COURSE OF STUDIES

for

Master of Philosophy

in

Anatomy

UNIVERSITY OF HEALTH SCIENCES, LAHORE PAKISTAN

Program Rationale:

This professional degree is designed to develop subject specialists in the field of health & medical education. Professional development is achieved by inculcating in-depth knowledge of subject, critical reflection, competence, and ability to apply theory and research in their disciplines**.**

Mission Statement:

The Department of Anatomy aims to provide high-quality teaching of anatomical sciences to postgraduate and undergraduate medical & allied students. We strive to prepare the next generation of scientists by conducting need based basic and applied research.

Program Educational Objectives:

The salient objectives of this program are to:

1. Provide the knowledge of all essential and basic concepts of the subject

2. Equip the students with high order cognitive skills required for lifelong learning like critical thinking, problem solving by engaging them in interactive sessions, discussions rigorous writing exercises, multimedia presentation at different forums

3. Give the student effective teaching skills through peer mentoring and teaching undergraduates

4. Provide them basics of required research skills by giving them hands on training in lab

5. Enable them to communicate effectively in verbal and written modes

6. Develop professional awareness including ethical, social and global

7. Develop lifelong learning tendencies with the aim of improving knowledge, skills and competences within a personal, civic, social and/or employment-related perspective

Program Learning Outcomes:

By the end of this program students shall have an ability to

1. Develop core concepts in Anatomy
2. Apply knowledge of Anatomy in clinical scenarios
3. Develop essential lab skills
4. Design master level research independently
5. Analyze scientific research data
6. Read scientific literature with critical mind
7. Work in teams including multidisciplinary groups
8. Collaborate with colleagues in other branches of biomedical sciences
9. Incorporate innovation in teaching, learning and research
10. Develop teaching skills
11. Be able to do need assessment and get engage with continuing professional development

SCHEME OF STUDIES (2-Year)

MPhil Anatomy

Semester #	Course code	Course title	Credit hours		
			Theory	Practical	Total
1	BSRM-801	Biostatistics and Research Methodology	2	0	2
	GANAT-801	Gross Anatomy-I (Upper limb, Thorax, Head, and Neck)	1.5	1	8
	GANAT-802	Gross Anatomy-II (General Anatomy, Lower Limb, Abdomen pelvis)	1.5	1	
	NANAT-801	Neuroanatomy	2	1	
	MBCG-801	Molecular Biology & Cytogenetics	2	0	2
2	MANAT-801	Microanatomy-I (General Histology)	1.5	1	8
	MANAT-802	Microanatomy – II (Special Histology)	1.5	1	
	DANAT-801	Developmental Anatomy	2	1	
	GP-801	General Pathology	2	0	2
3	Research (thesis)		6		6
4	Professional & Teaching Skills Apprenticeship (PTSA)		0		2
(Total: 30)					

Course Title Gross Anatomy-I

Contact Hours: 72	Credit Hours: 2.5
Theory = 24	Theory = 1.5
Practical = 48	Practical = 1
Total = 72	Total = 2.5

Course Objective & Learning Outcome:

This course includes Upper limb, Thorax, and Head & Neck. The objectives shall be achieved through self-study, a few didactic lectures on selected topics, and mostly by interactive lectures and practical sessions.

Course Objectives & Learning Outcomes of Upper Limb

On completing in in-depth study of the anatomy of the upper limb the students shall:

1. Develop expertise in prosection and identification of structures in a cadaver
2. Develop clear concepts of the topographic anatomy of the region.
3. Understand muscle attachments, their actions, nerve supply and the effect of paralysis occurring in groups and important individual muscles
4. Develop clear concept of structure and mechanism of joints and the clinical conditions involving them.
5. Understand bones of the appendicular skeleton, and their general and special features.
6. Be able to recognize and describe the bones of the hand individually, in articulation and in skiagrams.

7. Develop a clear concept about common fractures of the bones, displacement of their fragments, and factors causing it.

8. Understand nerve plexuses of the limb, their normal variations, and different clinical conditions related to them.

9. Understand different kinds of injuries to the important nerves of the extremities, the ways these injuries are produced, their effects, and clinical tests.

