Study Guide

SECOND PROFESSIONAL MBBS

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STUDY GUIDE

ANATOMY

2nd PROFESSIONAL MBBS

Pak Red Crescent Medical & Dental College

48-KM Multan Road, Lahore-Pakistan.

INTRODUCTION	Human anatomy is a field of science that studies the human body structures at three levels, macroanatomy, microanatomy, and developmental anatomy. Anatomy is an important lesson for medical students worldwide and they must learn anatomy including gross anatomy, histology, and embryology; these are the major part of the basic sciences of medicine. Many of the clinical specialists consider having enough knowledge of anatomy a prerequisite for performing safe and competent interventions in medicine. Learning anatomy practically and with clinical approach is necessary for medical students to decrease the medical errors. Knowing the importance and clinical uses of anatomy, on the other hand, could help students improve their skills.
TARGET STUDENTS	2nd year MBBS
COURSE TO BE STUDIED IN SECOND YEAR MBBS	1. Gross Anatomy: a. Abdomen, Pelvis & Perineum. b. Head & Neck c. Neuroanatomy 2. Special Histology 3. Special Embryology
COURSE TITLE	**ABDOMEN, PELVIS & PERINEUM**
DURATION	10 weeks
OUT COMES	At the end of the module, the students will be able to: • Explain the normal and abnormal gross and microscopic structures related to the abdomen, pelvis &perineal regions.
OBJECTIVES	**At the end of the course student must be able to:** **Anterolateral abdominal Walls** • Describe walls, cavities, regions, and planes of anterolateral abdominal wall • Describe the layers, attachments & extent of fascia of the anterolateral abdominal wall • Enumerate muscles of anterolateral abdominal wall with their attachments, nerve supply & actions. • Describe Nerves of anterolateral abdominal wall • Discuss vessels of anterolateral abdominal wall • Draw Dermatomes of anterolateral abdominal wall • Discuss Applied anatomy including Clinical Significance of Fascia and Spaces of abdominal wall • Enlist the causes of Protuberance of Abdominal Hernias • Enlist clinical significance of injury to nerves of anterolateral abdominal wall • Discuss advantages & disadvantages of each type Abdominal Surgical Incisions • Illustrate Pathways of Superficial Abdominal Veins **Inguinal region:** • Discuss Inguinal region: Inguinal ligaments and canal • Describe boundaries of Inguinal Canal and effects in increased

intraabdominal Pressure.

- Recall clinical aspects of inguinal region including external supravesical Hernia, postnatal patency of umbilical vein, Metastasis of Uterine Cancer to Labium Majus, inguinal cysts and Hernias of Canal of Nuck.
- Differentiate different types of Inguinal Hernias.

Spermatic cord, Scrotum and testis

- Describe the Anatomy, Blood supply, nerve supply, and lymphathicdrainageof spermatic cord, scrotum & testis
- Discuss clinical anatomy including Undescended (Cryptorchid) Testis,Hydrocele of Spermatic Cord, and/or Testis,Hematocele of Testis
- Recall the Clinical Anatomy of: Torsion of Spermatic Cord, Anesthetizing Scrotum, Spermatocele and Epididymal Cyst, Vestigial Remnants of Embryonic Genital Ducts, Varicocele&Cancer of Testis and Scrotum

Peritoneum and peritoneal cavity

- Explain the layers, folds, recesses and compartments of peritoneum with their clinical importance (mesentry, omentum, ligaments,folds wall and recess).
- Discuss the extent of peritoneum, peritoneal cavity and reflections
- Explain the boundaries of greater & lesser sac
- Describe Subdivisions of peritoneal cavity.
- Discuss the clinical Anatomy of Peritoneum and peritoneal cavity under following points:
    - Patency and Blockage of Uterine Tubes
    - The Peritoneum and Surgical Procedures
    - Peritonitis and Ascites
    - Peritoneal Adhesions and Adhesiotomy
    - Abdominal Paracentesis
    - Intraperitoneal Injection and Peritoneal Dialysis
    - Functions of Greater Omentum
    - Abscess Formation
    - Spread of Pathological Fluids
    - Flow of Ascitic Fluid and Pus
    - Fluid in Omental Bursa
    - Intestine in Omental Bursa
    - Severance of Cystic Artery

Esophagus & Stomach

- Describe the gross anatomy of abdominal esophagus with its peritoneal & visceral relations, neurovascular supply , lymphatic drainage and clinical importance
- Describe the gross anatomy of stomach with its peritoneal & visceral relations, neurovascular supply , lymphatic drainage and clinical importance
- Recall Position and parts of stomach..
- Discuss clinical aspects of stomach including Displacement of Stomach, Hiatal Hernia, Pylorospasm, Congenital Hypertrophic Pyloric Stenosis, Carcinoma of Stomach, Gastrectomy and Lymph Node Resection

- Define Gastric& peptic ulcer & discuss its pathogenesis and relation to H. Pylori infection

Duodenum

- Describe different parts of duodenum with its anatomical relations
- Discuss important clinical aspects including Duodenal Ulcers &Paraduodenal Hernias

Jejunum and ileum

- Differentiate between Jejunem and ileum with neurovascular supply and lymphatic drainage
- Discuss the clinical anatomy of jejunum and ileum like ischemia of Intestine, Ileal Diverticulum.

Large Intestine

- Differentiate various parts of large intestine on the basis of anatomical features (Caecum, appendix and colon).
- Describe neurovascular supply and lymphatic drainage
- LEnlist the clinical conditions related to large intestine like volvulus and intussusceptions, Position of Appendix, Appendicitis, Appendectomy, Colitis, Colectomy, Ileostomy, and Colostomy.

Spleen

- Describe the location, size, extent, visceral & peritoneal relations of spleen.
- Discuss clinical aspects including Rupture of Spleen, Splenectomy and Splenomegaly, Accessory Spleen(s), Splenic Needle Biopsy and Splenoportography

Pancreas

- Describe the gross anatomical features of pancreas with its neurovascular supply, peritoneal relations
- Discuss following topics of clinical importance
  - Blockage of Hepatopancreatic Ampulla and Pancreatitis
  - Endoscopic Retrograde Cholangiopancreatography
  - Accessory Pancreatic Tissue
  - Pancreatectomy
  - Rupture of Pancreas
  - Pancreatic Cancer

Liver

- Illustrate anatomical lobes &Functional subdivision of liver
- Draw & label Hepatic (Surgical) Segments of Liver.
- Describe Blood supply of liver
- Explain Lymphatic drainage and innervation of liver

Biliary Ducts and Gallbladder

- Describe Bile duct, Gall bladder, hepatic portal vein and portal systemic anastomosis
- Discuss applied aspects of Mobile Gallbladder, Variations in cystic and hepatic ducts, Acessory Hepatic ducts, Gall stones, Gallstones in duodenum, Cholecystectomy, Portal Hypertention&Portosystemic Shunts

Kidneys

- Describe the gross structure of kidney, its location and shape.
- Discuss Coverings of kidney
- Describe the Cortex and medulla of kidney.
- Discuss the Relations of kidney.
- Describe Functions of kidney
- Discuss the clinical conditions related to kidney including Palpation of Kidney, Perinephric Abscess, Nephroptosis, Renal Transplantation, Renal Cysts, Pain in Pararenal Region, Accessory Renal Vessels and Renal Vein Entrapment Syndrome
- Describe the structures passing through the hilum of kidney with their sequence.
- Discuss the blood supply of kidney in detail, with clinical segmentation of kidney according to its blood supply.
- Discuss the nerve supply of kidney.
- Discuss the lymphatic drainage of kidney

Ureters

- Describe Ureters. Name the parts of urinary system (ureter, urinary bladder and urethra).
- Describe the structure, course, anatomical constrictions, and relations of ureter.
- Discuss the clinical conditions related to ureter like ureteric calculi

Urinary bladder

- Explain the location, apex, base, surfaces and relations of urinary bladder.
- Describe the trigone of the urinary bladder.
- Explain the support to the urinary bladder.
- Describe the blood supply, nerve supply and lymphatic drainage of urinary bladder and urethra.
- Discuss SuprapubicCystotomy, Rupture of the Bladder & Cystoscopy

Diaphragm

- Describe attachments of Diaphragm
- Illustrate Vessels and Nerves of Diaphragm
- Demonsrate Diaphragmatic Apertures
- Explain Actions of Diaphragm
- Discuss Clinical Anatomy like Hiccups, Section of a Phrenic

