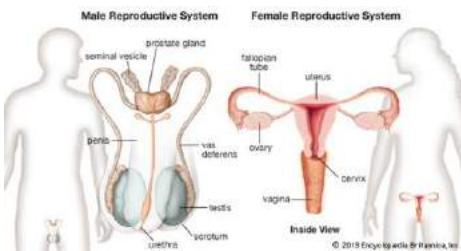
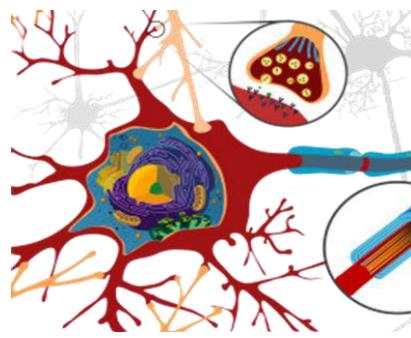
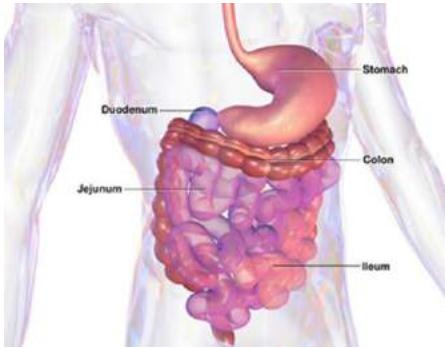


SECOND YEAR MODULES

KGMC



The module guide outlines the course content along with the learning objectives for the modules of second year MBBS.

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Vision and Mission of KGMC

Khyber Medical University: Vision



Khyber Medical University will be the global leader in health sciences academics and research for efficient and compassionate health care.

Khyber Girls Medical College: Vision



Khyber Girls Medical College will promote health care leaders that are critical thinker, ethical, research oriented, culturally and professionally competent

Khyber Girls Medical College: Mission



To develop competent health care leaders by ensuring appropriate policies, procedures which reflect ethical, cultural, community orientated and evidence based practices to achieve best possible health outcomes for society at large.

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Neuro-Science 1 Module

General learning outcomes

1. At the end of this module, the 2nd year MBBS students will be able to:
2. Explain the gross and microscopic structural and functional features of peripheral nerves, spinal cord and brain.
3. Describe the development of forebrain, midbrain and hindbrain
4. Describe the basic functions of synapses, neurotransmitters and mechanisms of electrical events during neuronal excitation
5. Explain the structure and functions of different receptors during neuronal excitation
6. Describe the mechanisms and pathways of sensory inputs in the nervous system
7. Explain the organization, structure, functions, and neurotransmitters of autonomic nervous system
8. Describe the blood supply and venous drainage of brain and spinal cord
9. Describe the organization, structure and functions of motor system of the brain and spinal cord
10. Explain the organization, structure and functions of cerebellum and basal ganglia
11. Explain the structure, formation and drainage of cerebrospinal fluid in the brain and spinal cord
12. Describe the functions of limbic system and reticular activating system
13. Describe the pathophysiology and prevention of common diseases like stroke, epilepsy, hydrocephalus and brain injuries
14. Describe the behavioral and psychological aspects of death, dying and bereavement
15. Explain the preventive strategies of mental illnesses
16. Describe the basic concepts of clinical research and epidemiology

Theme-1 (numbness and tingling)

Subject	Topic	S. No	Learning objectives
Gross anatomy	Overview of nervous system		Describe the general features of neurons and its classification
			Differentiate between central and peripheral nervous system.
			Describe the general features of brain (forebrain, midbrain and hindbrain)
			Describe the general features of spinal cord including its enlargements at different levels
			Describe the general features of cranial and spinal nerves
			Differentiate between the anatomical aspects of sympathetic and parasympathetic system
Embryology	Forebrain, midbrain and hindbrain		Describe the development of primary and secondary brain vesicles
			Enlist the derivatives of the brain vesicles
			Describe the development of prosencephalon, mesencephalon and rhombencephalon
			Discuss congenital anomalies associated with each region of brain
Physiology	Organization of the Nervous System		Describe general design of the nervous system
			Describe various divisions of the nervous system.
			Describe structural and functional unit of CNS.

			Describe Functional components of Neuron.
			Describe Functional and Structural classification of Neurons
			Describe major levels of central nervous system function
			Describe Glial cells and their functions.
			Compare nervous system to a computer
	Basic Functions of Synapses		Define and classify synapses
			Explain physiological structure of synapse
			Describe Mechanism by Which an Action Potential Causes Transmitter Release from the Presynaptic Terminals
			Describe synaptic transmission and explain properties of synaptic transmission.
			Describe mechanism of action of neurotransmitter on the post synaptic membrane.
			Describe Second messenger system in the post synaptic neuron
	Functions of Neurotransmitters	Add these LOs in Biochemistry	Define the characteristics of a neurotransmitter
			Enumerate the neurotransmitters involved in central nervous system.
			Classify neurotransmitters and describe the actions of some common neurotransmitters in central

			nervous system.
	Electrical Events during Neuronal Excitation and Inhibition		Describe resting membrane potential of the neuronal soma.
			Describe Effect of Synaptic Excitation on the Postsynaptic Membrane—Excitatory Postsynaptic Potential.
			Describe Effect of Inhibitory Synapses on the Postsynaptic Membrane—Inhibitory Postsynaptic Potential.
			Describe Generation of Action Potentials in the Initial Segment of the Axon Leaving the Neuron—Threshold for Excitation
	Sensory Receptors		Define and classify receptors.
			Classify receptors according to their location in the body.
			Describe specific functions of receptors.
			Describe Receptor or generation potential
			Discuss mechanism of action of sensory transduction.
	Coding of Sensory Information		Describe Doctrine of specific nerve energies
			Describe Modality of Sensation—The “Labeled Line Principle”
			Define and discuss law of projection
			Discuss properties of stimulus; modality, Stimulus location Stimulus

			intensity Stimulus duration
			Describe Frequency of action potentials with threshold level of receptor potential
	Transmission and Processing of Signals in CNS		Describe Relaying of signals through Neuronal pools; Divergence, Convergence, Prolongation of Signals
	Types of nerve fibers, its regeneration and degeneration		Describe the mechanism of degeneration & regeneration.
			Describe the duration required for regeneration inside & out of CNS.
			Enumerate the causes of degeneration.
			Discuss Wallerian degeneration
			Identify the microscopic appearance of degenerating neurons
	Somatic Sensations		Describe Tactile receptors in the skin and their functions: Pacinian corpuscles, Meissner's corpuscles, Ruffini endings, Merkle cell, A-delta and C free nerve endings
	Transmission in the Dorsal column-medial Lemniscal system		Describe ascending pathways and enumerate the differences between the two.
			Describe Transmission in the Dorsal column-medial Lemniscal system
			Describe Spatial Orientation of the Nerve Fibers in the Dorsal Column-Medial Lemniscal System

			Describe two-point discrimination
	Somatosensory Cortex		Identify the diagrammatic representation of different areas of the body in the somatosensory cortex I
			Identify Broadman's areas of cerebral cortex and correlate each one of them with their respective functions.
			Describe the functions of somatosensory area I.
			Describe layers of the somatosensory cortex and their function.
			Describe the functions of somatosensory association area
	Transmission of Sensory signals in the Anterolateral pathway		Differentiate the submodalities of nondiscriminative touch, temperature and nociception based on receptor transduction mechanism, localization within the spinal gray matter, and central termination of the pathways.
			Describe functional organization at all levels and sub-modalities served by the anterolateral system and the equivalent components of the spinal trigeminal system.
Biochemistry	Neurotransmitters		Explain the biosynthesis of different neurotransmitters
	Brain and nervous tissues metabolism		Describe the metabolism of brain and nervous tissues
General Medicine	Peripheral neuropathies		Describe the etiology and types of peripheral neuropathies
			Discuss the clinical presentation and complications of diabetic

			neuropathies
pharmacology	Drugs acting on neuromuscular endings		Describe drugs acting on neuromuscular endings and its mechanism of action.

Theme-2 (Paraplegia)

Gross anatomy	Externals features of Spinal Cord		Describe the shape, grooves and sulci and extension of spinal cord
			Enlist the segments of spinal cord
			Differentiate between white and grey matter of spinal cord
			Describe the meningeal covering of spinal cord
			Describe the blood supply of spinal cord
	Grey Matter of Spinal Cord		Describe the distribution of spinal cord into horns
			Differentiate between anterior, lateral and posterior horns
			Describe the distribution of sensory and motor neuron within the grey matter
			Explain formation of Rexed lamina of spinal cord
	White matter of spinal cord		Enumerate the ascending tracts
			Explain the origin, pathway and termination of dorsal column medial lemniscal system
			Explain the origin, pathway and termination of anterolateral spinothalamic tract.
			Enumerate the descending tracts
			Explain the origin, pathway and termination of pyramidal tracts

			Explain the origin, pathway and termination of extrapyramidal tracts
			Differentiate between pyramidal and extrapyramidal tracts Differentiate between upper and lower motor neuron.
Embryology	Spinal cord		Discuss the development of alar and basal plate and its derivatives
Histology	Spinal cord		Identify the light microscopic transverse section of spinal cord at cervical, thoracic, lumbar and sacral regions
			Draw and label the transverse section of spinal cord at different levels
Physiology	Introduction to Motor Nervous System (General Principles)		Describe organization of the spinal cord for motor functions
			Give an overview of the components of nervous system involved in motor control
			Identify and differentiate upper and lower motor neurons
			Describe the types of anterior horn cells
			Describe the concept of Final Common Path
			Describe broad types of motor activities
	Motor functions of Spinal cord I: Stretch Reflex		Describe structural organization of the muscle spindle
			Define a reflex action and enlist

			components of reflex arc.
			Describe types of reflexes and their level of integration.
			Describe Stretch Reflex
			Differentiate between Static (Tonic) and Dynamic (Phasic) stretch reflex
			Describe Functions of muscle spindle
			Discuss physiological significance of these reflexes.
			Describe Functions of Gamma efferent system
			Describe the role of the muscle spindle in voluntary motor activity
	Motor functions of Spinal cord II: Golgi Tendon Reflex, Withdrawal Reflexes		Describe Golgi Tendon Reflex
			Differentiate between muscle spindle and Golgi tendon organ.
			Describe types of polysynaptic reflexes and their level of integration.
			Discuss physiological significance of these reflexes.
			Describe reciprocal inhibition and reciprocal innervation
	Support of the body against gravity, Reflexes of Posture And		Describe Positive Supportive Reaction

	Locomotion		
			Describe Cord "Righting" Reflexes.
			Describe stepping and walking movements
			Describe Excitatory-Inhibitory Antagonism Between Pontine and Medullary Reticular Nuclei
	Vestibular Sensations and Maintenance of Equilibrium		Describe the physiologic anatomy of vestibular apparatus
			Describe function of the utricle and saccule in the maintenance of static equilibrium
			Describe function of semicircular ducts
			Describe Neuronal Connections of the Vestibular Apparatus
			Describe Vestibular mechanism for stabilizing the eyes
	Lesions of the Spinal Cord: Upper and Lower Motor Neuron lesion		Define muscle tone and describe its significance.
			Explain the sequence of events during development of muscle tone.
			Discuss spinal shock
			Differentiate between signs of the upper and lower motor neurons.
General medicine	Hemi-section of spinal cord		Describe the clinical features of Brown Sequard syndrome

			Describe the etiology, clinical features, investigations and management of a patient with paraplegia
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Theme- 3 (Syncope)

Gross anatomy	Medulla		Enlist the components of brain stem
			Describe the external features of brainstem
			Describe the transverse section of medulla at the level of sensory decapsulation, motor decapsulation and inferior Olivary nuclei
			Enumerate the cranial nerves nuclei present within the medulla
	Pons		Describe the transverse section of pons at the level of cranial and caudal parts
			Describe the cranial nerves nuclei present within the pons and their functions
	Midbrain		Describe the transverse section of pons at the level of superior colliculus and inferior colliculus
			Enumerate the cranial nerves nuclei present within the midbrain
Physiology	Involuntary function of brain		
	Functions of reticular activating system		

	Coma and brain death		
	The Autonomic Nervous System 1		Describe the differences in the locations, level and organization of sympathetic and parasympathetic nervous system.
			Identify the target organs of sympathetic and parasympathetic nervous system.
			Describe the distribution of afferent and efferent sympathetic and parasympathetic fibers to their respective target organs.
			Contrast the sympathetic and parasympathetic branches of the autonomic nervous system based on: spinal cord division of origin, length of preganglionic and postganglionic neurons, neurotransmitters and receptors at the ganglionic and target organ synapse.
	The Autonomic Nervous System 2		Discuss basic characteristics of sympathetic and parasympathetic functions
			Describe receptors on the effector organs
			Describe function of the adrenal medullae
			Describe sympathetic and parasympathetic “tone”
			Describe “alarm” or “stress” response of the sympathetic nervous system
Pharmacology	Drugs acting on sympathetic		Enlist the drugs acting on SNS and describe their mechanism of actions

	nervous system		
	Drugs acting on parasympathetic nervous system		Enlist the drugs acting on PNS and describe their mechanism of action
Forensic medicine	Brain death		Certify brain death Describe brain death and its criteria.
			Describe the medicolegal importance of brain death

Theme-4 (Hemiplegia)

Gross anatomy	<p>Cerebrum</p> <ul style="list-style-type: none"> • Grey matter of cerebrum • White matter of • cerebrum 		<p>Division of cerebrum into different lobes, its surfaces, sulci and gyri. Describe the general features of the cerebral hemispheres.</p>
			<p>Distribution of grey matter in cerebral hemispheres. Describe the cortical areas of the cerebrum.</p>
			Enumerate the types of white matter fibers
			Differentiate between association, projection and commissural fibers
			Detailed account of corpus callosum
	Diencephalon		Structure and important nuclei of Thalamus and Hypothalamus
	Blood supply of brain		<p>Describe the blood supply and venous drainage of the brain Describe the formation of circle of</p>

			Willis
Histology	Cerebral cortex		Identify the cerebral cortex on light microscope
			Enlist the different histological layers of cerebral cortex
Physiology	Cortical Control of Motor Functions		Describe Motor Functions of Specific Cortical Areas
			Describe transmission of signal from the motor cortex to the muscles. (Pyramidal and extrapyramidal).
			Explain the excitation of the spinal cord motor control areas by the primary motor cortex and red nucleus.
	Functions of Descending Tracts		Describe the functions of Descending Tracts
			Describe Decerebrate and Decorticate Rigidity
Community medicine	Risk factors of cerebrovascular diseases		Describe risk factors for the development of cerebrovascular diseases
			Explain the strategies to prevent cerebrovascular diseases
General medicine	Stroke		Differentiate between hemorrhagic and ischemic stroke
			Describe the etiology, clinical features, investigations and prevention of stroke

