



REGULATIONS, SCHEME AND SYLLABUS
FOR
MSc MEDICAL ANATOMY
(Under Credit and Semester System-CSS)

AT THE AFFILIATED COLLEGES OF
MAHATMA GANDHI UNIVERSITY
KOTTAYAM, KERALA
(W.E.F 2026)

MSc Medical Anatomy Syllabus

Mahatma Gandhi University Credit and Semester System (CSS)

School of Medical Education, Gandhinagar, Kottayam

Program Overview

- **Name of the Course:** Master of Science (MSc) in Medical Anatomy
- **Faculty:** Modern Medicine
- **Duration:** 2 years (4 semesters)
- **Medium of Teaching and Assessment:** English

GOAL

The goal is to provide comprehensive knowledge of the gross and microscopic structure and development of the human body to understand the normal disposition of organs, structures, and their anatomical applications.

OBJECTIVES

- Students should comprehend the normal disposition, functional, cross-sectional, and applied anatomy of body structures.
- Identify the microstructure of the tissues
- Comprehend the basic structure and connections of the central nervous system
- Understand the basic principles and development of organs, systems, and their abnormalities.
- Knowledge about clinical aspects of anatomy
- Knowledge of histology slides
- Knowledge of post-mortem procedures and embalming.

SKILLS

- Identify and locate all body structures and mark their surface anatomy topography.
- Identify the organs and tissue under the microscope
- Understand the principles of karyotyping and gross congenital anomalies
- Teach anatomy to medical and paramedical students.

- Able to do embalming of dead bodies
- Able to assist in post-mortem examinations.
- Able to prepare histology slides
- To prepare for further studies leading to a PhD in anatomy or related fields.
- Apply anatomical knowledge in super-speciality hospitals as clinical anatomists.

ELIGIBILITY FOR ADMISSION

- Candidates must possess an undergraduate degree from a recognized university with a minimum of 50% marks. Candidates with any paramedical or medical science degree, as well as those with a BSc in Zoology or a BSc in Nutrition and Dietetics from a recognized university or an equivalent institution, are eligible to apply for the MSc in Medical Anatomy program.
- Relaxation in marks as per Government of Kerala norms for Scheduled Castes, Scheduled Tribes, and Other Backward Classes.
- Two seats are reserved for any medical graduates (MBBS, BDS, BHMS, BAMS, BNYS, BUMS, BSMS). In the absence of such candidates, the seats will be allotted to general merit candidates.
- 10% weightage will be given to postgraduate qualifications such as MSc in Zoology, B.Ed in natural sciences etc.

Staff Requirement for M.Sc. Medical Anatomy Program

Designation	Number Required	Minimum Qualifications	Experience Required
Professor and HOD	1	MSc. Anatomy / MSc Medical Anatomy	10+ years teaching experience
Associate Professor	2	MSc. Anatomy / MSc Medical Anatomy	8 years teaching experience
Assistant Professor	2	MSc. Anatomy / MSc Medical Anatomy	3 years teaching experience
Histotechnologist	1	Diploma or B.Sc. or M.Sc. in Medical Laboratory Technology	2+ years in histology lab work
Mortuary Attender	1	SSLC (Secondary School Leaving Certificate)	1+ years in mortuary or related work
External Faculty	8	MSc Medical Biochemistry, MSc Medical Physiology, MSc Biomedical instrumentation, MSc Medical documentation	3+ years teaching experience

Semester 1

Course Code	Course Title	Type	L:T:P (Hours/Week)	Credits
ANA-MP-C1-01	General Anatomy, Histology, Embryology	Core	L-4	4
ANA-MP-C1-02	Upper Limb and Lower Limb	Core	L-4	4
ANA-MP-C1-03	Physiology	Core	L-2	2
ANA-MP-C1-04	Biochemistry	Core	L-2	2
ANA-MP-C1-05	Practical 1 (General Anatomy, Histology, Embryology)	Core	T/P-12	4
ANA-MP-C1-06	Practical 2 (Upper Limb and Lower Limb)	Core	T/P-12	4
Total				20

Semester 2

Course Code	Course Title	Type	L:T:P (Hours/Week)	Credits
ANA-MP-C2-01	Thorax, Abdomen	Core	L-4	4
ANA-MP-C2-02	Pelvis	Core	L-4	4
ANA-MP-C2-03	Practical I (<i>Histology of thorax, abdomen and Pelvic Organs</i>)	Core	T/P-14	6
ANA-MP-C2-04	Practical II (<i>Thorax, Abdomen, pelvic organs and Bones</i>)	Core	T/P-14	6
Total				20

Semester 3

Course Code	Course Title	Type	L:T:P (Hours/Week)	Credits
ANA-MP-C3-01	Head and Neck I	Core	L-4	4
ANA-MP-C3-02	Head and Neck II	Core	L-4	4
ANA-MP-C3-03	Practical I (Histology)	Core	T/P-12	4
ANA-MP-C3-04	Practical II (Head and Neck)	Core	T/P-12	4
ANA-MP-C3-E01	Elective I (Choose one):	Elective	L-4	4
	A: Genetics			
	B: Health Information Management			
Total				20

Semester 4

Course Code	Course Title	Type	L:T:P (Hours/Week)	Credits
ANA-MP-C4-01	Neuroanatomy	Core	L-4	4
ANA-MP-C4-02	Practical I (Histology)	Core	P-4	2
ANA-MP-C4-03	Practical II	Core	P-4	2
ANA-MP-C4-04	Microteaching	Core	T-4	2
ANA-MP-C4-05	Project	Core	P-12	6
ANA-MP-C4-06	Practical III Dissection	Core	P-4	2
ANA-MP-C4-E02	Elective II (Choose one):	Elective	L-4	4
	A: Embalming Technique			
	B: Introduction to Biomedical Instrumentation			
Total				22

Grand Totals for All Semesters

Semester	Total Max Marks	Total Min Marks
Semester 1	300	150
Semester 2	450	225
Semester 3	175	87.5
Semester 4	600	300
Total	1525	762.5

FIRST SEMESTER

ANA-MP-C1-01

General Anatomy, Histology, Embryology (80 hrs)

GENERAL ANATOMY

Basic Terminology (2 hrs)

- Define nomenclature of anatomy.
- Explain key anatomical terms and their applications.

Cell Biology (2 hrs)

- **Cytoplasm**
 - Describe the cytoplasmic matrix, cell membrane, cell organelles, the cytoskeleton, cell inclusions, cilia, flagella, and cell junctions.
- **Nucleus**
 - Detail the nuclear envelope, nuclear matrix, DNA, chromatin components, and nucleolus.

Bones (2 hrs)

- Describe the types, classification, composition, and parts of long bones.
- Explain the periosteum, the ossification process, and the blood supply.

Joints (2 hrs)

- Outline the general classification of joints.
- Describe synovial joints, including their structure and movements.

Epithelial Tissue (2 hrs)

- Classify epithelial tissue types.
- **Surface (Lining) Epithelium**
 - Describe the general features, intercellular junctions (junctional complexes), and surface modifications.
 - Classify lining epithelium based on structure and function.

Glands (2 hrs)

- Describe the general features of glands.
- Classify glands based on structure and secretion.

Connective Tissue (2 hrs)

- Describe the general features of connective tissue.
- Classify connective tissue based on structure and function.
- Detail ordinary connective tissue.

Cartilage (2 hrs)

- Describe the features, components, types, and functions of cartilage.

Bone (2 hrs)

- Describe the features and types of bone.
- Explain the composition of bone.
- Detail the structure of compact bone (cross-section and longitudinal section).
- Describe the structure of spongy bone.
- Explain bone formation (ossification).

Lymphoid Tissue (2 hrs)

- **Thymus**
 - Describe the features, components, and functions of the thymus.
- **Lymph Node**
 - Describe the features, structure, and functions of lymph nodes.
- **Spleen**
 - Describe the features, structure, splenic circulation, and functions of the spleen.
- **Palatine Tonsils**
 - Describe the structure and function of palatine tonsils.

Muscular Tissue (2 hrs)

- Introduce muscular tissue.
- Describe the types: skeletal muscle, smooth muscle, and cardiac muscle.

Nervous Tissue (2 hrs)

- Introduce nervous tissue.
- Outline the anatomical classification of the nervous system.
- Classify neurons.
- Describe the structure of a multipolar neuron.
- Explain ganglia and neuroglia in the CNS.

Blood Vessels (2 hrs)

- Introduce blood vessels.
- Describe the types: elastic artery, medium-sized artery, and large- and medium-sized veins.

Integumentary System (2 hrs)

- Introduce the integumentary system.
- Describe the functions of skin.
- Differentiate types of skin.
- Detail the structure, including the epidermis, glands, appendages, and skin receptors.

General Histology

Microscope (2 hrs)

- Describe the parts and types of microscopes.

Microscopic Features of Tissues

- Describe the microscopic features of the following tissues and correlate structure with function:

1. Epithelial Tissue (2 hrs)

- Classify epithelia.
- Describe simple epithelium:
 - Simple squamous epithelium
 - Simple cuboidal epithelium
 - Simple columnar epithelium
 - Pseudostratified epithelium
- Describe stratified epithelium:
 - Stratified squamous epithelium
 - Stratified cuboidal epithelium
 - Stratified columnar epithelium
 - Transitional epithelium/urothelium

2. Glands (2 hrs)

- Gland's classification
- Exocrine glands
 - Duct branching patterns
 - Secretion types
 - Serous, mucous, and mixed glands
 - Secretion modes
 - Merocrine glands
 - Apocrine glands
 - Holocrine glands

3. Connective Tissue (3 hrs)

- General connective tissue
- Connective tissue components
- Connective tissue fibers
- Ground substance
- Connective tissue cells
- Embryonic connective tissue
- Loose connective tissue
- Dense connective tissue
 - Dense irregular connective tissue

- Dense regular connective tissue
- Adipose tissue
 - Yellow adipose tissue
 - Brown adipose tissue

4. Cartilage (3 hrs)

- Hyaline cartilage
- Elastic cartilage
- Fibrocartilage

5. Bone (3 hrs)

- Bone features (cross-section and longitudinal section)
- Bone tissue composition
- Bones classification
- Bone formation and growth

6. Nervous Tissue (2 hrs)

- Neurons
- Neurons classification
- Neuroglia
- Peripheral nerves
- Ganglia

7. Muscle Tissue (3 hrs)

- Types of muscle tissue
 - Skeletal muscle
 - Cardiac muscle
 - Smooth muscle

8. Vascular Tissue (3 hrs)

- Blood vessel structure
- Blood vessels classification
- Arteries vs. veins

9. Lymphatic Tissue (3 hrs)

- Lymphoid system cells
- Lymphatic nodules
- Lymph nodes
- Thymus
- Spleen
- Tonsils

10. Skin (3 hrs)

- Types of skin
- Skin structure
- Skin appendages

General Embryology

Main Topic	Hours	Subtopics
Introduction to General Embryology	2	Stages of embryonic development
Cell Division and Gametogenesis	2	Mitosis and meiosis Spermatogenesis, Oogenesis
Uterine and Ovarian Cycles	2	Correlation between uterine and ovarian cycles
Fertilization and Early Development	3	Fertilization Cleavage Morula Blastocyst
Germ Layers	1	Germ layer formation and fate
Implantation and Extraembryonic Structures	3	Implantation and decidua Chorion and Placenta Amnion formation Yolk sac Allantois Connecting stalk and Umbilical cord Extraembryonic coelom
Primitive Streak and Early Structures	2	Primitive streak formation and fate Notochord Neural tube
Intraembryonic mesoderm	2	Subdivisions and fate, Somatomeres, Somites : Development, fate and its importance.
Folding of embryo	1	Process and effects of folding
Intraembryonic coelem	2	Formation , Subdivisions and its derivatives.
Twinning	1	Monozygotic and dizygotic twins
Teratology	2	Teratogens and their effects on the embryo

Reference Books:

General Anatomy

- Principles Of General Anatomy by A. K. Datta
- Textbook of General Anatomy with Early Clinical Exposure by Yogesh Sontakke
- Gray's Anatomy for Students by Richard L. Drake, A. Wayne Vogl, Adam W.M. Mitchell
- General anatomy by Vishram Singh
- Cunningham's Manual of Practical Anatomy

General Histology

- **Inderbir Singh's Textbook of Human Histology with Colour Atlas and Practical Guide**
- **Textbook of Human Histology with Color Atlas, 3D Illustrations and Flowcharts by Yogesh Sontakke**
- **Histology – Text and Atlas by Brijesh Kumar**
- **Functional Histology (PB) by Asin Kumar Datta**
- **Textbook of Histology and Practical Guide by J.P. Gunasegaran**
- Practical Manual and Workbook of Histology by Veena V. Kulkarni
- Practical Histology Workbook by Krishna Garg
- Multiple Choice Questions and Viva Voce in Human Histology by Ujwala Bhanarkar and Yogesh Sontakke
- Wheater's Functional Histology: A Text and Colour Atlas
- **diFiore's Atlas of Histology with Functional Correlations**
- **Histology Practical Manual by Balakrishna Shetty**
- Histology: A Text and Atlas by Michael H. Ross and Wojciech Pawlina
- Junqueira's Basic Histology: Text and Atlas
- Stevens & Lowe's Human Histology
- Gartner's Color Textbook of Histology
- Histology and Cell Biology: An Introduction to Pathology by Abraham L. Kierszenbaum and Laura Tres
- Wheater's Pathology: A Text, Atlas, and Review of Histopathology

Embryology

- **Textbook of Clinical Embryology – Vishram Singh**
- **Inderbir Singh's Human Embryology**
- **Essentials of Human Embryology – A.K. Datta**
- **Langman's Medical Embryology**
- **Textbook of Human Embryology with Clinical Cases – Yogesh Sontakke**
- Embryology: Text & Atlas – Brijesh Kumar

- Textbook of Embryology: For Undergraduate Students – Suresh D. Gangane, Shabana M. Borate
- Embryology Workbook – P. Sonje
- Multiple Choice Questions and Viva Voce in Human Embryology – Ujwala Bhanarkar, Yogesh Sontakke
- The Developing Human: Clinically Oriented Embryology – Keith L. Moore, T.V.N. Persaud, Mark G. Torchia
- Before We Are Born: Essentials of Embryology and Birth Defects – Keith L. Moore, T.V.N. Persaud, Mark G. Torchia
- Human Embryology and Developmental Biology – Bruce M. Carlson
- Larsen's Human Embryology – Gary C. Schoenwolf, Steven B. Bleyl, Philip R. Brauer, Philippa H. Francis-West
- Molecular Biology of the Cell – Bruce Alberts, et al. (includes embryology sections)
- The Ontogenetic Basis of Human Anatomy – Erich Blechschmidt

ANA-MP-C1-02

Upper limb and Lower limb (80 hrs)

Topic	Description
Osteology	Bones of the upper limb, including the clavicle, scapula, humerus, radius, ulna, carpal bones, metacarpals, and phalanges. (4 hrs)
Pectoral Region	Describe the extent, cutaneous innervation, muscles, and clavipectoral fascia. (2 hrs)
Mammary Gland	Describe the location, extent, mammary bed, structure, blood supply, and lymphatic drainage. (2 hrs)
Back and Shoulder	Describe the muscles, intermuscular spaces, and rotator cuff. (4 hrs)
Axilla	Describe the boundaries and enumerate the contents. Axillary artery, vein, and axillary group of lymph nodes. Brachial plexus and its applied aspects. (4 hrs)
Arm and forearm	Outline the compartments of the arm and forearm and describe in detail the muscles of both front and back of arm (6 hrs)
Hand	Describe the arrangement of structures in the palm, including muscles, palmar aponeurosis, carpal tunnel, flexor retinaculum, fascial spaces. Describe the dorsum of the hand, including the extensor retinaculum. (4 hrs)
Nerves of the Upper Limb	Describe the axillary, musculocutaneous, ulnar, median, and radial nerves with applied anatomy. (4 hrs)
Arteries of the Upper Limb	Describe the major arteries, collateral circulation, anastomosis around the scapula and elbow, and palmar arches. (4 hrs)
Segmental Innervation and Drainage	Describe the segmental innervation of skin and muscles, venous and lymphatic drainage, and axillary group of lymph nodes. (2 hrs)
Joints of the Upper Limb	Describe the joints of the upper limb, including the shoulder joint, wrist joint, radioulnar joints, elbow joint, carpometacarpal joints, metacarpophalangeal joints, Interphalangeal joints. (4 hrs)

LOWER LIMB

Topic	Description
Osteology	Describe the bones of the lower limb, including the Hip Bone, femur, patella, tibia, fibula, tarsal bones, metatarsals, and phalanges. (5 hrs)
Thigh	Describe the deep fascia, compartments of the thigh, muscle groups, their attachments, actions, femoral triangle and its contents, adductor canal, and applied anatomy. (5 hrs)
Gluteal Region	Describe the muscles of the gluteal region, structures under the cover of gluteus maximus, and arterial anastomoses. (3 hrs)
Popliteal Fossa	Describe the popliteal fossa and anastomoses around the knee joint. (3 hrs)
Leg	Describe the retinacula, compartments of the leg, their contents, and actions of muscle groups. (4 hrs)
Foot	Describe the dorsum of the foot and sole of the foot. Describe in detail the arches of the foot. (5 hrs)
Segmental Innervation and venous, Lymphatic Drainage	Describe the segmental innervation, lymphatic drainage, superficial and deep veins of the lower limb, applied aspects, and surface anatomy. (4 hrs)
Vessels of the Lower Limb	Describe the vessels of the lower limb, including collateral circulation and surface anatomy. (4 hrs)
Nerves of the Lower Limb	Describe the nerves of the lower limb with applied aspects. (3 hrs)
Joints of the Lower Limb	Describe the joints of the lower limb, including the hip joint, knee joint, ankle joint, tibiofibular joints, subtalar joint, midtarsal joints, tarsometatarsal joints, metatarsophalangeal joints, and interphalangeal joints. (4 hrs)

Reference Books:

- **Vishram Singh's Textbook of Anatomy**, Volume 1: Upper Limb and Thorax and Volume 2: Lower Limb and Abdomen by Vishram Singh
- **Essentials of Human Anatomy** by A.K. Datta
- **Gray's Anatomy 42e**
- **Gray's Anatomy for Students** by Richard L. Drake, A. Wayne Vogl, Adam W.M. Mitchell
- **Clinically Oriented Anatomy** by Keith L. Moore, Arthur F. Dalley, Anne M.R. Agur
- **Cunningham's Manual of Practical Anatomy**, Volume 1: Upper and Lower Limbs
- **Netter's Atlas of Human Anatomy** by Frank H. Netter
- **Textbook of Anatomy** by Inderbir Singh
- **Textbook of Anatomy** by Yogesh Sontakke
- **Weir & Abrahams' Imaging Atlas of Human Anatomy** - Jonathan D. Spratt, Lonie R. Salkowski, Marios Loukas, et al.
- **Sectional Anatomy by MRI and CT** - Mark W. Anderson, Michael G. Fox

- **Anatomy with Surface Anatomy and Clinical Aspects** - Abdul Halim
- **Gray's Surface Anatomy and Ultrasound** - Claire France Smith, Andrew Dilley, Barry Mitchell, Richard L. Drake
- **Surface Anatomy: The Anatomical Basis of Clinical Examination** - John S.P. Lumley

ANA-MP-C1-03

Physiology

BLOOD (4 hrs)

- Functions of RBC, WBC, and Platelets.
- Blood groups.
- Blood Coagulation

MUSCLE (4 hrs)

- Neuromuscular junction – histological features.
- Physiology of neuromuscular transmission.
- Skeletal muscle contraction.
- Neuron – structure and functions.

CARDIOVASCULAR SYSTEM (4 hrs)

- Cardiac cycle, cardiac output.
- Regulation of heart rate.
- Blood pressure – regulation.

RESPIRATORY SYSTEM (4 hrs)

- Mechanism of respiration.
- Oxygen and carbon dioxide carriage.
- Hypoxia.
- Regulation of respiration.

EXCRETORY SYSTEM (4 hrs)

- Nephron.
- Mechanism of urine formation.
- Micturition.

DIGESTIVE SYSTEM (5 hrs)

- Salivary secretion – composition, functions
- Stomach - composition, functions and regulations.
- Pancreas - composition, functions and regulations.
- Liver – bile (composition, functions)
- Small intestine, large intestine. (composition, functions)

ENDOCRINE SYSTEM (4 hrs)

- Thyroid, parathyroid, pancreas.
- Adrenal cortex, adrenal medulla.
- Pituitary – anterior and posterior lobes.

NERVOUS SYSTEM (5 hrs)

- Cerebral cortex, basal ganglia, cerebellum, thalamus, and hypothalamus.
- Cerebrospinal fluid (CSF): Formation, circulation, and functions.
- Autonomic Nervous System

SPECIAL SENSES (3 hrs)

- **Vision:** Visual pathway, refractory errors.
- **Hearing:** Functions of the ear, auditory pathway.
- **Taste:** Taste pathway.
- **Smell:** Olfactory pathway.

REPRODUCTIVE SYSTEM (3 hrs)

- **Male:** Functions of Testis
- **Female:** Menstrual cycle.

PRACTICAL

- **There is no practical examination for Physiology.**

Reference Books:

- **Textbook of Medical Physiology** by G.K. Pal
- **Textbook of Physiology** by A.K. Jain (2 Volumes)
- **Essentials of Medical Physiology** by K. Sembulingam and Prema Sembulingam
- **Guyton and Hall Textbook of Medical Physiology** by John E. Hall
- **Review of Medical Physiology** by William F. Ganong (Ganong's Physiology)

ANA-MP-C1-04

Biochemistry

Definitions, Objectives, and Scope of Biochemistry

Chemistry of Biomolecules (10 hrs)

Biochemistry of Carbohydrates

- **Monosaccharides:** Glucose, fructose, galactose, mannose
- **Disaccharides:** Maltose, lactose, sucrose
- **Polysaccharides:** Glycogen, starch, dextrin, inulin, cellulose
- **Mucopolysaccharides:** Significance
- Occurrence and significance of carbohydrates

Biochemistry of Lipids

- **Reactions and General Properties of the Following:**
 - **Simple lipids:** Triglycerides, waxes
 - **Compound lipids:** Phospholipids, glycolipids
 - **Derived lipids:** Fatty acids, sterols, other alcohols

Biochemistry of Proteins

- Biological functions of proteins
- Classification of proteins
- Classification of amino acids
- Physical properties of amino acids
- Chemical reactions of amino acids
- Structure of proteins and their biological functions
- Denaturation of proteins

Biochemistry of Nucleic Acids

- Chemistry and functions
- Hydrolysis products of nucleic acids: Nucleotides, nucleosides, purines, pyrimidines, and sugars
- Nucleotides and nucleosides of biological importance
- Structure of nucleic acids: DNA and RNA

Enzymes (5 hrs)

- Chemical nature, catalytic properties, and classification of enzymes
- Brief outline of the mode of action of enzymes and isoenzymes
- Effect of substrate concentration, enzyme concentration, pH, and temperature on the rate of an enzyme-catalyzed reaction
- Michaelis-Menten constant
- Coenzymes, activators, and inhibitors
- Competitive and non-competitive inhibition of enzyme reactions

Porphyrins and Bile Pigments (6 hrs)

- Structure, biosynthesis, and reactions of porphyrins and hemochromogens

- Formation and circulation of bile pigments

Vitamins and Minerals of Biological Importance (4 hrs)

- Structure, properties, deficiencies, manifestations, and biological functions of fat- and water-soluble vitamins
- Macro and microelements in health

Intermediary Metabolism of Carbohydrates, Amino Acids, and Lipids (10 hrs)

A) Carbohydrates

- Digestion and absorption
- Metabolism of glucose: glycolysis, gluconeogenesis
- Alternative pathways for glucose metabolism
- Glycogen formation and breakdown; glycogen storage diseases
- Maintenance of blood sugar levels and hormonal influence
- Diabetes mellitus and muscle glycogen metabolism
- Interconversion of monosaccharides

B) Proteins

- Digestion and absorption of proteins
- Metabolism of amino groups
- Urea formation and blood urea levels

C) Lipids

- Digestion and absorption
- Synthesis and oxidation of fatty acids
- Cholesterol biosynthesis, regulation, and biologically important compounds synthesized from cholesterol.