	Nerve,Referred Pain from Diaphragm, Rupture of Diaphragm and Herniation of Viscera & Congenital Diaphragmatic Hernia **Posterior abdominal wall** • Describe Fascia and muscles of Posterior Abdominal Wall. • Describe Nerves of Posterior Abdominal Wall • Enlist Vessels of posterior abdominal wall • Give Lymphatic vessels and lymph nodes of posterior abdominal wall • Recall the clinical Anatomy like Psoas Abscess, Posterior Abdominal Pain,Partial Lumbar Sympathectomy, Pulsations of Aorta and Abdominal Aortic Aneurysm and Collateral Routes for Abdominopelvic Venous Blood **Pelvis and perineum** • Discuss the features of bony pelvis • Describe the boundaries of pelvic inlet & outlet • Discuss the osteology of sacrum • Identify muscles and ligaments attached to sacrum • Differentiate between male and female pelvis • Discuss the important points of pelvimetry • LEnlist various types of joints of pelvis • Explain types, articulations, ligaments & relations of joints of pelvis • LEnlist factors providing stability to the joints of pelvis • Describe the blood supply, nerve supply & movements of joints of pelvis **Pelvic cavity** • Describe the anatomy of the pelvic walls • Enumerate the muscles of pelvic floor/pelvic diaphragm and discuss their attachment & actions, • Discuss the blood supply, nerve supply& lymphatic drainage of pelvic floor muscles • Describe the attachment and significance of pelvic fascia (membranous pelvic fascia and endopelvic fascia) • Discuss the clinical conditions associated with the pelvic floor & fascia • Discuss the role of pelvic floor in urinary and fecal continence • Describe injury to Pelvic Floor & Prenatal “Relaxation” Training for Participatory Childbirth **Neurovasculature of pelvis** • Enlist Arteries and veins of pelvis. • Illustrate Lymph Nodes of Pelvis • Enumerate the nerves innervating pelvis & Pelvic autonomic nerves. • Describe Sacral plexus and explain its formation • Describe the branches and divisions of sacral plexus • Identify coccygeal plexus • Describe hypogastric plexus, its location, formation and its branches

	• Visceral afferent innervation in pelvis
	• Discuss the following applied aspects of pelvis
	  ○ Iatrogenic injury of ureters
	  ○ Injury during ligation of uterine artery
	  ○ Injury during ligation of ovarian artery
	  ○ Ligation of internal iliac artery
	  ○ Collateral circulation in pelvis
	  ○ Injury to pelvic nerves)
	• Discuss the injuries associated with the nerves of pelvis, perineum and sacral plexus
	
	Male Internal Genital Organs
	
	• Identify Ductus deference, seminal Gland and ejaculatory ducts
	• Discuss the blood supply, nerve supply& lymphatic drainage of ductus deference, seminal Gland and ejaculatory ducts
	• Describe Prostate with its anatomical lobes
	• Discuss clinical anatomy of structures including male sterilization method, abscesses in seminal glands and hypertrophy of prostate.
	
	Female Internal Genital Organs
	
	• Enlist the parts of uterus, cervix & vagina
	• Describe the location & relations of uterus, cervix and vagina with surrounding structures
	• Describe the ligaments of uterus
	• Discuss the blood supply, nerve supply& lymphatic drainage of uterus, cervix & vagina
	• Discuss the clinical conditions associated with uterus, cervix and vagina including the following:
	  ○ Infections of Female Genital Tract
	  ○ Patency of Uterine Tubes
	  ○ Hysterosalpingography
	  ○ Endoscopy
	  ○ Ligation of Uterine Tubes
	  ○ Ectopic Tubal Pregnancy
	  ○ Remnants of Embryonic Ducts
	  ○ Bicornate Uterus
	  ○ Disposition of Uterus and Uterine Prolapse
	  ○ Manual Examination of Uterus
	  ○ Lifetime Changes in Normal Anatomy of Uterus
	  ○ Cervical Cancer
	  ○ Cervical Examination
	  ○ Pap Smear
	  ○ Hysterectomy
	  ○ Distension of Vagina
	  ○ Digital Examination Through Vagina
	  ○ Vaginal Fistulae
	  ○ Culdoscopy and Culdocentesis
	  ○ Laparoscopic Examination of Pelvic Viscera
	  ○ Anesthesia for Childbirth

Perineum

- Illustrate Fasciae and pouches of Urogenital triangle.
- Describe boundaries & contents of Superficial & Deep perineal pouches
- Distinguish Current concept of deep perineal Pouch and External Urethral Sphincter

Anal triangle

- Explain boundaries of anal triangle
- Describe contents of anal triangle
- Explain boundaries of Ischioanal fossae
- Illustrate Pudendal canal and its neurovascular bundle
- Enlist Arteries of perineum
- Discuss disruption of perineal body, episiotomy rupture of urethra in males and extravasation of urine

Rectum &Anal canal

- Describe rectum & anal canal levels, anatomical structures (anal valves, columns, pectinaate line, white line)
- Describe the visceral & peritoneal relations of rectum and anal canal.
- Enumerate its supports of rectum and anal canal.
- Describe arterial and venous supply, innervation and lymphatic drainage of anal canal above & below pectinate line.
- Discuss the following applied aspects
    - Starvation and rectal prolapse
    - Pectinate line—a clinically important landmark
    - Anal fissures and perianal abscesses
    - Hemorrhoids
    - Anorectal incontinence.

Male Urogenital Triangle

- Describe parts of Distal part of male urethra
- Describe anatomy of Scrotum
- Discuss Lymphatic drainage of perineum
- Enlist Perineal muscles of males
- Discuss Urethral Catheterization, Distension of Scrotum, Palpation of Testes, Hypospadias, Phimosis, Paraphimosis, and Circumcision, Impotence and Erectile Dysfunction

Female Urogenital Triangle

- Describe parts of Female external genitalia
- Discuss Lymphatic drainage of female perineum
- Enumerate Perineal muscles with its attachments
- Discuss Nerve supply of perineal structures.
- Describe clinical aspects including Female Circumcision, Vulvar Trauma, Infection of Greater Vestibular Glands, Pudendal and Ilioinguinal Nerve

	Blocks, Exercises for Increased Development of Female Perineal Muscles &Vaginismus.
SURFACE ANATOMY	**Students must perform surface marking of following viscera** • Anatomical planes (subcostal, transpyloric, intertubercular) • Stomach • Duodenum • Liver • Pancreas • Kidneys • Spleen
PRACTICALS	**Conducted in the wet labs** **On cadavers :** o Dissect and identify different viscera of abdomen & pelvis o Identification of different structures in prossected specimens **In Museum:** Identification on models
TUTORIALS/ DSL	• Discussions on clinical oriented problems • Team based learning (TBL) • Visit to radiology department for observing normal X-ray findings and comparison with abnormal findings • Visit to skills lab
INTERNAL ASSESMENT	1. Continuous monitoring of attendance 2. Practical assessment in short groups. It will be in the form of: o Multiple choice questions (MCQs), o Short essay questions (SEQs), o Assignments, o Stages/sub-stages, projects, o Objective structured practical examination. o Viva voce 3. Internal evaluation carries 20% weightage in summative examination.
EXAMINATION	SEQs, MCQs, Viva voce and OSPE (observed + un observed)
LEARNING RESOURCES:	**K.L. Moore, Clinically Oriented Anatomy**
COURSE TITLE	**HEAD & NECK**
DURATION	09 weeks
OUT COMES	At the end of the module, the students will be able to: • Discuss the normal gross structures and functions of the head and neck region

OBJECTIVES	**At the end of the course student must be able to:** **Skull** • Identify gross features of different skull bones/ cranium, sex differences, anatomical position. • Recognize different bony landmarks of the skull • Discuss Norma frontalis in detail • Explain gross features of Lateral Aspect of Cranium/ Norma lateralis • Illustrate gross structures in Superior Aspect of Cranium/ Norma verticalis • Describe detailed view of occipital Aspect of Cranium/ Norma occipitalis • Discuss Applied aspects of bony skull • Identify the sutures and relate the foramina with their respective contents • Describe Internal Surface of Cranial Base, including Anterior, Middle & posterior cranial fossae • Enlist structures passing through foramina • Describe Gross features of mandible with its muscles attachments • Discuss age changes & fractures of mandible. **Meninges** • Enlist layers, falxcereberi, falx cerebella, diaphragm sellae& tentorium cerebella • Discuss applied aspects including the following: o Thrombophlebitis of Facial Vein o Blunt Trauma to Head o Tentorial Herniation o Bulging of DiaphragmaSellae o Dural Origin of Headaches o Leptomeningitis o Head Injuries o Intracranial Hemorrhage **Dural Venous sinuses** • Enlist paired and unpaired dural venous sinuses with their location & drainage. • Recall applied aspects including Occlusion of Cerebral Veins and Dural Venous Sinuses, Metastasis of Tumor Cells to Dural Venous Sinuses **Scalp** • Enumerate layers of scalp with their clinical significance • Describee nerve supply of scalp. • Discuss arterial supply & venous drainage of scalp. • Discuss Scalp Injuries, Scalp Wounds, Scalp Infections,Cephalhematoma&Scalp Lacerations.