Theme- 5 (Tremors)

Gross anatomy	Basal nuclei		<p>Describe the components of basal nuclei</p> <p>Describe the structure and relation of corpus striatum, red nucleus and substantia nigra</p>
	Cerebellum		<p>Describe the general features of cerebellum</p>
			<p>Name the lobes of cerebellum and discuss its anatomical and physiological classification</p>
			<p>Describe the intracerebellar nuclei of cerebellum and their functions</p>
			<p>Describe the input and output of cerebellum</p>
Histology	Histology of cerebellum		<p>Identify the cerebellar cortex on light microscope</p>
			<p>Enlist the different histological layers of cerebellar cortex</p>
Physiology	Cerebellum I: Basic Circuit and Connections		<p>Describe the divisions of cerebellum into 3 lobes and their connections.</p>
			<p>Describe Interconnections of neurons of cerebellar cortex</p>
			<p>Describe Cerebellar afferent fibers</p>
			<p>Describe Cerebellar efferent fibers</p>
			<p>Describe the functional circuits of</p>

			cerebellum
	Cerebellum II: Functions and Disorders		Explain the functional differences between vermis and cerebellar hemispheres.
			Describe Functions of vestibulocerebellum
			Describe Functions of spino cerebellum
			Describe Functions of cerebro cerebellum
			Describe the clinical abnormalities of cerebellum
	Basal Ganglia I: Pathways and connections		Describe the anatomical and physiological classification of basal ganglia.
			Describe the functional circuits of basal ganglia.
			Describe connections of putamen circuit.
			Describe connections of caudate circuit.
			Enlist the differences between direct and indirect pathways
	Basal Ganglia II: Functions and Diseases		Describe functions of putamen circuit.
			Describe functions of caudate circuit.
			Explain the clinical problems related to basal ganglia
Biochemistry	Phosphosphingolipids		Describe the metabolism of phosphosphingolipids.
Pharmacology	Drugs used in Parkinson's disease		Describe the groups of drugs used in Parkinson's disease and their mechanism of actions

	Drugs used for schizophrenia		Describe drugs used for schizophrenia and their mechanism of actions
General medicine	Parkinson's disease		Describe the pathology, clinical features and treatment of Parkinson's disease
			Differentiate between cerebellar and parkinsonian tremors

Theme-6 (Headache)

Gross anatomy	Dural venous sinus		Differentiate between paired and unpaired venous sinuses Discuss the structure and drainage of individual venous sinuses
	CSF in ventricular system		Discuss the structure of choroidal plexus and the formation of CSF in ventricles
Physiology	Pain Sensation Pathways		Describe pain receptors and type of stimuli causing pain.
			Describe types of pain.
			Explain in detail the pathway for pain.
	Pain suppression (analgesia) System in the brain and Spinal cord		Define analgesia
			Explain pain suppression system in the brain and spinal cord.
			Describe Gate control theory and Brain Opiate system

		Describe clinical abnormalities of pain: Primary and Secondary Hyperalgesia
	Headache, Referred Pain	Define referred pain and describe its mechanism.
		Describe the clinical significance of referred pain with examples.
		Enumerate the causes of referred pain.
		Enlist the causes of intra-cranial and extra-cranial headache and correlate with the underlying mechanism of pain.
	Thermal Sensations	Describe thermal receptors and their excitation
		Describe mechanism of stimulation of thermal receptors
		Describe transmission of thermal signals in the nervous system
	Functions of Specific Cortical Areas (Concept of Dominant Hemisphere)	Name the association areas of brain. Briefly describe their location and function?
		Draw the diagram of cerebral cortex to show the different functional areas
	Language and Speech	Define and classify speech
		Describe how the brain performs the function of speech.
		Describe Broca's area in the brain, and its function.
		Describe wernicke's area in the brain, and its function.

			Describe the speech pathways for perceiving a heard word and then speaking the same word & perceiving a written word and repeating it and correlate it with their clinical significance
			Describe the effects of damage to broca's area and wernicke's area
			Describe disorders related to speech.
	Learning and Memory		Define and classify memory and explain its basic mechanism.
			Describe the mechanism of synaptic facilitation and synaptic inhibition
			Describe consolidation of memory, and briefly describe one of its most important features.
			Describe Codifying of new memories
			Role of specific parts of the brain in the memory process
			Explain disorders related to memory.
	Activating-Driving Systems of the Brain		Describe bulboreticular facilitatory area. Explain continuous stimulation from lower brain by four neurohormonal systems.
			Explain continuous stimulation from lower brain by four neurohormonal systems.
	Limbic System		Describe the principal components of the limbic system: hippocampus, amygdala, prefrontal cortex, and nucleus accumbens), the pathways connecting them and their functions.
			Discuss the anatomy of memory and emotion in relation to the limbic system

		Describe Functions of limbic system
		Describe the connection of hypothalamus with different areas of brain.
		Describe the vegetative and endocrine functions of hypothalamus.
		Describe the behavioral functions of hypothalamus.
	Brain Waves and Sleep	Describe brain waves.
		Describe the clinical significance of EEG.
		Define sleep. Describe its various types and characteristics.
		Describe basic theories of sleep.
		Describe genesis of n-REM and REM sleep.
		Enumerate the neurotransmitters involved in sleep.
		Describe various sleep disorders.
	Seizures and Epilepsy	Define seizure and epilepsy.
		Classify seizures & epilepsies
		Enumerate causes of seizure and epilepsy.
		Discuss the clinical features of patient presents with epilepsy.
		Discuss the significance of electrophysiologic studies imaging and other investigations in epilepsy.
		Describe briefly about pharmacologic treatment.
	CSF formation,	Describe regulation of cerebral

	circulation and functions		blood flow
			Describe formation, flow, and absorption of cerebrospinal fluid
			Describe Blood–Cerebrospinal Fluid and Blood-Brain Barriers
<u>Biochemistry</u>	<u>C.S.F</u>		<u>Describe composition of CSF.</u>
	<u>Prostaglandins</u>		<u>Describe the synthesis of prostaglandins and pain management.</u>
Pathology	Alzheimer's disease		Explain the pathogenesis and microscopic findings of Alzheimer's disease and its types
	Inflammation of brain		Describe the inflammatory processes related to meninges and brain parenchyma
			Describe the pathogenic mechanisms of meningitis and encephalitis
General medicine	Epilepsy		Explain the types of epilepsy
			Describe the investigations and enlist anti-epileptic drugs
	Hydrocephalus		Describe the etiology, pathogenesis and clinical features of hydrocephalus
Radiology	Neuroradiology- CT scans		Describe relevant CT scan findings of intracerebral bleeds, hematomas and subarachnoid hemorrhage
			Describe relevant CT scan findings of ischemic strokes
	Neuroradiology- MRI scans		Describe relevant MR scan findings of intracerebral bleeds, hematomas
			Describe relevant MR scan findings of

			ischemic strokes
Neurosurgery	Brain injuries		Describe the types, clinical presentations and investigations of a patient with head injury
	Brain and spinal tumors		Explain the types, clinical features and investigations of brain and spinal tumors

Neurosciences-2 module

General learning outcomes:

At the end of this module, the 2nd year students will be able to:

- 1) Describe the structure of vertebrae, skull bones palate, pharynx, larynx, facial bones and base of the skull
- 2) Describe the contents walls and boundaries of anterior and posterior triangles of the neck
- 3) Describe the structure, relation, blood supply and venous drainage of thyroid
- 4) Describe the arteries, veins and nerves of the neck including cervical plexuses
- 5) Describe the nuclei, course, relations, and structures supplies by all cranial nerves
- 6) Describe the origin, course, relations and structures supplies by the arteries, veins and lymphatics of head and neck
- 7) Describe the anatomy of all the muscles of facial expression and head and neck
- 8) Describe the structure and functions of eye, ears, nose and paranasal sinuses
- 9) Describe the development of different structures of organs of the head and neck
- 10) Describe the types of research, components of a research article, data collection, sampling and variables in research

Theme-1 (Facial palsy)				
Gross anatomy	Osteology of mandible			Describe the gross features of adult mandible.
				Describe the bony features of mandible
	Structure and movements of TMJ			Name the joints formed by mandible
				Name the attachment of muscles and ligaments on mandible
	Norma frontalis			Describe the bony features of frontal view of skull
	Norma basalis			Name the bones forming the base of skull
				Name the bony features
				Identify the different foramina and name the structures passing through these foramina
				Describe the attachment and relation of base of skull
				Describe the clinical importance
	Norma lateralis			Name the boundaries of temporal fossa
				Enumerate the contents of

			temporal fossa
			Describe the relations of temporal fossa
			Name the boundaries of infratemporal fossa
			Enlist the contents of fossa
			Describe the relations of Infratemporal fossa
			Name the layers of scalp
	Scalp and muscles of facial expression		Describe the muscles of scalp
			Name the neurovascular supply of scalp
			Describe the lymphatic drainage of scalp
			Name the fascial muscles along with attachments, nerve supply and actions
	Muscles of mastication		Enumerate the muscles of mastication along with their attachments, nerve supply and actions
	Blood supply and lymphatic drainage of face		Describe the blood supply and lymphatic drainage of face portion
	Temporomandibular joint (TMJ)		Name the type of TMJ
			Name the ligaments related with TMJ
			Describe the relations of

			TMJ
			Name the muscles causing movements of TMJ
			Name the neurovascular supply of TMJ
	Extra cranial course of CN VII		Describe the extra cranial course of CN VII along with its clinical importance
Embryology	Face development		Discuss the five facial primordia
			Describe the inter-maxillary segment
			Describe the embryological defects of face
Histology	Parotid glands		Identify the variety of gland according to nature of its acinus
			Discuss the capsular structure and its extensions in the gland
			Differentiate between the stroma and parenchyma of parotid gland
			Describe the ductal system of the gland and its lining epithelium
			Differentiate between the intercalated and striated ducts in intralobular parts of gland

				Describe the detailed structure of serous acinus
				Discuss the location of stenson,s duct and its structure
				Discuss clinical conditions related with parotid gland
Biochemistry	Biotechnology	Lectures-2		Describe the indications and procedure of Polymerase Chain Reaction (PCR), Cloning and Restriction fragment length polymorphism (RFLP)
	Metabolism of Nucleotides			Describe the metabolism of nucleotide Describe purine nucleotide synthesis and degradation. Discuss hyperuricemia, gout. Describe pyrimidine nucleotide synthesis and degradation. Describe salvage pathways of nucleotide synthesis.
Medicine	Bell`s palsy			Describe the clinical features and management of Bell`s palsy

Theme-2 (neck swelling)

Subject	Topic	Duration	S.	Learning objectives
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		No	
Gross Anatomy	Typical cervical vertebra		Describe the bony features of typical cervical vertebrae
			Name the joints formed by typical vertebrae
			Describe the attachments
	Atypical cervical vertebra		Describe the bony features of atypical cervical vertebrae
			Name the joints formed by atypical vertebrae
			Describe the attachments
	Hyoid bone		Describe the bony features of hyoid bone
			Describe the attachments of muscles and ligaments with hyoid bone
	Pterygopalatine fossa		Name the boundaries of pterygopalatine fossa
			Enumerate the contents of pterygopalatine fossa
			Describe the relations of pterygopalatine fossa
	Deep fascia of neck		Enumerate the layers of deep cervical fascia
			Draw and labelled diagram of transverse section of neck showing deep cervical fascia
			Describe the layers of deep cervical fascia along with its clinical importance

	Larynx			Name the paired and unpaired cartilages of larynx
				Enumerate the ligaments and membrane of larynx
				Describe the sensory and blood supply of larynx
				Enumerate the intrinsic and extrinsic muscle of larynx along with its actions and nerve supply
				Describe the pyriform fossa
	Ant. triangle of neck			Enlist the subdivisions of anterior triangle of neck
				Describe the boundaries and contents of submental triangle
				Describe the boundaries and contents of carotid triangle Describe the boundaries and contents of digastric triangle Describe the boundaries and contents of muscular triangle
	Post triangle of neck			Enlist the subdivisions of posterior triangle of neck
				Describe the boundaries and contents of occipital triangle
				Describe the boundaries and contents of supraclavicular triangle
	Arteries of neck			Describe the course,

				Distribution and branches of main arteries of neck
	veins of neck			Describe the course, Draining and tributaries of main veins of neck
	cervical plexus and nerves of neck			Describe the cervical plexus along with its branches and distribution
Embryology	Pharyngeal apparatus			Describe the components of pharyngeal apparatus.
	Development of head and neck			Describe the development of pharyngeal apparatus
				Enlist the derivatives of the first pharyngeal arch
				Define the terms pharyngeal arch, pouch, cleft and membrane
				Enumerate the derivatives of the second pharyngeal arch
				Enumerate the derivatives of the 3 rd pharyngeal arch
				Enumerate the derivatives of the 4 th pharyngeal arch
				Enlist the derivatives of 1 st , 2 nd , 3 rd and 4 th pharyngeal pouches
				Describe the derivatives of pharyngeal, grooves, and membranes
				Discuss the arterial supply

				and innervation of the pharyngeal arches
				Describe the pharyngeal membranes
				Discuss the branchial cyst, sinuses, and fistula
				Describe the 1 st arch developmental defects
Histology	Thyroid gland			Discuss the structural unit of thyroid gland
				Identify the lining epithelium of follicular cells
				Discuss the formation and storage of colloid in the lumen of follicular cells
				Describe the location and structure of parafollicular cells
				Discuss the interfollicular connective tissue
Biochemistry	DNA			Describe the basis of cellular information. Describe DNA, chromosomes, discovery and organization in genome.
ENT	Lump in neck			Approach to a patient with lump in the neck
Theme-3 (Anosmia)				
	Nose and			Describe the external

	paranasal sinuses			features of nose
				Describe the relations of nose with other structures
				Describe the nasal septum
				Describe the lateral wall of nose
				Name the neurovascular supply of nose
				Describe the olfactory nerve
				Describe the paranasal sinuses along with its clinical importance
Embryology	Development of nose			Describe the development of nasal cavities and paranasal air sinuses.
				Describe the development of nasolacrimal groove, duct, and sac
				Enlist developmental defects of nose
Physiology	Sense of Smell			Describe olfactory membrane
				Explain mechanism of excitation of the olfactory cells.
				Discuss Rapid Adaptation of Olfactory Sensations.
				Define threshold for smell
				Describe transmission of smell signals into the central

				nervous system
				Describe primitive and newer olfactory pathways into the central nervous system
				Describe centrifugal control of activity in the olfactory bulb by the central nervous system.
Biochemistry	RNA & DNA			<ul style="list-style-type: none"> • Describe the process of DNA Replication • Describe the process of RNA Replication • Describe mutation, DNA damage and repair.
	Protein synthesis			Describe protein synthesis
ENT	Sinusitis			Describe the causes and clinical features of acute and chronic sinusitis

