JINNAH MEDICAL AND DENTAL COLLEGE

FIRST YEAR BDS STUDY GUIDE

COURSE: ANATOMY

LEARNING OBJECTIVES:

By the end of the course the first year BDS student will be able to:

GENERAL ANATOMY

1. Introduction to Anatomy

- Define anatomy and Anatomical Position.
- Define various branches of anatomy with their practical implications.
- List special investigation techniques used for anatomical studies.

2. Terms of position and movements

- Define supine, prone and lithotomy position.
- Define sagittal, coronal and median planes.
- Name the movements occurring in different planes.
- Recognize the location and movement of different parts of body with respect to various terms of position and movement.
- Define movements like flexion, extension, pronation, supination, adduction and abduction.

3. Cartilages

- Define cartilage and its main features.
- Classify cartilage with regard to their location, morphology and function.

4. Bones

- Define bone and its main functions
- List bones of Axial and Appendicular skeleton
- Classify bones according to their shape, development, structure and region with examples
- List the steps of ossification (Endochondral and membranous).
- Define parts of young and adult bone.
- Give examples of various types of epiphyses.
- Name types and locations of bone marrow.
- Describe Periosteum and its features.
- Describe common clinical conditions of bone.

5. Joints of Body

- Define joint.
- Classify joints according to location, structure and movements with examples.
- Describe general features of synovial joints.
- Classify synovial joints with examples.
- Identify different clinical conditions of joints.

6. Muscle

- Describe parts of muscles.
- Differentiate between the three main types of muscles with their location.
- Classify skeletal muscles according to arrangement of fibers (Architecture).
- Name the connective tissue coverings of skeletal muscles.
- Define prime movers, agonists, synergist and antagonist muscles.
- Describe a motor unit.

7. General organization of CVS

- Discuss the components and organization of systemic and pulmonary circulatory system.
- Differentiate between arteries and veins based on their tunics.
- Describe sinusoids, anastomosis and end arteries with their locations.
- Define portal circulation and its functional importance.

8. Lymphatic system

- Define lymphatic system and its main functions.
- List the components and channels of Lymphatic system.
- Explain the general features of Lymph nodes.
- Describe the formation of thoracic duct and Cisterna Chyle
- List components of the immune system.
- List the primary and secondary lymphatic organs.

9. Skin and Fascia

- Describe the main layers of skin (epidermis and dermis).
- Define distribution of thick and thin skin.
- Define superficial and deep fascia and its locations throughout the body.

10. Nervous system

- Describe the structural and functional components and organization of nervous system.
- Name parts of central and peripheral nervous system.
- Relate cells of nervous system (neurons and neuroglia) with their functions.
- Define grey matter and white matter.
- Explain formation of Spinal nerve and its branches.

- Differentiate between afferent and efferent nerves.
- Define ganglion and its types.
- Describe the origin, components and function of sympathetic and parasympathetic nervous system.
- List the cranial nerves and their functional components.

GENERAL AND SPECIAL HISTOLOGY

1. Cell

- Relate the components and functions of cell.
- List the features of nucleus and mitochondria.
- Describe the structure of cell membrane and its functions.
- Explain the difference between cytoplasmic organelles and inclusion bodies.
- List the features and functions of Golgi apparatus and Endoplasmic reticulum.
- Define cilia and stereocilia with respect to their locations and functions.

2. Microscopy and Tissue processing

- List parts and features of microscope.
- Demonstrate operational steps of microscope handling and slide observation.
- List steps of tissue preparation (Fixation, Dehydration, Embedding and sectioning etc.).
- Describe features and results of H&E staining.

3. Epithelial Tissue

- Define epithelium and its main functions.
- Classify simple and stratified epithelium with examples of each type.
- Compare and identify different types of epithelia with regard to their features, functions and locations. (Practical)
- Describe different types of cell junctions.
- Relate surface modifications to the epithelial function.
- Define glands.
- Classify glands according to their structure, type and mode of secretion.
- Explain the features of serous and mucus acini.
- Define serous demilunes.

4. Connective Tissue

- Define connective tissue and its main functions.
- Describe the components of connective tissue and their main features.
- Classify and identify connective tissue according to structure, function and location. (Practical)
- List resident and transient connective tissue cells
- Explain the features of white and brown adipose tissue.