10. Recognize important superficial veins and their clinical importance.

12. Understand anatomical relevance to important clinical conditions in the region.

13. Understand the scheme of regional lymphatic drainage and vascular supply.

14. Comprehend normal skiagrams, C.T. Scans, MRI, Ultrasound and normal findings of other imaging techniques related to the regions.

Course Objectives & Learning Outcomes of Thorax:

On completion of detailed study of the Gross Anatomy of Thorax the students shall be able to:

1. Develop an understanding of the topographic anatomy of the region.

2. Develop clear understanding of the Anatomy of the bony thorax and costo-vertebral and other joints of thorax and the mechanism of respiration.

3. Mark the important thoracic viscera and pleural reflections on the surface of the body

4. Understand the importance of percussion in eliciting the extent of resonant and non-resonant viscera and their clinical importance.

5. Give a precise account of the Anatomy of thoracic viscera, muscles, nerves, blood vessels and fasciae of the region and correlate anatomical information to common clinical conditions.

6. Understand the scheme of the regional lymphatic drainage and lymph nodes

Head And Neck Course Objectives & Learning Outcomes:

On completion of in-depth study of the region of Head and Neck including back muscles and bones, the students shall be able to:

1. Describe mandible and different normae of the articulated skull.

2. Identify individual bones of the skull, their parts with important features.

3. Give post-natal growth changes in skull and face.

4. Comprehend cranial fossae, Identify the foramina of the skull and the structures passing through them.

5. Understand the vertebral column as a whole including sacrum and coccyx; regional features of the vertebrae, intervertebral joints, the movements thereof, and comprehend clinical problems of the region.

6. Identify, comprehend and describe cervical vertebrae, skeletal elements of larynx and the joints of the region i.e. temporo-mandibular, intervertebral, cranio-vertebral, cricothyroid and crico-arytenoid joints.

7. Identify important muscles of the region i.e. muscles of facial expression, mastication, prevertebral, postvertebral, infra and suprahyoid, suboccipital, tongue, palate, pharynx, and larynx; comprehend their nerve supply, the effect of injury to their nerves and clinical tests applied for diagnosis.

8. Name and identify muscles of the floor of the mouth, sternocleidomastoid, trapezius, and levator scapulae, and describe their origin, insertion, nerve supply, actions, important relations to the effects of injury to their nerves, and clinical tests.

9. Identify and describe important arteries of the region, their branches, and distribution i.e. subclavian, common, internal, and external carotid arteries.

10. Comprehend clinical importance related to the arteries of the head and neck and their branches

11. Identify subclavian, internal, external, and anterior Jugular veins, and give their course, relationship, tributaries, and clinical importance.

12. Identify and describe cranial venous sinuses and give their clinical significance.

13. Locate, identify, and enlist the regional lymph nodes and describe the scheme of lymphatic drainage of the region.

14. Understand and describe the course and distribution of the cervical spinal and cranial nerves; comprehend the formation of Cervical and Brachial plexuses, describe their branches and distribution.

15. Understand and describe clinical conditions related to the nerve plexuses and their clinical manifestations.

16. Comprehend, understand, and clearly describe the effects of injuries to different nerves and their clinical tests

17. Identify the sympathetic trunk and describe the pattern of sympathetic and parasympathetic innervations of the region, including the four parasympathetic ganglia, their roots, branches, and distribution along with the clinical and applied anatomy.

18. Identify and describe the boundaries, contents, and subdivisions of the anterior and posterior triangles of the neck.

19. Understand and describe the superficial and deep fasciae of the region and correlate different fascial planes to their clinical importance.

20. Identify and describe the viscera of the region i.e., salivary, thyroid, parathyroid glands, larynx, pharynx, trachea and esophagus, and describe their anatomy and its applied aspects.

21. Understand and describe the anatomy of the scalp, orbital and cranial cavities including meninges with highlights on important clinical aspects.

22. Identify the anatomical features of the oral cavity, tongue, cheek, lips, gums and teeth, and describe these in detail, emphasizing their clinical applications.

23. Understand and describe the anatomy of the nasal cavity, Para nasal sinuses, eyeball and ear along with the clinical aspects.