Theme-4 (cleft palate)

Gross anatomy	Tongue			Describe the mucosa and muscles of tongue along with its attachments, nerve supply and actions
	Salivary glands			Name the salivary glands
				Describe the location of each gland
				Describe the relations of each gland
				Name the nerve supply

				Describe the drainage of salivary glands along with its importance
	Palate			Name the bones forming the hard palate
				Describe the soft palate along with its muscles, attachments and nerve supply
				Describe the relations of palate
				Name the neurovascular supply of palate
	Pharynx			Enumerate the division of pharynx
				Describe the nasopharynx with its clinical significance
				Describe the oropharynx with its clinical significance
				Describe the laryngopharynx with its clinical significance
				Enlist the muscles of pharynx with its nerve supply and actions
	Extra-cranial course of CN IX, XXI, XII			Describe the extra cranial course of CN IX, X, XI and XII
Embryology	Tongue			Describe the development of anterior 2/3 of the tongue

				Discuss the role of the third pharyngeal arch in tongue development.
				Discuss the innervation, blood vessels, and muscles of tongue.
				Describe the development of papillae, taste buds and salivary glands.
				Describe the developmental anomalies of tongue.
	Palate			Describe the development of primary and secondary palate.
				Discuss the developmental defects of lip and primary, secondary palate
Histology	Submandibular glands			Identify the variety of gland according to nature of its acinus.
				Discuss the capsular structure and its extensions in the gland
				Differentiate between the stroma and parenchyma of submandibular gland
				Describe the ductal system of the gland and its differences with parotid gland
				Describe the detailed

				structure of serous and mucous acinus
				Discuss the formation of serous demilune
				Discuss the opening of Wharton,s duct
				Discuss different pathological conditions of the gland
	Sublingual glands			Identify the variety of gland according to its nature of acinus
				Differentiate between the stroma and parenchyma of sublingual gland
				Describe the ductal system of the gland and its lining epithelium
				Describe the detailed structure of its acinus
				Discuss the opening of Bartholin ducts
				Discuss different pathological conditions of the gland
Physiology	Sense of Taste			Discuss primary sensations of taste
				Explain threshold for taste
				Describe the taste bud and its function

				Describe mechanism of stimulation of taste buds
				Describe transmission of taste signals into the central nervous system
biochemistry	PCR			Describe the indicator and procedure of PCR, cloning and RFLP.
Pediatric surgery	Cleft palate			Describe the pathogenesis, clinical features and management of a patient with cleft palate

Theme-5 (Diplopia)

Gross anatomy	Bony orbit			Name the bones forming the bony orbit
				Identify the foramina, fissures, and fossae associated with the orbit and what are the structures transmitted through these openings.
				Name the contents of orbit
	Eye ball			Name the layers of eyeball
				Describe the fibrous layer of eyeball
				Describe the pigmented layers of eyeball
				Describe the inner nervous layer of eyeball

				Describe the chambers and of eyeball
				Describe the secretion and drainage of aqueous humor and vitrous humor
				Describe the neurovascular supply of eye
				Describe the intra and extraocular muscles with their attachment, actions and nerve supply
	Extra cranial course of CN III, IV, VI			Describe the course of optic, oculomotor, trochlear and abducent nerve with clinical importance
Embryology	Development of eye			Define lens placode and formation of retina.
				Describe the development of ciliary body, iris, lens and choroid.
				Discuss the formation of sclera, cornea, sphincter and dilator pupillae
				Discuss the development of vitreous body and optic nerve
				Describe developmental anomalies of eye
Histology	Eye			Enlist different histological layers of the eye

				Discuss retinal pigment epithelium(RPE) in detail
				Describe the structural details of rods
				and cones and the supporting cells
				Discuss structure of macula densa
				Describe the histological layers of cornea and retina
Physiology	Physical Principles of Optics			Describe refraction at interface between two media.
				Describe the physical principles of optics.
				Apply refractive principles to lenses
				Describe Focal Length of a Lens
				Explain formation of image by convex lenses
				Explain how to measure refractive power of a lens
	Optics of The Eye			Explain lens system of the eye.
				Describe the concept of "Reduced" Eye.
				Explain accommodation reflex.
				Explain presbyopia

				Describe that “depth of focus” of the lens system increases with decreasing pupillary diameter
				Define visual acuity.
				Explain the determination of distance of an object from the eye- —“DEPTH PERCEPTION”
				Describe errors of refraction
	Fluid System of The Eye— Intraocular Fluid			Describe the formation of aqueous humor by the ciliary body
				Describe the outflow of aqueous humor from the eye
				Describe Regulation of Intraocular Pressure and Glaucoma
	Anatomy and Function of The Structural Elements of The Retina			Describe foveal region of the retina and its importance in acute vision.
				Discuss the functional parts of the Rods and Cones.
				Describe blood supply of the retina—the central retinal artery and the choroid
	Photochemistry of Vision			Explain rhodopsin-retinal visual cycle and excitation of the rods

				Explain the role of vitamin A for formation of rhodopsin.
				Describe excitation of the rod when rhodopsin is activated by light
				Describe receptor potential, and logarithmic relation of the receptor potential to light intensity
				Describe mechanism by which rhodopsin decomposition decreases membrane sodium conductance—the excitation “cascade.”
				Explain dark and light adaptation.
	Color Vision			Describe photochemistry of color vision by the cones
				Explain tricolor mechanism of color detection
				Explain Young-Helmholtz theory of color vision.
				Explain color blindness.
	Neural Function of The Retina			Describe different neuronal cell types and their functions
				Describe the visual pathway from the cones to the ganglion cells
				Discuss the retinal

				neurotransmitters.
				Discuss retinal ganglion cells and their respective fields
				Describe lateral inhibition.
				Explain excitation of ganglion cells.
				Discuss on and off response of ganglion cells.
	Visual Pathways			Discuss the function of the dorsal lateral geniculate nucleus of the thalamus.
				Describe organization and function of the visual cortex
				Describe primary visual cortex.
				Describe secondary visual areas of the cortex.
				Describe two major pathways for analysis of visual information: (1) the fast “position” and “motion” pathway and (2) the accurate color pathway
				Describe neuronal patterns of stimulation during analysis of the visual image
				Discuss detection of color
	Eye Movements and Their Control			Describe muscular control of eye movements.

				Describe neural pathways for control of eye movements.
				Describe fixation movements of the eyes
				Explain mechanism of involuntary locking fixation—role of the superior colliculi.
				Explain “Fusion” of the visual images from the two eyes
				Describe neural mechanism of stereopsis for judging distances of visual objects
	Autonomic control of Accommodation and pupillary aperture			Describe autonomic nerves to the eyes
				Describe control of accommodation
				Describe control of pupillary diameter
				Discuss Pupillary reflexes or reactions in central nervous system disease.
Community medicine	Prevention of blindness			Describe the causative agents and prevention of community blindness
Medicine	Ocular nerves palsies			Describe the clinical features and etiology of 3, 4 and 6 th nerve palsies

Ophthalmology	blindness			Approach a patient with unilateral and bilateral blindness
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Theme-6 (Deafness)

Gross anatomy	External and middle ear			Describe the auricle
				Describe the external auditory meatus with clinical importance
				Name the neurovascular supply of external ear
				Name the boundaries of middle ear
				Describe the contents of middle ear
				Describe the auditory tube along with its clinical importance
	Inner ear			Describe the bony labyrinth
				Describe the membranous labyrinth
				Describe the course of CN VIII along with its clinical importance
Embryology	Development of ears			Describe the development of external and middle ear
				Explain the origin of internal ear along the relationship of saccule, utricle, semi-circular

				canals
				Describe the development of cochlear duct and organ of corti
				Enlist the developmental anomalies of external middle and internal ear
Physiology	Tympanic Membrane and The Ossicular system			Explain conduction of sound from the tympanic membrane to the cochlea.
				Describe "Impedance Matching" by the Ossicular System.
				Describe attenuation of sound by contraction of the tensor tympani and stapedius muscles.
				Describe transmission of sound through bone.
	Cochlea			Describe functional anatomy of the cochlea
				Describe basilar membrane and resonance in the cochlea.
				Describe transmission of sound waves in the cochlea—"traveling wave"
				Describe pattern of vibration of the basilar membrane for different sound frequencies.

				Describe amplitude pattern of vibration of the basilar membrane.
				Describe function of the organ of corti
				Describe Excitation of the Hair Cells
				Discuss the “place” principle
				Describe detection of changes in loudness—the power law.
				Describe threshold for hearing sound at different frequencies.
	Auditory Nervous Pathways			Describe auditory pathway.
				Explain the function of the cerebral cortex in hearing.
				Describe how to determine the direction from which sounds come.
				Describe transmission of centrifugal signals from CNS to lower auditory centres
				Describe different types of deafness.
	Vestibular Sensations and Maintenance of Equilibrium			Describe the physiologic anatomy of vestibular apparatus

				Describe function of the utricle and saccule in the maintenance of static equilibrium
				Describe function of semi-circular ducts
				Describe Neuronal Connections of the Vestibular Apparatus
				Describe Vestibular mechanism for stabilizing the eyes
ENT	Hearing loss			Describe different clinical tests for hearing loss
				Describe the etiology and management of conduction and sensorineural hearing loss

GIT, Hepatobiliary & Metabolism

	Topics List	MIT	Objectives Anatomy	Week 01 – Theme General Principles of Gastrointestinal Tract
1	General Layout & Divisions of the abdominal cavity	LGF	1. Discuss general layout and divisions of abdominal cavity 2. Explain cutaneous innervation and blood supply	
2	Gross Anatomy of Anterior Abdominal wall	SGF	1. Discuss origin, insertion and nerve supply of Muscles of anterior abdominal wall	
3	Rectus Sheath	SGF	1. Demonstrate formation of rectus sheath and related clinicals	
4	General Histology of GIT	LGF		
5	Inguinal Canal & Hernias	LGF	1. Discuss Inguinal canal and its contents 2. Discuss Inguinal hernias	
6	Peritoneum & its Reflections	SGF	1. Explain Gross anatomy of peritoneum	
7	Peritoneum & its Reflections	LGF	1. Discuss Reflections and tracings of peritoneum	
8	Histology of Tongue, Lip, Salivary glands – Review / Revision	Practical		
Physiology				
1	General features & electrical activity of GIT	LGF	1. Describe the functional significance of gastrointestinal system. 2. Explains different aspects of electrical activities occurring in GIT	
2	General principles of GIT movements & their Control	LGF	1. Describe general principles of GIT motility 2. Discuss general principles of Control of GIT movements	

3	Mastication and Deglutition-I	LGF	1.Define Mastication and Deglutition & their Importance 2.Describe Chewing & swallowing Reflex 3.Name the Stages of Swallowing 4.Describe the events occurring in different Stages of swallowing	
4	Mastication and Deglutition-II	LGF	1.List the Functions of tongue, teeth & esophagus 2.Define Receptive Relaxation of the Stomach 3.List the factors that prevent esophageal reflux	
5	Neural & hormonal control of GIT	SGF	1. Describe general principles of neural & hormonal control of GIT functions. 2. Differentiate between structure, location & function of myenteric & submucosal plexus enteric nervous system. 3. List GIT hormones, along with their site of secretion	
6	General principles of GIT secretions &Types of glands in GIT	SGF	1.Cite examples of different types of alimentary tract glands. 2.Describe general principles of GIT secretions	
7	Saliva	SGF	1.Describe the composition, characteristics, & mode of secretion of saliva 2.Describe functions & regulation of secretion of saliva	

Bio Chemistry

1	High energy compounds, enzymes and coenzymes involved in Redox reactions	LGF	1.Explain how energy from oxidation of fuels like fats, carbohydrates & amino acids is liberated as reducing equivalents which pass through ETC by a series of redox carrier molecules of 4 complexes, embedded in the inner mitochondrial membrane & finally reduce the oxygen to	
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			form water 2. Enumerate & describe the 4 complexes & their components molecules involved in electrons transfer through ETC & the roles of flavoproteins, iron-sulfur proteins, & coenzyme Q	
2	Respiratory chain and electron carriers	LGF	1. Describe how coenzyme Q accepts electron from NADH via comp-1 & from FADH2 via complex-II 2. Explain the process by which reduced cytochrome-C is oxidized & oxygen is reduced to water	
3	Saliva	SGF	1. Describe the composition & Functions of saliva 2. Enlist & explain the different factors Which regulate salivary glands secretion	
4	Determination of blood Glucose	Practical		

Anatomy			Week 02 Theme – Esophagus & Stomach
1	Gross Anatomy of Esophagus	SGF	1. Explain Gross anatomy of esophagus
2	Histology of Stomach	LGF	1. Describe Histology of stomach
3	Development of Foregut	LGF	
4	Esophagus & Stomach	Practical Histology	1. Describe Histology of esophagus
5	Gross Anatomy of Stomach	SGF	1. Explain gross anatomy of stomach 2. Discuss Development of foregut and developmental abnormalities

Physiology

1	Gastric secretion and its regulation	LGF	1. Describe the phases of gastric secretion 2. Describe the composition, characteristics and functions of gastric secretions 3. Describe the mechanism of HCl secretion by the stomach. 4. Describe the function of each type cell in different glands of the stomach 5. Describe the regulation & control of gastric secretions 6. Explain the composition & significance of gastric mucosal barrier	
2	Motor function of Stomach-1	SGF	1. Describe the functional anatomy of stomach. 2. List the functions of stomach. 3. List the motor functions of stomach. 4. Describe the storage function of stomach	
3	Motor function of Stomach-1I	SGF	5. Describe the mixing and propulsive movements of stomach. 6. Describe the regulation of gastric emptying 7. Explain the role of pyloric pump in gastric emptying. 8. Explain hunger contractions.	
4	Disorders of stomach	SGF		
Bio Chemistry				
1	Oxidative Phosphorylation	LGF	1. Describe the generation of proton gradient & the resultant motive force across the inner mitochondrial membrane by transport of electrons through ETC which in turn produces ATP by oxidative phosphorylation 2. Describe the structure of ATP synthase enzyme(complex-V) & explain how it works as a rotary motor to synthesize ATP from	