Biological Oxidation (5 hrs)

- Significance of biological oxidation
- Oxidative phosphorylation

Practicals

- **No practical examination for Biochemistry.**

Reference Books:

- Textbook of Biochemistry for Medical Students by D.M. Vasudevan, Sreekumari S., and Kannan Vaidyanathan
- **Textbook of Medical Biochemistry** by M.N. Chatterjea and Rana Shinde
- **Harper's Illustrated Biochemistry** by Victor W. Rodwell, David A. Bender, Kathleen M. Botham, Peter J. Kennelly, and P. Anthony Weil
- **Biochemistry** by U. Satyanarayana and U. Chakrapani
- **Lippincott's Illustrated Reviews: Biochemistry** by Denise R. Ferrier
- **Textbook of Biochemistry** by S.K. Gupta and Veena Bharihoke

Practical 1

(General Anatomy, Histology, Embryology)

EMBRYOLOGY MODELS AND CHART DEMONSTRATION (5 hrs/week)

Demonstrate embryology models and charts, explaining the following processes and structures:

- **Stages of Spermatogenesis and Oogenesis**
 - Describe the cellular stages and key events in sperm and egg development.
- **Structure of the Blastocyst**
 - Detail the components, including the inner cell mass, trophoblast, and blastocoel.
- **Formation of the Bilaminar Embryonic Disc**
 - Explain the development of the epiblast and hypoblast.
- **Formation of the Yolk Sac and Its Fate**
 - Describe the yolk sac's formation, role, and eventual regression.
- **Development and Fate of the Primitive Streak**
 - Explain the formation, function, and regression of the primitive streak.
- **Development and Fate of the Notochord**
 - Describe the notochord's formation, role in development, and adult remnants.
- **Formation and Derivatives of Neural Crest Cells and Neural Tube Defects**
 - Detail the origin, migration, and derivatives of neural crest cells.
 - Discuss common neural tube defects.
- **Formation of Head, Tail, and Lateral Folds and Formation of the Gut**
 - Explain embryonic folding and the development of the primitive gut.
- **Twinning**
 - Describe the mechanisms of monozygotic and dizygotic twinning.
- **Placenta and Its Anomalies**
 - Detail the structure, function, and common placental anomalies.

Histology Demonstrations (7 hrs/week)

Demonstrate and identify the following tissues and structures microscopically, with differentiation and labelled diagrams where specified:

Microscope and Tissue Types

- **Epithelia**
 - Identify different types of epithelia microscopically.
- **Connective Tissue**
 - Identify different types of connective tissue microscopically.
- **Cartilage**
 - Identify different types of cartilage microscopically.
- **Bone**
 - Identify bone microscopically.
 - Draw neat, labelled diagrams of bone in transverse section (TS) and longitudinal section (LS).
- **Nervous Tissue**
 - Identify myelinated and non-myelinated nerve fibers, optic nerve, sympathetic ganglia, and spinal ganglia microscopically.
 - Differentiate between sympathetic and spinal ganglia based on structure.
- **Muscle Tissue**
 - Identify different types of muscles (smooth, skeletal, cardiac) microscopically.
 - Differentiate between smooth, skeletal, and cardiac muscle fibers with neat, labelled diagrams for each.
- **Vascular System**
 - Identify different types of blood vessels microscopically.
 - Differentiate between arteries and veins, including their subtypes.
- **Lymphatic System**
 - Identify spleen, thymus, palatine tonsil, and lymph node microscopically.
 - Differentiate between these lymphoid structures based on histological features.
- **Skin**
 - Identify different types of skin microscopically.
 - Differentiate skin types with respect to each layer.

- **Glandular Tissue**

- Identify different types of glandular tissue microscopically.
- Differentiate between mucous, serous, and mixed salivary glands.

Umbilical Cord and Placenta

- Identify the placenta at term pregnancy and the umbilical cord microscopically.

Reference Books:

- Inderbir Singh's Textbook of Human Histology
- Textbook of Human Histology by Yogesh Sontakke
- Junqueira's Basic Histology: Text and Atlas
- DiFiore's Atlas of Histology with Functional Correlations
- Textbook of Histology by G.P. Pal
- Wheater's Functional Histology
- Textbook of Histology and A Practical Guide by J.P. Gunasegaran
- Essentials of Medical Histology by A.K. Datta

ANA-MP-C1-06

Practical 2

(Upper limb and Lower limb)

Anatomical Demonstration: Upper ^{6 hr} and Lower Limbs ^{6 hr}

Introduction

- Describe the superficial fascia and its distribution.
- Outline the pectoral region and its anatomical significance.
- Demonstrate awareness of cadaveric ethics, dissection hall etiquette, professional behaviour, and general principles of biomedical waste disposal.
- Demonstrate terms of position (e.g., anterior, posterior) and terms of movement (e.g., flexion, extension).
- Identify structures encountered during dissection of the upper limb, including superficial fascia, blood vessels, nerves, spinal nerve branches, deep fascia, muscles, joints, and bones.

Upper Limb (6 hrs/week)

General Structures

- Identify the superficial veins of the upper limb (cephalic, basilic, and median cubital veins).
- Identify the cutaneous nerves of the upper limb and their areas of supply.
- Describe the deep fascia and its modifications (e.g., retinacula, aponeuroses) in the upper limb.
- **Bones:** Identify the bones of the upper limb (clavicle, scapula, humerus, radius, ulna, carpals, metacarpals, phalanges) and their features, including palpable landmarks and joint articulations.

Pectoral Region

- Identify the muscles, vessels, and nerves of the pectoral region.
- Demonstrate the attachments and structures piercing the clavipectoral fascia.

Axilla

- Demonstrate the boundaries and contents of the axilla.

Back and Shoulder Region

- Identify the muscles attaching the scapula to the trunk, their actions, and the resulting scapular movements.
- Locate the triangle of auscultation, its boundaries, and clinical significance.
- Demonstrate the muscles attaching the humerus to the scapula (deltoid, supraspinatus, infraspinatus, teres minor, teres major, subscapularis), including attachments, nerve supply, and actions.
- Demonstrate the quadrangular and triangular spaces, their boundaries, and structures passing through them.
- Identify the origin, course, branches, and distribution of the axillary nerve.

Posterior Compartment of the Arm

- Demonstrate the attachments, nerve supply, and actions of the triceps brachii muscle.
- Describe the origin, course, and distribution of the profunda brachii artery.
- Demonstrate the radial nerve, including its origin, course, and distribution.

Cubital Fossa and Anterior Compartment of the Arm

- Identify the boundaries and contents of the cubital fossa.
- Demonstrate the muscles (biceps brachii, coracobrachialis, brachialis), including their attachments, nerve supply, and actions.
- Describe the extent, course, and branches of the brachial artery.
- Identify the musculocutaneous nerve, its course, and distribution.
- Demonstrate the median and ulnar nerves, their courses, and relations in the arm.

Anterior Compartment of the Forearm

- Identify the cutaneous nerves and their areas of supply.
- Demonstrate the superficial and deep flexor muscles, including attachments, nerve supply, and actions.
- Describe the radial and ulnar arteries, including their extent, course, and branches.
- Identify the median nerve, ulnar nerve, and superficial branch of the radial nerve, including their courses, branches, distributions, and applied anatomy.

Hand

- Identify the cutaneous nerves and their areas of supply.
- Demonstrate the attachments of the palmar aponeurosis.
- Demonstrate the flexor retinaculum, its attachments, and relations, and identify the boundaries and contents of the carpal tunnel.
- Identify the thenar, hypothenar, and lumbrical muscles, including their attachments, nerve supply, and actions.
- Demonstrate the formation and branches of the superficial and deep palmar arches.
- Demonstrate the branches and distribution of the median and ulnar nerves in the hand.

Extensor Compartment of the Forearm and Hand

- Demonstrate the superficial and deep extensor muscles, including attachments, nerve supply, and actions.
- Describe the posterior interosseous artery, including its extent, course, and termination.
- Identify the posterior interosseous nerve, including its course, branches, distribution, and applied anatomy.
- Identify the cutaneous nerves and their areas of supply on the dorsum of the hand.

- Demonstrate the attachments and relations of the extensor retinaculum.
- Identify the boundaries of the anatomical snuffbox.

Joints of the Upper Limb

- Demonstrate the articular surfaces, ligaments, relations, nerve supply, movements, and muscles responsible for movements of the following joints:
 - Shoulder joint
 - Elbow joint
 - Radioulnar joints
 - Wrist joint
 - Joints of the hand

Surface Anatomy

- Identify and describe the following landmarks:
 - Clavicle, jugular notch, sternal angle, nipple, infraclavicular fossa, axilla, scapula, vertebral spines, iliac crest.
- Demonstrate the bones of the upper limb, their parts, palpable bony landmarks, joints, and movements at these joints.

Lower Limb (6 hrs/week)

General Structures

- **Bones:** Identify the bones of the lower limb (pelvis, femur, patella, tibia, fibula, tarsals, metatarsals, phalanges) and their features, including palpable landmarks and joint articulations.

Thigh

- Describe the deep fascia of the thigh and its modifications (e.g., iliotibial tract).
- Identify the compartments of the thigh and their muscle groups, including attachments.
- Identify the muscles forming the boundaries of the femoral triangle and its contents.
- Identify the muscles forming the boundaries of the adductor canal and its contents.

Gluteal Region

- Identify the Gluteus maximus, Gluteus Medius, and Gluteus minimus, including their attachments.
- Describe the structures under the gluteus maximus and Gluteus medius, including related vessels and nerves.

Popliteal Fossa

- Identify the boundaries and contents of the popliteal fossa.

Leg

- Identify the compartments of the leg, including retinacula and their contents.

Foot

- Identify the cutaneous nerves supplying the dorsum and sole of the foot.
- Demonstrate the layers of muscles in the foot.
- Identify the arches of the foot and their components.

Vessels and Nerves

- Identify the origin, course, tributaries, and termination of the small and great saphenous veins.
- Identify the sciatic nerve and its branches in the posterior thigh.
- Describe the relations of the tibial nerve with popliteal vessels.
- Identify the course and branches of the tibial and common peroneal nerves.

Joints of the Lower Limb

- Identify the articular surfaces and ligaments of the following joints:
 - Hip joint
 - Knee joint
 - Ankle joint
 - Tibiofibular joints
 - Subtalar joint
 - Midtarsal joints

- Joints of the foot

Reference Books:

Dissection Books

1. Cunningham's Manual of Practical Anatomy, Volume 1: Upper and Lower Limbs
2. Grant's Dissector
3. Textbook of Anatomy with Dissection Manual

Atlas Books

1. Netter's Atlas of Human Anatomy
2. Grant's Atlas of Anatomy
3. Thieme Atlas of Anatomy
4. McMinn's and Abrahams' Clinical Atlas of Human Anatomy

Semester 1: Examination Mark and Scheme

Course Code	Course Title	University Exam		Internal Exam		Total Max Marks	Total Min Marks
		Max Marks	Min Marks	Max Marks	Min Marks		
ANA-MP-C1-01	General Anatomy, Histology, Embryology	50	25	25	12.5	75	37.5
ANA-MP-C1-02	Upper Limb and Lower Limb	50	25	25	12.5	75	37.5
ANA-MP-C1-03	Physiology	50	25	25	12.5	75	37.5
ANA-MP-C1-04	Biochemistry	50	25	25	12.5	75	37.5
Total						300	150

Note: No practical exams are conducted in the first Semester. Only theoretical university exams are held.