24. Correlate the anatomical information of the region to their clinical applications.

Mode of Learning:

1. Multimedia presentations and white board

2. Interactive discussions & small group discussions

3. Journal clubs & Lab meetings

4. Self-directed learning

Practical:

Anatomy practical part shall include

Teaching via Cadaver Dissection/Prosection: Students will have the opportunity to learn anatomy via dissection of human cadavers or on prosected specimens under the guidance of experienced anatomy faculty to understand the three-dimensional structure of the human body, including variations in anatomy among individuals.

Anatomical Models: Learning by utilizing anatomical models to understand specific structures and systems within the body.

Medical Imaging Interpretation: Interpretation of various medical imaging techniques such as X-rays, CT scans, MRI scans, and ultrasound for better understanding of anatomical relationships and applied aspects.

Virtual Anatomy Resources: Incorporation of virtual anatomy resources, such as computer software and 3D virtual models, to supplement traditional teaching methods. These tools can provide interactive learning experiences and facilitate visualization of complex anatomical structures.

Recommended Books:

Grays Anatomy, Snell Clinical Anatomy, Keith L Moore Clinical Oriented Anatomy, Lasts Anatomy, Netters Atlas

Course Title Gross Anatomy-II

Contact Hours: 72	Credit Hours: 2.5
Theory = 24	Theory = 1.5
Practical = 48	Practical = 01
Total = 72	Total = 2.5

Course Objective & Learning Outcome:

This course includes General Anatomy, Lower Limb, and Abdomen & Pelvis. The objectives shall be achieved through self-study, a few didactic lectures on selected topics, and mostly by interactive lectures and practical sessions.

Course Objectives & Learning Outcomes of General Anatomy

After completion of in-depth study of this part of the course, the students shall be able to

1. Understand the anatomical terms, planes and general organization of the body.
2. Comprehend the structure of bones, and their classification based on different criteria and occurrence. Their nerve and blood supply development, repair and functions.
3. Understands different varieties of cartilages and their basic structure-function, source of nutrition, repair, and occurrence.
4. Classify different types of muscles on different criteria, and understand their structure, function, and properties
5. Comprehend different modes of muscle functions and their practical implications.
6. Understand differences between different types of fasciae, their regional modifications, and reasons for these changes.

7. Comprehend the structure and functions of bursae, synovial sheaths, ligaments and tendons.

8. Comprehend basis of classification of joints along with the movements permissible in different varieties.

9. Understand the blood supply of joints, the importance of anastomosis around them; their nerve supply, and factors of their stability.

10. Comprehend basic structure of different kinds of blood vessels and correlate their structure to the function.

11. Understand the basic structure of lymphatics and their functions in relation to the structure.

12. Comprehend the organization of central and peripheral nervous system.

13. Understand the organization of a typical spinal nerve and nerve plexuses

14. Comprehend the implications of myotomes and dermatomes and their applied significance

15. Understand basic concepts of the autonomic nervous system.

Course Objectives & Learning Outcomes of Lower Limb

On completing in in-depth study of the anatomy of the limbs the students shall:

1. Develop expertise in prosection and identification of structures in a cadaver.

2. Develop clear concepts of the topographic anatomy of the regions.

3. Understand muscle attachments, their actions, nerve supply, and effect of paralysis occurring in groups and important individual muscles

4. Develop clear concept of structure and mechanism of joints and the clinical conditions involving them.

5. Understand bones of the appendicular skeleton, their general and special features

6. Be able to recognize and describe the bones of the foot individually, in articulation and in skiagrams.

7. Develop clear concept about common fractures of the bones, displacement of their fragments and, factors causing it.

8. Understand nerve plexuses of limbs, their normal variations and different clinical conditions related to them.

9. Understand different kinds of injuries to the important nerves of the extremities, the ways these injuries are produced, their effects and clinical tests.

10. Recognize important superficial veins and their clinical uses.

11. Understand the mechanism by which the blood is pumped from lower limb and anatomical factors which predispose to development of varicose veins.