Face

- Enlist muscles of facial expression
- Describe motor & cutaneous nerve supply of face
- Explain Trigeminal Neuralgia, Lesions of Trigeminal Nerve, Herpes Zoster Infection of Trigeminal Ganglion
- Draw& label Arterial supply, Venous drainage &lymphatics of face
- Recall applied aspects of face including Sebaceous Cysts,Flaring of Nostrils, Paralysis of Facial Muscles, , Compression of Facial Artery, Squamous Cell Carcinoma of Lip

Eye

- Describe boundaries of bony orbit
- Discuss gross features of eyelids, lacrimal apparatus.
- Describe arterial supply & venous drainage of eyeball, eyelid & lacrimal apparatus.
- Explain Vasculature of the eyeball
- Enumerate coats, contents, extrinsic and intrinsic muscles

Extra ocular muscles and movements of eye ball

- Elaborate applied aspects of Orbit like fractures, Tumors.
- Recall Injury To Nerves Supplying Eyelids
- Describe the following terms:
    - Inflammation Of Palpebral Glands
    - Hyperemia Of Conjunctiva
    - Subconjunctival hemorrhages
    - Retinal Detachment
    - Pupillary Light Reflex
    - Uveitis
    - Papilledema
    - Presbyopia
    - Cataracts
    - Coloboma Of Iris
    - Glaucoma
    - Hemorrhage Into Anterior Chamber
    - Artificial Eye Corneal Abrasions And Lacerations
    - Corneal Ulcers And Transplants
    - Horner Syndrome
    - Blockage Of Central Artery Of Retina

Parotid region

- Describe boundaries of parotid region
- Discuss the anatomical features & relations of parotid gland,
- Describe sensory, sympathetic & parasympathetic components of otic ganglion
- Discuss shape, size and course of parotid duct.
- Discuss the facial nerve and its branches in the mass of parotid gland.
- Recall clinical problems of Parotidectomy, Infection of Parotid Gland, Abscess in Parotid Gland, Sialography of Parotid Duct, Blockage of Parotid Duct, Accessory Parotid Gland

Temporal region

- Enlist the boundaries of temporal region,
- Describe attachments of Temporal fascia
- Enlist the contents of temporal region

Infratemporal fossa

- Enlist contents of infratemporal fossa
- Describe attachments of muscles of mastication
- Describe neurovasculature of infratemporal fossa

Temporomandibular joint

- Describe articulation, movements and themuscles producing these movements of temporomandibular joint.

Hard & Soft Palate

- Describe Hard palate, soft palate, palatine Waldeyer's ring aponeurosis, muscles & movement of soft palate
- Discuss the boundaries, muscle attachments and mucosal coverings of hard and soft palate
- Discuss the function of hard and soft palate during process of mastication and deglutination

Tongue

- Explain the anatomy of tongue with its nerve supply, blood supply & lymphatic drainage.
- Enlist intrinsic & extrinsic muscles of tongue with their attachments &movements.
- Describe clinical anatomy of paralysis of genioglossus, injury to hypoglossal nerve, sublingual absorption of drugs, lingual carcinoma &frenelectomy.

Salivary Glands

- Explain Submandibular andsublingual glands
- Describe blood supply, nerve supply & lymphatic drainage of salivary glands

Pterygopalatine fossa

- Discuss boundaries & contents of pterygopalatine ganglion.
- Describe the course and branches of maxillary nerve & maxillary artery

Nose, 1st cranial nerve &Paranasal sinuses

- Describe Externalnoseandnasal septum,
- Discuss the walls, nerve & blood supply of nasal cavity.
- Illustrate the following clinical terms:
    - Nasal fractures

	○ Deviationof nasal septum ○ Rhinitis ○ Epistaxis ○ Sinusitis ○ Infection of ethmoidal cells ○ Infection of maxillary sinuses ○ Little's area and its significance **Ear** • Describe external, middle & internal ears. • Discuss tympanic membrane & Auditory ossicles. • Explain gross features of Mastoid air cells, mastoid antrum, auditory tube • Define following clinical aspects: ○ Acute otitis externa ○ Otitis media ○ Perforation of tympanic membrane ○ Mastoiditis ○ Blockageof auditory tube ○ Paralysis of stapedius ○ motion sickness ○ Dizziness & hearing loss ○ Meineres syndrome **Bones of Neck** • Identify Bones of neck, Cervical vertebrae and Hyoid bone • Differentiate between strangulation & throttling **Deep fascia of neck** • Describe attachment of fascia of neck (investing layer, Pretracheal layer, prevertebral layer, carotid sheath) • Define retropharyngeal space. • Tell about paralysis of platysma& spread of infections in neck **Superficial & deep structures of neck** • Enlist superficial structures of neck: structures in Posterior cervical region, lateral cervical region, muscles, arteries, veins, lymph nodes &nerves of lateral cervical region. • Discuss structures in anterior cervical region, muscles, arteries, veins, lymph nodes &nerves • Describe the arteries, veins & nerves in root of neck • Discuss the applied aspects including Cervicothoracic Ganglion Block, Lesion of Cervical Sympathetic Trunk **Anterior Triangle of Neck** • Discuss the division of triangles of neck • Name the subdivision of anterior triangle • Describe the boundaries and contents of sub divisions of anterior triangles i.e. Sub mental, Submandibular, Muscular & Carotid

Posterior Triangle of Neck

- Briefly discuss the division of neck into anterior and posterior triangles.
- Describe the boundaries of posterior triangle of neck.
- Enlist the contents of posterior triangle of neck.

Prevertebral region

- Describe structures in Root of neck
- Draw & label Cervical plexus
- Discuss boundaries & contents of Sub-occipital triangle

Thyroid gland

- Explain Location, relation, arterial, venous, nerve supply and lymphatic drainage of thyroid gland
- Recall the following clinical aspects :
    - Thyroid Ima Artery
    - Thyroglossal Duct Cysts
    - Aberrant Thyroid Gland
    - Accessory Thyroid Glandular Tissue
    - Pyramidal Lobe of Thyroid Gland
    - Enlargement of Thyroid Gland
    - Thyroidectomy
    - Injury to Recurrent Laryngeal Nerve

Larynx

- Describe Structure, skeleton, location, ligaments and interior of larynx
- Discuss the lyrangeal muscles
- Explain Nerve supply, arterial supply, venous drainage of larynx
- Describe Applied anatomy including:
    - Fractures of Laryngeal Skeleton
    - Laryngoscopy
    - Valsalva Maneuver
    - Aspiration of Foreign bodies and Heimlich Maneuver
    - Tracheostomy
    - Injury to Laryngeal Nerves
    - Superior Laryngeal Nerve Block
    - Carcinoma of Larynx
    - Age Changes in Larynx
    - Foreign Bodies in Laryngopharynx
    - Sinus Tract from Piriform Fossa
    - Tonsillectomy

Trachea

- Describe the gross features of trachea

Pharynx

- Describe the gross features of pharynx & pharyngeal constrictors muscles

	• Describe blood supply, nerve supply of Pharynx **Esophagus** • Describe blood supply, nerve supply of esophagus • Explain the following: o Adenoiditis o Branchial Fistula o Branchial Sinuses and Cysts o Esophageal Injuries o Tracheo-Esophageal Fistula o Esophageal Cancer o Zones of Penetrating Neck Trauma
SURFACE ANATOMY	**Students must perform surface marking of following structures:** • Parotid gland • Submandibular gland • Thyroid gland • Facial artery & vein • Parotid duct • Common carotid artery • Internal & external carotid arteries • Internal, external & anterior jugular veins • Retromandibular vein • Vagus nerve
PRACTICALS	**Conducted in the wet labs** **On cadavers :** o Dissect and identify different structures of head & neck o Identification of different structures in prossected specimens **In Museum:** Identification on models
TUTORIALS/ DSL	• Discussions on clinical oriented problems • Team based learning (TBL) • Visit to radiology department for observing normal X-ray findings and comparison with abnormal findings • Visit to skills lab
INTERNAL ASSESMENT	Continuous monitoring of attendance Practical assessment in short groups. It will be in the form of: o Multiple choice questions (MCQs), o Short essay questions (SEQs), o Assignments, o Stages/sub-stages, projects, o Objective structured practical examination. o Viva voce

	Internal evaluation carries 20% weightage in summative examination.
EXAMINATION	SEQs, MCQs, Viva voce and OSPE (observed + un observed)
LEARNING RESOURCES:	**K.L. Moore, Clinically Oriented Anatomy**
COURSE TITLE	**NEUROANATOMY**
DURATION	8 weeks
Out comes	By the end of the module students will be able to: • Describe the normal structure and functions of the central, peripheral and the Autonomic Nervous Systems • Relate the pathophysiological changes in the nervous system with signs and symptoms in the patients

OBJECTIVES **PRACTICALS**	**At the end of the course student must be able to:** **Conducted in the wet labs** **On cadavers :** ○ Dissect and identify different cranial nerves, cerebrum, brain stem & cerebellum ○ Identification of different structures in prossected specimens ○ Identification of sliced cerebrum **In Museum:** Identification on models, cut sections of cerebrum
TUTORIALS/ DSL	• Discussions on clinical oriented problems • Team based learning (TBL) • Visit to radiology department for observing normal X-ray, CT scan & MRI findings and comparison with abnormal findings • Visit to skills lab
INTERNAL ASSESMENT	• Continuous monitoring of attendance • Practical assessment in short groups. It will be in the form of: ○ Multiple choice questions (MCQs), ○ Short essay questions (SEQs), ○ Assignments, ○ Stages/sub-stages, projects, ○ Objective structured practical examination. ○ Viva voce Internal evaluation carries 20% weightage in summative examination.