			ADP & Pi	
2	Respiratory Chain Inhibitors & Uncouples	LGF	<p>1. Describe the control of the rate of respiration, oxidation of reducing equivalents via ETC & its tightly coupling with oxidative phosphorylation in mitochondria</p> <p>2. Discuss certain common poisons which block respiration or oxidative phosphorylation & identify their site of action</p> <p>3. Explain how uncouplers act as poisons by dissociating oxidation from oxidative phosphorylation via ETC but at the same time they may have a physiological role in generating body heat.</p>	
3	Gastric juice	SGF	<p>1. Identify the different components of gastric juice & explain their significance</p> <p>2. Describe the synthesis of HCl & discuss the health hazards occur due to its imbalanced production</p> <p>3. List & explain the various factors responsible for regulation of the secretion of gastric juice & their effects on the rate of synthesis of HCl</p>	
4	Pancreatic juice	SGF	<p>1. Describe the composition of pancreatic juice</p> <p>2. Discuss the role of enzymes of pancreas in digestion of food stuff & the role of Bicarbonate ions in neutralizing the acidic PH of Chyme</p> <p>3. Name the phases of pancreatic juice secretion & discuss the factors regulating these secretory phases</p>	
5	Determination of	Practical		

	serum Bilirubin			
Anatomy			Week 03 Theme – Movements of GIT	
1	Gross Anatomy of Small Intestine - Duodenum	SGF	Discuss Gross anatomy of Small intestine	
2	Histology of Small Intestine	LGF	Discuss Histology of small intestine	
3	Small Intestine – Jejunum , Ileum & mesenteries	SGF	Discuss Gross anatomy of Small intestine	
4	Gross Anatomy of Small Intestine	LGF	Discuss Gross anatomy of Small intestine	
5	Histology of Small Intestine	Practical		
Physiology				
1	GIT Hormones	LGF	1.Name GIT Hormones 2.Contrast stimuli for secretion, site of secretion & actions of Gastrin, Secretin, Cholecystokinin, GIP & Motilin	
2	Movements of small intestine	LGF	1.Classify movements of small intestine 2.Explain mechanism, functions, significance & regulation of different types of movements of small intestine 3.List the autonomic reflexes affecting bowel activity 1.Classify movements of large intestine 2.Explain mechanism, functions, significance & regulation of different types of movements of intestine 3.Describe the function(s) of ileocecal valve & sphincter. 4.Describe the regulation of emptying at ileocecal sphincter.	

Bio Chemistry				
1	Digestion and absorption of carbohydrates	LGF	1.Describe the process of CHO digestion & enzymes involved 2.Discuss the mechanism of absorption of the end products of hydrolysis of different carbohydrates in the diet	
2	Digestion and absorption of Proteins	LGF	1.List the different proteolytic enzymes & explain their role in protein digestion 2.Describe the mechanism of absorption of the end products, amino acids 3.List the factors which influence protein digestion & absorption	
3	Digestion and absorption of Lipids	LGF	1.Describe the role of different lipases & phospholipases in lipids digestion 2.Discuss the role of bile salts in digestion & absorption of fats & fats soluble vitamins 6.Describe the mechanisms of absorption long & short chain fatty acids	
4	Succus entericus	SGF	1.Describe the nature of secretion of the small intestine 2.Describe the role of succus entericus in digestion of the ingested food	
5	Bile	SGF	1.Recognize the organic & inorganic components of bile & explain their significance 2.Describe the synthesis & importance of bile salts 3.Explain the regulation of secretion of bile & clinical aspects of its imbalances	
6	Hyper, Hypo-chlorhydria & lactose intolerance	SGF		
7	Elisa, Determination of serum cholesterol, Determination of	Practical		

	plasma protein			
Anatomy		Week 04 Theme –Large Intestine		
1	Colon & Appendix	Practical		
2	Histology of Colon & Appendix	LGF	Discuss Histology of appendix and colon	
3	Large Intestine	SGF	Explain Gross anatomy of Large intestine and appendix	
4	Appendix	SGF		
5	Development of Midgut & Foregut	LGF	Explain Development of midgut and developmental abnormalities	
Physiology				
1	Digestion in GIT	LGF	1.Discuss the basic principle of digestion of various foods. 2.Describe the process of digestion of carbohydrates, fats & proteins in different parts of alimentary tract	
2	Absorption in GIT	LGF	1.Discuss the basic principle of absorption of gastrointestinal absorption 2.Describe the mechanism of absorption of carbohydrates, fats & proteins in different parts of alimentary tract 3.Describe the mechanism of absorption of water & ions in different parts of alimentary tract 4.Describe the mechanism of formation & composition of feces	
3	Secretion and movements of small & large intestine	SGF	1.List the functions of small & large intestine. 2.Describe the composition, characteristics and functions of secretions of small and large intestine	

			3. Describe the regulation & control of secretions of small and large intestine	
4	Defecation reflex	SGF	1. Classify GIT reflexes 2. Give examples of different Type of Reflexes 3. List neurotransmitters secreted by enteric neurons	
5	Abnormalities of intestine	SGF		
6	Taste Sensations	Practical		

Bio Chemistry

1	Nitrogen balance and Reactions involved in amino acid metabolism-I	LGF	1. Define nitrogen balance	
2	Reactions involved in amino acid metabolism-II	LGF	1. Explain the different reactions of amino acid metabolism after absorption 2. Explain the significance & steps of urea cycle	
3	Urea Cycle - I & Related Disorders	LGF	1. Describe defects of various enzymes & the resultant disorders of urea cycle	
4	Metabolism of Phe and Tyr	SGF	1. Describe the metabolism of Phe & Tyr metabolism. 2. Discuss the congenital defects of certain enzymes of Phe & Tyr metabolism & the resultant disorders	
5	Disorders of Phe and Tyr metabolism	SGF	1. Enumerate & explain the synthesis of specialized products of Phe & Tyr	
6	Metabolism of Glycine & Related Disorders	SGF		
7	Determination of serum creatinine	Practical		

Anatomy	Week 05 Theme – GIT Accessory Organs
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1	Liver & Gall Bladder	Practical		
2	Liver	SGF	1.Discuss Histology of liver and gallbladder	
3	Gall Bladder 7 Extra hepatic Biliary Apparatus	SGF	1.Discuss gross features of Gallbladder and extra hepatic biliary apparatus	
4	Pancreas - Revision	SGF	1.Discuss Histology of liver and gallbladder	
5	Development of Accessory organs	LGF	1.Explain Development of accessory apparatus and developmental abnormalities	
6	Portal Venous Circulation	LGF		

Physiology

1	Liver as an Organ	LGF	1.List the functions of liver 2.Describe the role of liver in control of body functions. 3.Highlight the physiological significance of liver as an organ.	
2	Biliary secretion	SGF	1.Compare the composition of liver bile & gall bladder bile 2.Describe the physiological anatomy of biliary secretion, including the course followed by bile during rest & digestion 3.Describe the functions of different components of bile 4.Describe the mechanism of secretion, regulation & factors affecting bile secretion. 5.Describe the role of gall bladder in storing & concentrating bile 6.Correlate the knowledge of mechanism of biliary secretion with causes of gall stone formation.	
3	Defecation reflex	SGF	1.Define Defecation reflex 2.List the types of Defecation reflex	

			3. Describe the components & control of Defecation reflex	
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Bio Chemistry

1	Glucose tolerance test	Practical		
2	Metabolism of alanine, serine & threonine	SGF	1. Explain the metabolic fate of Ala, Ser, Thr 2. Illustrate the role of these amino acids in the body 3. Discuss the role of peptidyl serine, threonine & tyrosine in metabolic regulation & signals transduction pathway 4. Discuss the pathway by which alanine being a glucogenic amino acid is converted to glucose 5. Specialized product formed by the metabolism of other standard amino acids	
3	Metabolism of Glycine & Related Disorders	SGF	1. Describe the disorders related different amino acids metabolism 2. Describe the enzyme defects of various inherited diseases of amino acid metabolism 3. Describe the management of disorders of various amino acid metabolism	
	Glucose Tolerance test	Practical		

Anatomy				Week 06 Theme – Blood Supply of GIT
1	Revision GIT	Practical		
2	Aorta / Inferior Vena Cava	SGF	Explain Origin, course branches and area of distribution of aorta and inferior vena cava	

3	Blood Supply of GIT	LGF	Blood supply and lymphatic	
4	Posterior Abdominal Wall	LGF	Describe Gross anatomy of posterior abdominal wall including muscles,	

Physiology

1	Physiology of GIT disorders	LGF	<p>1. Correlate the knowledge of GIT Physiology with physiological basis of vomiting, diarrhea, constipation, gastrointestinal obstruction & excessive flatus.</p> <p>2. Describe the physiological basis of the causes, effects, mechanism of development, and Physiology of treatment of paralysis of swallowing mechanism, achalasia & megaesophagus</p> <p>3. Describe the physiological basis of the causes, effects, mechanism of development, and Physiology of treatment of gastritis, gastric atrophy & peptic ulcer.</p> <p>4. Name different disorders of stomach</p> <p>5. Explain physiological basis of different disorders of stomach</p> <p>6. Predict how these disorders can affect the homeostatic functions of GIT</p> <p>7. Describe the physiological basis of the causes, effects, mechanism of development, and Physiology of treatment of pancreatic failure, sprue</p> <p>8. Explain the effects of spinal cord injuries on defecation.</p>	
2	Pancreatic Secretion	SGF	<p>1. Describe the composition, characteristics and functions of pancreatic secretions</p> <p>2. Describe the phases of pancreatic secretion</p> <p>3. Describe the regulation & control of pancreatic secretions</p>	

Bio Chemistry				
1	Determination of blood urea	Practical		
2	Metabolism of Branch Chain Amino Acids	SGF	1. Describe the reactions involved in the metabolism of branched chain amino acids 2. Identify the specific enzymatic defects in hyper valinemia, Maple syrup urine disease, intermittent branched-chain ketonuria & iso-valeric acidemia	
3	Urea Cycle-II & Related Disorders	LGF	1. Explain the significance & steps of urea cycle 2. Describe defects of various enzymes & the resultant disorders of urea cycle	
	BMR & factors affecting BMR, Respiratory quotient and Caloric requirements	LGF	1. Describe BMR & factors affecting BMR 2. Define respirator quotient & describe the caloric requirements of normal individuals	
	Nutrition importance of CHO, Proteins, Lipids and Fiber	SGF	1. Describe the nutritional importance of carbohydrate & protein, 2. Describe the nutritional significance of lipids & fiber	
	Balanced diet, Diet required in pregnancy & lactation	SGF	1. Describe balanced diet 2. Describe the nutritional requirements for a woman in pregnancy & Lactation	
	Obesity, Protein energy malnutrition (PEM)	LGF	1. Describe Obesity 2. Describe protein energy malnutrition 3. Differentiate between Marasmus & Kwashiorkor	

ISL/Pak	Early problem of Pakistan
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ISL/Pak	The role of ulama and mashikh in the freedom
ISL/Pak	Constitutional and political development in Pakistan since 1947
Community Medicine	Medical Sociology
Medicine	Overview of disorders of large & small Intestine
Medicine (CSC)	Basic signs and symptoms of GIT disorders
Pharmacology	Treatment of Viral Hepatitis
DME	Pre-Post- Feed Back
PAL - Seminar (Interdisciplinary)	Peptic-ulcer
Family Medicine	Role of Family in Health & Disease
Surgery	Disorders of defecation

Vertical Subject Topic List

Medicine	Hepatitis
	Diarrhea
	GERD
Community Health Sciences	Food Poisoning
	Poliomyelitis
	Water borne infections
Surgery	Gall Stones
	Intestinal obstruction
Pathology	Gastritis

Endocrinology Module

2nd Year MBBS

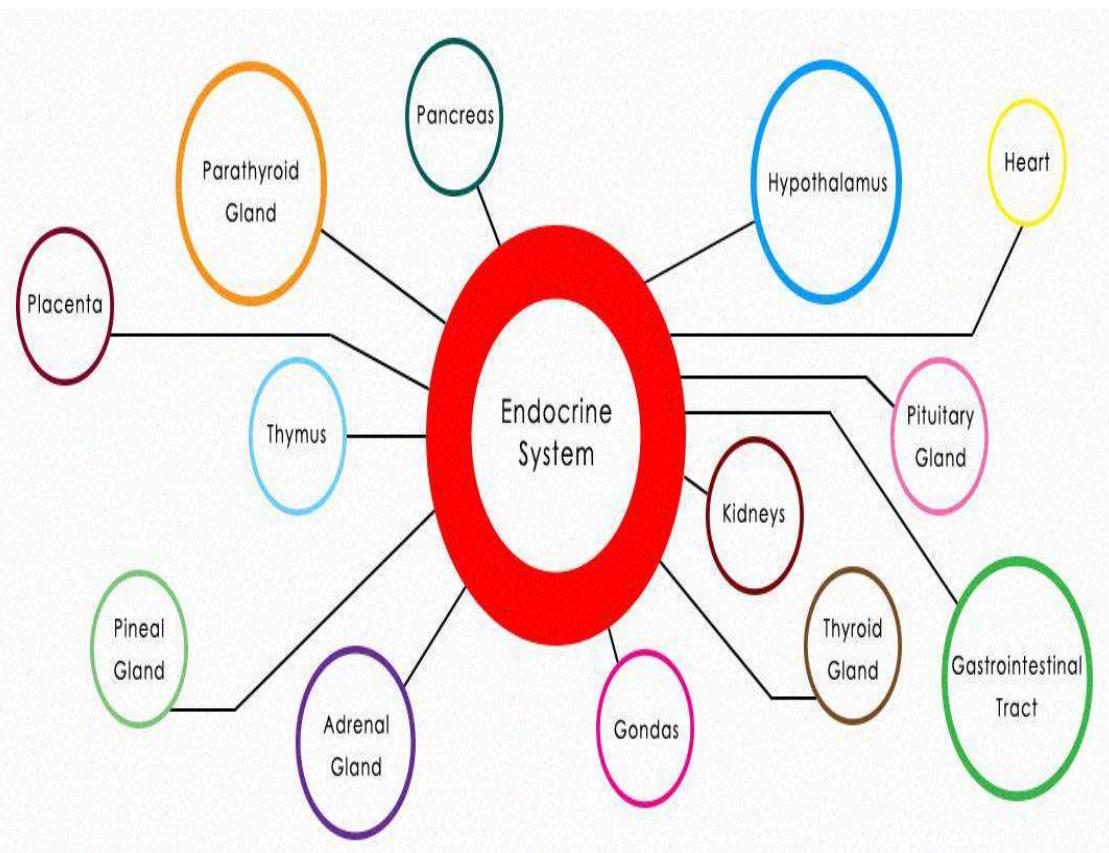
Duration: 5-weeks

RATIONALE:

The function of the endocrine system is to coordinate and integrate cellular activity within the whole body by regulating cellular and organ function throughout life and maintaining **homeostasis**. Homeostasis, or the maintenance of a constant internal environment, is critical to ensuring appropriate cellular function. In this module the anatomy and physiology of the endocrine organs along with functional biochemistry of the hormones secreted along with normal physiological changes are taught in integrated fashion with reference to common disease processes occurring in our community.