12. Understand anatomical relevance to important clinical conditions in the region.

13. Understand the scheme of regional lymphatic drainage and vascular supply.

Course Objectives & Learning Outcomes of Abdomen and Pelvis

On completion of the Gross Anatomy of Abdomen and Pelvis the students shall be able to:

1. Develop a sound understanding of the topographic anatomy of the regions.

2. Mark the regions of the abdomen on the surface of the body.

3. Mark the important abdominal and pelvic viscera on the surface of the body

4. Understand the importance of percussion notes in eliciting the extent of resonant and non-resonant viscera and their clinical importance.

5. Give a description of the Anatomy of the anterolateral and posterior abdominal walls.

6. Understand and give clear description of inguinal canal, different varieties of external hernias and their complications.

7. Understand the peritoneum, peritoneal cavity and possible sites of internal hernias along with their clinical features.

8. Comprehend, understand and describe the abdomino-pelvic fasciae and their clinical importance.

9. Give a precise account of the Anatomy of abdominal and pelvic viscera, muscles, nerves and blood vessels of the regions and correlate anatomical information to common clinical conditions.

10. Understand the clinical effects and apply clinical tests to verify injuries to different nerves of the region.

11. Develop clear concepts about the anatomy of normal male and female pelvises, and differences between them.

12. Understand the dimensions of the normal and contracted adult female pelvis and their clinical importance in the mechanism of delivery.

13. Understand the anatomy of the perineal region in both male and female and comprehend the anatomical basis of clinical conditions of the area.

14. Understand the anatomy of male & female external genital organs and their clinical importance.

15. Understand anatomical basis of possible birth injuries to the mother in difficult labor and the clinical conditions produced thereafter.

16. Understand the scheme of the regional lymphatic drainage and lymph nodes.

Mode of Learning:

1. Multimedia presentations and white board

2. Interactive discussions & small group discussions

3. Journal clubs & Lab meetings

4. Self-directed learning

Practical:

Anatomy practical part shall include

Teaching via Cadaver Dissection/Prosection: Students will have the opportunity to learn anatomy via dissection of human cadavers or on prosected specimens under the guidance of experienced anatomy faculty to understand the three-dimensional structure of the human body, including variations in anatomy among individuals.

Anatomical Models: Learning by utilizing anatomical models to understand specific structures and systems within the body.

Medical Imaging Interpretation: Interpretation of various medical imaging techniques such as X-rays, CT scans, MRI scans, and ultrasound for better understanding of anatomical relationships and applied aspects.

Virtual Anatomy Resources: Incorporation of virtual anatomy resources, such as computer software and 3D virtual models, to supplement traditional teaching methods. These tools can provide interactive learning experiences and facilitate visualization of complex anatomical structures.

Recommended Books:

Grays Anatomy, Snell Clinical Anatomy, Keith L Moore Clinical Oriented Anatomy, Lasts Anatomy, Netters Atlas, Laiq Hussain General Anatomy, Tassaduq Hussain General Anatomy

Course Title Neuroanatomy

Contact Hours: 80	Credit Hours: 3
Theory = 32	Theory = 2
Practical = 48	Practical = 1
Total = 80	Total = 03

Course Objective & Learning Outcome:

These shall be achieved through self-study, few didactic lectures on selected topics, and mostly by interactive Lectures and practical session

On completion of the region of Neuroanatomy, the students shall be able to:

1. Define, enumerate and describe the structure and functions of receptors.
2. Define and describe motor end plates and their functions.
3. Understand and describe the meninges of brain and spinal cord.
4. Describe subdural and subarachnoid spaces including subarachnoid cisterns.
5. Understand and describe internal structure of spinal cord at different level.
6. Understand and describe ascending and descending tracts of spinal cord, their functions and effects of their lesions.
7. Understand and describe external & internal structure of medulla oblongata with its associated applied anatomy.
8. Comprehend and describe the external & internal structure of pons with its associated applied anatomy.
9. Understand and describe external & internal structure of mid brain with its associated applied anatomy.
10. Identify locate and connections of red Nucleus.
11. Comprehend and describe the surfaces of cerebral hemisphere, its lobes, their sulci and gyri.
12. Locate, identify and describe functions of different functional areas of the brain.

13. Locate, identify and describe organization of white matter of brain with different types of projection, commissural and association fibers of brain and their functions.