EXAMINATION	SEQs, MCQs, Viva voce and OSPE (observed + un observed)
LEARNING RESOURCES:	**Snell's neuroanatomy**
COURSE TITLE	**SPECIAL HISTOLOGY**
DURATION	30 weeks
OUT COMES	At the end of the module, the students will be able to: • Discuss the light & electron microscopic structures of special systems with their related applied aspects • Draw & label histological diagrams of systems including GIT, Endocrinology, Male & female reproductive systems, Urinary system & special senses.
OBJECTIVES	**At the end of the course student must be able to:** **Salivary glands** **(parotid, submandibular & sublingual)** • Describe salivary glands and differentiate among glands. • Draw and label salivary glands. • Identify the slides of salivary glands. • List down the points of identification for that specific slide **Tongue** • Recall Lips, palate Gums and Teeth • Enlist Lingual papilla (filliform, fungiform, circumvellate& foliate) • Discuss Glands of tongue • Draw and label salivary glands. • Identify the slides • List down the points of identification for that specific slide • Understand related clinical terms :Hurshprungdiseace, chagas disease, canker sores **Esophagus** • Discuss the General structural plan of alimentary canal • Explain the structure of Pharynx • Discuss Mucosa, submucosa, muscularis externa & serosa of esophagus • Differentiate b/w upper, middle & lower esophagus • Define : GERD, Barretts esophagus **Cardio-esophageal junction** • State the Transitions in oesophagus& cardiac end of stomach • Draw and label Cardio-esophageal junction.

	• Identify the slides • List down the points of identification for that specific slide • Define terms: prenecious anemia, H- pylori **Stomach** • Explain Mucosa, submucosa, muscularis externa & serosa • Discuss the Gastric glands & cells. • Identify the slides • List down the points of identification. Define terms: duodenal & gastric ulcers, gastric **Duodenum, Jejunum & ileum** • List down the Cells of intestine • Differentiate among three parts. • Draw and label Duodenum, Jejunum & ileum. • Identify the slides. • List down the points of identification for that specific slide • Define: celiac disease, leiomyomas, crhons disease **Colon & Rectum** • . Discuss Mucosa, submucosa, muscularisexterna& serosa of colon and rectum. • Define Teniae coli • Draw and label histologic section of colon. • Identify the slides. • List down the points of identification for that specific slide • Define: colorectal carcinoma,, diverticulosis **Appendix & Anal Canal** • Desctibe Mucosa, submucosa, muscularisexterna& serosa of appendix and anal canal. • Draw and label histologic section of appendix and anal canal • Identify the slides. • List down the points of identification for that specific slide • Describe the terms :anal abscess, fistula in ano, piles, hemmorroides **Pancreas** • Describe the Exocrine and endocrine pancreas. • Draw and label pancreas. • Identify the slides. • List down the points of identification for that specific slide • Define terms: pancreatic cancer, pancreatitis, diabetes mellitus **Liver & Gall Bladder** • Recall Stroma& parenchyma of gall bladder. • Describe the General structural plan include classical hepatic lobule, portal

	lobule & hepatic acinus) • Explain Hepatocytes, cholangiocytes, perisinusoidal space, bile canaliculi, canals of Hering, hepatic sinusoids. • Define: cirrhosis, clotting disorders, fatty liver disease, steatosis, hepatitis, liver carcinoma, cholelithiasis, cholecystitis **Suprarenal Gland** • Describe Adrenal cortex (zona glomerulosa,zonafasciculata, zona reticularis) and Adrenal medulla. • Define : addisons disease, pheochromocytom

Kidney

- Describe Stroma& parenchyma of Kidneys
- Recall Nephron, renal corpuscles and Bowmans capsule
- Describe Podocytes
- Describe Glomerular basement membrane
- Explain Glomerulus (mesangial cells, filtration barrier)
- Enlist the components of Juxtaglomerular apparatus
- Define: polycystic kidneys, glomerulonephritis, proteinurea, diabetic glomerulosclerosis, hemodialysis, sickle cell nephropathy, renal calculi, lithotripsy

Ureter & Urinary bladder

- Describe Mucosa, submucosa, muscularisexterna& adventitia of ureter and urinary bladder.
- Recall structure of Urethra
- Define: pilonephritis, cystitis, transitional cell carcinoma, UTI,urethritis

Male reproductive system

- Discus, Draw & Label Testis, Epididymus, prostate, vas deferens, seminal vesicles & urethra
- Describe Seminiferous tubules, Sertoli cells, Blood testis barrier
- Recall Ductusepididymus, Epithelium of epididymus
- Define :hydrocoele, crypochiditism, testicular cancer, male infertility, orchitis, epididymitis
- Recall Prostate(epithelium, parenchyma,stroma, prostatic concretions) and PSA-prostate specific antigen
- Define: Cancer of prostate, BPH-benign prostatic hypertrophy,vasectomy Recall structure of the given topics.
- Define: erectile dysfunction,impotency

Female reproductive system (ovary & fallopian tubes uterus Vagina & cervix)+ Mammary gland

Discuss the following:

  - Ovary(epithelium, medulla, cortex)
  - Ovarian cycle
  - Ovarian follicles
  - Corpus luteum
  - Fallopiantuve (Mucosa, submucosa, muscularis externa & serosa)
- Define : polycystic ovaries, follicular cyst, salpangitis, tuballigationPerimetrium,myometrium, endomertrium
- Describe Menstrual cycle(proliferativephase, secretory phase, premenstrual phase,menstrual phase)
- Define: Fibroids, endometriosis, placenta previa Cervix (endocervical-exocervical mucosa)
- Draw & label Transition at Vagino –cervix junction
- Define clinical term Nabothian cyst
- Draw & label Vagina(mucosa,muscularis,adventitia)

PRACTICALS	Conducted in the histology labs • Draw & label microscopic pictures of different structures • Proper handling with microscopes • Identification of slides
TUTORIALS/ DSL	• Discussions on clinical oriented problems • Team based learning (TBL)
INTERNAL ASSESMENT	• Continuous monitoring of attendance • Practical assessment in short groups. It will be in the form of: o Multiple choice questions (MCQs), o Short essay questions (SEQs), o Assignments, o Projects, o Objective structured practical examination. o Viva voce Internal evaluation carries 20% weightage in summative examination.
EXAMINATION	SEQs, MCQs, Viva voce and OSPE (observed + un observed)
LEARNING RESOURCES:	**LaiqHussain Histology**
COURSE TITLE	**SPECIAL EMBRYOLOGY**
DURATION	30 weeks
OUT COMES	At the end of the module, the students will be able to: • Discuss the developmental changes of special systems with their related applied aspects • Explain the development of systems including GIT, Head & Neck, CNS, CVS, Respiration & body cavities, Genitourinary systems & special senses.
OBJECTIVES	**At the end of the course student must be able to:** **Development of Body Cavities.** • Explain formation of intra-embryonic cavity & serous membranes. • Describe formation of mesenteries. • Discuss the Clinical correlation. **Development of Diaphragm.** • Explain the Development of diaphragm. • Describe Embryological basis for diaphragmatic hernias **Development of respiratory system.** • Give an overview on development of Trachea & bronchi. • Explain Trachea- esophageal fistulas.

	• Describe development & maturation of lungs • Discuss the Malformations of lungs. • Describe development of Larynx. • Explain the Development of diaphragm. • Describe Embryological basis for diaphragmatic hernias **Development of Digestive system (Foregut).** • Discuss the development of gut tube. • Describe the development of esophagus, stomach & duodenum. • Explain the esophageal anomalies. • Describe the development of stomach & duodenum. • Discuss development of pancreas. • Describe the development of liver. • Discussthe Anomalies related to development of liver • Explain the Biliary apparatus, & spleen. • Discuss congenital anomalies of Biliary apparatus and Spleen. **Development of Digestive system (Midgut and Hindgut).** • Discuss the development of midgut, • Explain basis of physiological herniation, rotation of midgut. • Describe the Body wall defects. • Discuss the Gut rotation defects. • Discuss the development of Hindgut, **Development of Urinary System.** • Describe development of kidney. • Describe the development of urinary bladder & urethra **Development of Genital System.** • Give an overview of development of male genital ducts • Explain the development of testes and its descent. • Describe the formation of male genital ducts & seminal glands, formation of prostate • Explain the development of ovaries & descent of ovary. • Explain the formation of female genital ducts. • Discuss the formation of uterus and vagina. • Discuss the associated congenital anomalies of the genital system. • Describe the auxiliary Genital Glands in Females. • Enlist the Vestigial Structures Derived from Embryonic Genital Ducts • Give details of development of external genitalia & related congenital anomalies. • Discuss the development of inguinal canal & related congenital anomalies. **Development of Head and Neck.** • Describe and enlist Pharyngeal arch formation 1st, 2nd& 3rd arch derivatives.