Theory Examinations:

- ANA-MP-C1-01 and ANA-MP-C1-02: **2 hours each.**
- ANA-MP-C1-03 and ANA-MP-C1-04: **2 hours each.**

All exams (ANA-MP-C1-01, ANA-MP-C1-02, ANA-MP-C1-03, ANA-MP-C1-04) are scheduled on separate dates.

Semester 2

ANA-MP-C2-01: Thorax, Abdomen

Thorax (35 hrs)

- **Extent, Surface Landmarks, and Applied Anatomy:** Define the extent, surface landmarks, and applied anatomy of the thorax. List the constituents of the thoracic wall and their applied anatomy. (5 hrs)
- **Thoracic Cavity and Mediastinum:** Describe the anatomy of the thoracic cavity, pleura, its reflections, mediastinum, and their applied anatomy. (4 hrs)
- **Thoracic Organs:** Describe the location, dimensions, external and internal features, relations, blood supply, lymphatic drainage, nerve supply, and applied anatomy of thoracic organs. (*Pericardium, heart, Lungs, Pleura, Trachea, bronchi, Esophagus, Thymus, Thoracic duct*) (6 hrs)
- **Diaphragm:** Detail the attachments, openings, blood supply, nerve supply, development, and applied anatomy of the diaphragm. (4 hrs)
- **Major Blood Vessels:** Identify major blood vessels and describe their origin, course, termination, relations, branches/tributaries, area of supply/drainage, and applied anatomy. (6 hrs)
- **Microscopic Features:** Describe the microscopic features of the trachea, lungs, thymus correlating structure with function. (5 hrs)
- **Development of Cardiovascular System and Respiratory System:** Describe the development of the heart tube, chambers, and septation of the heart, as well as arteries, veins, and fetal circulation. Correlate developmental sequences with related congenital anomalies. Respiratory System: Development of Trachea and lung (5 hrs)

Abdomen (45 hrs)

- **Extent, Surface Landmarks, and Applied Anatomy:** Define the extent, surface landmarks, regions, and applied anatomy of the abdomen. (5 hrs)
- **Abdominal Walls and Lumbar Vertebrae:** List the constituents of the anterior and posterior abdominal walls and lumbar vertebrae, and their applied anatomy. Describe the anterior abdominal wall, including the general arrangement of muscles, rectus sheath, inguinal canal, and their applied anatomy. (5 hrs)

- **Abdominal Cavity and Peritoneum:** Describe the anatomy of the abdominal cavity, peritoneum, omentum, mesentery, greater and lesser sacs and their applied anatomy. (5 hrs)
- **Abdominal Organs:** Describe the location, dimensions, external and internal features, relations, blood supply, lymphatic drainage, nerve supply, and applied anatomy of the following organs: stomach, small and large intestines, duodenum, caecum and appendix, pancreas, liver, gallbladder and extrahepatic biliary apparatus, spleen, kidneys, and suprarenal glands. (7 hrs)
- **Major Blood Vessels:** List major blood vessels and describe their origin, course, termination, relations, branches/tributaries, area of supply/drainage, and applied anatomy, including superior and inferior mesenteric vessels, portal vein and portocaval anastomosis, abdominal aorta and its branches, and inferior vena cava and its tributaries. (5 hrs)
- **Microscopic Features:** Describe the microscopic features of the following tissues, correlating structure with function: esophagus and stomach, duodenum, jejunum, ileum, large intestine and appendix, liver, gallbladder, pancreas, spleen, kidney, suprarenal gland, ureter. (10 hrs)
- **Developmental Anatomy:** Describe and demonstrate the development of the gastrointestinal tract (including liver, spleen, gallbladder, and pancreas), and Kidney, ureter. Correlate developmental sequences with related congenital anomalies. (6 hrs)
- **Osteology:** all vertebrae (cervical, thoracic, lumbar, sacrum, coccyx) (2 hrs)

ANA-MP-C2-02: Pelvis (80 hrs)

- Bones of the Pelvis, Joints and Ligaments of the Pelvis, Differences Between the Male and Female Pelvis, Obstetric Pelvis (True Pelvis), Obstetric Pelvic Measurements, Types of the Female Pelvis. Pelvic walls and associated structures (10 hours)
- **Pelvic Organs:** Describe the location, dimensions, external and internal features, relations, supports, blood supply, lymphatic drainage, nerve supply, development and applied anatomy of the following pelvic organs: (15 hours)
 1. Urinary bladder
 2. Urethra
 3. Rectum and anal canal
 4. Prostate
 5. Testis and epididymis
 6. Vas deferens and seminal vesicles
 7. Uterus and fallopian tubes
 8. Ovaries
 9. Vagina
- **Perineum:** Boundaries and divisions (anterior urogenital triangle and posterior anal triangle), perineal membrane, superficial and deep perineal pouches, urogenital diaphragm, perineal body, ischiorectal (ischioanal) fossa, pudendal nerve, pudendal canal, and internal pudendal artery. (15 hrs)
- **Pelvic Diaphragm:** Discuss the pelvic diaphragm, including its parts, attachments, role in supporting the pelvic viscera, and clinical significance. (15 hrs)

Microscopic Anatomy and Development (15 hrs)

- **Microscopic Features:** Describe the microscopic features of the following tissues and correlate their structure with function:
 1. Urinary bladder
 2. Urethra
 3. Rectum and anal canal
 4. Prostate
 5. Testis and epididymis
 6. Vas deferens and seminal vesicles
 7. Uterus and fallopian tubes
 8. Ovary
 9. Vagina

- **Development of Genital Systems:** Describe and demonstrate the development of the male and female genital systems, including major anomalies, and correlate the developmental sequence with related congenital anomalies (10 hrs).

Reference Books:

- Vishram Singh's Textbook of Anatomy, Volume 1: Upper Limb and Thorax
- Vishram Singh's Textbook of Anatomy, Volume 2: Lower Limb and Abdomen
- Textbook of Anatomy: Upper Limb and Thorax (Volume 1) by Yogesh Sontakke
- Textbook of Anatomy: Lower Limb and Abdomen (Volume 2) by Yogesh Sontakke
- Gray's Anatomy 42e
- Clinically Oriented Anatomy by Keith L. Moore
- Cunningham's Manual of Practical Anatomy, Volume 1: Upper and Lower Limbs
- Netter's Atlas of Human Anatomy
- Essentials of Human Anatomy, Volume 1: Thorax, Abdomen, and Pelvis by A.K. Datta

ANA-MP-C2-03

Practical I

Identify under microscope the histological features of the various organs of thorax, abdomen and pelvis. (14 hrs/week)

- Trachea, Lungs, Oesophagus, Stomach, Duodenum, Jejunum, Ileum, Large Intestine, Appendix, Liver, Gallbladder, Pancreas, Kidney, Suprarenal Gland, Ureter, Testis, Urinary Bladder, Epididymis, Vas Deferens, Prostate, Ovary, Fallopian Tube, Uterus.

ANA-MP-C2-04

Practical II

Dissect and demonstrate the anatomy of the thoracic, abdominal and pelvic cavities; location, dimensions, external and internal features, relations, blood supply, lymphatic drainage, nerve supply of the various thoracic, abdominal and pelvic organs.

Demonstrate in model and charts the sequential development of the respiratory, cardiovascular systems, GIT, genitourinary systems and their related congenital anomalies.

Thorax (4 hrs/week)

- Dissection and demonstration of thorax and their contents
 - Appreciate the extent and surface landmarks of the thorax. To identify the structures which constitute the thoracic wall.
 - Identify the anatomy of the thoracic cavity, pleura, its reflections and the structures present in the mediastinum.
 - Appreciate the location, dimensions, external and internal features, relations, blood supply, lymphatic drainage and nerve supply of heart and lungs.
 - Recognize the attachments, openings, blood supply and nerve supply of the diaphragm.
 - Identify the major blood vessels their origin, course, termination, relations, branches/tributaries and area of supply/drainage.
 - Appreciate the cross-sectional anatomy of the thorax at various vertebral levels.
 - Identify the bone(s) and appreciate its parts, features and attachments.
 - Identify the radiographs both plain and contrast pertaining to the thorax and identify the structures present in it.

- Demonstrate the surface marking of the various organs and structures of the thoracic cavity.

Lab: Abdomen (6 hrs/week)

- Dissection and demonstration of abdomen and their contents
 - To identify the extent, surface landmarks and regions of the abdomen.
 - To recognize the constituents of the anterior and posterior abdominal wall.
 - To appreciate the anatomy of the abdominal cavity, peritoneum, its reflections and various spaces in the abdomen.
 - To identify the location, dimensions, external and internal features, relations, blood supply, lymphatic drainage and nerve supply of following organs of the abdomen.
1. Stomach
 2. small and large intestines
 3. Duodenum
 4. Caecum and appendix
 5. Pancreas
 6. Liver
 7. Gall bladder and extra biliary apparatus
 8. spleen
 9. Kidney and suprarenal glands

To recognize the major blood vessels and appreciate their origin, course, termination, relations, branches/tributaries and area of supply/ drainage.

- Superior and inferior mesenteric vessels
- portal vein and portocaval anastomosis
- abdominal aorta and its branches
- inferior vena cava and its tributaries
- To identify the bone(s) and appreciate its parts, features and attachments.
- To recognize the radiographs, both plain and contrast pertaining to the abdomen and identify the structures present in it.
- To demonstrate the surface marking of the various organs and structures of the abdominal cavity and planes of the abdomen.

Pelvis (4 hrs/week)

- Dissection and demonstration of the pelvis and its contents.
 - Identify the peritoneal investment of pelvic viscera and their clinical implications.
 - Demonstrate the location, dimensions, external and internal features, relations, supports, blood supply, lymphatic drainage, and nerve supply of the following pelvic organs:
 1. Urinary bladder
 2. Urethra
 3. Prostate
 4. Rectum and anal canal
 5. Uterus and Fallopian tube
 6. Perineum
-
- Appreciate the boundaries and contents of the ischiorectal fossa and perineal pouches.
 - Locate the parts of the pelvic diaphragm, its attachment, and its role in supporting the pelvic viscera.
 - Demonstrate the location, branches, and distribution of major pelvic vessels and nerves and their clinical implications.
 - Identify the sex of the bony pelvis with an emphasis on major sex differences.
 - Appreciate radiographs, both plain and contrast, pertaining to the pelvis.
 - Histology of Reproductive and Urinary Systems: urinary bladder, urethra, uterus, ovary, fallopian tube, vagina, prostate, testis, epididymis, vas deferens, seminal vesicles.

SEMESTER 2: EXAMINATION AND MARK SCHEME

Course Code	Course Title	Theory University Exam		Theory Internal Exam		Practical Exam University		Practical Exam Internal		Total Max Marks	Total Min Marks
		Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks		
ANA-MP-C2-01	Thorax, Abdomen	50	25	25	12.5	-	-	-	-	75	37.5
ANA-MP-C2-02	Pelvis	50	25	25	12.5	-	-	-	-	75	37.5
ANA-MP-C2-03	Practical I (General Histology [Semester 1] and Histology of Thorax and Abdomen)	-	-	-	-	100	50	50	25	150	75
ANA-MP-C2-04	Practical II	-	-	-	-	100	50	50	25	150	75
Total										450	225

Notes:

- **Theory Examinations:**

- ANA-MP-C2-01 and ANA-MP-C2-02 are theory exams, each with a duration of 2 hours.