- Name various types of fibers with their location.

5. Histology of Cartilages

- Classify cartilage according to their histological features with examples of location.
- Explain identification points of microscopic slides of hyaline, elastic and fibrocartilage. (Practical)

6. Histology of Bones

- Explain the histological difference between compact and spongy bones. (Practical)

7. Histology of Muscles

- Differentiate between the three main types of muscles histologically. (Practical)
- Describe the ultrastructural organization of a motor unit.

8. Histology of CVS

- Describe general structure of blood vessels.
- Differentiate between the histological structure of arteries, veins and capillaries. (Practical)

9. Histology of Lymphatic system

- List the lymphoid cells and their functions.
- Describe and identify the histological features of lymph nodes, tonsils, spleen and thymus on microscopic slides. (Practical)

10. Histology of Skin and Fascia

- Give identification points of a section of skin slide. (Practical)
- List main features of the skin appendages.
- Describe sweat and sebaceous glands.

11. Histology of oral cavity & tongue

- Differentiate the histological features of contents of oral cavity
- Features of lining epithelium of oral cavity

12. Salivary Glands Histology

- Differentiate between histological features of salivary glands
- Explain with their functional correlations
- List identification points of slide sections of parotid, submandibular & sublingual glands

13. Nose, pharynx, larynx & trachea Histology

- Describe the histological features of nose & pharynx
- Explain the microscopic features of Larynx & trachea
- Explain the functional Correlation with histological features of these organs

14. Endocrine Glands Histology

- List the identification points of microscopic sections of various endocrine glands
- Explain histological features of all endocrine gland

GENERAL AND SYSTEMIC EMBRYOLOGY

1. Introduction and terminologies of embryology

- Define Embryology.
- Define the following terms: Gamete, Zygote, Embryo, Fetus, Embryonic period and Fetal period.

2. Introduction to Male and Female reproductive organs

- Name parts of male reproductive system and coverings of the male gonad.
- Describe the functions of cells present in the wall of seminiferous tubule.
- Identify parts of mature sperm and their constituents.
- Name parts of female reproductive system.
- Describe the layers of uterine wall.
- Describe the histological features and cells present in ovarian cortex and medulla.

3. Cell divisions (Mitosis and Meiosis) and Cell Cycle

- Discuss different types of cell divisions and their clinical importance.
- Define cell cycle and its phases.
- List features and phases of mitotic cell division.
- Describe the main features of Meiotic cell division and its results.

4. Gametogenesis: Spermatogenesis and Oogenesis

- Define spermatogenesis and its duration
- Define primordial germ cells and their features
- Describe Spermiogenesis.
- List various spermatogenic cells and their main features.
- Define features of various types of ovarian follicles.
- Describe the structure and function of Graffian’s follicle and corpus leuteum.
- Correlate meiosis with steps of gametogenesis.

5. Reproductive Cycles

- Correlate menstrual and ovarian cycles and hormonal secretions.
- Define corpus Albicans and corpus atreticum.

6. Fertilization

- Define fertilization.
- List results of fertilization.
- Discuss phases and site of fertilization.
- Define capacitation and zona reaction.

7. First week of Development and Implantation

- List the changes which occur during first week.
- Define morula and fate of morula cells.
- Define trophoblast cells and their functions.
- Describe factors involved in transport of fertilized ovum.
- Define implantation and Decidual reaction.
- Name the normal and abnormal sites of implantation.

8. Second week of development

- List main changes occurring during second week.
- Describe the formation of cytotrophoblast and syncytiotrophoblast cells.
- Define chorion, amnion and yolk sac.
- Define embryonic disc and its layers.
- List the structures formed during the second week.
- Name the layers of extra embryonic mesoderm.
- Define the source of secretion of human chorionic gonadotropic hormone (βHCG).
- Define connecting stalk and its transformation.

9. Third week of development and gastrulation

- List main events of development during third week.
- Describe main events of gastrulation.
- Explain formation of notochord and its derivatives in adults.
- Define parts of intra-embryonic mesoderm.
- List abnormalities of gastrulation.

10. Neurulation and Ectoderm

- Describe the process of Neurulation.
- List derivatives and neural tube and neural crest cells.
- List the structures derived from ectoderm.
- Enumerate the neural tube defects.