	• Enumerate the derivatives of 4th& 6th pharyngeal arches. • Enlist the derivatives of pharyngeal pouches. • Explain the histogenesis of thymus. • Enumerate the Derivatives of pharyngeal clefts & membrane. • Outline the anomalies of pharyngeal apparatus. • Describe the development of thyroid gland. • Discuss the histogenesis& congenital anomalies of thyroid gland. • Give detailed account on the development of tongue & salivary glands. • Enlist the congenital anomalies of tongue. • Explain the development of face, palate, cleft palate and lip. • Give comprehensive detail on development of eye. • Give an overview development of ear. **Development of Central Nervous System** • Describe the development of spinal cord. • Give development of hind brain. • Explain the development of midbrain. • Describe the development of forebrain • Outline the Anomalies of CNS
PRACTICALS	Conducted in the museum • Identification of embryology models • Label diagrams
TUTORIALS/ DSL	• Discussions on clinical oriented problems • Team based learning (TBL)
INTERNAL ASSESMENT	• Continuous monitoring of attendance • Practical assessment in short groups. It will be in the form of: o Multiple choice questions (MCQs), o Short essay questions (SEQs), o Assignments, o Projects, o Objective structured practical examination. o Viva voce Internal evaluation carries 20% weightage in summative examination.
EXAMINATION	SEQs, MCQs, Viva voce and OSPE (observed + un observed)
LEARNING RESOURCES:	1. Keith L. Moore. The Developing Human 2. Langman's Medical Embryology

STUDY GUIDE

PHYSIOLOGY

2nd PROFESSIONAL MBBS

Pak Red Crescent Medical & Dental College

Physiology	
Introduction	Physiology is the study of the normal functioning of a living organism and its component parts, including all its chemical and physical processes. The term physiology literally means "knowledge of nature." Aristotle used the word in this broad sense to describe the functioning of all living organisms, not just of the human body. However, Hippocrates considered the father of medicine, used the word physiology to mean "the healing power of nature," and thereafter the field became closely associated with medicine. By the sixteenth century in Europe, physiology had been formalized as the study of the vital functions of the human body. Today we benefit from centuries of work by physiologists who constructed a foundation of knowledge about how the human body functions. A few decades ago we thought that we would find the key to the secret of life by sequencing the human genome.
Course to be studied in second year MBBS	1. Renal Physiology 2. Gastrointestinal Physiology 3. Sensory System Physiology (CNS) 4. Motor System Physiology (CNS) 5. Special Senses 6. Endocrine Physiology 7. Male Reproductive Physiology 8. Female Reproductive Physiology 9. Fetal & Neonatal Physiology
Teaching strategies	• Interactive Lectures. • Tutorials. • Clinical Integration. • Seminars • Assignments • Presentations
Target students	1st year MBBS
Duration	36 weeks
Assessment	• MCQs • SEQs • Viva Voce • Assignments • Presentations • Open Book Examination • Internal evaluation carries 20% weightage in summative examination. • Continuous monitoring of attendance and academics in tutorials

Learning Resources	1. Guyton and Hall Textbook of Medical Physiology 13th Edition 2. Ganong's Review of Medical Physiology 23rd Edition 3. Berne and Levy Physiology 7th Edition 4. Fundamentals of Human Physiology by Laurali Sherwood 4th Edition 5. Essentials of Medical Physiology by Prof. Dr. Mushtaq Ahmad 6. Physiology by Linda and Costanzo

Course Title	**Renal Physiology**
Introduction	The survival and proper functioning of cells depend on maintaining stable concentrations of salt, acids, and other electrolytes in the internal fluid environment. Cell survival also depends on continuous removal of toxic metabolic wastes that cells produce as they perform life-sustaining chemical reactions. The kidneys play a major role in maintaining homeostasis by regulating the concentration of many plasma constituents, especially electrolytes and water, and by eliminating all metabolic wastes (except CO2, which is removed by the lungs). As plasma repeatedly filters through the kidneys, they retain constituents of value for the body and eliminate undesirable or excess materials in the urine. Of special importance is the kidneys' ability to regulate the volume and osmolarity (solute concentration) of the internal fluid environment by controlling salt and water balance.
Target Students	**2nd year MBBS**
Duration	5 weeks/ 30 lectures
Learning Outcomes	• To explain the body fluid compartments and edema • To discuss urine formation by the kidneys • To explain glomerular filtration, renal blood flow, and their control • To explain tubular processing of the glomerular filtrate • To understand regulation of extracellular fluid osmolarity and sodium concentration • To understand renal regulation of potassium, calcium, phosphate, and magnesium; integration of renal • To explain mechanisms for control of blood volume and extracellular fluid volume • To discuss regulation of acid-base balance • To understand kidney diseases and diuretics
Learning Objectives	**At the end of the course student must be able to:** • Describe the morphology of a typical nephron and its blood supply. • Define autoregulation and list the major theories advanced to explain autoregulation in the kidneys. • Define glomerular filtration rate, describe how it can be measured, and list the major factors affecting it. • Outline tubular handling of Na+ and water. • Discuss tubular reabsorption and secretion of glucose and K+. • Describe how the countercurrent mechanism in the kidney operates to

	produce hypertonic or hypotonic • urine. • List the major classes of diuretics and how each operates to increase urine flow. • Describe the voiding reflex and draw a cystometrogram • Describe the morphology of a typical nephron and its blood supply.

Course Title	**Gastrointestinal Physiology**
Introduction	Digestion is defined as the process by which food is broken down into simple chemical substances that can be absorbed and used as nutrients by the body. Most of the substances in the diet cannot be utilized as such. These substances must be broken into smaller particles, so that they can be absorbed into blood and distributed to various parts of the body for utilization. Digestive system is responsible for these functions.The digestive system contributes to homeostasis by transferring nutrients, water, and electrolytes from the external environment to the internal environment.
Target Students	**2nd year MBBS**
Duration	2weeks 12 lectures
Learning Outcomes	• To discuss general principles of gastrointestinal function • To understand motility, nervous control, and blood circulation • To explain propulsion and mixing of food in the alimentary tract • To discuss secretory functions of the alimentary tract • To explain digestion and absorption in the gastrointestinal tract • To understand physiology of gastrointestinal disorders
Learning Objectives	**At the end of the course student must be able to:** Understand the functional significance of the gastrointestinal system, and in particular, its roles in nutrient assimilation, excretion, and immunity Describe the structure of the gastrointestinal tract, the glands that drain into it, and its subdivision into functional segments. List the major gastrointestinal secretions, their components, and the stimuli that regulate their production Describe water balance in the gastrointestinal tract and explain how the level of luminal fluidity is adjusted to allow for digestion and absorption. Identify the major hormones, other peptides, and key neurotransmitters of the gastrointestinal system. Describe the special features of the enteric nervous system and the splanchnic Circulation

	Describe the propulsion and mixing movement of different parts of gasterointestinal tract.

Course Title	**Sensory System Physiology (CNS)**
Introduction	The nervous system is one of the two major regulatory systems of the body; the other is the endocrine system. The three basic functional types of neurons—afferent neurons, efferent neurons, and interneurons—form a complex interactive network of excitable cells. Ninety percent of the cells of the nervous system are glial cells, which serve as the connective tissue of the nervous system and interact extensively both structurally and functionally with neurons. The central nervous system (CNS), which consists of the brain and spinal cord, receives input about the external and internal environment from the afferent neurons. The CNS sorts and processes this input, then initiates appropriate directions in the efferent neurons, which carry the instructions to glands or muscles to bring about the desired response—some type of secretion or movement. Many of these neurally controlled activities are directed toward maintaining homeostasis. In general, the nervous system acts by means of its electrical signals (action potentials) to control the rapid responses of the body.
Target Students	**2nd year MBBS**
Duration	14 lectures (2.2 weeks)
Learning Outcomes	• To discuss organization of the nervous system • To explain basicfunctions of synapses, “transmitter substances” • To discuss sensory receptors, neuronal circuits forprocessing information • To understand somatic sensations • To explain general organization,the tactile and position senses • To discuss pain, headache and thermal sensations • To sketch pain pathways. • To explain the developing knowledge of basic elements of sensory coding.
Learning Objectives	**At the end of the course student must be able to:** Name the types of peripheral nerve fibers and receptor types that mediate warmth, cold, and nociception. Explain the difference between pain and nociception. Explain the differences between fast and slow pain and acute and chronic pain. Explain hyperalgesia and allodynia Describe and explain referred pain **Somatosensory Pathways**

	Compare the pathway that mediates sensory input from touch, proprioceptive, and vibratory senses to that mediating information from pain and thermoreceptors. Describe the somatotopic organization of ascending sensory pathways. Describe descending pathways that modulate transmission in pain pathways List some drugs that have been used for relief of pain, and give the rationale for their use and their clinical effectiveness. **Vision** Describe the various parts of the eye and list the functions of each. Trace the neural pathways that transmit visual information from the rods and cones to the visual cortex. Explain how light rays in the environment are brought to a focus on the retina and the role of accommodation in this process Define hyperopia, myopia, astigmatism, presbyopia, and strabismus. Describe the electrical responses produced by rods and cones, and explain how these responses are produced. Describe the electrical responses and function of bipolar, horizontal, amacrine, and ganglion cells Describe the responses of cells in the visual cortex and the functional organization of the dorsal and ventral pathways to the parietal cortex. Define and explain dark adaptation and visual acuity Describe the neural pathways involved in color vision. Name the four types of eye movements and the function of each. **Hearing & Equilibrium** Describe the components and functions of the external, middle, and inner

	ear. Describe the way that movements of molecules in the air are converted into impulses generated in hair cells in the cochlea. Trace the path of auditory impulses in the neural pathways from the cochlear hair cells to the auditory cortex, and discuss the function of the auditory cortex. Explain how pitch, loudness, and timbre are coded in the auditory pathways. Describe the various forms of deafness. Explain how the receptors in the semicircular canals detect rotational acceleration and how the receptors in the saccule and utricle detect linear acceleration. List the major sensory inputs that provide the information which is synthesized in the brain into the sense of position in space. **Smell & Taste** Describe the basic features of the neural elements in the olfactory epithelium and olfactory bulb. Describe signal transduction in odorant receptors. Outline the pathway by which impulses generated in the olfactory epithelium reach the olfactory cortex Describe the location and cellular composition of taste buds. Name the five major taste receptors and signal transduction mechanisms in these receptors. Outline the pathways by which impulses generated in taste receptors reach the insular cortex. **Electrical Activity of the Brain, Sleep–Wake States, & Circadian Rhythms**

