molecular Screening, Cancer Genetics – Haematological malignancies, Pharmacogenetics.
4. Reproduction Genetics- Male and Female Infertility, Abortuses, assisted reproduction, Preimplantation genetics, Prenatal diagnosis, Genetic Counselling, Ethics and Genetics.

## **PRACTICALS**

DNA Isolation from peripheral blood lymphocytes, Polymerase Chain Reaction (PCR), Fluorescence In-Situ Hybridization (FISH), Chromosomal Analysis.

### **SECTION –3**

## **NEUROANATOMY:**

### **COURSE CONTENT**

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, Cross sectional anatomy of brain and spinal cord.

## **PRACTICALS**

Identification of structures in sections of brain stem and spinal cord at different levels. Staining nervous tissue using Nissl's staining. Discussions on clinical problems related to neurological disorders and anatomical explanation for the same.

### **SECTION – 4**

## **APPLIED ANATOMY AND RECENT ADVANCES**

### **COURSE CONTENT**

Clinical correlations of structure and functions of human body. Anatomical basis and explanations for clinical problems. Applications of knowledge of developmental, micro, 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.

***Recommended Books***

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| 1. Gray's Anatomy<br>38th edition, 1995 reprint in 2000<br>Churchill Livingstone          | Williams et al                                    |
| 2. Wheaters Functional, Histology 4th ed.(2000)<br>Churchill Livingstone                  | B. Young and J.Heath<br>www.med.uc.edu.embryology |
| 3. Histology: A text & atlas<br>3rd edition (1995) Williams & Wilkins                     | M.H.Ross, E.& L.J.                                |
| 4. Medical Embryology<br>8th edition William and Wilkins                                  | Jan Langman                                       |
| 5. Genetics in medicine<br>6th edition, 2001<br>W.B. Saunders & Co. Philadelphia, London  | J.S.Thompson &<br>M.W. Thompson                   |
| 6. Human Neuroanatomy<br>9th edition, 1996  | Stuin J and Carpenter MB                          |
| 7. Clinical Neuroanatomy<br>for Medical Students<br>Willian and Wilkins 5th edition, 2001 | Richard S. Snell                                  |