- **Practical Examinations:**

- **Practical I Exam:**

- General Histology: Semester 1 topics
 - Histology of the Thorax and Abdomen: Semester 2 topics
 - Spotters 15 ✕ 4 Marks= 60 marks, slide Discussion: Major: 20 Marks, Minor 20 Marks

- **Practical II Exam: ANA-MP-C2-04 Practical University Exam (100 marks):**

- Spotter: (15× 2 mark = 30 marks)

- Cadaver Region Discussion: 20 marks (2 × 10)
- Viva Voce: Osteology, Surface Anatomy, Radiological Anatomy (Upper & Lower Limb, Thoracic and abdominal organs and Bones excluding Pelvis): 50 marks

Semester 3

ANA-MP-C3-01

Head and Neck I (80 hrs)

Topic	Hours
Introduction and Overview of Living Anatomy of Head & Neck	2
Osteology of Head and Neck (skull bones, cranial/facial skeleton, joints, anatomical position, exterior, foramina, canals, fissures, sex differences, fetal/newborn skull, cervical vertebrae, applied anatomy). Cranial Cavity, Meninges & Dural Venous Sinuses.	10
Scalp, Temple, Face (muscles of facial expression, nerve/arterial/lymphatic supply, applied anatomy)	6
Eyelids, Conjunctiva, Lacrimal Apparatus	4
Skin, Superficial/Deep Fascia of Neck, Platysma, Cutaneous Nerves, Superficial Veins, Cervical Lymphatics, Deep Cervical Fascia & Spaces, Applied Anatomy	12
Side of Neck: Sternocleidomastoid & Posterior Triangle	5
Anterior Region of the Neck, Anterior Triangle of Neck: Ansa Cervicalis & Infrahyoid Muscles with Applied Anatomy	5
Back of the Neck: Muscles of the back of the neck, Suboccipital Region, Cervical Spine & Joints	5
Parotid Region: Parotid Gland & Extracranial Facial Nerve, Applied Anatomy	5
Submandibular Region: Contents (Suprahyoid Muscles, Salivary Glands: Submandibular gland, Sublingual gland, Nerves: Lingual nerve, Hypoglossal nerve, Glossopharyngeal nerve, Submandibular ganglion. Vessels: Lingual artery, Facial artery, Corresponding veins.) Applied Anatomy	4
Temporal & Infratemporal Fossae, TMJ, Muscles of Mastication, Pterygopalatine Fossa, Maxillary Artery, Pterygopalatine Ganglion.	15
Development of Face, Salivary Glands, eyelids, lacrimal apparatus, Pharyngeal Arches.	7
Total	80

ANA-MP-C3-02: Head and Neck II (80 hrs)

Topic	Hours
Thyroid & Parathyroid Glands, Trachea & Oesophagus (Gross, Microscopic structure, development and applied anatomy.)	7
Pre- & Paravertebral Regions and Root of Neck (Muscles, cervical plexus, ansa cervicalis, phrenic nerve, sympathetic chain, root of neck and Applied Anatomy).	7
Oral Cavity, Teeth & Tongue (Gross, Microscopic structure, development and applied anatomy.)	8
Pharynx & Palate: Gross, Microscopic structure, development and applied anatomy.	8
Larynx: Gross, Microscopic structure, development and applied anatomy.	10
Major Blood Supply & Lymphatic Drainage of Head & Neck, Applied Anatomy	8
Nose & Paranasal Sinuses (gross, development, applied anatomy)	5
Ear (external, middle, pharyngotympanic tube, internal ear, organ of Corti): Gross, Microscopic structure, Development, applied anatomy.	9
Orbit & Eyeball (boundaries, fascia, extraocular muscles, sheath, nerves, ciliary ganglion, vessels, eyeball layers/compartments/lens). Development of Eye.	9
Special Senses Overview and Integration (olfaction, gustation, vision, hearing, equilibrium; sensory pathways, receptors, clinical correlations).	9
Total	80

ANA-MP-C3-03

Practical I (Histology)

Lab: Museum Techniques (5 hrs/week)

- Steps for mounting dissected specimens for museum display following appropriate guidelines
- Preparation of different anatomical models for museum display
- Knowledge of alternative preservation methods: corrosion cast and plastination

Histology Practical (7 hrs/week)

- Histology of Endocrine Glands: Pituitary Gland, Thyroid Gland, Parathyroid Gland, Suprarenal Gland
- Histology of Sensory Organs: Retina, Cornea, Eyelid, Lacrimal Gland, Cochlea, Tympanic Membrane
- Histology of Salivary Glands: Parotid, Submandibular, Sublingual
- Histology of the Tongue with All Papillae

ANA-MP-C3-04

Practical II (Head and Neck)

Head (6 hrs/week)

- Scalp
 - Identify layers, blood supply, nerve supply
- Face
 - Identify muscles: Orbicularis oculi, Orbicularis oris, Buccinator
 - Demonstrate course, branches, termination of facial vessels
- Lacrimal Apparatus
 - Recognize components: lacrimal gland, lacrimal canaliculi, lacrimal sac, nasolacrimal duct
- Cranial Cavity
 - Identify meninges, arachnoid villi, and granulations

- Recognize dural folds: Falx Cerebri, Falx Cerebelli, Tentorium Cerebelli, Diaphragma Sellae with attachments
 - Identify dural venous sinuses
- Pituitary Gland
 - Identify situation, presenting parts, relations, blood supply, development, applied anatomy
- Orbit
 - Identify boundaries, contents
 - Recognize extraocular muscles, attachments, optic nerve, oculomotor nerve, trochlear nerve, abducent nerve, branches of ophthalmic nerve, ciliary ganglion, ophthalmic artery, veins
- Parotid Gland
 - Demonstrate borders, surfaces, relations, structures passing through
- Infratemporal Fossa
 - Appreciate boundaries, contents
 - Identify course, relations, branches of mandibular nerve, otic ganglion
 - Identify origin, course, relations, branches of maxillary artery
 - Identify muscles of mastication, attachments
 - Appreciate articular surfaces, ligaments of temporomandibular joint
- Maxillary Nerve and Pterygopalatine Ganglion
 - Identify maxillary nerve, branches
 - Mention location, relations, connections, branches of pterygopalatine ganglion
- Submandibular Region
 - Identify origin, insertion, relations, nerve supply of mylohyoid, hyoglossus
 - Appreciate neurovascular structures
- Pharynx, Soft Palate, Tonsil
 - Identify location, extension, boundaries, structures of pharynx
 - Recognize boundaries, contents of piriform fossa in laryngopharynx
 - Identify muscular components of soft palate
- Nasal Cavity and Paranasal Air Sinuses
 - Recognize gross features of medial and lateral walls of nasal cavity
- Tongue
 - Identify external features, parts, papillae, muscles
- Development

- Demonstrate development of face, nose, palate, lip, and anomalies using models and charts
- Demonstrate derivatives of pharyngeal arches, tongue, thyroid using charts and models

Lab: Neck (6 hrs/week)

- Posterior Triangle
 - Identify boundaries, subdivisions, contents
 - Identify sternocleidomastoid muscle: origin, insertion, relations
- Anterior Triangle
 - Identify boundaries, subdivisions, contents
 - Identify carotid sheath, contents: common carotid artery, internal jugular vein, ansa cervicalis
- Thyroid and Parathyroid Glands
 - Identify situation, extent, parts, relations, blood supply
- Great Vessels of the Neck
 - Identify origin, course, branches of common carotid artery, external carotid artery, subclavian artery, internal jugular vein with tributaries
- Cervical Sympathetic Chain
 - Identify situation, number of ganglia
- Larynx
 - Identify cartilages, extrinsic and intrinsic membranes, ligaments, intrinsic muscles, interior
- Surface and Radiological Anatomy

ANA-MP-C3-E01

Elective I (Choose one): (80 hrs)

(Only internal examination; no university exam or practical exams)

A. Genetics

- Describe the structure and classification of chromosomes. Explain Barr bodies, mutations. Detail karyotyping for normal males and females. Describe chromosomal abnormalities (structural and numerical), including: *Turner syndrome, Klinefelter syndrome, Down syndrome, Edwards syndrome, Patau syndrome, Cri du chat syndrome*. Explain inheritance patterns: autosomal, sex-linked. Describe pedigree analysis and dermatoglyphics.

B. Health Information Management

Unit 1 - Evolution of Health Care System

- Historical development
- Health care delivery system: issues and trends
- Hospital ownership
- Hospital organization, administration, and essential services

Unit 2 - Introduction to Health Information System

1. Historical development of health record
2. Health care in the United States and development of health care records
 - (a) Accreditation
 - (b) Physician certification
 - (c) Insurance payment for

Unit 3 - Health Record Forms

- General forms
- Administrative, Clinical, Operative, Obstetric, Ancillary, Nursing, etc.
- Record flow
- Format Types
- Mental health Records
- Rehabilitation

- Home health care
- Hospice

Unit 4 - Data Access and Retention

- Record identification
 - Alphabetic Master Patient Index
 - Numeric methods of numbering
 - (a) Serial
 - (b) Unit
 - (c) Serial-unit
- Filing equipment
 - Centralized and decentralized filing methodologies
 - (a) Alphabetic
 - (b) Straight numeric
 - (c) Terminal digit
- Record management issues
 - File folders
 - Color coding
 - Record security and related issues
- Records tracking
 - Manual systems and automated systems
- Access and retention of image-based records
 - Digital information
 - Optical image processing
 - System components and system benefits and advantages

Unit 5 - Coding and Classification Schemes

- Definition
- Nomenclature
- Classification
- Purpose of coding

Unit 6 - Introduction to Registries

- Cancer Registry

- (a) History and development
- (b) Hospital cancer Registry
- (c) Population Based Cancer Registry
- (d) Hospital cancer Registry model
- Birth Defect Registers
- (a) Model
- (b) Use-AIDS Registries
- (a) Model
- Trauma Registries
- (a) Use
- (b) Database management
- DM Registries
 - (a) Use
 - (b) Database management

Unit 7 - Data Quality

- Importance
- Role of HIM Professional in data quality
- Internal External
 - Characteristics of data quality
 - Methods to ensure data quality
 - Record content review and retrospective completion
 - Qualitative, quantitative and legal analysis
 - (b) Point of care documentation
 - (c) Data quality in statistical reports
 - (d) Coding Quality-Committees

Reference Book:

Genetics

- Principles of Clinical Genetics by Yogesh Sontakke
- Medical Genetics by G.P. Pal
- Emery's Elements of Medical Genetics by Peter D. Turnpenny & Sian Ellard
- Human Genetics by S.D. Gangane

Health Information Management

- Health Information Management: Concepts, Principles, and Practice, 6th Edition by Oachs and Watters
- Essentials of Health Information Management: Principles and Practices by Michelle Green and Mary Jo Bowie

Semester 3 Examination and Marks Scheme

Course Code	Course Title	Theory University Exam		Theory Internal Exam		Total	Total
		Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks
ANA-MP-C3-01	Head and Neck I	50	25	25	12.5	75	37.5
ANA-MP-C3-02	Head and Neck II	50	25	25	12.5	75	37.5
ANA-MP-C3-E01	Elective I (A: Genetics or B: Health Information Management)	-	-	25	12.5	25	12.5
Total						175	87.5

Note: No practical exams in Semester 3 for any of the listed courses.

Semester 4

ANA-MP-C4-01 Neuroanatomy

Topic	80 Hours	Subtopics
Spinal Cord	6	External features and internal features, position, spinal segments, relative positions of tracts. Ascending and descending tracts, blood supply, clinical importance.
Medulla Oblongata	6	External features and internal structures at different levels of transverse section, cranial nerve nuclei, clinical importance.
Pons	6	External features and internal structures at different levels of transverse section, cranial nerve nuclei, auditory pathway, clinical importance.
Midbrain	6	External features and internal features, cranial nerve nuclei, important connections, blood supply, clinical importance.
Cerebellum	6	External features, location, subdivisions, nuclei, connections, functions, blood supply, clinical importance.
Ventricles and CSF	18	Introduction to the Ventricular System, Lateral Ventricle, Third Ventricle, Fourth Ventricle, CSF Formation, Circulation, and Integration, Applied anatomy.
Cerebrum	6	External features, sulci, gyri, cortical areas, homunculus, insula, blood supply, clinical importance. White matter classification with examples, corpus callosum, association fibers, corona radiata, internal capsule with arterial supply, clinical importance. Basal Nuclei: Definition, components (caudate nucleus, putamen, globus pallidus, etc.), external features, parts of each component, afferent and efferent connections, functions, clinical importance.
Diencephalon: Thalamus	3	Definition, major subdivisions, external and internal features, nuclei, connections, functions, clinical importance.
Diencephalon: Hypothalamus and Related Structures	3	Boundaries, subdivisions, connections, functions, clinical importance of hypothalamus. Subthalamic nucleus, zona incerta, structure, nerve supply, functions, development of pineal body.