	Describe the primary types of rhythms that make up the electroencephalogram (EEG). List the main clinical uses of the EEG. Summarize the behavioral and EEG characteristics of each of the stages of nonrapid eye movement (NREM) and rapid eye movement (REM) sleep and the mechanisms responsible for their production. Describe the pattern of normal nighttime sleep in adults and the variations in this pattern from birth to old age. Discuss the circadian rhythm and the role of the suprachiasmatic nuclei (SCN) in its regulation Describe the diurnal regulation of synthesis of melatonin from serotonin in the pineal gland and its secretion into the bloodstream **Control of Posture& Movement** Describe how skilled movements are planned and carried out. Name the posture-regulating parts of the central nervous system and discuss the role of each. Define spinal shock and describe the initial and long-term changes in spinal reflexes that follow transection of the spinal cord. Define decerebrate and decorticate rigidity, and comment on the cause and physiologic significance of each. Describe the basal ganglia and list the pathways that interconnect them, along with the neurotransmitters in each pathway Describe and explain the symptoms of Parkinson disease and Huntington

	disease. List the pathways to and from the cerebellum and the connections of each within the cerebellum Discuss the functions of the cerebellum and the neurologic abnormalities produced by diseases of this part of the brain **The Autonomic Nervous System** Describe the location of the cell bodies and axonal trajectories of preganglionic sympathetic and parasympathetic neurons. Describe the location and trajectories of postganglionic sympathetic and parasympathetic neurons. Name the neurotransmitters that are released by preganglionic autonomic neurons, postganglionic sympathetic neurons, postganglionic parasympathetic neurons, and adrenal medullary cells Outline the functions of the autonomic nervous system List the ways that drugs act to increase or decrease the activity of the components of the autonomic nervous system Describe the location of neurons that provide input to sympathetic preganglionic neurons **Hypothalamic Regulation of Hormonal Functions** Describe the anatomic connections between the hypothalamus and the pituitary gland and the functional significance of each connection List the factors that control water intake, and outline the way they exert their effects. Describe the synthesis, processing, storage, and secretion of the hormones of the posterior pituitary. Discuss the effects of vasopressin, the receptors on which it acts, and how its secretion is regulated Discuss the effects of oxytocin, the receptors on which it acts, and how its

	secretion is regulated. Name the hypophysiotropic hormones, and outline the effects that each has on anterior pituitary function. List the mechanisms by which heat is produced in and lost from the body, and comment on the differences in temperature in the hypothalamus, rectum, oral cavity, and skin List the temperature-regulating mechanisms, and describe the way in which they are integrated under hypothalamic control to maintain normal body temperature. Discuss the pathophysiology of fever. **Learning, Memory, Language, & Speech** Describe the various types of long-term memory. Define synaptic plasticity, long-term potentiation (LTP), long-term depression (LTD), habituation, and sensitization, and their roles in learning and memory. List the parts of the brain that appear to be involved in memory in mammals and summarize the proposed role of each in memory processing and storage. Describe the abnormalities of brain structure and function found in Alzheimer disease. Define the terms categorical hemisphere and representational hemisphere and summarize the difference between these hemispheres Summarize the differences between fluent and nonfluent aphasia, and explain each type on the basis of its pathophysiology

Course Title	**Endocrinology** **The Thyroid Gland**
Introduction	The nervous system is one of the two major regulatory systems of the body; the other is the endocrine system. The three basic functional types of neurons—afferent neurons, efferent neurons, and interneurons—form a complex interactive network of excitable cells. Ninety percent of the cells of the nervous system are glial cells, which serve as the connective tissue of the nervous system and interact extensively both structurally and functionally with neurons. The central nervous system (CNS), which consists of the brain and spinal cord, receives input about the external and internal environment from the afferent neurons. The CNS sorts and processes this input, then initiates appropriate directions in the efferent neurons, which carry the instructions to glands or muscles to bring about the desired response—some type of secretion or movement. Many of these neurally controlled activities are directed toward maintaining homeostasis. In general, the nervous system acts by means of its electrical signals (action potentials) to control the rapid responses of the body.
Target Students	**2nd year MBBS**
Duration	4.5 weeks (27 lectures)
Learning Outcomes	• To understand motor functions of the spinal cord and cord reflexes • To understand cortical and brain stem control of motor function • To explain contributions of the cerebellum and basal ganglia to overall motor control • To understand cerebral cortex • To discuss intellectual functions of the brain, learning and memory • To explain behavioral and motivational mechanisms of the brain • To understand physiology of limbic system and hypothalamus • To discuss different States of Brain Activity • To understand sleep, brain waves, epilepsy, psychoses • To discuss the physiology of adrenal medulla • To explain Cerebral Blood Flow, • To discuss physiology of cerebrospinal fluid
Learning Objectives	**At the end of the course student must be able to:** • Describe the structure of the thyroid gland and how it relates to its function • Define the chemical nature of the thyroid hormones and how they are synthesized • Understand the critical role of iodine in the thyroid gland and how its transport is controlled. • Describe the role of protein binding in the transport of thyroid hormones and peripheral metabolism • Identify the role of the hypothalamus and pituitary in regulating thyroid function.

- Define the effects of the thyroid hormones in homeostasis and development.
- Understand the basis of conditions where thyroid function is abnormal and how they can be treated.

Pancreas

- Describe the structure of the pancreatic islets and name the hormones secreted by each of the cell types in the islets.
- Describe the structure of insulin and outline the steps involved in its biosynthesis and release into the bloodstream
- List the consequences of insulin deficiency and explain how each of these abnormalities is produced.
- Describe insulin receptors, the way they mediate the effects of insulin, and the way they are regulated.
- Describe the types of glucose transporters found in the body and the function of each.
- List the major factors that affect the secretion of insulin.
- Describe the structure of glucagon and other physiologically active peptides produced from its precursor.
- Describe the structure of glucagon and other physiologically active peptides produced from its precursor.
- Understand the major differences between type 1 and type 2 diabetes

Adrenal Glands

Name the three catecholamine secreted by the adrenal medulla and summarize their biosynthesis, metabolism, and function.

List the stimuli that increase adrenal medullary secretion

Differentiate between C18, C 19,and C 21 steroids and give examples of each.

Outline the steps involved in steroid biosynthesis in the adrenal cortex

List and briefly describe the physiologic and pharmacologic effects of glucocorticoids

Contrast the physiologic and pathologic effects of adrenal androgens

Describe the mechanisms that regulate secretion of glucocorticoids and adrenal sex hormones.

List the actions of aldosterone and describe the mechanisms that regulate aldosterone secretion

Describe the main features of the diseases caused by excess or deficiency of each of the hormones of the adrenal gland

	Name the major site of adrenocortical hormone metabolism and the principal metabolites produced from glucocorticoids, adrenal androgens, and aldosterone **The Pituitary Gland** Describe the structure of the pituitary gland and how it relates to its function. Define the cell types present in the anterior pituitary and understand how their numbers are controlled in response to physiologic demands Understand the function of hormones derived from proopiomelanocortin in humans, and how they are involved in regulating pigmentation in humans, other mammals, and lower vertebrates Define the effects of the growth hormone in growth and metabolic function, and how insulin-like growth factor I (IGF-I) may mediate some of its actions in the periphery List the stimuli that regulate growth hormone secretion and define their underlying mechanisms Understand the basis of conditions where pituitary function and growth hormone secretion and function are abnormal, and how they can be treated