13. Identify, locate and describe thalamus, its nuclei and their connection and functions.

14. Identify, locate and describe hypothalamus, its nuclei and their connection and functions.

15. Identify, locate and describe meta thalamus and its connections and functions.

16. Identify, locate and describe epithalamus and its connections and functions.

17. Understand and describe the ventricular system of the brain.

18. Comprehend and describe production and circulation of CSF and clinical conditions associated with it.

19. Comprehend, describe and discuss blood supply of the brain and spinal cord and the effect of hemorrhagic and thrombotic lesions.

20. Describe intra cranial course of cranial nerves and their applied aspects.

21. Identify, locate and describe cranial nerves nuclei and their connection and functions.

22. Understand and describe different lobes of cerebellum, its white and grey substances including the deep cerebellar nuclei.

23. Understand afferent and efferent connections of cerebellum and correlated these to its functions.

24. Understand and describe the signs and symptoms of cerebellum disease with logical explanation.

25. Identify, locate and describe different components of basal ganglia.

26. Understand afferent and efferent connections of basal ganglia.

27. Identify, locate and describe different components of limbic system.

28. Understand afferent and efferent connections of limbic system.

29. Comprehend the visual, auditory & olfactory pathways along with clinical conditions.

30. Understand and describe autonomic nervous system and related clinical conditions.

31. Comprehend and understand neuroanatomical basis of the following:

a) Hemiplegia / hemiparesis.

b) Upper motor and lower motor neuron lesions.

c) Parkinsonism

d) Syringomyelia.

e) Hemi-section / complete section of spinal cord.

f) Cerebellar ataxia

g) Other clinical conditions

Mode of Learning:

1. Multimedia presentations and white board

2. Interactive discussions & small group discussions

3. Journal clubs & Lab meetings

4. Self-directed learning

Practical:

Practical course shall include

Learning through Brain Dissection/Prosected Specimens: Students will have hands on experience to dissect brains (human/ animal), to gain an in-depth understanding of the anatomical structures of the central nervous system.

Neuroimaging Interpretation: Interpretation of various neuroimaging modalities such as MRI & CT scans to understand the essential brain anatomy and neurological conditions in vivo.

Brain Model Demonstrations: Utilize anatomical models of the brain to demonstrate specific structures and pathways to understand the spatial relationships between different brain regions.

Neuroanatomy Software Tools: Integration of software tools and interactive apps that allow to explore 3D models of the brain, simulate neural pathways, and visualize neuroanatomical structures in virtual reality. These tools enhance understanding and engagement with complex neuroanatomical concepts.

Recommended Books:

Clinical Neuroanatomy by Richard S. Snell, Gray's Anatomy

Course Title Microanatomy I

Contact Hours: 72	Credit Hours: 2.5
Theory = 24	Theory = 1.5
Practical = 48	Practical =1
Total = 72	Total = 2.5

Course Objective & Learning Outcome:

These shall be achieved through self-study, few didactic lectures on selected topics, and mostly by interactive Lectures and practical session

On completion of in-depth study of courses of Microscopic Anatomy, the students shall be able to:

1. Describe the methods of tissue fixation, their principles and importance.
2. Comprehend procedures for tissue embedding.
3. Understand commonly used general and special staining methods including cytochemical, immunological and histochemical and their rationale.
4. Understand commonly used fields of microscopy i.e. light, scanning, electron, florescent and other means of microscopic examinations
5. Understand light and electron microscopic structure of the cell and its organelle and, describe them correctly.
6. Identify and give functional significance of the nucleus, nucleolus, cytoplasmic organelles, inclusions, plasmalemma, and describe cell motility, secretodynamics, and process of secretion synthesis.
7. Understand and describe various types of epithelia; identify these under the microscope and correlate their structure to the functions with clinical correlates.

8. Classify and describe connective tissue proper according to type, density and orientation of its fibrous components, identify their components and describe their functional significance.

9. Classify and describe adipose tissue, and Identify it under light microscopy with clinical manifestations.

10. Identify and describe histological structure of various types of cartilages and discuss these in relation to their functions, location, and sources of nutrition.

11. Describe the histological structure of various types of bones as a tissue and an organ; understand microstructural changes in the process of bone development, remodeling, and healing.

12. Identify and describe the normal components of circulating peripheral blood and give the normal values of hematocrit, hemoglobin and various formed elements of blood.