Blood Supply of Brain	4	Internal carotid arteries, vertebral artery system, arterial Circle of Willis, arterial supply to cerebral hemisphere surfaces, venous drainage, clinical importance.
Development of the Nervous System	3	Development of the central nervous system, neural tube, brain vesicles, major congenital anomalies, clinical importance.
Meninges	2	Structure, functions, dural sinuses, clinical importance.
Reticular Formation	2	Structure, connections, functions, clinical importance.
Limbic System	3	Structure, components, connections, functions, clinical importance.
Autonomic Nervous System	3	Structure, divisions, functions, clinical importance.
Special Senses Pathways	3	Visual, auditory, olfactory pathways, clinical importance.

Reference Books:

- Textbook of Human Neuroanatomy – Inderbir Singh
- Textbook of Clinical Neuroanatomy – Vishram Singh
- Essentials of Neuroanatomy – A.K. Datta
- Clinical Neuroanatomy – Richard S. Snell
- Textbook of Neuroanatomy – Yogesh Sontakke
- Human Neuroanatomy – James R. Augustine
- Neuroanatomy: An Illustrated Colour Text – Alan R. Crossman & David Neary

ANA-MP-C4-02

Practical I (Histology) (4 hrs/week)

- Histology of the Spinal Cord
- Histology of the Cerebellum
- Histology of the Cerebrum

HISTOTECHNIQUES

- **Microtomes:** Rotatory, rocking, freezing microtome, cryostat, and paraffin oven.
- **Histotechniques Equipment:**
 - Tissue flotation bath
 - Vacuum embedding oven
 - Automated tissue processor
 - Slide warmer, Microscope slides and coverslips

Reagents & Fixatives

- **Preparation of reagent solutions:** Fixatives, decalcifying solutions, embedding materials, stains, solvents, clearing reagents, mounting media, etc.
- **Fixation & Tissue Preparation:**
 - Preparation of tissues and fixatives
 - Routine fixative: Formaldehyde
 - Special fixatives: Zenker's fluid, Bouin's fluid, Carnoy's fluid
 - Decalcification

Tissue Processing

- **Steps involved:** Dehydration, clearing, infiltration, impregnation, embedding, and section preparation

Microtome Knife Sharpening & Section Cutting

- **Sharpening Techniques:** Honing and stropping
- **Techniques of Section Cutting:**

- Trimming of paraffin block
- Attaching the paraffin block to the microtome
- Orienting the block
- Cutting sections
- Attaching sections to microscope slides

Staining Procedures in Histotechnology

- **Routine Staining:** Haematoxylin and eosin (H&E) staining procedure
- **Staining Equipment & Preparation:**
 - Drying
 - Deparaffinizing
 - Hydration
 - Staining of slides
- **Reagents:** Harris's haematoxylin stain, eosin solution
- **Post-Staining Procedures:** Dehydration, mounting

Special Stains & Staining Techniques

- **Connective Tissue Stains:**
 - Collagen and collagen fibres
 - Weigert van Gieson stain
 - Masson Trichrome stain
 - Phosphotungstic Acid Haematoxylin (PTAH)
 - Reticulin stain (Silver impregnation method)
 - Elastic fibres – Verhoeff's stain
- **Stains for Specific Substances:**
 - Periodic Acid-Schiff (PAS) stain
 - Toluidine Blue stain
 - Crystal Violet stain

Frozen Section Techniques

- **Freezing Microtomy & Cryostat Techniques**

Reference Books:

- **Theory and Practice of Histological Techniques**
- **Histological and Histochemical Methods: Theory and Practice by J.A. Kiernan**

ANA-MP-C4-03

Practical II (4 hrs/week)

- Identify different parts of Brain, its situation, membranes and spaces in relation to them.
- Demonstrate external and internal features of spinal cord and its meninges.
- Appreciate the base of the brain with interpeduncular fossa, internal carotid arteries & its branches, Vertebral system & its branches, blood supply of different surfaces of cerebral hemispheres.
- Identify external and internal features of Medulla, pons and midbrain and cranial nerves emerging.
- Identify parts of Cerebellum, its nuclei, and connections.
- Locate and identify the boundaries of 4th ventricle, its different areas and its choroid plexus.
- Appreciate external and internal features of midbrain, Cranial nerves emerging.
- Demonstrate external features, sulci, gyri and cortical areas of cerebrum, blood supply.
- Identify major example of white matter of brain, Corpus callosum, Internal capsule and relationship.
- Study of median sagittal section of cerebrum, Pineal body, Boundaries, recesses and communications of 3rd ventricle
- Identify different parts, boundaries of lateral ventricles
- Appreciate deep dissection of cerebral hemisphere, internal capsule, basal nuclei, and thalamus: its parts and relations, hypothalamus: its parts and relations, Study of Sections- Horizontal & Coronal.
- Demonstrate the development of structures of nervous system and related congenital anomalies
- Interpret normal and abnormal images (X-ray, CT and MRI) of brain.
- Surface Anatomy

ANA-MP-C4-04

Microteaching (4 hrs/week)

- To acquire skills in teaching by making PowerPoint presentation, chalk board and other modalities of teaching available in the institution.
- Communicate effectively in students and teachers in various teaching – learning activities
- Deliver lectures
- engage in small group teaching
- develop assessment skills
- update subject knowledge by participating in discussions, workshop, reading journal,
- Update with newer technologies in the field

ANA-MP-C4-05

Project/Dissertation (12 hrs/week)

- Identify the field of interest to conduct the research
- Identify a topic on which research will be conducted
- Conduct literature review and determine the relevance of the topic and discuss with guide and finalize
- Frame a research question
- Design the materials and methods of the experiment to be conducted
- Develop skills to use the instruments and process involved in research
- Determine the statistical analysis that needs to be applied in consultation with the statistician
- Prepare protocol and standardize the intervention tools/ dosage of drugs or process of estimations, consent forms if any etc
- Prepare a protocol and seek clearance from scientific and ethics committee, animal ethics committee, biomedical research committee
- Conduct the experiment
- Collate the findings, apply statistical tests and formulate the results
- Discuss the results citing evidence from earlier reports and your new findings (both positive and negative).
- Prepare project report and pass it through plagiarism check software (acceptable level - Similarity index less than 10%) .
- Submit to university with relevant approval of HOD.

ANA-MP-C4-06

Dissection Practical III (4 hrs/week)

Upper Limb

1. Introduction to Upper Limb Dissection

- Pectoral region, axilla, cutaneous nerves, and vessels.
- Brachial plexus and dissection of the back.
- Free upper limb, lymph vessels, lymph nodes, cutaneous nerves, and deep fascia.

2. Shoulder

- Movements of the limb at the shoulder and shoulder joints.

3. Arm

- Anterior and posterior compartments.

4. Forearm and Hand

- Palmar aponeurosis, superficial palmar arch, flexor retinaculum, and flexor tendons.
- Arteries and nerves of the flexor compartment of the forearm.
- Muscles of the front of the forearm and hand.
- Fascial compartments of the palm.

5. Extensor Compartment

- Extensor compartment of the forearm and hand, including extensor tendons of the phalanges.

6. Joints of the Upper Limb

- Elbow joint, wrist joint, radio-ulnar joints, intercarpal, carpometacarpal, and intermetacarpal joints.

Lower Limb

1. Sole of the Foot

- First, second, third, fourth, fifth, and sixth layers of the sole.

2. Thigh and Hip

- Front of the thigh, adductor canal, and medial side of the thigh.
- Gluteal region, popliteal fossa, back of the thigh, and hip joint.

3. Leg and Foot

- Front of the leg, dorsum of the foot, and superficial dissection of the anterior compartment.

- Lateral and medial compartments of the leg.
- Back of the leg, ankle, tibiofibular, and other joints.

Thorax

1. Thoracic Structures

- Walls, cavity, mediastinum, root of the lungs, and autonomic nervous system.
- Lungs, anterior mediastinum, middle mediastinum, surface anatomy of the heart, and chambers of the heart (right atrium, left atrium, right ventricle, left ventricle).
- Superior mediastinum, aorta, arch of the aorta, conducting system of the heart, thoracic part of the aorta, vagus nerve, esophagus, thoracic duct, posterior intercostal vessels, and joints of the thorax.

2. Abdominal Wall and Related Structures

- Muscles of the anterior abdominal wall, inguinal canal, male external genitalia, nerves, and vessels of the anterior abdominal wall.
- Dissection of the loin.

Abdomen

1. Peritoneal Cavity and Organs

- Shape, boundaries, and divisions of the peritoneal cavity (greater and lesser sacs).
- Ligaments of the liver, spleen, esophagus, vagal trunk, stomach, mesentery, superior mesenteric artery, inferior mesenteric artery, and arterial anastomosis of the gastrointestinal tract.
- Small intestine, large intestine, duodenum, portal vein, ducts of the liver, pancreas, liver, gall bladder, and cystic duct.

2. Other Abdominal Structures

- Abdominal structures in contact with the diaphragm, autonomic nervous system, suprarenal glands, kidney, and abdominal part of the ureter.

3. Diaphragm and Posterior Abdominal Wall

- Vessels (inferior vena cava, azygos, and hemiazygos veins), lymph nodes, muscles, and nerves of the posterior abdominal wall.

Pelvis

1. Pelvic Viscera

- Ovaries, uterine tubes, pelvic part of the ureters, urinary bladder, internal surface of the urinary bladder, ductus deferens, prostate, male urethra, uterus, rectum, and anal canal.

2. Vessels, Nerves, and Muscles

- Vessels, nerves (including obturator and autonomic nerves), muscles, and joints of the lesser pelvis.

Perineum

1. Perineal Structures

- Ischiorectal fossa, perineal pouches, perineal body, and pudendal canal.

Deep Dissection of the Neck

1. Endocrine and Neurovascular Structures

- Thyroid gland, parathyroid gland, trachea, esophagus, brachiocephalic artery, subclavian artery, branches of the subclavian artery, brachiocephalic veins, and thoracic duct.
- Vertical neurovascular bundles of the neck, neurovascular bundles at the base of the neck and skull, nerves of the neck, scalene muscles, cervical fascia, lymph nodes, and lymph vessels of the head and neck.
- Prevertebral regions.

Deep Dissection of the Face and Head

1. Facial and Cranial Structures

- Nerves of the face, structures in the cheeks and lips, eyelids, lacrimal apparatus, orbit, and structures in the orbit.
- Parotid region, parotid gland, temporal and infratemporal regions, temporal fascia, temporalis muscle, and temporomandibular joint (TMJ).
- Infratemporal fossa (superficial and deep contents).

2. Other Head Structures

- Submandibular gland, mylohyoid muscle, hyoglossus, stylohyoid ligament, mouth, pharynx, nasal cavity, larynx, tongue, organs of hearing and equilibrium, and eyeball.
- Vertebral canal and joints of the neck.

Brain

1. Introduction to the Brain

- Membranes of the brain (meninges), blood vessels, cerebellum, fourth ventricle, midbrain, pons, medulla, cerebrum, white matter of the cerebrum, third ventricle, lateral ventricles, and choroid fissure.

2. Thalamus and Deep Structures

- Nuclei and connections of the thalamus, optic tract, deep dissection of the hemispheres, deep nuclei of the telencephalon, and cerebral topography.

ANA-MP-C4-E02

Elective II (Choose one) (80 hrs)

A. Embalming Techniques

- Procurement and preservation of cadavers using 10% formalin. Preparation of various types of embalming fluids, including injection and drainage techniques. Methods of embalming. Awareness of ethical and legal guidelines as per the Anatomy Act. Biomedical waste disposal guidelines.

Reference Book

- Principles and Legal Aspects by ML Ajmani.
- Embalming: History, Theory, and Practice, Fourth Edition by Robert Mayer

B: Introduction to Biomedical Instrumentation

Module I: Define BMI, Bioelectricity

- **Content:**
 - Define Biomedical Instrumentation (BMI)
 - Bioelectricity concepts: Excitable cells, Nernst potential, resting membrane potential, polarized state, action potential, depolarization, repolarization, propagation of nerve impulses, refractory period (absolute and relative), and modes of transport of substances across the cell membrane.