Course Title	**Acid base regulation**
Introduction	The eyes are complex sense organs that have evolved from primitive light-sensitive spots on the surface of invertebrates. They gather information about the environment; and the brain interprets this information to form an image of what appears within the field of vision. The eye is often compared to a camera, with the cornea acting as the lens, the pupillary diameter functioning like the aperture of the camera, and the retina serving as the film. However, the eye, especially the retina, is far more sophisticated than even the most expensive camera. Within its protective casing, each eye has a layer of photoreceptors that respond to light, a lens system that focuses the light on these receptors, and a system of nerves that conducts impulses from the receptors to the brain. Our ears not only let us detect sounds, but they also help us maintain balance. Receptors for two sensory modalities (hearing and equilibrium) are housed in the ear. The external ear, the middle ear, and the cochlea of the inner ear are involved

	with hearing. The semicircular canals, the utricle, and the saccule of the inner ear are involved with equilibrium. Both hearing and equilibrium rely on a very specialized type of receptor called a hair cell. There are six groups of hair cells in each inner ear: one in each of the three semicircular canals, one in the utricle, one in the saccule, and one in the cochlea. Receptors in the semicircular canals detect rotational acceleration, those in the utricle detect linear acceleration in the horizontal direction, and the ones in the saccule detect linear acceleration in the vertical direction. Smell (olfaction) and taste (gustation) are generally classified as visceral senses because of their close association with gastrointestinal function. Physiologically, they are related to each other. The flavors of various foods are in large part a combination of their taste and smell. Consequently, food may taste "different" if one has a cold that depresses the sense of smell. Both smell and taste receptors are chemoreceptors that are stimulated by molecules in solution in mucus in the nose and saliva in the mouth. Because stimuli arrive from an external source, they are also classified as exteroceptors. The sensations of smell and taste allow individuals to distinguish between estimates of up to 30 million compounds that are present in food, predators, and mates and to convert the information received into appropriate behaviors.
Target Students	**2nd year MBBS**
Duration	24 lectures (4 weeks)
Learning Outcomes	• To understand optics of vision • To discuss receptors and neuralfunction of the retina • To understand central neurophysiology of vision To understand sense of hearing • To describe the sensory organs of smell, trace the olfactory pathways to their destinations in the cerebrum, and explain how olfactory perception occurs. • To explain physiological processes involved in taste and trace the gustatory pathway.
Learning Objectives	**At the end of the course student must be able to:** • Define Ph. and buffers. Classify body buffers. How the function. • Give an account of renal control of acid& base regu • Give definetions causes and treatment of respiratory and metabolic acidosis and alkalosis

Course Title	**The Body Fluid Compartments** **Extracellular and Intracellular Fluids; Edema**
Introduction	Endocrinology is the study of endocrine system in the human body. The multiple activities of the cells, tissues, and organs of the body are coordinated by the interplay of several types of chemical messenger systems like neurotransmitters,

	neuroendocrine and endocrine hormones. The multiple hormone systems play a key role in regulating almost all body functions, including metabolism, growth and development, water and electrolyte balance, reproduction, and behavior.
Target Students	**2nd year MBBS**
Duration	4 Weeks (24 lectures)
Learning Outcomes	• To understand basics of endocrinology • To explain pituitary hormones and their control by the hypothalamus • To discuss thyroid metabolic hormones and their abnormalities • To explain adrenocortical hormones and their abnormalities • To discuss insulin, glucagon and diabetes mellitus • To understand parathyroid hormone and calcitonin • To explain calcium and phosphate metabolism
Learning Objectives	**At the end of the course student must be able to:** • Name the different fluid compartments in the human body. • Define moles, equivalents, and osmoles. • Give the Name of the different fluid compartments in the human body and their measurements • Volume and osmolarity of extracellular and intracellular fluid and give their abnormalities • Define edema give its type and pathophysiology of edema.

Course Title	**Male Reproductive Physiology**
Introduction	The gonads have dual function the production of germ cells (gametogenesis) & the secretion of sex hormones. The androgens are the steroid sex hormones that are musculinizing in their action. The testis secrete large amount of androgens especially testosrerone but they also secrete small amount of estrogen. Androgens are secreted from the adrenal cortex in both sexes & some of the androgens are converted to estrogens in fat &other extra-gonadal& extra adrenal tissue.
Target Students	**2nd year MBBS**
Duration	1 Week, 6 lectures
Learning Outcomes	• To understand reproductive and hormonal functions of the male • To discuss spermatogenesis. • To explain performance of the male sexual act. • To understand regulation of male reproductive functions by the various hormones.
Learning Objectives	**At the end of the course student must be able to:** Name the key hormones secreted by Leydig cels and Sertoli cels of the testes Outline the steps involved in spermatogenesis

	Outline the mechanisms that produce erection and ejaculation Know the general structure of testosterone and describe its biosynthesis,transport,metabolism and actions.. Describe the proceses involved in regulation of testosterone secretion Semen analysis Causes of male infertility

Course Title	**Female Reproductive Physiology**
Introduction	The female reproductive system is made up of internal organs and external structures. Internal organs include ovaries, fallopian tubes, uterus, cervix and vagina. External structures include labia majora and minora, clitoris and vaginal orifice. Function of female reproductive system is to enable reproduction of the species. Its functions can be divided into two major phases: (1) preparation of the female body for conception and pregnancy and (2) the period of pregnancy itself.
Target Students	**2nd year MBBS**
Duration	2 Weeks, 12 lectures
Learning Outcomes	• To discuss physiological anatomy of the female sexual organs • To explain oogenesis and follicular development in the ovaries • To explain female hormonal systems • To understand female monthly sexual cycle/menstrual cycle • To discuss functions of the ovarian hormones—estradiol and progesterone • To understand regulation of the female monthly rhythm • To explain female sexual act • To discuss maturation and fertilization of the ovum • To explain anatomy and function of the placenta • To understand hormonal factors in pregnancy • To discuss physiology of parturition • To explain physiology of lactation
Learning Objectives	**At the end of the course student must be able to:** Summarize the hormonal changes that occur at puberty in females. Outline the hormonal changes and their physiologic effects during perimenopause and menopause List the physiologic stimuli and the drugs that affect prolactin secretion Describe the physiologic changes that occur in the female reproductive organs during the menstrual cycle

	Know the general structures of 17-estradiol and progesterone, and describe their biosynthesis, transport, metabolism, and actions. Describe the roles of the pituitary and the hypothalamus in the regulation of ovarian function, and the role of feedback loops in this process. Describe the hormonal changes that accompany pregnancy and parturition Outline the processes involved in lactation.

Course Title	**Fetal & Neonatal Physiology**
Introduction	A brief review of essential details regarding fetal development, physiology of the child immediately after birth, and growth and development through the early years of life is discussed in this chapter.
Target Students	**2nd year MBBS**
Duration	Weeks
Learning Outcomes	• To discuss physiology of fetal development • To understand fetal metabolism • To understand adjustments of the infant to extrauterine life • To explain growth and development of the child
Learning Objectives	**At the end of the course student must be able to:** Describe the growth and development of fetus Describe the development of organ systems and fetal metabolism Discus the adjustment of infant to extrauterine life Describe the functional problems in neonate and prematurity

STUDY GUIDE

BIOCHEMISTRY

2nd PROFESSIONAL MBBS

Pak Red Crescent Medical & Dental College

48-KM Multan Road, Lahore-Pakistan.

Title	**Biochemistry**
Introduction	Biochemistry is an emerging science, related to the chemical processes taking place in human body. Biochemistry helps to understand the complexity of life. It enables us to know how the cells, tissues and organs work in coordination, and keeps our body work normally. It is the recent field of science with lot of research advancements. It helps us to know the molecular events occurring in our body, so that we can understand better the causes of the abnormal processes resulting in the disease. Also we can find the cure of various diseases by knowing them at molecular level.
Target students	2nd year MBBS
Course to be studied in second year MBBS	• Bioenergetics and Oxidative Phosphorylation • GIT • Metabolism of Carbohydrates, • Metabolism of Proteins, • Metabolism of Lipids, • Integration of metabolism • Nucleotides • Genetics • Endocrinology • Cancer and Xenobiotics • Acid Base Balance
Course title	**GASTROINTESTINAL SYSTEM**
Duration	7 lectures
Outcomes	1. To understand the basic concepts of bioenergetics 2. To describe the respiratory chain and oxidative phosphorylation 3. To explain the mechanism of energy production by respiratory chain and oxidative phosphorylation 4. To correlate the action of inhibitors and uncouplers at various sites of respiratory chain
Objectives	1. Describe and understand digestion of Carbohydrates, Proteins and Dietary lipids. 2. Recognize the biochemical basis of Cystic fibrosis 3. Explain abnormalities in Protein, Carbohydrates and Lipid digestion
Course Title	**WATER AND ELECTROLYTES BALANCE / ACID BASE REGULATION**
Duration	07 lectures