11. Folding of embryo & Endoderm

- Describe the formation of endoderm
- Enumerate the derivatives of endoderm
- Describe folding of embryo and enumerate its result

12. Intraembryonic mesoderm & Somitogenesis

- Describe the formation and differentiation of intra embryonic mesoderm.
- Enumerate the derivatives of each part of intraembryonic mesoderm & ectoderm
- Describe the formation of somites & fate of somites.

13. Embryonic & Fetal period

- Summarize the main developmental changes and events in external form of embryo during week 4-8
- Summarize the events of fetal period

14. Placenta

- Describe the maternal and fetal components of placenta
- Describe the development structure and functions of placenta.
- Describe placental circulation (maternal and fetal).
- List the structures forming the placental barrier.

15. Fetal membranes

- List the fetal membranes.
- Describe the development components and functions of umbilical cord.
- Describe the development and functions of amnion.
- Describe the circulation formation and composition of amniotic fluid.
- Enumerate the disorders of amniotic fluid volume with causes of each.

16. Teratology and role of genes (Birth Defects)

- Define teratology and its main causes.
- List various types of teratogens.
- List the examples of environmental factors and drugs causing malformations.
- Define Non disjunction.
- Define chromosomal and Structural abnormalities.
- Define trisomy and Monosomy and give examples of each type.

17. Antenatal Diagnosis

- Differentiate between the common antenatal diagnostic techniques: ultrasound, chorionic villus sampling and amniocentesis.

18. Development of Pharyngeal arches

- Define pharyngeal arches & their components

- Enumerate the nerves of all pharyngeal arches
- Derivatives of First pharyngeal arch
- Enumerate the derivatives of third & fourth arches
- Define the sources of development of hyoid bone
- Define steps of development of mandible

19. Development of Pharyngeal Pouches & Clefts

- Define pharyngeal Pouch & pharyngeal cleft
- List the derivatives of all pharyngeal pouches
- Explain the fate of pharyngeal clefts & branchial cyst & branchial fistula
- Describe various types of congenital malformations of pharyngeal apparatus

20. Development of Face, Tongue & Palate

- Explain the facial prominences, Stomodeum & their derivatives
- Enumerate the sources of development of tongue & foremen cecum
- Define Ankyloglossia or tongue tie
- Define primary palate & its components
- Describe the development of secondary palate & Cleft lip & cleft palate
- Discuss the development and common anomalies of oral structures

21. Development of nose, Paranasal sinuses & salivary Glands

- Outline development of nose & embryonic sources
- Explain the process of development of paranasal sinuses
- Describe the process of development of salivary glands & their germ layer origin
- List the congenital anomalies of nose, paranasal sinuses & salivary glands

22. Development of Teeth

- Explain the embryonic sources of development of teeth
- Describe various stages of formation of teeth
- Define primary & permanent teeth eruption
- List the factors affecting the development of teeth & their malformations

23. Development of Endocrine glands

- Describe the Sources of Development of Pituitary gland & pineal gland
- Explain the deve of Thyroid & Parathyroid glands and their anomalies
- Sources of development of adrenal gland

24. Development of Eye & Ear

- Describe the sources of development of the eye ball
- Define optic cup & its derivatives

- Define optic stalk & its derivatives
- Define the development of lens of eyeball
- Define the sources of development of the external & middle ear
- Define otic placode & Otic vesicle & their derivatives

HEAD AND NECK

1. Topography of head and neck

- Explain general arrangement of structures in the head and neck region.
- Name skeletal components of Head and Neck region.
- Define root of neck.

2. Skull: Four Normas and its Foramina

- List the Paired and unpaired bones of skull.
- Name Sutures of skull.
- Identify the features and bones of Norma frontalis, Occipitalis, verticalis, Lateralis and basalis.
- Identify the Foramina of skull and structures passing through them (foramen Magnum, ovale, Jugular, spinosum, rotundum, lacerum, superior orbital fissure, infraorbital and carotid canal etc).
- Name parts of ethmoid, sphenoid, temporal and occipital bones.
- Name the bones forming hard palate, pterion and asterion.