13. Give the histological structure of various types of formed elements of the blood and correlate their structure to the functions

14. Differentiate different varieties of bone marrow; comprehend their structure and correlate it to their functions.

15. Identify and describe the three general types of muscles in term of their structure as seen both with the light and electron microscopes and correlate their structure to the functions.

16. Comprehend structural differences between three types of muscles and understand the mechanisms of their contraction.

17. Define, identify and describe histological structure of neuron, its perikaryon and processes, their terminations and synapses as seen with both the light and electron microscopes.

18. Identify and describe relationship of supporting cells both in peripheral and central nervous system; understand connective tissue investments of the peripheral nerves, and describe differences between spinal and autonomic ganglia.

19. Comprehend light and electron microscopic structure of myelinated and unmyelinated nerves, identify them and understand the process of myelination.

20. Describe histological structure of the heart including its conducting system and correlate structure to the function.

21. Classify arteries and veins; identify and describe their histological structure and changes which occur in their tunics at different levels and relate these changes to their functions.

22. Describe and identify different types of capillaries and correlate their structure to functions.

23. Understand and lucidly comprehend the constituents of micro-circulation and its in importance in regulating the blood flow.

24. Comprehend clinical correlates associated with vascular system.

25. Comprehend and develop clear concepts about the immune system in the body and the role of primary and secondary lymphoid organs, lymphocytes and other cell types belonging to the system.

26. Identify and describe histological structure of spleen, lymph node, tonsils, thymus and Peyer's patches.

27. Give a general description of the functions of lymphocytes and differences in the nature and functions of "B" and "T" lymphocytes, plasma cells, and their role in immune responses.

Mode of Learning:

1. Multimedia presentations and white board

2. Interactive discussions & small group discussions

3. Journal clubs & Lab meetings

4. Self-directed learning

Practical:

The practical classes shall include

Light microscopy & Slides identification: Hands on training to familiarize students with light microscopy techniques. Provide opportunities for students to observe stained tissue sections under different magnifications and learn how to identify and interpret cellular structures and tissue morphology.

Hands on training of histological techniques: Hands on training of tissue fixation, processing, embedding, microtomy and staining with H& E & Toludine blue used in paraffin embedding and frozen sections.

Recommended Books:

Junqueira's Basic Histology: Text and Atlas, Laiq Hussain Histology, Histology - Michael H. Ross, Wojciech Pawlina, diFiore's Atlas of Histology

Course Title Microanatomy II

Contact Hours: 72	Credit Hours: 2.5
Theory = 24	Theory = 1.5
Practical = 48	Practical =1
Total = 72	Total = 2.5

Course Objective & Learning Outcome:

These shall be achieved through self-study, few didactic lectures on selected topics, and mostly by interactive Lectures and practical sessions.

On completion of in-depth study of courses of Microscopic Anatomy, the students shall be able to:

1. Identify and describe the histological structure of integumentary system with clinical correlates.
2. Identify and describe the histological structure of lip, tongue, oral mucosa, salivary glands and differentiate between them with clinical correlates.
3. Define, identify and describe the histological organization of esophagus, stomach, small and large intestines including vermiform appendix, and correlate the histological changes in the digestive tube to their functions with clinical correlates.
4. Identify and describe the structure and functions of liver, pancreas and gall bladder with clinical correlates.
5. Identify and describe mucoperiosteum or muco-perichondrium of nose, Para nasal sinuses and olfactory epithelium.

6. Identify and describe histological features of trachea, primary and secondary bronchi, and bronchioles of different types, alveolar ducts, alveoli and blood air barrier along with their functions with clinical correlates.

7. Identify and describe the histological structure of kidney with clinical correlates.

8. Identify components of the uriniferous tubule tubules and describe their light and electron microscopic structure and correlate it to the functions of each component with clinical correlates.

9. Comprehend special features of the renal blood vessels and their relationship to different components of the nephron both in renal cortex and medulla with clinical correlates.

10. Identify and describe the histological structure of ureter, urinary bladder and urethra with clinical correlates.

11. Identify and describe histological structure and functional aspects of: Hypophysis cerebri, pineal body, adrenal, thyroid and parathyroid glands with clinical correlates.