Module II: Electrocardiogram, Electroencephalogram, Electromyogram

- **Content:**
 - **Electrocardiogram (ECG):** Electrical activity of the heart, cardiac muscle, action potentials in cardiac muscle, SA node, origin and propagation of rhythmic excitation and contraction, regular and ectopic pacemakers, ECG waveforms and their significance, arrhythmias (abnormal rhythms), heart blocks, premature contractions, flutter, fibrillation, vulnerable period.
 - **Electroencephalogram (EEG):** Electrical activity of the brain, waveforms, different stages.
 - **Electromyogram (EMG):** Electrical activity of muscles, neuromuscular junction, synaptic potentials, artifacts, motor unit action potentials, nerve conduction studies (NCV).

Module III: Electrodes for Measurement of Biopotentials

- **Content:**

- **Electrodes for Measurement of Biopotentials:** Electrode-tissue interfaces, electrode-electrolyte and electrolyte-skin interfaces, skin contact impedance, electrodes for ECG, EEG, EMG.

Reference Books:

- Medical Instrumentation: Application and Design" by John G. Webster
- Biomedical Instrumentation and Measurements" by Leslie Cromwell.

Examination Marks and Scheme

Course Code	Course Title	Theory University Exam		Theory Internal Exam		Practical Exam University		Practical Exam Internal		Total Max Marks	Total Min Marks
		Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks		
ANA-MP-C4-01	Neuroanatomy	50	25	25	12.5	-	-	-	-	75	37.5
ANA-MP-C4-02	Practical I (Histology)	-	-	-	-	100	50	50	25	150	75
ANA-MP-C4-03	Practical II (Spotters, Discussion, Viva)	-	-	-	-	100	50	50	25	150	75
ANA-MP-C4-04	Microteaching	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-05	Dissertation (Project)	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-06	Practical III Dissection	-	-	-	-	50	25	25	12.5	75	37.5
ANA-MP-C4-07A	Histology Record	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-07B	Gross Anatomy Record	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-07C	Surface Anatomy Record	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-E02	Elective II (A: Embalming techniques or B: Introduction to Biomedical Instrumentation)	-	-	25	12.5	-	-	-	-	25	12.5
Total										600	300

Notes:

Theory Examinations:

- ANA-MP-C4-01 (Neuroanatomy) has a theory university exam (50 marks) and internal assessment (25 marks).
- ANA-MP-C4-E02 (Elective II) is assessed only via an internal exam (25 marks), with no university exam.

Practical Examinations:

- **University Practical:**

- ANA-MP-C4-02 (Practical I: Whole Histology): 100 marks
 - Spotter :15 x 4 marks = 60 marks.
 - Slide discussion: Major 10 Marks and Minor 10 Marks = Total: 20 Marks.
 - Histotechniques: 20 Marks
- ANA-MP-C4-03 (Practical II): 100 marks
 - **Spotter:** 30 marks (15 questions × 2 marks each)
 - **Cadaver Region Discussion:** 20 marks (2 discussions × 10 marks each)
 - **Viva** (Osteology, Myology, Organs, Surface Anatomy, Radiological Anatomy - whole body): **50 marks**
- ANA-MP-C4-04 (Microteaching): 25 marks
- ANA-MP-C4-05 (Dissertation): 25 marks
- ANA-MP-C4-06 (Dissection Practical III): 50 marks
- ANA-MP-C4-07A (Histology Record): 25 marks
- ANA-MP-C4-07B (Gross Anatomy Record): 25 marks
- ANA-MP-C4-07C (Surface Anatomy Record): 25 marks

- **Internal Practical:**

- ANA-MP-C4-02 (Practical I): 50 marks
- ANA-MP-C4-03 (Practical II): 50 marks
- ANA-MP-C4-06 (Dissection Practical III): 25 marks

Examination Scheme

Theory Papers (50 University Marks):

- Each paper includes one essay (choose one from two options, 15 marks), one short essay (choose one from two options, 10 marks), and short notes (eight questions, answer any five, 5 marks each, 25 marks). Duration: 2 hours per paper.
- **Pass Requirement:** Minimum of 45% marks in each paper.
- **Internal Examinations:** Candidates must achieve at least 50% marks in internal assessments in each semester.
- **Attendance Requirement:** Minimum of 75% attendance in both theory and practical sessions combined.
- **University Practical Examinations:** Conducted only at the end of the 2nd and 4th semesters.
- **University Theory Examinations:** Held at the end of each semester.
- **Internal Marks:** Awarded by the department based on faculty evaluations, including class tests, assignments, seminar performance, and class participation.
- **Eligibility for University Examinations:** Candidates must attend at least 75% of the total theory and practical sessions to be eligible for university examinations.
- **Dual Evaluation:** All papers undergo dual evaluation. If the difference in marks between the first and second examiners exceeds 5, a third examiner from the subject panel evaluates the paper, and their marks are final. If the difference is 5 or less, the average of the two marks is awarded.

Vacation/Holidays

1. Gazetted holidays: 10 days
2. Onam holidays: 10 days
3. Christmas holidays: 10 days
4. Summer vacation: 10 days

Grading System (CSS)

Grade	Performance	Grade Point	% Marks
O	Outstanding	10	95-100
A+	Excellent	9	85-<95
A	Very Good	8	75-<85
B+	Good	7	65-<75
B	Above Average	6	55-<65
C	Average	5	45-<55
P	Pass	4	40-<45
F	Fail	0	<40

- **SGPA:** (Sum of Credit Points) / (Total Credits).
- **CGPA:** (Sum of Credit Points across semesters) / (Total Credits).
- **Minimum CGPA for Pass:** 4.0.

SEMESTER 1

Course Code	Course Title	Type	L:T:P (Hours/Week)	Credits
ANA-MP-C1-01	General Anatomy, Histology, Embryology	Core	L-4	4
ANA-MP-C1-02	Upper Limb and Lower Limb	Core	L-4	4
ANA-MP-C1-03	Physiology	Core	L-2	2
ANA-MP-C1-04	Biochemistry	Core	L-2	2
ANA-MP-C1-05	Practical 1 (General Anatomy, Histology, Embryology)	Core	T/P-12	4
ANA-MP-C1-06	Practical 2 (Upper Limb and Lower Limb)	Core	T/P-12	4
Total				20

EXAMINATION MARK AND SCHEME

Course Code	Course Title	Theory University Exam		Theory Internal Exam		Total Max Marks	Total Min Marks
		Max Marks	Min Marks	Max Marks	Min Marks		
ANA-MP-C1-01	General Anatomy, Histology, Embryology	50	25	25	12.5	75	37.5
ANA-MP-C1-02	Upper Limb and Lower Limb	50	25	25	12.5	75	37.5
ANA-MP-C1-03	Physiology	50	25	25	12.5	75	37.5
ANA-MP-C1-04	Biochemistry	50	25	25	12.5	75	37.5
Total						300	150

- **Theory Examinations:**
 - ANA-MP-C1-01 and ANA-MP-C1-02: 2 hours each.
 - ANA-MP-C1-03 and ANA-MP-C1-04: 2 hours each.
 - All exams are scheduled on separate dates.
- **Practical Exams:** No practical exams (University or Internal) are conducted in the first semester.

Semester 2

Course Code	Course Title	Type	L:T:P (Hours/Week)	Credits
ANA-MP-C2-01	Thorax, Abdomen	Core	L-4	4
ANA-MP-C2-02	Pelvis	Core	L-4	4
ANA-MP-C2-03	Practical I (Histology of thorax, abdomen and Pelvic Organs)	Core	T/P-14	6
ANA-MP-C2-04	Practical II (Thorax, Abdomen, pelvic organs and Bones)	Core	T/P-14	6
Total				20

SEMESTER 2: EXAMINATION AND MARK SCHEME

Course Code	Course Title	Theory University Exam		Theory Internal Exam		Practical Exam University		Practical Exam Internal		Total	Total
		Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks
ANA-MP-C2-01	Thorax, Abdomen	50	25	25	12.5	-	-	-	-	75	37.5
ANA-MP-C2-02	Pelvis	50	25	25	12.5	-	-	-	-	75	37.5
ANA-MP-C2-03	Practical I (General Histology [Semester 1] and Histology of Thorax and Abdomen [Semester 2])	-	-	-	-	100	50	50	25	150	75
ANA-MP-C2-04	Practical II	-	-	-	-	100	50	50	25	150	75
Total										450	225

Notes:

- **Theory Examinations:**
 - ANA-MP-C2-01 and ANA-MP-C2-02 are theory exams, each with a duration of 2 hours.
- **Practical Examinations:**
 - **Practical I Exam:** Includes Topics of ANA-MP-C1-05 (Semester 1) and ANA-MP-C2-03 (Semester 2).
- **Practical II Exam:**

ANA-MP-C2-04 Practical II University Exam (100 marks):

- **Practical : 50 marks**
 - **(Spotter:** 15× 2 mark = 30 marks;
 - **Cadaver Region Discussion:** 2 × 10 mark = 20 marks.)
- **Viva voce: 50 marks**
 - **Osteology, Surface Anatomy, Radiological Anatomy** [*Upper & Lower Limb, Thoracic and abdominal organs and Bones*]

Semester 3

Course Code	Course Title	Type	L:T:P (Hours/Week)	Credits
ANA-MP-C3-01	Head and Neck I	Core	L-4	4
ANA-MP-C3-02	Head and Neck II	Core	L-4	4
ANA-MP-C3-03	Practical I (Histology)	Core	T/P-12	4
ANA-MP-C3-04	Practical II (Head and Neck)	Core	T/P-12	4
ANA-MP-C3-E01	Elective I (Choose one):	Elective	L-4	4
	A: Genetics			
	B: Health Information Management			
Total				20

SEMESTER 3: EXAMINATION AND MARK SCHEME

Course Code	Course Title	Theory University Exam		Theory Internal Exam		Total	Total
		Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks
ANA-MP-C3-01	Head and Neck I	50	25	25	12.5	75	37.5
ANA-MP-C3-02	Head and Neck II	50	25	25	12.5	75	37.5
ANA-MP-C3-E01	Elective I (A: Genetics or B: Health Information Management)	-	-	25	12.5	25	12.5
Total						175	87.5

Theory Examinations:

- ANA-MP-C3-01 and ANA-MP-C3-02 have theory university exams (50 marks each) and internal assessments (25 marks each).
- ANA-MP-C3-E01 (Elective) has only an internal assessment (25 marks) and no university exam.

Practical Examinations: No practical exams (University or Internal) are conducted in Semester 3 for any course.

Semester 4

Course Code	Course Title	Type	L:T:P (Hours/Week)	Credits
ANA-MP-C4-01	Neuroanatomy	Core	L-4	4
ANA-MP-C4-02	Practical I (Histology)	Core	P-4	2
ANA-MP-C4-03	Practical II	Core	P-4	2
ANA-MP-C4-04	Microteaching	Core	T-4	2
ANA-MP-C4-05	Project	Core	P-12	6
ANA-MP-C4-06	Practical III Dissection	Core	P-4	2
ANA-MP-C4-E02	Elective II (Choose one):	Elective	L-4	4
	A: Embalming Techniques			
	B: Introduction to Biomedical Instrumentation			
Total				22

SEMESTER 4 Examination Marks and Scheme

Course Code	Course Title	Theory University Exam		Theory Internal Exam		Practical Exam University		Practical Exam Internal		Total Max Marks	Total Min Marks
		Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks		
ANA-MP-C4-01	Neuroanatomy	50	25	25	12.5	-	-	-	-	75	37.5
ANA-MP-C4-02	Practical I (Histology)	-	-	-	-	100	50	50	25	150	75
ANA-MP-C4-03	Practical II (Spotter, Discussion,Viva)	-	-	-	-	100	50	50	25	150	75
ANA-MP-C4-04	Microteaching	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-05	Dissertation (Project)	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-06	Practical III Dissection	-	-	-	-	50	25	25	12.5	75	37.5
ANA-MP-C4-07A	Histology Record	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-07B	Gross Anatomy Record	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-07C	Surface Anatomy Record	-	-	-	-	25	12.5	-	-	25	12.5
ANA-MP-C4-E02	Elective II (A: Embalming Techniques or B: Introduction to Biomedical Instrumentation)	-	-	25	12.5	-	-	-	-	25	12.5
Total										600	300

Notes: Theory Examinations:

- ANA-MP-C4-01 (Neuroanatomy) has a theory university exam (50 marks) and internal assessment (25 marks).
- ANA-MP-C4-E02 (Elective II) is assessed only via an internal exam (25 marks), with no university exam.