3. The scalp

- Name layers of scalp.
- Name the neurovasculature of scalp.
- Describe the clinical conditions associated with the scalp (dangerous layer, black eye etc.).

4. Osteology of mandible and hyoid bone

- Identify the bony features of mandible and hyoid bone along with their articulations.
- Identify Muscle attachments, related nerves and foramen with their contents on mandible.
- Discuss age-related changes in mandible.

5. Face

- Explain the different functional groups of muscles of face and their nerve supply.
- Describe the Motor and Cutaneous nerve supply, blood supply and lymphatic drainage of face.

- Explain the danger area of face and its clinical importance.
- Describe the features of Bell's palsy and muscles involved.

6. Temporal fossa

- Identify the boundaries of temporal fossa.
- Describe the contents of temporal fossa.

7. Infratemporal fossa

- Identify the boundaries of infratemporal fossa.
- Describe the contents of infratemporal fossa (including maxillary artery and otic ganglion).
- List the connections of infratemporal fossa and their contents.

8. Temporomandibular joint (TMJ) and Muscles of mastication

- Describe the type and articulations of TMJ.
- Name the neurovascular supply of TMJ.
- Describe the muscles of mastication and associated movements of TMJ
- Discuss the movements and associated clinical conditions (eg. dislocation) associated with TMJ.

9. Cervical vertebra

- Identify the main features of cervical vertebrae (typical and atypical).
- Describe articulations and movements of axis and atlas and typical cervical vertebrae.

10. Pterygopalatine fossa and its contents

- Describe boundaries and communications of pterygopalatine fossa.
- List contents of pterygopalatine fossa.
- Describe the connections and innervation of pterygopalatine ganglion.

11. Orbital cavity and its contents

- Describe the bony boundaries of orbital cavity.
- List contents of the orbital cavity.
- List the structures passing through the foramen of orbital cavity.
- Name the connections of lacrimal apparatus.

12. Nerves and Vessels of Orbital cavity

- Define optic nerve and its origin and termination.
- Define ophthalmic nerve, its branches and distribution.
- Explain the origin, course and branches of ophthalmic artery.
- List the veins of orbital cavity and their drainage.

- Define ciliary Ganglion and its innervation.

13. Anatomy of Eye Ball and Eyelids

- Explain the 3 coats of eyeball.
- Name extra ocular muscles and their nerve supply.
- Explain ocular adnexa and their main features.
- Describe the circulation of aqueous humor through Schlemm's canal, anterior and posterior chambers and vitreous humor.
- Describe the structure of eyelids.

14. The Ear

- List the general features of External, middle and Internal ear.
- Describe the boundaries, walls and contents of the middle ear.
- Describe ossicles according to their shapes and functions.
- Describe the course of the intra petrous part of facial nerve.
- Explain the anatomical features of internal ear.

15. Nose and Paranasal sinuses

- Describe the general features and neurovascular supply of external nose.
- Discuss the skeletal boundaries, openings and neurovascular supply of the nasal cavity (including, roof, floor, septum and lateral wall).
- Name Paranasal sinuses and their location and drainage.
- Describe Maxillary air sinus and its clinical importance.

16. Gross Anatomy of Hard and soft palate

- Define parts of palate.
- Name the muscles of palate and their nerve supply.
- Describe the gag reflex.

17. Gross of oral cavity and Tongue

- Discuss the boundaries and divisions of oral cavity.
- Describe its contents.
- Describe the gross features of tongue.
- Name its intrinsic and extrinsic muscles with attachments, innervation and actions.
- Describe vascular and sensory nerve supply and lymphatic drainage of tongue.
- Describe the development of the tongue.

18. Gross Anatomy of Major salivary glands

- Discuss the location, relations, drainage and neurovascular supply of salivary glands.

- List structures passing through the parotid gland.
- Explain the clinical correlations of major salivary glands.

19. Skin, Fascia, spaces and muscles of neck

- Describe attachments, innervation and actions of trapezius and sternocleidomastoid muscles.
- Describe fascial layers of neck, their attachments and enclosed muscles.
- Describe modifications of deep fascia and their contents.
- Describe the cutaneous innervation of neck.

20. Triangles of neck: anterior and Posterior triangle

- Name the boundaries, divisions and contents of the anterior and posterior triangles of neck.
- Name the supra-hyoid and infra-hyoid muscles, their innervation and actions.
- Describe the formation of cervical plexus.