12. Understand and comprehend endocrine role of scattered tissue in the body with endocrine functions.

13. Identify and describe essential histological and functional features of the ovary, Fallopian tube, uterus, vagina and mammary gland with clinical correlates.

14. Comprehend the process of spermatogenesis & spermiogenesis.

15. Identify and describe the histological structure and functional features of testis, epididymis, ductus deferens, prostate, seminal vesicle and penis with clinical correlates.

16. Identify and describe histological structure of thick and thin skin, epidermis, dermis and skin appendages with clinical correlates.

17. Understand histological structure of various layers and component of the eye ball and correlate these to their functions with clinical correlates.

18. Comprehend structural aspects of different component of internal and middle ears and correlate these to their functions with clinical correlates.

Mode of Learning:

1. Multimedia presentations and white board

2. Interactive discussions & small group discussions

3. Journal clubs & Lab meetings

4. Self-directed learning

Practical:

Light microscopy & Slides identification: Hands on training to familiarize students with light microscopy techniques. Provide opportunities for students to observe stained tissue sections under different magnifications and learn how to identify and interpret cellular structures and tissue morphology.

Digital Histology: Integration of digital histology resources and virtual microscopy platforms that allow students to access digitized slides and practice virtual microscopy. This enables remote learning and facilitates collaborative exploration of histological samples.

Recommended Books:

Junqueira's Basic Histology: Text and Atlas, Laiq Hussain Histology, Histology - Michael H. Ross, Wojciech Pawlina, diFiore's Atlas of Histology

Course Title Developmental Anatomy

Contact Hours: 80	Credit Hours: 3
Theory = 32	Theory = 2
Practical = 48	Practical = 1
Total = 80	Total = 03

Course Objective & Learning Outcome:

These shall be achieved through self-study, few didactic lectures on selected topics, and mostly by interactive Lectures and practical session

On completing the course in developmental anatomy, the students shall:

1. Clearly develop the understanding of identifying the stage of development during gestation.
2. Be able to plan and undertake work on experimental embryology, particularly involving teratogenesis.
3. Be able to fix, process and serially section the embryo and fetuses in various stages of development
4. Be able to interpret and reconstruct from serial sections, three dimensional pictures of the embryos/fetuses at different staged of development.
5. Understand the reduction division and gametogenesis.
6. Understand the processes of fertilization and implantation both at normal and abnormal sites.
7. Develop clear concept of formation of three embryonic layers and their derivatives.

8. Understand folding of the embryo and its implications.

9. Understand the twinning and its types

10. Be able to draw clear distinction between embryonic and fetal periods and their implications.

11. Be able to describe various stages of early development, formation of placenta, its functions, variations and fetal membranes.

12. Clearly conceive the genetic molecular regulation in developing different organs systems and body axis.

13. Comprehend factors responsible for teratogenesis, congenital malformations and different clinical syndromes.

14. Clearly understand development of bones including vertebral column and skull, and the abnormal development of the area.

15. Understand, comprehend and correctly describe development of muscular system in the body and its abnormalities.

16. Understand, comprehend and correctly describe the development of the body cavities and the abnormalities thereof.

17. Develop clear understanding of the cardiovascular system, including lymphatic system and the developmental anomalies here.

18. Understand the development of gastro-intestinal systems and congenital abnormalities occurring here.

19. Comprehend and correctly describe development of respiratory system and developmental abnormalities here.

20. Comprehend and correctly describe the development process of urinary system and common congenital abnormalities involving it.

21. Comprehend and correctly describe development of male genital system and anomalies involving it.

22. Understand, comprehend and correctly describe normal and abnormal development of female genital system.

23. Understand the formation of pharyngeal arches, clefts, pouches, their derivatives, and malformations of the region.

24. Develop clear concept of formation of face, nose, teeth, and different syndromes related to the developing head and neck.

25. Comprehend and correctly describe development nervous system and abnormalities occurring here.

26. Comprehend and correctly describe the development of special sense organs i.e. eye, ear. taste and smell and congenital abnormalities occurring here.

27. Develop clear concepts of formation of endocrine system and abnormalities thereof.

28. Develop clear concepts about the structure and process of formation of integumentary system and abnormalities thereof.