By the end of this module student will be able to:

- Review the anatomy of endocrine organs (pituitary, thyroid, pancreas, parathyroid and adrenal gland).
- Describe the role of hormones in relation to homeostasis and metabolism.
- Identify and list functional physiology of hormones.
- Recognize stepwise synthesis and release of various hormones
- Enlist common endocrine related disorders and their pathogenesis
- Recognize various endocrine disorders on the basis of clinical and investigative findings
- Highlight the role of pharmacological agents used to treat endocrine disorders



THEME-I**MOON FACIES****COURSE OBJECTIVES & STRATEGIES**

OUTCOMES AND OBJECTIVES	FACULTY
1. GROSS AND DEVELOPMENT OF PITUITARY AND RELATED ANOMALIES 1.1 Discuss embryological development of pituitary gland 1.2 Discuss the gross anatomy of pituitary gland. 1.3 Describe the development of pituitary gland. 1.4 Enumerate the congenital anomalies related to pituitary gland 1.5 Describe the arterial supply, venous drainage and nerve supply of pituitary gland.	Anatomy
2. ADRENAL GLAND 2.1 Outline structure of suprarenal gland 2.2 Identify the different zones of adrenal cortex 2.3 List the hormones released by adrenal cortex and their functions. 2.4 Know the relations of right and left adrenal glands 2.5 Discuss the development of adrenal gland. 2.6 Enumerate the developmental anomalies of adrenal gland. 2.7 Discuss the gross anatomy of adrenal gland 2.8 Enumerate the hormones released by adrenal cortex and their functions. 2.8 Describe the relations of right and left adrenal gland 2.10 Describe the arterial supply, venous drainage and nerve supply of Adrenal glands.	Anatomy
3. ADRENAL GLANDS, RELATION OF STRUCTURE WITH FUNCTION	Anatomy

<p>3.1 Describe anatomy and division of adrenal gland 3.2 Enlist and discuss Hormones of adrenal cortex, 3.3 Enlist and discuss Hormones of adrenal medulla.</p>	
<p>4. MICROSCOPY OF PITUITARY GLAND.</p> <p>4.1 Identify the histological features of pituitary gland. 4.2 Discuss the different subtypes of the pituitary gland lobes. 4.3 Identify the normal microscopic features of thyroid gland 4.5 Discuss the histology of thyroid gland 4.6 Discuss the histological features of pancreas 4.7 Identify the normal microscopic features of pancreas 4.8 Discuss the differences between Parotid gland and Pancreas 4.9 Identify microscopic features of adrenal gland 4.10 Discuss Histology of adrenal gland. 4.11 Identify Microscopic structure of Parathyroid Gland 4.12 Describe histology of parathyroid gland 4.13 Identify the histological features of pituitary gland. 4.14 Discuss the histology of the pituitary gland.</p>	Histology
<p>5. MICROSCOPIC STRUCTUREOF ADRENAL GLAND.</p> <p>5.1 Discuss the histological features of Adrenal gland</p>	Histology
<p>6. DEVELOPMENT OF ADRENAL GLAND AND RELATED ANOMALIES</p> <p>6.1 Discuss the development of adrenal gland. 6.2 Enumerate the developmental anomalies of adrenal gland.</p>	Embryology

<p>7. INTRODUCTION TO ENDOCRINOLOGY/ Pituitary Hormones</p> <p>1 Classify endocrine glands and discuss various chemical messenger systems in the body.</p> <p>2 Describe mechanisms of action of hormones</p> <p>3 Describe Role and function of the endocrine glands and hormones secreted by them.</p> <p>4 Enumerate the factors that control human growth</p> <p>5 Describe the endocrine control of human growth</p> <p>6 Describe a normal growth curve</p> <p>7 Explain the relationship between growth hormone and insulin like growth factors in promoting growth of bones and soft tissues</p> <p>8 Tabulate the metabolic effects of growth hormone in humans</p> <p>9 Explain the mechanism by which growth hormone can cause diabetes</p> <p>10 Draw a table showing the stimulatory and inhibitory factors for the secretion of growth hormone</p> <p>11 Describe the role of hypothalamus in controlling the secretion of growth hormone</p> <p>12 Describe pan hypopituitarism in adults and children</p> <p>13 Differentiate between growth hormone excess before puberty and after puberty</p> <p>14 Explain the role of ant diuretic hormone in controlling osmolarity of blood</p> <p>15 Describe the role of ant diuretic hormone in restoring blood pressure</p> <p>16. Describe second messenger mechanisms for mediating intracellular hormonal functions</p>	<p>Physiology</p>
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<p>17. Describe measurement of Hormone Concentrations in the Blood</p> <p>18. Describe physiological anatomy of pituitary gland</p> <p>19. Describe Growth hormone's effect on growth and metabolism</p> <p>20. Explain Insulin-LikeGrowth Factors</p> <p>21. Describe regulation of Growth Hormone</p> <p>22. Describe formation &physiological functions of Oxytocin</p> <p>23. Describe formation &physiological functions of ADH</p>	
<p>8. Thyroid Hormone</p> <ol style="list-style-type: none"> 1. Enlist the effects of thyroid hormone on different body tissues and organs 2. Describe the regulation of thyroid hormone secretion 3. Explain the effect of high dose of iodides on thyroid gland and its function 4. Compare the causes of hyperthyroidism and hypothyroidism 5. Compare the clinical features of hypothyroidism and hyperthyroidism 6. Explain the pathogenesis of goiter 	Physiology
<p>9. REGULATION OF HORMONAL SECRETION</p> <p>8.1 Discuss secretion, transport, clearance of hormones from blood</p> <p>8.3 Explain the control of hormone secretion by hypothalamus</p>	Physiology
<p>10. THE PINEAL GLAND</p> <p>9.1 Describe physiological anatomy of Pineal gland</p> <p>9.3 Discuss the physiological functions of pineal gland</p> <p>9.4 Explain the control of melatonin secretion</p> <p>9.5 Describe prostaglandins</p>	Physiology

<p>9.6 Discuss the effects of prostaglandins</p> <p>9.7 Describe the therapeutic uses of prostaglandins</p>	
<p>10. HORMONES OF POSTERIOR PITUITARY AND RELATED DISORDERS</p> <p>10.1 Give an overview of the posterior pituitary</p> <p>10.2 Discuss the functions of Oxytocin and ADH</p> <p>10.3 Discuss the disorders of ADH and correlate clinically</p>	Physiology
<p>11. ADRENAL CORTEX - FUNCTIONS OF THE GLUCOCORTICOIDS</p> <ol style="list-style-type: none"> 1. List the factors causing release of aldosterone from adrenal cortex 2. Explain the mechanism by which aldosterone increase extracellular volume 3. Explain the role of aldosterone in controlling potassium ion concentration in plasma 4. Discuss the Renin-angiotensin system and the actions of Angiotensin II 5. List the effects of aldosterone on different target tissues 6. Explain the effects of excess aldosterone 7. Explain the effects of aldosterone deficiency 8. Explain the role of cortisol in adaptation to stress 9. Describe the anti-inflammatory effects of cortisol 10. Explain the integrated stress response 11. Draw a chart showing the major hormones released and the changes brought about by each hormone during stress response 12. Described the effects of cortisol on blood cells and immunity 13. Describe the role of adrenal androgen in males and female 14. Explain the clinical features of Addison's disease 15. Explain Cushing's syndrome 	Physiology

<p>16. Discuss primary aldosteronism (Conn's syndrome 17. Explain adrenogenital syndrome</p>	
<p>12. Classification of hormones according to the chemical nature</p> <ol style="list-style-type: none"> 1. Discuss the basic functions of endocrine system 2. Classify the hormones chemically 3. Recall the mechanism of action according to the chemical nature <ol style="list-style-type: none"> a. Recognize the chemical properties and structure of each group of hormones b. Describe hormonal receptors 4. Explain the chemical nature of hormonal receptors 5. classify hormonal receptors 6. Enumerate the tropic hormones 7. Describe chemistry and metabolic role of gonadotropic hormones 8. Enumerate the various hypothalamic releasing factors that control the secretion of hormones 9. Enumerate the hormones produced by anterior ,intermediate and posterior pituitary gland 10. Describe chemistry and metabolic role of melanocyte stimulating hormone 11. Describe chemistry and metabolic role of oxytocin and antidiuretic hormone 12. Describe chemistry and mechanism of action of growth hormones. 13. Define hormones ,Differentiate between the terms endocrine, paracrine & autocrine 14. Define 2nd messengers and their roles 15. Enumerate the hormones of anterior pituitary gland 16. Describe Regulation of Thyroid Hormone Secretion 	<p>Biochemistry</p>

17. Explain Mechanism of action PTH 18. Describe Control of Parathyroid Secretion	
13. ADRENAL CORTEX: FUNCTIONS OF MINERALOCORTICOIDS. 13.1 Enumerate various mineralocorticoids 13.2 Describe actions of mineralocorticoids 13.3 Discuss the factors that help in regulation of Aldosterone	Biochemistry
14. ADRENOCORTICAL HORMONES CHEMISTRY AND SYNTHESIS 14.1 Discuss the various adreno-cortical hormones, their structure and synthesis.	Biochemistry
15. METABOLIC FUNCTIONS OF MINERALOCORTICOIDS AND THEIR DISORDERS 15.1 Discuss the mode of action, functions and diseases associated with deficiency and excess of mineralocorticoids	Biochemistry
16. BIOCHEMISTRY OF ADRENAL MEDULLA & PHAEOCHROMOCYTOMA 16.1 Identify the parts of the adrenal gland 16.2 Identify hormones secreted by adrenal medulla and their main actions 16.3 Discuss the diseases caused by imbalance of adrenal medulla. 16.4 Discuss the common clinical presentation of phaeochromocytoma.	Biochemistry
17. ADRENOCORTICAL HORMONES CHEMISTRY, SYNTHESIS AND METABOLIC FUNCTIONS OF GLUCOCORTICOIDS & DISORDERS To understand : 17.1 Discuss the various adrenocortical hormones, their structure and synthesis. 17.2 Describe the effects of Glucocorticoids on carbohydrate metabolism, fat metabolism, protein metabolism and immune	Biochemistry

system 17.3 Describe the role of Glucocorticoids as Anti-inflammatory Agents	
18. DRUGS USED IN HYPERCORTISOLISM: 18.1 Enlist and understand the mechanism of action ,clinical uses and side effects of Steroids 18.2 Discuss the role of drugs used in Addison's disease/Addisonian crises, their uses and adverse effects.	Pharmacology
19. DISORDERS OF ANTERIOR PITUITARY. 19.1 Discuss common disorders of Pituitary gland.. 19.2 Discuss Hyperpituitarism 19.3 Discuss hypopituitarism	Pathology
20. CLINICAL DISORDERS OF ADRENAL GLAND 20.1 Discuss the common diseases caused by excess or deficiency of adrenal hormones. 20.2 Describe the common clinical presentation of these disorders	Medicine
21. CLINICAL DISORDERS OF PITUITARY 21.1 To identify the parts of the pituitary gland 21.2 To identify hormones secreted by each lobe and their main actions 21.3 Discuss the common diseases caused by excess or deficiency of pituitary hormones 21.4 Recognize and discuss the common clinical presentation of these disorders	Medicine

THEME-II

POLYPHAGIA BUT LOSS OF WEIGHT

OUTCOMES AND OBJECTIVES	FACULTY
1. GROSS STRUCTURE OF THYROID GLAND. <p>1.1 Recognize the anatomy of thyroid gland. 1.2 Define the relations of lobes of thyroid and isthmus of thyroid. 1.3 Discuss Blood vessels of supplying thyroid. 1.4 Discuss Nerve supply of thyroid.</p>	Anatomy
2. MICROSCOPIC STRUCTURE OF THYROID GLAND <p>2.1 Discuss the histological structure of thyroid gland</p>	Histology
3. DEVELOPMENT OF THYROID GLANDS AND RELATED ANOMALIES <p>3.1 Discuss embryological development of thyroid glands 3.2 Enumerate related developmental anomalies</p>	Embryology
4. FUNCTIONS OF THYROID HORMONE <p>4.1 Describe the physiologic anatomy of the Thyroid Gland. 4.2 Discuss the steps of production of thyroid hormones. 4.3 Discuss Thyroid Hormone Transport and Protein Binding 4.4 Discuss the mode of action of Thyroid Hormones 4.5 Discuss the clinical Disorders of Thyroid Function including hypo and hyper thyroidism</p>	Physiology
5. SYNTHESIS, MODE OF ACTION, METABOLIC FUNCTIONS AND DISORDERS <p>5.1 Discuss the steps involved in Thyroid Hormone Synthesis 5.2 Describe the chemical nature of Thyroid Hormones 5.3 Discuss Thyroid Hormone Transport and Protein Binding 5.4 Describe the mode of action of Thyroid Hormones 5.5 Discuss the metabolic effects of Thyroid Hormones 5.6 Discuss the clinical disorders of Thyroid Function</p>	Biochemistry
6. DRUGS USED IN HYPO AND HYPERTHYROIDISM <p>6.1 Understand the mechanism of action ,clinical uses and side</p>	Pharmacology

effects of drugs used in hypo and hyper thyroidism	
7. HYPERTHYROIDISM AND GRAVES DISEASE	Pathology
7.1 Discuss patho-physiology of hypo and hyper thyroidism	
7.2 Discuss graves disease/ goiter	
8. SIGNS & SYMPTOMS OF HYPO/HYPERTHYROIDISM	Medicine
8.1 Discuss the normal regular functioning of thyroid gland.	
8.2 Enlist the common investigations used for thyroid functional disorders	
8.3 Describe clinical signs & symptoms caused by excess or deficiency of thyroid hormone.	
9. IODINE CONTROL PROGRAM IN PAKISTAN	Medicine
9.1 Discuss the epidemiology and consequences of iodine deficiency and the salient features of iodine control program in Pakistan	
9.2 Prevalence and causes of iodine deficiency in Pakistan	
9.3 Iodine control program in Pakistan	