21. Gross anatomy of Trachea

- Identify the extent, relations and gross anatomical features of trachea.

22. Gross Anatomy of Thyroid and Parathyroid glands

- Discuss location, relations, gross features and neurovascular supply of thyroid and parathyroid glands.
- Explain the clinical importance of thyroid and parathyroid glands.

23. Prevertebral region and back of neck

- Name the muscles and neurovascular region of the prevertebral region.
- Describe the boundaries and contents of the sub-occipital triangle.

24. Gross anatomy of Pharynx

- Describe location, extent, divisions and communications of pharynx.
- Describe communications and structure of auditory tube.
- Describe palatine tonsils and Tonsillar and piriform fossa.

25. Gross anatomy of Larynx

- List paired and unpaired cartilages of Larynx.
- Name the boundaries, divisions, composite structures, neurovascular supply of Larynx.
- Describe the boundaries of laryngeal inlet.
- Name the muscles of larynx, their attachments, nerve supply and actions.

26. Major Vessels of neck.

- Identify major arteries and veins of the neck.
- Describe the course and division of common carotid artery and its vertebral level.
- Describe the extent, course and branches of external carotid artery.
- Describe the formation of internal jugular vein and its tributaries.

27. Lymphatic drainage of head and neck

- List the groups of lymph nodes and their drainage areas in head and neck region.

28. Cranial nerves 1 to 12

- Describe the course and distribution of cranial nerves in head and neck.
- Explain effects of injury / lesions of cranial nerves.
- Demonstrate the clinical nerve examination techniques. (Practical)

29. Ganglia of the head and neck

- List the parasympathetic ganglia of Head and neck, their location and connections.
- Describe location and communications of sympathetic cervical ganglia.

31. Gross anatomy of Pituitary and Pineal gland

- Outline the gross anatomical features, location and relations of pituitary gland.
- Explain the location and function of Pineal gland.

32. Surface anatomy and radiology of head and neck

- Mark on the surface the following structures: major vessels of head and neck, parotid and thyroid gland, triangles of neck, facial nerve.
- Identify the important structures of head and neck on radiographs.

NEUROANATOMY

1. The Cranial cavity

- Identify boundaries, bones, foramina and contents of anterior, middle and posterior cranial fossae.
- List structures passing through the cranial fossae foramina.
- Define main features of calvaria.

2. Introduction to parts of Brain

- List parts of fore brain, mid brain and hind brain.
- List part of brain stem.

3. Spinal cord

- Describe the external and internal features of spinal cord.
- Identify the extent of spinal cord (including cauda equina and filum terminale).
- Explain the arrangement of grey matter and white matter in spinal cord.
- List the coverings of spinal cord.
- Describe the origin and area of supply of spinal arteries.

4. Meninges of the brain and spinal cord

- Describe the layers of meninges.
- Discuss the clinical importance of epidural, subdural and subarachnoid spaces, and arachnoid villi and granulations.
- Identify the site for lumber puncture.
- Describe the dural folds, falx cerebri, tentorium cerebelli and tentorial notch.

5. Ascending Tracts of Spinal cord

- Describe the neurons involved in the sensory pathway.
- Identify the location and type of sensation of ascending tracts of spinal cord.
- Define spinothalamic tracts and they carry which type of sensations.

6. Descending Tracts of Spinal cord

- Describe the neurons involved in the motor pathway.
- Describe the difference between upper and lower motor neurons.
- Identify the location of descending tracts of spinal cord.
- Define the functions, crossing, termination and functional significance of corticospinal tracts.
- Describe the lesions of descending tracts.

7. Brain stem: Medulla oblongata

- Describe the features of ventral and dorsal surfaces of Medulla oblongata.
- Define pyramids and pyramidal decussation
- Identify grey matter and white matter components of Medulla on cut-section.
- Define the Location of main nuclei of cranial nerves in Medulla
- Describe the location of emergence of cranial nerves from medulla oblongata and ponto-medullary junction.

8. Brain stem: Pons

- Describe the features of ventral and dorsal surfaces of Pons.
- Describe the location of emergence of cranial nerves from Pons.
- Identify grey matter and white matter components of Pons on cut-section.