29. Become aware of the clinical measures for the prevention and correction of congenital abnormalities.

Mode of Learning:

1. Multimedia presentations and white board

2. Interactive discussions & small group discussions

3. Journal clubs & Lab meetings

4. Self-directed learning

Practical:

Practical part shall include:

Embryonic Specimen Observation: Provide access to embryonic specimens in Anatomy Museum to study human fetuses at different developmental stages.

Comparative Embryology: Explore the developmental processes and evolutionary relationships by examining and reconstruction of three-dimensional picture from the serial section of chick embryos. Use comparative embryology to highlight similarities and differences in embryonic development.

Recommended Books:

Langman's Medical Embryology by Sadler, Keith L. Moore - Embryology

Course Title: Professional & Teaching Skills Apprenticeship (PTSA)

Credit Hours:02

Professional Skills Apprenticeship credit hours: 01

Teaching Skills Apprenticeship credit hours (CMT): 01

Professional Skills Apprenticeship:

Objective:

The objectives of this apprenticeship are to

1. Develop teaching and professional skills for Master's students.
2. Enhance knowledge and understanding of pedagogical approaches and practices.
3. Prepare students for academic and professional careers.

Apprenticeship Structure:

- Professional Skills Component

TASKS

1. Make embalming/fixative solution for specimens and bodies under indirect supervision
2. Specimen handling and basics of anatomy museum keeping under indirect supervision
3. Clinical rotation of 2 weeks in Radiology department of affiliated institute to understand i)The basic principles of imaging modalities such as plain x rays,

ultrasound, CT scan & MRI ii) Identify anatomical structures on X-rays and differentiate clinical aspects iii) identify anatomical structures of limbs, abdomen pelvis, thorax, head & neck and brain structures on CT and MRI and differentiate normal from abnormal under indirect supervision

4. Animal handling keeping in view the animal ethics, safety, housing, general handling, euthanasia and sample collection under indirect supervision
5. Perform histological techniques (tissue fixation, processing, embedding, slide preparation and H&E staining) under indirect supervision
6. Light microscopy handling and photomicrography under indirect supervision
7. Write complete grant proposal on the relevant research project under supervision
8. Make designated number of MCQs & SEQs at paper setting section

Teaching Skills Apprenticeship

CMT® Certificate in Medical Teaching

All students of M Phil programme will get registered for the CMT Certification in the final semester. Completing the course work and successfully getting certified for CMT, which is a patent of UHS, will be a compulsory integral component of PTSA (Professional and Teaching Skills Apprenticeship) for the 4th semester of all M Phil programs at UHS.

DEPARTMENT OF MEDICAL EDUCATION
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ASSESSMENT M. PHIL ANATOMY SEMESTER I

Paper Pattern & Marks Distribution of Mid Term & Term I

Course codes	Course Title	Credit Hours	Theory		Total Marks	Practical		Grand Total
			MCQs	SEQs*		OSPE marks	Viva Marks	
BSRM-801	Biostatistics and Research Methodology	2+0	40	08	80	-	-	80
GANAT-801	Gross Anatomy-I (Upper limb, Thorax)	1.5+1	30	06	60	20	20	100
GANAT-802	Gross Anatomy-II (General Anatomy, Lower Limb)	1.5+1	30	06	60	20	20	100
NANAT-801	Neuroanatomy	2+1	40	08	80	20	20	120
MBCG-801	Molecular Biology & Cytogenetics	2+0	40	08	80	-	-	80

*SEQs will be of 5 marks each

M. PHIL ANATOMY SEMESTER II

Paper Pattern & Marks Distribution of Mid Term & Term II

Course codes	Course Title	Credit Hours	Theory		Total Marks	Practical		Grand Total
			MCQs	SEQs*		OSPE Marks	Viva Marks	
MANAT-801	Microanatomy-I (General Histology)	1.5+1	30	06	60	20	20	100
MANAT-802	Microanatomy – II (Special Histology)	1.5+1	30	06	60	20	20	100
DANAT-801	Developmental Anatomy	2+1	40	08	80	20	20	120
GP-801	General Pathology	2+0	40	08	80	-	-	80

*SEQs will be of 5 marks each