Practical Examinations:

- **University Practical:**
 - ANA-MP-C4-02 (Practical I: Histology covers Semesters 1, 2, 3, and 4): 100 marks
 - ANA-MP-C4-03 (Practical II covers Semesters 1, 2, 3, and 4): 100 marks
 - **Spotter:** 30 marks (15 questions × 2 marks each)
 - **Cadaver Region Discussion:** 20 marks (2 discussions × 10 marks each)
 - **Viva** (Osteology, Myology, Organs, Surface Anatomy, Radiological Anatomy - covers Semesters 1, 2, 3, and 4): **50 marks**
 - ANA-MP-C4-04 (Microteaching): 25 marks
 - ANA-MP-C4-05 (Dissertation): 25 marks
 - ANA-MP-C4-06 (Dissection Practical III): 50 marks
 - ANA-MP-C4-07A (Histology Record): 25 marks
 - ANA-MP-C4-07B (Gross Anatomy Record): 25 marks
 - ANA-MP-C4-07C (Surface Anatomy Record): 25 marks
- **Internal Practical:**
 - ANA-MP-C4-02 (Practical I Histology covers Semesters 1, 2, 3, and 4): 50 marks
 - ANA-MP-C4-03 (Practical II covers Semesters 1, 2, 3, and 4): 50 marks
 - ANA-MP-C4-06 (Dissection Practical III): 25 marks

Grand Totals for All Semesters

Semester	Total Max Marks	Total Min Marks
Semester 1	300	150
Semester 2	450	225
Semester 3	175	87.5
Semester 4	600	300
Total	1525	762.5

MODEL QUESTION PAPER

FIRST SEMESTER (MSc MEDICAL ANATOMY) DEGREE EXAMINATION

ANA-MP-C1-01: General Anatomy, Histology, Embryology

(2026 Admissions—Regular)

Time: Two Hours

Maximum Mark: 50 Marks

Draw diagrams wherever necessary.

I – Essay

(1 x 15 = 15 marks)

Answer any ONE of the following:

- a. Describe the classification, structure, and functions of epithelial tissues.
- b. Explain the process of fertilization, implantation, and formation of the bilaminar embryonic disc.

II – Short Essay

(1 x 10 = 10 marks)

Answer any ONE of the following:

- a. Discuss the structure and types of synovial joints.
- b. Describe the microscopic features of lymph nodes and their functional significance.

III – Short Answer

(5 x 5 = 25 marks)

Answer any FIVE of the following:

- a. Types of cartilage.
- b. Spermatogenesis stages.
- c. Structure of compact bone.
- d. Formation of the primitive streak.
- e. Microscopic features of smooth muscle.
- f. Ossification process.
- g. Teratogens and their effects.

FIRST SEMESTER (MSc MEDICAL ANATOMY) DEGREE EXAMINATION

ANA-MP-C1-02: Upper Limb and Lower Limb

(2026 Admissions—Regular)

Time: Two Hours

Maximum Mark: 50 Marks

Draw diagrams wherever necessary.

I – Essay

(1 x 15 = 15 marks)

Answer any ONE of the following:

- a. Describe the muscles, nerves, and blood supply of the anterior compartment of the forearm.
- b. Explain the anatomy of the hip joint, including its ligaments, movements, and clinical significance.

II – Short Essay

(1 x 10 = 10 marks)

Answer any ONE of the following:

- a. Discuss the boundaries and contents of the axilla.
- b. Describe the arches of the foot and their biomechanical importance.

III – Short Answer

(5 x 5 = 25 marks)

Answer any FIVE of the following:

- a. Brachial plexus and its applied anatomy.
- b. Anastomoses around the elbow joint.
- c. Rotator cuff muscles.
- d. Femoral triangle contents.
- e. Palmar aponeurosis.
- f. Segmental innervation of the lower limb.
- g. Clavipectoral fascia.

FIRST SEMESTER (MSc MEDICAL ANATOMY) DEGREE EXAMINATION

ANA-MP-C1-03: Physiology

(2026 Admissions—Regular)

Time: Two Hours

Maximum: 50 Marks

Draw diagrams wherever necessary.

I – Essay

(1 x 15 = 15 marks)

Answer any ONE of the following:

- a. Explain the transport of respiratory gases in blood.
- b. Define BP. Explain the regulation of arterial BP.

II – Short Essay

(1 x 10 = 10 marks)

Answer any ONE of the following:

- a. Explain the mechanism of neuromuscular transmission.
- b. Briefly explain the functions of gastric juice and explain the regulation of gastric juice.

III – Short Answer

(5 x 5 = 25 marks)

Answer any FIVE of the following:

- a. Visual Pathway
- b. Hormones of the thyroid gland
- c. Erythroblastosis Fetalis
- d. Circulation and functions of CSF
- e. Functions of RBC, WBC, and Platelets.
- f. Define GFR. Factors affecting GFR
- g. Functions of Liver

FIRST SEMESTER (MSc MEDICAL ANATOMY) DEGREE EXAMINATION

ANA-MP-C1-04: Biochemistry

(2026 Admissions—Regular)

Time: Two Hours

Maximum: 50 Marks

Draw diagrams wherever necessary.

I – Essay

(1 x 15 = 15 marks)

Answer any ONE of the following:

- a. Describe the glycolytic pathway and its regulation in human cells.
- b. Explain the structure, classification, and biological functions of proteins.

II – Short Essay

(1 x 10 = 10 marks)

Answer any ONE of the following:

- a. Discuss the urea cycle and its metabolic significance.
- b. Explain the classification and biological roles of lipids.

III – Short Answer

(5 x 5 = 25 marks)

Answer any FIVE of the following:

- a. Structure of DNA.
- b. Enzyme inhibition types.
- c. Functions of polysaccharides.
- d. Formation of bile pigments.
- e. Fat-soluble vitamins.
- f. Oxidative phosphorylation.
- g. Coenzymes in metabolism.

SECOND SEMESTER (MSc MEDICAL ANATOMY) DEGREE EXAMINATION

ANA-MP-C2-01: Thorax, Abdomen

(2026 Admissions—Regular)

Time: Two Hours

Maximum: 50 Marks

Draw diagrams wherever necessary.

I – Essay

(1 x 15 = 15 marks)

Answer any ONE of the following:

- a. Describe the anatomy of the heart, including its chambers, valves, and blood supply.
- b. Explain the structure, relations, and blood supply of the liver, along with its applied anatomy.

II – Short Essay

(1 x 10 = 10 marks)

Answer any ONE of the following:

- a. Discuss the development of the gastrointestinal tract and associated congenital anomalies.
- b. Describe the anatomy of the diaphragm, including its attachments and openings.

III – Short Answer

(5 x 5 = 25 marks)

Answer any FIVE of the following:

- a. Pleura and its reflections.
- b. Portal vein and portocaval anastomosis.
- c. Microscopic features of the pancreas.
- d. Lumbar vertebrae features.
- e. Development of the heart tube.
- f. Inguinal canal structure.
- g. Superior mesenteric artery branches.

SECOND SEMESTER (MSc MEDICAL ANATOMY) DEGREE EXAMINATION

ANA-MP-C2-02: Pelvis

(2026 Admissions—Regular)

Time: Two Hours

Maximum: 50 Marks

Draw diagrams wherever necessary.

I – Essay

(1 x 15 = 15 marks)

Answer any ONE of the following:

- a. Describe the anatomy of the uterus, including its supports, blood supply, and clinical significance.
- b. Explain the development of the male and female genital systems, highlighting major congenital anomalies.

II – Short Essay

(1 x 10 = 10 marks)

Answer any ONE of the following:

- a. Discuss the boundaries and contents of the ischioanal fossa.
- b. Describe the microscopic features of the testis and epididymis.

III – Short Answer

(5 x 5 = 25 marks)

Answer any FIVE of the following:

- a. Pelvic diaphragm structure.
- b. Differences between male and female pelvis.
- c. Blood supply of the rectum.
- d. Histology of the urinary bladder.
- e. Perineal pouches.
- f. Obstetric pelvic measurements.
- g. Development of the prostate gland.

THIRD SEMESTER (MSc MEDICAL ANATOMY) DEGREE EXAMINATION

ANA-MP-C3-01: Head and Neck I

(2026 Admissions—Regular)

Time: Two Hours

Maximum: 50 Marks

Draw diagrams wherever necessary.

I – Essay

(1 x 15 = 15 marks)

Answer any ONE of the following:

- a. Describe the anatomy of the scalp, including its layers, blood supply, and nerve supply.
- b. Explain the boundaries, contents, and applied anatomy of the orbit.

II – Short Essay

(1 x 10 = 10 marks)

Answer any ONE of the following:

- a. Discuss the development of the face and associated congenital anomalies.
- b. Describe the anatomy of the parotid gland and structures passing through it.

III – Short Answer

(5 x 5 = 25 marks)

Answer any FIVE of the following:

- a. Lacrimal apparatus components.
- b. Dural venous sinuses.
- c. Muscles of facial expression.
- d. Cervical sympathetic chain.
- e. Nasal cavity walls.
- f. Pituitary gland relations.
- g. Atlanto-occipital joint.

THIRD SEMESTER (MSc MEDICAL ANATOMY) DEGREE EXAMINATION

ANA-MP-C3-02: Head and Neck II

(2026 Admissions—Regular)

Time: Two Hours

Maximum: 50 Marks

Draw diagrams wherever necessary.

I – Essay

(1 x 15 = 15 marks)

Answer any ONE of the following:

- a. Describe the anatomy of the pharynx, including its parts, muscles, and nerve supply.
- b. Explain the structure, blood supply, and innervation of the thyroid gland, along with its applied anatomy.

II – Short Essay

(1 x 10 = 10 marks)

Answer any ONE of the following:

- a. Discuss the boundaries and contents of the infratemporal fossa.
- b. Describe the development of the tongue and its congenital anomalies.

III – Short Answer

(5 x 5 = 25 marks)

Answer any FIVE of the following:

- a. Maxillary nerve branches.
- b. Muscles of mastication.
- c. Submandibular gland structure.
- d. Laryngeal cartilages.
- e. Pharyngeal arches derivatives.
- f. Internal jugular vein tributaries.
- g. Histology of taste buds.

FOURTH SEMESTER (MSc MEDICAL ANATOMY) DEGREE EXAMINATION

ANA-MP-C4-01: Neuroanatomy

(2026 Admissions—Regular)

Time: Two Hours

Maximum: 50 Marks

Draw diagrams wherever necessary.

I – Essay

(1 x 15 = 15 marks)

Answer any ONE of the following:

- a. Describe the external and internal features of the cerebrum, including its sulci, gyri, and blood supply.
- b. Explain the structure, nuclei, and connections of the cerebellum, along with its clinical importance.

II – Short Essay

(1 x 10 = 10 marks)

Answer any ONE of the following:

- a. Discuss the formation and circulation of cerebrospinal fluid and its clinical significance.
- b. Describe the internal features of the medulla oblongata at different levels.

III – Short Answer

(5 x 5 = 25 marks)

Answer any FIVE of the following:

- a. Ascending tracts of the spinal cord.
- b. Basal nuclei functions.
- c. Arterial Circle of Willis.
- d. Thalamic nuclei.
- e. Third ventricle boundaries.
- f. Internal capsule structure.
- g. Cranial nerve nuclei in the pons.

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