Outcomes	1. To study introduction, chemical composition and secretion and regulation of various digestive juices of GIT such as saliva, gastric juice and HCl, pancreatic juice, bile and succusentericus 2. To understand hydrolysis (digestion) of carbohydrates, lipids, proteins, and nucleic acids in gastrointestinal tract 3. To learn the absorption of carbohydrates, lipids and amino acids 4. To learn about the diseases associated with GIT disorders like achlorhydria, peptic ulcers, lactose intolerance, cholelithiasis and pernicious anemia, cystic fibrosis and celiac disease 5. To study site of synthesis and major actions of gastrointestinal hormones like gastrin, cholecystokinin (CCK), secretin, gastric inhibitory peptide (GIP), vasoactive intestinal polypeptide (VIP), motilin, enkephalins, substance P, neurotensin and enteroglucagon.
Objectives	Digestion and Absorption of Carbohydrates a. Identify fluid compartments of body and their biochemical regulation b. Apprehend body buffer system and their maintenance by kidneys and lungs c. Predict acid base disturbance d. Compare respiratory and metabolic acidosis and alkalosis e. Interpret lab reports of ABG's
Course Title	**NUCLEOTIDE METABOLISM**
Duration	23 lectures
Outcomes	1. To get the concept of different types of metabolic pathways (catabolic, anabolic, amphibolic) 2. To understand utilization of glucose in body and its various fates 3. To describe TCA cycle: A common and final pathway for breakdown of "Active acetate" obtained from carbohydrate, lipids and proteins to CO_2 and H_2O 4. To explain metabolism of Glycogen—to study formation of glycogen from glucose (glycogenesis) and its breakdown (glycogenolysis) and inherited disorders. 5. To describe other alternative pathways for oxidation of glucose — Hexose monophosphate pathway and Uronic acid pathway. 6. To describe formation of glucose from non-carbohydrate sources (gluconeogenesis). 7. To explain metabolism of other carbohydrates and inherited disorders associated with them. a. Metabolism of galactose b. Metabolism of fructose c. Metabolism of Lactose 8. To discuss regulation of blood sugar level: a. Autoregulation, b. Hormonal control, 9. To learn the normal blood glucose level and clinical significance of its

	variations. 10. To learn and describe diabetes mellitus and its types along with the metabolic changes in each type
Objectives	1. Define nucleosides and nucleotides 2. Illustrate synthesis and degradation of purines and pyrimidines 3. Understand biochemical aspects of gout and leschnyhan syndrome
Course Title	**XENOBIOTICS**
Duration	19 lectures
Outcomes	1. To understand the overview of "General amino acid pool" and utilisation of amino acids. 2. To study interorgan amino acid exchange in normal post absorptive state 3. To study in detail degradation of amino acids 4. To learn the fate of ammonia and fate of carbon skeleton in the body 5. To study the decarboxylation reactions and the functions of various biogenic amines. 6. To understand the metabolic fate and metabolic role of aromatic amino acids, phenyl alanine and tyrosine and the inherited disorders associated with them. 7. To study the metabolic fate and metabolic role of sulphur containing amino acid and the inherited disorders associated with them. 8. To learn the metabolic role of other amino acids, like glycine, serine, histidine, tryptophan and other amino acids. 9. To study the conversion of amino acids to specialized products like, epinephrine, nor-epinephrine, creatine, histamine, GABA, serotonin, melatonin and melanin
Objectives	1. Define xenobiotics and their metabolism with their classification
Course Title	**BIOENERGETICS AND OXIDATIVE PHOSPHORYLATION**
Duration	19 lectures
Outcomes	**1.** To learn the synthesis of Fatty acids **2.** To study synthesis, storage and degradation of triacylglycerol **3.** To study how fatty acids are oxidised in the body to give energy. **4.** To learn how Ketone bodies are produced and utilised in the body. **5.** To describe how cholesterol is metabolised in the body. **6.** To study biosynthesis and fate of bile acids **7.** To study synthesis and functions of eicosanoids **8.** To describe the metabolism of phospholipids and sphingolipids **9.** To study the chemistry and metabolism of lipoproteins and the clinical disorders associated with them.

	10. To learn what is fatty liver and how it is formed?
Objectives	Relate endergonic and exergonic reactions and free energy productions Sketch out reactions of ETC its components and organization Indicate energy release in ETC and its use in ATP synthesis
Course Title	**CARBOHYDRATES METABOLISM**
Duration	4 lectures
Outcomes	To understand various points at which various metabolic pathways of carbohydrates, proteins and lipids are interlinked and the significance of the same.
Objectives	Determine phases and reactions of glycolysis, cori's cycle, glucuneogenesis, citric acid cycle , glycogen metabolism HMP-shunt and glucoronic acid pathway, galactose and fructose metabolism their regulation and associated disorders Relate regulation of blood glucose levels and biochemistry of DM.
Course Title	**PROTEIN METABOLISM**
Duration	08 lectures
Outcomes	1. To learn the details of de novo pyrimidine synthesis, salvage and its catabolism. 2. To learn the details of de novo purine synthesis, salvage and its catabolism. 3. To study various disorders associated with purine and pyrimidine metabolism. 4. To describe natural and synthetic derivatives of purines and pyrimidines and their role in health and disease.
Objectives	Describe protein turnover and nitrogen balance in human body Understand amino acid degradation, ammonia sources and ammonia toxicity Explain metabolism of individual A.A and important metabolic defects in their metabolism

	Illustrate ketogenic and glucogenic amino acids
Course Title	**LIPID METABOLISM**
Duration	23 lectures
Outcomes	**1.** To understand in detail the process of DNA replication and its importance. **2.** To differentiate between prokaryotic and eukaryotic DNA replication. **3.** To study DNA repair mechanisms **4.** To learn the details of the process of transcription. **5.** To understand post transcriptional modifications **6.** To have an idea about reverse transcription **7.** To study the genetic code and its characteristics. **8.** To study in detail the process of translation (or protein biosynthesis) and their inhibitors. **9.** To study gene expression in prokaryotes and in eukaryotes. **10.** To explain the process and applications of recombinant DNA technology.
Objectives	1. Understand de-novo synthesis of fatty acids and their oxidation 2. Explain synthesis and storage of TAGs in the body 3. Summarize synthesis of eicosanoids, phospholipids, glycolipids, cholesterol, bile acids and lipoproteins their regulation and associated disorders 4. Comprehend biochemical defects leading to fatty liver.
Course Title	**GENETICS**
Duration	13 lectures
Outcomes	1. To study hormones, their classification, their general characteristics and mechanism of action. 2. To study the chemistry, mechanism of action, and metabolic role of various hormones secreted by various endocrine glands
Objectives	Relate basic concepts of intermediary metabolism, anabolic and catabolic pathways and their regulation Sketch out structural basis of cellular information, organization of DNA and chromosomes Explain transcription and translation, gene regulation Determine types of DNA damage and repair, mutations, genetic basis of diseases and tumor markers Apprehend molecular biology, DNA cloning, PCR, hybridization

	and blotting techniques
Course Title	**ENDOCRINOLOGY**
Duration	07 lectures
Outcomes	1. To learn about oncogenes, proto-oncogenes and tumor suppressor gene 2. To learn about tumor markers and their importance 3. To study important xenobiotics of clinical relevance 4. To learn the details different phases of metabolism of xenobiotics 5. To study responses to xenobiotics
Objectives	Cancer Understand endocrine system including thyroid, pituitary, parathyroid, hypothalamus, adrenals, pancreas and their related disorders Classify hormones according to nature, mechanism of actions and their second messengers.

STUDY GUIDE

Islamiyat & Pakistan Study

2nd PROFESSIONAL MBBS

Pak Red Crescent Medical & Dental College

48-KM Multan Road, Lahore-Pakistan.

Subject: Islamiat& Pakistan Study

Course Title	**Islamiat**
Target Students	**2nd year MBBS**
Duration	25 Hours
Learning Outcomes	The aims of the syllabus are to enable candidates to: • Acquire knowledge of the major aspects of Islam, its main beliefs and its early history • Develop an inquisitive approach to the study of Islam • Identify and explore the religious, historical and moral questions raised in the text studied.
Learning Objectives	**At the end of the course student must be able to:** 1. Fundamental Beliefs and Practices of Islam. • Tauheed (Unity of Allah), Risalat (Finality of the Prophet hood), Akhirat (Day of Judgement). • Salat, Soum, Zakat, Hajj and Jehad 2. Need of Religion and its role in human life. 3. Morality in Islam. • Concept of morality. • Concept of morality and Faith. • Islamic principles and methods of character – building. • Moral values in Islam. 4. Rights of the individual in Islam. 5. Quran as a guide for the modern society and scientific development. 6. Holy Prophet (Peace be upon Him) and his life. 7. Islamic concept of state. 8. Islam and society. • Role of man and women in society. • Rights of women children in Islam. • Concept of woman's freedom in Islam. • Hukook-ul-Ibad. 9. Importance of Rizk-e-Hilal. 10. Contribution of Islamic scholars in science and medicine.
Learning Resource	**1. Introduction to Islam by Dr. Hamidullah.**

	2. Islam: Its meaning and message by Khurshid Ahmad.

Course Title	**PAKISTAN STUDIES**
Target Students	**2nd year MBBS**
Duration	25 Hours
Learning Outcomes	• A knowledge and understanding of the importance to the people and country of Pakistan of its physical characteristics, human and natural resources, economic development and population characteristics. • Provide insights into the origins, creation and development of Pakistan • Encourage discussion of issues facing Pakistan.
Learning Objectives	**At the end of the course student must be able to:** 1. Ideology of Pakistan. • Definition and elucidation. • Historical aspect. • Ideology of Pakistan in the light of speeches and sayings of AllamaIqbal and Quaide-Azam. 2. Pakistan Movement. • Basis for the creation of Pakistan. • Historical developments : 1857-1947 3. Political Developments in Pakistan since 1947. 4. Land and People of Pakistan. • Geography. • Society. • Culture. • Natural resources. • Health and education with reference to characteristics trends and problems.
Learning Resource	**1. Ideological Orientations of Pakistan by Sharif Al Mujahid.** **2. Struggle for Pakistan by I.H. Qureshi.** **3. The Making of Pakistan by Richard**