9. Brain stem: Mid Brain

- Describe the features of ventral and dorsal surfaces of Midbrain.

- Describe the location of emergence of cranial nerves from Midbrain.
- Identify grey matter and white matter components of midbrain on cut-section.

10. Dural venous sinuses

- List paired and unpaired dural venous sinuses.
- Briefly explain the location, communications and clinical significance of dural venous sinuses (including cavernous sinus).

11. Cerebrum

- Name the lobes of Cerebrum.
- Identify the main sulci and gyri on all surfaces of cerebrum.
- Identify functional cortical areas of Cerebrum, their significance and Broadman's number.

12. Arterial Blood supply of Brain

- Name the cerebral arteries, their origin and supply.
- Describe the location and formation of Circle of Willis.
- Explain the clinical effects of occlusion of cerebral arteries.
- Describe blood supply of brain stem.
- List branches of vertebral artery and Internal carotid artery.

13. Venous drainage of brain and spinal cord

- Name superficial cerebral veins, their location and drainage areas.
- Explain deep cerebral veins and their drainage areas.
- Name the veins of cerebellum.

14. Ventricles of brain

- Describe the location, boundaries and communications of ventricles of brain.
- Describe formation and flow of Cerebrospinal fluid.
- Describe clinical correlation of Cerebrospinal fluid disorders.

15. Diencephalon

- Describe the location and parts of diencephalon.
- Explain the main nuclei and connections of thalamus with other parts of brain.

16. White matter of cerebrum

- Classify white matter of cerebrum into association, projection and commissural fibers and name the examples.
- Name parts of corpus callosum.
- Define internal capsule, its parts and relations.

17. Cerebellum

- List the anatomical and functional lobes of cerebellum.
- Describe external features of cerebellum.
- Name deep cerebellar nuclei and their connections.
- Explain the features of lesions of cerebellum.

18. Basal ganglia

- List parts of basal ganglia: corpus striatum, putamen, globus pallidus and caudate nucleus.
- Describe briefly the function of basal ganglia.
- Explain Parkinson's disease and its features.

19. Cranial nerves I - XII

- Identify the nuclei of the cranial nerves and their location.
- Describe their functional components and exit sites from the cranial cavity.
- Explain features of cranial nerves lesions.

20. Development of nervous system

- Describe the development of brain vesicles from neural tube.
- Explain the derivatives of brain vesicles.
- Define the main anomalies of nervous system.

21. Autonomic nervous system

- Describe the structural and functional organization of autonomic nervous system.
- Explain components of sympathetic and parasympathetic nervous system and its functions.

22. Imaging of Brain and spinal cord

- Apply anatomical knowledge on radiological images of brain and spinal cord.

ABDOMEN, THORAX AND LIMBS

1. Introduction to thoracic cavity

- Outline the boundaries of thoracic cavity
- Features of typical & atypical ribs & sternum
- Enumerate its contents

2. Mediastinum

- Define Mediastinum & its location
- Identify the boundaries and divisions of mediastinum
- Enumerate the contents of mediastinum

3. Gross and histology of thoracic part of respiratory tract

- Identify the gross features of lungs & parts of bronchial tree
- List Microscopic feature of Lungs.

4. Development of respiratory system

- Describe the features of development of respiratory system & germ layers involved
- Enumerate derivatives of Lung Bud
- Explain the importance of stages of lung development

5. Overview of Pericardium and Heart

- Outline gross features of Heart & pericardium
- Enumerate main vessels & nerves of heart and pericardium

6. Development of CVS

- Explain the formation & derivatives of primitive of heart tube.
- Describe the changes occurring in heart loop
- Define aortic arches

7. General & Histological features of GIT

- Differentiate gross features of GIT & liver & pancreas
- Histological features of different parts of GIT & associated glands

8. Development of GIT

- Describe germ layers involved in the formation of GIT
- Enumerate derivatives of foregut, Midgut & Hindgut
- List the malformations of GIT

9. Introduction to Limbs

- Recognize general arrangement of bones & regions in both Limbs
- Define muscle groups of both limbs

10. Development of Musculoskeletal system

- Outline the sources of development musculoskeletal system
- Define sclerotome & Dermomyotome