OUTCOMES AND OBJECTIVES	FACULTY
1. GROSS STRUCTURE OF PARATHYROID GLAND 1.1 Discuss the anatomical structure of parathyroid glands	Anatomy
2. MICROSCOPIC STRUCTURE OF PARATHYROID GLAND 2.1 Identify Microscopic structure of Parathyroid Gland 2.2 Describe Points of identification 2.3 Discuss Disorders of parathyroid gland	Histology
3. DEVELOPMENT OF PARATHYROID GLANDS AND RELATED ANOMALIES 3.1 Discuss embryological development of parathyroid glands 3.2 Enumerate and explain related developmental anomalies	Embryology
4. FUNCTION OF PARATHYROID HORMONES 4.1 Discuss Parathyroid hormone 4.2 Describe role of parathyroid and Calcitonin in Calcium regulation 4.3 Discuss the Calcium and Phosphate metabolism 4.4 Discuss the role of Vitamin D.	Physiology
5. DRUGS USED IN HYPO AND HYPERCALCEMIA: 5.1 Discuss the mechanism of action ,clinical uses and side effects of drugs used in hypo and hyper-calcemia 5.2 Discuss the role of vitamin D	Pharmacology
6. DISORDERS OF PARATHYROID 6.1 Explain the types of Parathyroid Disorders. 6.2 Discuss hypo and hyper parathyroidism.	Pathology

OUTCOMES AND OBJECTIVES	FACULTY
1. GROSS ANATOMY OF PANCREAS <p>1.1 Describe the location, peritoneal relations, and morphological and secretory parts of Pancreas</p> <p>1.2 Describe the gross features of different parts of pancreas</p> <p>1.3 Describe the arterial supply, venous drainage and nerve supply of pancreas</p>	Anatomy
2. MICROSCOPIC STRUCTURE OF PANCREAS <p>2.1 Discuss the histological components of pancreas</p> <p>2.2 Describe the capsule and stroma pancreas</p> <p>2.3 Discuss the Parenchyma and Lobules (acini) of Pancreas</p> <p>2.4 Discuss the Duct System of Pancreas</p> <p>2.5 Describe the endocrine component of pancreas</p> <p>2.6 Discuss the differences between Parotid gland and Pancreas</p>	Histology
3. HORMONAL SECRETION OF PANCREAS <p>3.1 Describe Endocrine portion of pancreas.</p> <p>3.2 Discuss the normal Insulin secretion and its function.</p> <p>3.3 Discuss the role of different hormones in regulation of blood glucose levels</p> <p>3.4 Discuss Diabetes Melitis</p>	Physiology
4. ENDOCRINE SECRETIONS OF PANCREAS- MOLECULAR STRUCTURE AND BIOCHEMICAL FUNCTION (INSULIN) <p>4.1 Discuss the molecular structure of Insulin</p> <p>4.2 Describe the biosynthesis of Insulin</p> <p>4.3 Describe the mechanism of action of Insulin</p> <p>4.4 Discuss the functions of Insulin</p>	Biochemistry
5. REGULATION OF BLOOD GLUCOSE LEVELS	Biochemistry

<p>HYPOGLYCEMIA AND HYPERGLYCEMIA</p> <p>5.1 Define normal blood glucose level 5.2 Describe its regulation 5.3 Define Hypoglycemia 5.4 Enlist different causes of hypoglycemia 5.5 Define Hyperglycemia 5.6 Enlist different causes of hypoglycemia 5.7 Justify that hypoglycemia is more dangerous for life as compare to hyperglycemia</p>	
<p>6. METABOLIC SYNDROME</p> <p>6.1 Definition of Metabolic Syndrome 6.2 Discuss Visceral obesity is an indicator of the syndrome and an independent marker for CVD 6.3 Describe Current and some potential future treatment options</p>	Biochemistry
<p>7. RELATE OBESITY, LEPTINS and Type II DIABETES</p> <p>1 Define Diabetes mellitus 2 Define obesity 3 Describe Leptins 4 Describe the relation of diabetes with obesity 5 Justify the role of Leptins in obese diabetic conditions Glycolysis Define Glycolysis, Describe the entry of glucose into different kinds of cells through various GLUT transporters Describe the reactions of glycolysis Describe the transportation of NADH to Mitochondria via various Shuttles Describe the energetics of glycolysis Describe the fates of pyruvate Describe the types of glycolysis especially the anaerobic glycolysis</p>	Biochemistry

<p>Describe the key enzymes and regulation of glycolysis</p> <p>Discuss the glycolysis in RBC</p> <p>Describe the biomedical Significance and clinical disorders of glycolysis</p> <p>Discuss glycolysis in cancer cells</p> <p>Describe the conversion of pyruvate into acetyl CoA</p> <p>Enumerate the enzymes & coenzymes of PDH complex</p> <p>Describe the sequence of reactions catalyzed by PDH complex.</p> <p>Describe the regulation of PDH complex</p> <p>Discuss the clinical aspects of PDH complex especially the congenital lactic acidosis</p> <p>Define citric acid cycle</p> <p>Describe the sources of acetyl CoA in mitochondria</p> <p>Describe the reactions of TCA</p> <p>Discuss the energetics of TCA</p> <p>Discuss the energy yield of one molecule of glucose when it is converted into carbon dioxide and water</p> <p>Name the vitamins that play key role in TCA</p> <p>Describe the amphibolic nature of TCA</p> <p>Discuss the regulation of TCA</p> <p>Enumerate the inhibitors of TCA and their sites of inhibition</p> <p>Define Gluconeogenesis</p> <p>Name the organs and sub cellular location where Gluconeogenesis occurs</p> <p>Describe the substrates or precursors of Gluconeogenesis</p> <p>Describe the three bypass reactions</p> <p>Describe the Gluconeogenesis from Fatty Acids</p> <p>Discuss the Cori's cycle</p> <p>Discuss the regulation of Gluconeogenesis</p> <p>Name the key enzymes of Gluconeogenesis</p> <p>Discuss the Role of Pentose</p>	
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Phosphate Pathway

Name the tissues where Hexose Mono Phosphate shunt occurs

Describe the reactions of the two parts of Hexose Mono Phosphate shunt

Describe the Role of thiamine in Hexose Mono Phosphate shunt

Enumerate the Similarities & differences b/w glycolysis and HMP shunt pathway

Discuss the functions of NADPH (produced in Hexose Mono Phosphate shunt) in various tissues and cells

Discuss G6PD deficiency and its effects in various tissues and cells

Describe the regulation of HMP shunt pathway

Enumerate the products of uronic acid pathway and their importance

Discuss why ascorbic acid is vitamin for humans

Describe the uses & requirements of galactose in the body

Discuss the various reactions with enzymes involved

Describe the Genetic Deficiencies of Enzymes in Galactose Metabolism and their effects

Describe the Main source of Fructose

Discuss the various reactions with enzymes involved

Discuss the Fructose formation in Seminal fluid

Describe the mechanism of formation of diabetic cataract

Discuss the Defects in Fructose Metabolism and their effects

Describe the structure and functions of the glycogen especially the significance of its polymer nature

Describe the Difference between Liver & muscle glycogen

Describe the synthesis of glycogen by two mechanisms with its enzymes

Discuss the breakdown of glycogen with its enzymes

<p>Describe the Regulation of Glycogen metabolism</p> <p>Discuss the glycogen storage diseases with deficient enzymes and cardinal clinical features</p> <p>Fatty acid (FA) synthesis <i>(De Novo)</i></p> <p>Enumerate the organs where fatty acid synthesis occurs with sub cellular sites</p> <p>Discuss the source of Acetyl CoA that will be used for FA synthesis with reason</p> <p>Discuss how acetyl CoA comes out of mitochondria for the synthesis of FA</p> <p>Describe the steps of FA synthesis with enzymes</p> <p>Describe the FA synthase enzyme with its structure and components</p> <p>Describe the product of FA synthase and the subsequent fate of this product</p> <p>Discuss the regulation of FA synthesis</p> <p>Discuss why animals cannot convert fatty acids into glucose</p> <p>Describe the further elongation and desaturation of FA and its regulation</p> <p>Describe how fats are mobilized from adipose tissues to the organs where they will be used for oxidation</p> <p>Enumerate the various methods of oxidation of FA</p> <p>Discuss the stages of beta oxidation with its reactions</p> <p>Calculate the no. of ATP obtained when one molecule of palmitic acid is oxidized completely</p> <p>Describe the genetic deficiencies of FA oxidation i.e. MCAD & CAT deficiencies with their hallmarks</p> <p>Discuss the oxidation of odd-chain FA</p> <p>Compare the processes of FA synthesis with FA oxidation</p>	
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<p>Enumerate the ketone bodies</p> <p>Define ketogenesis</p> <p>Describe the steps of ketogenesis</p> <p>Discuss the energy yield during ketogenesis in liver</p> <p>Enumerate the conditions in which there is increased ketogenesis</p> <p>Discuss utilization of ketone bodies</p> <p>Discuss the energy yield in ketone bodies utilization in extra hepatic tissues</p> <p>Describe the regulation of ketogenesis in well-fed healthy conditions, during early stages of starvation & in prolonged starvation</p> <p>Discuss the ketoacidosis in diabetes</p> <p>Describe the synthesis of triacylglycerol by two mechanisms</p> <p>Describe the synthesis of phosphatidic acid</p> <p>Enumerate the substances formed from phosphatidic acid</p> <p>Describe the synthesis of glycerophospholipids</p> <p>Discuss the degradation of glycerophospholipids</p> <p>Describe the synthesis of ceramide and sphingophospholipids (shingomyelin)</p> <p>Discuss the degradation of shingomyelin</p> <p>Discuss Niemann-Pick disease with its cardinal clinical features</p> <p>Discuss Farber disease with its cardinal clinical features</p> <p>Describe the synthesis of glycosphingolipids</p> <p>Describe the degradation of glycosphingolipids</p> <p>Describe the abnormalities of phospholipid metabolism i.e. true demyelinating diseases and sphingolipidosis</p> <p>Define eicosanoids and describe their two classes</p> <p>Describe the synthesis of prostanoids by cyclo-oxygenase pathway</p> <p>Enumerate the two isomers of cyclo-oxygenase with their inhibition</p>	
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Discuss why low dose aspirin therapy is used in strokes and heart attacks

Describe biochemical reason for the adverse effects of NSAIDs & steroids

Describe the catabolism of the prostanoids

Describe the lipoxygenase pathway for synthesis of Leukotrienes and lipoxins

Describe the synthesis of leukotriene biosynthesis inhibition

Enumerate the leukotriene receptor antagonists

Describe the major sites of cholesterol synthesis as well as subcellular sites

Describe the source of cholesterol synthesis

Describe the various steps of cholesterol synthesis

Discuss the regulation of cholesterol synthesis

Enumerate the inhibitors of HMG CoA reductase inhibitors

Describes the degradation and excretion of cholesterol with synthesis of bile acids, their conjugation, bile salt formation and micelle formation in lumen of the intestine

Discuss the enterohepatic circulation of bile salts

Discuss the role of bile acid sequestrants i.e. cholestyramine and dietary fiber

Discuss the regulation of bile acid synthesis

Describe the structure of a typical lipoprotein particle

Enymerate the various classes of LP

Enumerate the functions of apolipoproteins

Describe the steps of chylomicrons' metabolism

Describe the metabolism of VLDL

Describe the metabolism of LDL

Describe the metabolism of HDL

Differentiate between hyperlipidemia and dyslipidemia

Describe the Classification of hyperlipidemia with enzyme deficiency

<p>Describe the epidemiology, preventive strategies and diseases associated with hyperlipidemias</p> <p>Amino acid pool & chemical processes for dissimilation of proteins</p> <p>Discuss how amino acid pool is formed</p> <p>Discuss the chemical processes responsible for dissimilation of proteins: transamination, deamination and transdeamination</p> <p>Discuss the clinical importance of transaminases</p> <p>Discuss how ammonia is formed in various tissues and transported to liver</p> <p>Discuss the effects of ammonia toxicity in brain</p> <p>Describe The Krebs-Henselet Cycle of Urea Formation in Liver</p> <p>Describe the clinical significance of various enzymes involved in urea formation</p> <p>Discuss biosynthesis, fate, metabolic functions and related inherited disorders of aromatic amino acids</p> <p>Discuss biosynthesis, fate, metabolic functions and related inherited disorders of sulphur containing amino acids</p> <p>Discuss biosynthesis, fate, metabolic functions and related inherited disorders of Glycine, serine, and alanine</p> <p>Discuss biosynthesis, fate, metabolic functions and related inherited disorders of acidic amino acids</p> <p>Discuss biosynthesis, fate, metabolic functions and related inherited disorders of branched chain amino acids</p> <p>Enumerate purine and Pyrimidine bases</p> <p>Describe the steps of de novo synthesis of the parent purine nucleotide i.e Inosine mono phosphate (IMP)</p> <p>Discuss the conversion of IMP to AMP & GMP</p> <p>Describe the regulation of purine synthesis</p> <p>Describe the salvage pathway of purine synthesis with its</p>	
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<p>regulation</p> <p>Describe Lesch-Nyhan syndrome with its cardinal clinical features</p> <p>Discuss the anti-metabolites of purine nucleotides i.e purine analogs, amino acid analogs & folic acid analogs</p> <p>Enumerate the synthetic inhibitors of purine synthesis with their mechanisms</p> <p>Discuss the synthesis of deoxy ribonucleotides</p> <p>Describe the mechanism of action of ribonucleotide reductase with its inhibitors</p> <p>Describe the degradation of purine nucleotides</p> <p>Describe the fate of adenine</p> <p>Describe why the average serum level of uric acid in humans is close to the solubility limit</p> <p>Discuss the diseases associated with purine degradation i.e. gout</p> <p>Describe the types of gout</p> <p>Discuss why allopurinol is used in the treatment of gout</p> <p>Discuss adenosine deaminase deficiency</p> <p>Discuss the steps of de novo Pyrimidine synthesis</p> <p>Discuss the synthesis of thymidine mono phosphate from deoxy uridine mono phosphate with its inhibition</p> <p>Describe the salvage pathway of pyrimidines</p> <p>Describe the degradation of Pyrimidine nucleotides</p> <p>Discuss the abnormalities of Pyrimidine metabolism</p> <p>Discuss orotic aciduria</p> <p>Discuss the regulation of Pyrimidine metabolism</p>	
<p>8. DRUGS USED IN HYPERGLYCEMIA</p> <p>8.1 Enlist and understand the mechanism of action ,clinical uses and side effects of drugs used in Type I & II Diabetes mellitus</p>	<p>Pharmacology</p>

<p>1. Define diabetes 2. classify diabetes 3. Enlist risk factors for diabetes 4. Describe Health effects of diabetes</p> <p>Briefly explain primary, secondary and tertiary level of prevention for diabetes</p>	Community Medicine
<p>List of Histology Practical's</p> <p>Nervous system Cerebral cortex Cerebellum Spinal cord Endocrine system Pituitary gland Thyroid gland Parathyroid gland Pancreas (endocrine part) Supra renal gland Gastro intestinal tract Tongue Esophagus Stomach Duodenum Jejunum Ileum Colon Rectum Appendix Associated glands of G.I.T</p>	Practical

Liver	
Gall bladder	
Pancreas (exocrine port)	
Male genital system	
Gonads (testes)	
Genital ducts	
Epididymus	
Ductus deference	
Seminal vesical	
Ejaculatory duct	
Associated (Auxillary) glands	
Prostate gland	
Bulbourethral gland	
External genitalia	
Penis	
Female genital system	
Gonads	
Ovary	
Genital ducts	
Uterine tube	
Uterus	
Vagina	
Associated glands	
Greater vestibular gland	
Lesser vestibular gland	
External genitlia	
Labia majora	
labia minora	
urinary system	
Kidneys	
Ureter	
Urinary bladder	

Respiratory system
Epiglottis
Trachea
Lungs (bronchi –bronchioles- Alveoli)

List of Physiology Practical's

1. Triple Response.
2. Deep Tendon Reflexes.
3. Superficial Reflexes
4. Examination of Cranial Nerves I
5. Examination of Cranial Nerves II
6. Examination of Cranial Nerves III
7. Visual Acuity.
8. Perimetry.
9. Reflexes of the eye.
10. Hearing Function Tests I
11. Hearing Function Tests II
12. Audiometry.
13. Testing Sense of taste. (Gustation)
14. Testing Sense of Smell. (Olfaction)
15. Temperature Recording.
16. Pregnancy Test

List of Biochemistry Practical's

- To Determine the titrable Acidity of given urine.
2. Determine the concentration of chloride in the given urine.

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| <p>3. To estimate the amount of glucose in the urine.</p> <p>4. To estimate the concentration of Creatinine in the given urine.</p> <p>5. To estimate the free and combined Acidity of gastric juice.</p> <p>6. To estimate the concentration of glucose in the given blood.</p> <p>7. To estimate the concentration of Creatinine in the serum.</p> <p>8. To estimate the amount of total proteins in the plasma serum.</p> <p>9. To estimate the concentration of urea in the blood.</p> <p>10. To estimate the amount of chloride in the serum.</p> <p>11. To estimate the concentration of chloride in the plasma serum.</p> <p>12. To determine the direct Bilirubin in the plasma serum.</p> <p>13. To determine the total Bilirubin in the plasma serum.</p> | |
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Urinary System

Theme-1 Loin pain/ Flank Pain

Subject	Topic	S. No	Learning objectives
Gross anatomy	Overview of the urinary system		<p>List and describe the main components of the urinary system</p>
	Kidneys		<p>Discuss the location, anatomical structure, and relations of right and left kidneys to other abdominal organs</p> <p>-Discuss the gross morphological composition of kidneys</p> <ul style="list-style-type: none">• Capsule• Pericapsular adipose tissue• Cortex• Medulla• Pelvis• Hilum• Vascular system within kidneys• Arterial supply• Venous drainage• Lymphatic's• Innervation
			<p>Enumerate the various coverings of the kidney</p> <p>Explain the clinical significance of coverings of the kidneys</p> <p>Describe the structures entering and leaving the hilum of kidney and their relations</p>
	Posterior abdominal wall		Describe the general features of

		lumbar vertebrae
		Describe the special features of lumbar vertebrae
		Enlist the muscles of posterior abdominal wall. Describe their origin, insertion, nerve supply and actions
		Explain the course and relations of Abdominal Aorta
		Enumerate and elaborate the paired branches of abdominal aorta
		Discuss the formation of inferior vena cava
Embryology	Development of the urinary system	Trace the embryological origins and development of the urinary system
	Congenital anomalies of the urinary system	List and describe the common congenital anomalies of kidney and ureter.
Histology	Kidney	<p>Describe the parenchyma of kidney</p> <p>Enlist different components of uriniferous tubules</p> <p>Describe Histological features of the various components of Nephron</p> <p>Describe the histological features of renal corpuscle</p> <p>Describe filtration barrier</p> <p>Describe the parts of collecting tubules</p> <p>Describe the microscopic anatomy of collecting duct</p> <p>Enlist the components of juxtaglomerular apparatus</p>

Physiology	Physiological Anatomy Of the kidneys and Overview of its Functions	1	States major functions of the kidneys & brief physiological anatomy of kidney.
			Define the components of the nephron and their interrelationships: renal corpuscle, glomerulus, nephron, and collecting-duct system.
			Draw the relationship between glomerulus, Bowman's capsule, and the proximal tubule.
		2	Describe the 3 layers separating the lumen of the glomerular capillaries and Bowman's space; defines podocytes, foot processes, and slit diaphragms.
			Define glomerular mesangial cells and states their functions and location within the glomerulus. Detail of renal vessels & Pressure within them. Describe, in general terms, the differences among superficial cortical, midcortical, and juxtamedullary nephrons.
			List the individual tubular segments in order; states the segments that comprise the proximal tubule, Henle's loop, and the collecting-duct system; defines principal cells and intercalated cells.
			Define juxtaglomerular apparatus and describes its 3 cell types; states the function of the granular cells.
			Define the basic renal processes:

			glomerular filtration, tubular reabsorption, and tubular secretion
	Glomerular Filtration: Determinants and Equation		Describe how molecular size and electrical charge determine filterability of plasma solutes; states how protein binding of a low-molecular-weight substance influences its filterability.
			State the formula for the determinants of glomerular filtration rate, and states, in qualitative terms why the net filtration pressure is positive.
			Define filtration coefficient and states how mesangial cells might alter the filtration coefficient; states the reason glomerular filtration rate is so large relative to filtration across other capillaries in the body.
			Describe how arterial pressure, afferent arteriolar resistance, and efferent arteriolar resistance influence glomerular capillary pressure.
			Describe how changes in renal plasma flow influence average glomerular capillary oncotic pressure.
			State the Starling forces involved in capillary filtration.
			State how changes in each Starling force affect glomerular filtration rate
	Nervous & Hormonal Control of Renal Circulation		Define renal blood flow, renal plasma flow, glomerular filtration rate, and filtration fraction, and gives normal

		values.
		State the formula relating flow, pressure, and resistance in an organ.
		Describe sympathetic nerve supply of renal vessels & hormones affecting renal vessels
		Describe the effects of changes in afferent and efferent arteriolar resistances on renal blood flow
	Auto regulation of GFR and renal blood flow	Define auto regulation of renal blood flow and glomerular filtration rate
		Describe the myogenic and tubuloglomerular feedback mechanisms of auto regulation.
	Review of Transport Mechanisms across the Cell Membrane(Active and Passive transport)	Define and state the major characteristics of diffusion, facilitated diffusion, primary active transport, secondary active transport (including symport and antiport) and endocytosis.
		Define osmolality and osmolarity, and states why osmolarity is commonly used to approximate osmolality.
		Describe what is meant by the expression "water follows the osmoles."
		Describe qualitatively the forces that determine movement of reabsorbed fluid from the interstitium into peritubular capillaries.
		Compare the Starling forces governing glomerular filtration with those

		governing peritubular capillary absorption.
		Compare and contrasts the concepts of T_m and gradient-limited transport.
		Describe 3 processes that can produce bidirectional transport of a substance in a single tubular segment; states the consequences of pump-leak systems.
		Contrast "tight" and "leaky" epithelia.
Biochemistry	Acid-base balance & imbalance	Study the sources of Hydrogen Ion, pH & Anion Gap
		Describe Buffer Systems operating in the Body 1. Carbonic acid, protein, and phosphate buffer 2. Transporting acid and mitigating pH changes
		Describe Respiratory Regulation of Acid Base Balance
		Describe Renal Regulation of Acid Base Balance
		Describe Disorders of Acid Base Balance: their causes, mechanisms and compensations of Respiratory Acidosis & Alkalosis and Metabolic Acidosis & Alkalosis
PATHOLOGY	Smoky urine	List the common kidney symptoms Discuss the pathophysiology of renal infections Symptoms associated with renal pathology

		<ul style="list-style-type: none"> -Classification of renal diseases - Pathophysiology of renal infections -Treatment of chronic pyelonephritis
	Renal disorders	<p>2. Define the terms Nephrotic syndrome, Nephritic syndrome, Azotemia.</p> <p>3. Enlist the Causes types of renal stones.</p> <p>4. Enlist the causes and describe the pathogenesis of urinary tract infection.</p>
	Systemic disease affecting kidneys	<p>Explain how systemic diseases can affect renal function</p> <p>Systemic diseases affecting renal function</p> <ul style="list-style-type: none"> - Diabetes -Cardiovascular disorders (hypertension, CHF) -Immunological disorders (SLE, glomerulonephritis) -Cancers (myeloma) -Hematological disorders (sickle cell anemia, HUS)

Practicals

Anatomy	surface anatomy of the urinary system and radiology		<ul style="list-style-type: none">• Identify the gross anatomic features the kidneys, renal pelvis, ureter, urinary bladder and urethra• locate renal angle• Perform renal punch and its clinical significance• Develop Understanding of KUB• Identify different parts of urinary system on IVU
Biochemistry	Titrable acidity of urine		Find out PH of urine

Theme-2 Edema and Urinary retention/ Scanty Urine

Anatomy	Ureters	Describe the gross anatomy of ureters
		Describe the relations of right ureter in males and females
		Describe the relations of left ureter in males and females
		Highlight the clinical significance of relations of right and left ureters in both sexes
		Discuss constrictions in ureter and their clinical relevance.
	Urinary bladder	Describe the gross structure of urinary bladder Discuss the Ligaments/supports.
		Discuss the blood supply and nerve supply of urinary bladder
		Discuss the relations of urinary bladder in males
		Discuss the relations of urinary bladder in females
	Prostate gland	Describe the structure of prostate gland Describe Lobes,capsule,relations and structures within prostate.
		Discuss the common

		problems resulting from abnormal growth of the prostate. Relate the symptoms to structures
	Urethra	Describe the gross anatomy of urethra
		Enlist the differences between male and female urethra
Embryology	Development of the urinary system (Kidney and Ureter)	Enlist the stages of development of kidneys
		Describe the formation of pronephric, mesonephric and metanephric kidneys
		Enumerate the derivatives of metanephricblastema and describe their development
		Enumerate the derivatives of metanephric diverticulum/ureteric bud
		Describe the changes in position and blood supply of kidneys during development
		Enlist the various types of developmental anomalies of kidneys along with their embryological causes
		Enlist the various types of developmental anomalies of ureters along with their embryological causes

	(Bladder and urethra)		Describe the development of bladder
			Discuss the developmental anomalies of bladder
			Describe the development of male urethra
			Describe the development of prostate and bulbourethral glands
			Describe the development of female urethra
			Discuss the developmental anomalies of male and female urethra
	Prostate gland		Describe Embryological development of prostate gland
	Congenital anomalies of the urinary system		List and describe the common congenital anomalies of bladder and urethra.
Histology	Ureter		Describe the microscopic anatomy of ureter
	Bladder		Describe the histological features of urinary bladder
	Prostate		Describe the microscopic structure of prostate
	Urethra		Discuss the microscopic structure of male and female urethra
Physiology	Body fluid compartments		List the body fluid compartments -Recall the volumes of body fluid compartments

		<ul style="list-style-type: none"> -Discuss the interplay in fluid volumes between different fluid compartments -Describes principles of osmosis and osmotic pressure -Discuss the interplay between various pressures -Discuss principles of edema <ul style="list-style-type: none"> • Intracellular fluid compartment • Extracellular fluid compartment • Intravascular fluids • Blood • Plasma • Interstitial fluid • Constituents of intra- and extracellular fluid compartments • Calculating fluid volumes • Osmosis and osmotic fluid regulation
	Reabsorption /Secretion along Different Parts of the Nephron	List approximate percentages of sodium reabsorbed in major tubular segments.
		List approximate percentages of water reabsorbed in major tubular segments.
		Define the term <i>iso-osmotic volume</i> reabsorption.

		Describe proximal tubule sodium reabsorption, including the functions of the apical membrane sodium entry mechanisms and the basolateral sodium-potassium-adenosine triphosphatase.
		Explain why chloride reabsorption is coupled with sodium reabsorption, and lists the major pathways of proximal tubule chloride reabsorption.
		State the maximum and minimum values of urine osmolality.
		Define osmotic diuresis and water diuresis.
		Explain why there is an obligatory water loss.
		Describe the handling of sodium by the descending and ascending limbs, distal tubule, and collecting-duct system.
		Describe the role of sodium-potassium-2 chloride symporters in the thick ascending limb.
		Describe the handling of water by descending and ascending limbs, distal tubule, and collecting-duct system

	mechanisms of regulation of tubular reabsorption	<p>Discuss the mechanisms of regulation of tubular reabsorption</p> <ul style="list-style-type: none"> •Reabsorption and secretion by the renal tubules •Active and passive transport mechanisms •Mechanism of reabsorption of specific substances (eg. Water, electrolytes) •Reabsorption and secretion in different parts of the tubules •Glomerular balance •Peritubular and renal interstitial fluid physical forces •Effect of arterial pressure on urine output •Hormonal control of tubular reabsorption •Aldosterone •Angiotensin-II •ADH •Parathyroid hormone •Nervous regulation of tubular reabsorption
	Concept Of Renal Clearance	Define the terms clearance and metabolic clearance rate, and differentiates between general clearance and renal clearance.
		List the information required for clearance calculation

		<p>State the criteria that must be met for a substance so that its clearance can be used as a measure of glomerular filtration rate; states which substances are used to measure glomerular filtration rate and effective renal plasma flow.</p>
		<p>Predict whether a substance undergoes net reabsorption or net secretion by comparing its clearance with that of inulin or by comparing its rate of filtration with its rate of excretion.</p>
		<p>Calculate net rate of reabsorption or secretion for any substance.</p>
		<p>Calculate fractional excretion of any substance.</p>
		<p>Describe how to estimate glomerular filtration rate from C_{Cr} and describes the limitations.</p>
		<p>Describe how to use plasma concentrations of urea and creatinine as indicators of changes in glomerular filtration rate.</p>
	Mechanism of diluted urine formation	<p>Describe the process of "separating salt from water"</p>

			and how this permits excretion of either concentrated or dilute urine.
			Describe how antidiuretic hormone affects water reabsorption.
			Describe the characteristics of the medullary osmotic gradient.
			Explain the role of the thick ascending limb, urea recycling, and medullary blood flow in generating the medullary osmotic gradient.
			State why the medullary osmotic gradient is partially "washed out" during a water diuresis
			Describe the origin of antidiuretic hormone and the 2 major reflex controls of its secretion; define diabetes insipidus; state the effect of antidiuretic hormone on arterioles.
			Distinguish between the reflex changes that occur when an individual has suffered iso-osmotic fluid loss because of diarrhea as opposed to a pure water loss (ie, solute-water loss as opposed to pure-water

		loss).
		Describe the control of thirst.
		describe the pathways by which sodium and water excretion are altered in response to sweating, diarrhea, hemorrhage, high-salt diet, and low-salt diet.
	Mechanism of concentrated urine formation	Discuss the mechanism of concentrated urine formation.
	Renal regulation of Potassium	State the normal balance and distribution of potassium within different body compartments, including cells and extracellular fluid.
		Describe how potassium moves between cells and the extracellular fluid, and how, on a short-term basis, the movement protects the extracellular fluid from large changes in potassium concentration.
		Describe how plasma levels of potassium do not always reflect the status of total-body potassium.
		State generalizations about renal potassium handling for persons on high- or low-potassium diets.

		State the relative amounts of potassium reabsorbed by the proximal tubule and thick ascending limb of Henle's loop regardless of the state of potassium intake.
		Describe how the cortical collecting duct can manifest net secretion or reabsorption; describes the role of principal cells and intercalated cells in these processes.
		List the 3 inputs that control the rate of potassium secretion by the cortical collecting duct.
		Describe the mechanism by which changes in potassium balance influence aldosterone secretion.
		State the effects of most diuretic drugs and osmotic diuretics on potassium excretion.
		Describe the association between perturbations in acid-base status and the plasma potassium level
	The prostate	Discuss the physiological functions of the prostate
	physiochemical aspects	Discuss the physiochemical aspects (Diffusion, Adsorption,

		Viscosity, Colloid Osmotic pressure and role of Albumin in regulation of Osmotic pressure)
	Regulation of extracellular fluid osmolality and sodium concentration	<p>Discuss the homeostatic function of the kidneys</p> <ul style="list-style-type: none"> -Explain the mechanism by which kidneys are able to form diluted or concentrated urine Mechanism of formation of dilute urine - Mechanism of formation of concentrated urine -Requirements for excreting a concentrated urine -The counter-current mechanism -Role of distal tubules and collecting ducts -Quantifying urine concentration and dilution -Disorders of urine concentration ability
	Regulation of extracellular fluid osmolarity and sodium concentration-2	<p>Discuss the homeostatic function of the kidneys</p> <ul style="list-style-type: none"> -Discuss the principles of osmoregulation by the kidneys Explain how the body regulated the osmolarity of fluid compartments -Control of extracellular fluid osmolarity and sodium

			<p>concentration</p> <ul style="list-style-type: none"> -Osmoreceptor-ADH feedback system -Role of thirst in controlling extracellular fluid osmolarity and concentration -Salt-appetite mechanism -Integrated response to sodium intake
	Regulation of concentration of potassium, calcium, phosphate and magnesium		<p>Discuss the mechanisms of regulation of concentrations of various ions in the body</p> <p>Describe the processes occurring at cellular level to maintain/excrete various ions in the kidneys</p> <ul style="list-style-type: none"> -Regulation of potassium --Regulation of calcium -Regulation of phosphate -Regulation of magnesium
	Short and Long term control of Blood pressure by Kidneys		<p>Describe the 3 temporal domains of blood pressure control and the major mechanisms associated with them.</p>
			<p>Describe the relationship between renin and angiotensin II.</p>
			<p>Describe the 3 detectors that can alter renin secretion.</p>
			<p>Define pressure natriuresis and diuresis.</p>

			Define tubuloglomerular feedback and describe the mechanism for tubuloglomerular feedback and autoregulation of glomerular filtration rate
Biochemistry	Renal control of Calcium & Phosphorus		State the normal total plasma calcium concentration and the fraction that is free.
			Describe the distribution of calcium between bone and extracellular fluid and the role of bone in regulating extracellular calcium.
			Describe and compare osteocytic osteolysis and bone remodeling.
			Describe renal handling of phosphate.
			Describe how parathyroid hormone changes renal phosphate excretion.
	constituents of urine		Describe the normal and abnormal constituents of urine
General Surgery/urology	Urinary retention		Describe the etiology, and management of urinary retention
			Describe the etiology, clinical features and treatment of Benign prostatic hyperplasia
Pathology	Renal failure		Enlist the causes of Renal failure/ uraemia and

			<p>abnormalities related to micturition including incontinence</p> <p>Discuss the causes and pathophysiology of Chronic Renal failure</p>
	Urinary stones		Describe the pathophysiology of Urinary stones
Pharmacology	Nephrotoxic drugs		Describe the mechanism of drug excretion
			Enlist nephrotoxic drugs
			Describe the mechanism of action of diuretic drugs
	Drugs acting on the renal system (in NW module it's in theme of Scanty Urine)		<p>Classify diuretics</p> <p>Illustrate the mechanisms of action of various classes of diuretics</p> <p>Discuss the common indications for the use of diuretics</p> <ul style="list-style-type: none"> -Classification of diuretics -Mechanism of action of diuretics -Clinical used of diuretics -Adverse effects of diuretics -Anti-diuretics -Drugs for acid-base disorders
Pathology	Glomerular diseases		Describe the etiology and pathogenesis of

			glomerulonephritis
	Classification of kidney disorders		<p>Classify kidney disorders according to etiology, site of dysfunction and type of dysfunction</p> <ul style="list-style-type: none"> - Acute/ chronic -Infectious -Immunological -Neoplastic -Vascular/interstitial /parenchymal - Primary/systemic
			<p>Describe nephrotic syndrome and its etiology</p>
Clinical	Quality of life in problems of prostate		<p>Discuss quality of life issues in patients with prostate problems</p> <p>Overview of the concept of quality of life (QoL)</p> <p>Discuss the significance of quality of life in disease and treatment settings</p> <p>Discuss quality of life issues in geriatric population</p>
Practical			
Physiology	Intake output chart maintenance in bed ridden patients		Maintain Intake output chart maintenance in bed ridden patients

	Catheter insertion		Preform insertion of catheter on dummy
Biochemistry	Urine analysis		<p>Determine the normal/abnormal constituents in the urine</p> <ul style="list-style-type: none"> -Urine sugar -Amino acids -Proteins -Hemoglobin -Uric acid -Urea -Creatinine and chloride -Calcium and phosphate -Ammonia -Ketone bodies -Benzidine test for blood in urine

Theme-3 Urinary incontinence

Anatomy			
	The Perineum		<p>Define the pelvis and the perineum</p> <p>Discuss the openings in the pelvis and what passes through them</p> <p>List and describe the contents of the urogenital triangle</p> <ul style="list-style-type: none"> -Contents of the male urogenital triangle -Urethral injuries

		-Injury to the perineum in childhood
Physiology	Urinary bladder and micturition	<p>Describe the functional anatomy of urinary bladder</p> <p>Explain the mechanism of micturition</p> <p>Explain the micturition reflex and relate structures of the bladder with function</p> <p>Explain basal cystometrogram</p> <p>Describe the nervous control of bladder functions</p>
	Urinary incontinence	<p>Discuss the causes, symptoms and management of patients with urinary incontinence, urgency, frequency, burning micturition etc</p> <p>Causes of urinary incontinence, urgency, frequency, burning micturition</p> <p>Terms related to urinary obstruction and incontinence</p> <p>Clinical presentation of continence disorders</p> <p>General management of incontinence</p>
Radiology	Radiological diagnosis of urinary pathologies	Identify and describe the various anatomic landmarks of the renal

		<p>system on radiographs</p> <p>Discuss special radiological tests to determine renal function and pathologies</p> <p>Normal radiographs of abdomen and pelvis</p> <p>Special radiological tests to show renal pathology and function</p> <p>Abdominal ultrasound</p>
Clinical	Dialysis	<p>Describe the types, indications and the process of dialysis for kidney disease</p> <p>Types of dialysis</p> <ul style="list-style-type: none"> -Peritoneal dialysis -Hemodialysis -Hemofiltration -Haemodiafiltration -Intestinal dialysis -indications for dialysis -Disorders of acid-base balance, electrolyte abnormalities uremia or fluid overload resulting from acute and chronic renal failure, and intoxication -The process of hemodialysis and peritoneal dialysis -Dialyzable substances

Clinical	A young woman with excessive urination	<p>Discuss the disorders associated with urine concentrating ability</p> <p>Plan a line of investigation and management in renal disorders</p> <ul style="list-style-type: none"> - Disorders of renal concentration ability -Comparison of excessive urine volume with increased frequency of micturition - Mechanism of secretion and action of ADH -Urine concentrating ability of the various parts of the nephron Proximal convoluted tubule Descending limb of loop of Henle Ascending limb of loop of Henle Collecting system
Clinical	A girl with continuous dribbling of urine	<p>Discuss the causes of urinary incontinence</p> <p>Discuss the significance of radiological investigations in cases of urinary incontinence in children</p> <p>Define and describe enuresis</p> <ul style="list-style-type: none"> -Causes of urinary incontinence -The micturition reflex -Tests for investigating urinary incontinence

			-Enuresis definition, types, causes and treatment
Pathology			List and define the common pathologies of the perineal region - Urethral infection
Practicals			
Anatomy	surface anatomy of the perineum and radiology		Identification of the various structures forming the perineum on models Identify the radiographic landmarks of the perineum
	Histologic examination urinary system		Identify the characteristic microscopic features of the urinary system -Kidney -Ureter -Urinary bladder -Urethra
Biochemistry	Creatinine in urine		Estimation of creatinine in 24 hour urine sample
Physiology	Arterial blood-gas analysis		-Arterial blood sampling - Analysis and interpretation of arterial blood gases

Reproductive system

LEARNING OBJECTIVES

AT THE END OF THE Module THE STUDENT SHOULD BE ABLE TO

GROSS ANATOMY

BONY PELVIS SACRUM AND COCCYXJOINTS OF PELVIS

1. Identify the bony pelvis,
2. Describe features and articulations of Pelvic bones (Ischium , Ileum and Pubis)
3. Identify muscles associated with sacrum.
4. Differentiate between male and female sacrum. Enlist various types of joints of pelvis.
5. Explain type, articulations, ligaments and relation of pelvic joints (sacroiliac joint, symphysis Pubis and sacrococcygeal joint).
6. Enlist factors providing stability to the sacroiliac joint, sacrococcygeal joint.
7. Describe blood supply, nerve supply & movements of Pelvic joints.

THE BONY PELVIS (INLET & OUTLET DIFFERENCE BETWEEN MALE & FEMALE PELVIS

1. Differentiate the greater & lesser pelvis.
2. Describe the superior & inferior circumference and their boundaries.
3. Describe the anatomical position of pelvis.
4. Describe the different types of female pelvis

Differentiate between male & female pelvis.

PELVIC FLOOR

1. Describe the anatomy of the pelvic walls.
2. Discuss the components of pelvic floor
3. Explain the blood supply, nerve supply, lymphatic drainage of pelvic floor
4. Describe actions of pelvic diaphragm.
5. Illustrate and label the Pelvic floor

DIVISION OF PERINEUM AND CUTANEOUS NERVES. PERINEAL BODY.

1. Identify borders and relations of the perineum.
2. Describe divisions of the perineum.
3. Explain cutaneous nerves of the perineum.
4. Define perineal body.
5. Describe the Blood supply of Pelvic floor

MALE EXTERNAL GENITALIA

1. Describe gross anatomy of male external genitalia.
2. Explain their arterial, venous drainage & nerve supply.

3. Discuss the following clinical conditions

Circumcision

Phimosis

Urethral infections

Traumatic rupture of urethra

MALE INTERNAL GENITAL ORGAN - TESTES AND EPIDYDIMIS

1. Describe the coverings of testis.
2. Illustrate the gross features of testis.
3. Explain the significance of the normal anatomical location of testis
4. Describe the blood vessels, lymphatic's and nerves of testes.
5. Discuss:

Hydrocele

Varicocele

MALE INTERNAL GENITAL ORGAN - DUCTUS DEFERENS, SEMINAL VESICLES & PROSTATE

1. Describe the gross features of male internal organs: Epididymis, Ductus Deferens, Seminal Vesicles & Prostate
2. Explain their blood supply, nerve supply & lymphatic drainage.
3. Discuss clinical correlation: Benign Prostatic Hyperplasia, carcinoma of prostate and clinical significance of High PSA levels.

NERVES OF PELVIS AND PERINEUM + SACRAL PLEXUS

- 1 . Identify pelvic nerves.
- 2 . Illustrate sacral plexus.
- 3 . Identify coccygeal plexus.
- 4 . Describe pelvic hypo
gastric plexus.

BLOOD SUPPLY AND LYMPHATIC DRAINAGE OF PELVIS

1. Describe the course of the common iliac artery.
2. Identify divisions of internal iliac by their relationships to pelvic organs\ wall structures.
3. Describe main veins of the pelvis and their tributaries.
4. Identify area of drainage of these veins.
5. Describe different groups of lymph nodes of pelvic region.
(Common iliac, Internal Iliac, External iliac, Para-aortic and superficial inguinal)
6. Explain afferent and efferent pathways of different groups.
7. Explain role of lymphatic's in the spread of malignancy.

FEMALE EXTERNAL GENITALIA AND FEMALE URETHRA

1. Describe the anatomical features of female external genitalia.
2. Explain function, arterial supply, venous drainage and nerve supply of female external genitalia.
3. Discuss clinical importance of female external genitalia.
4. Describe arterial supply, venous drainage and nerve supply of female urethra.
5. Discuss clinical importance of female urethra.
(Stress incontinence)

OVARIES AND FALLOPIAN TUBE

1. Describe the anatomical features of ovaries and fallopian tubes.
2. Identify the ligaments of ovaries
3. Enumerate the clinical correlates of ovaries and uterine tubes.
 - a. uterine tubes as conduit for infection,
 - b. Salpingitis ,
 - c. Ectopic pregnancy and
 - d. cysts of the ovaries

UTERUS, CERVIX AND VAGINA

1. Explain the Anatomical features of uterus, cervix and vagina.
2. Identify the ligaments of uterus and relations of uterus.
3. Describe the clinical correlates of uterus, cervix and vagina.
 - a. Pelvic inflammatory diseases,
 - b. Prolapse of the uterus,
 - c. Hysterectomy and damage to the ureters,
 - d. Prolapse of vagina,
 - e. Trauma to vagina and
 - f. Culdocentesis

HISTOLOGY

HISTOLOGY OF TESTIS AND DUCT SYSTEM

1. Describe the histological anatomy of testis and duct system. •

2. Differentiate these two structure under microscope.
3. Identify the histological features of the above.

HISTOLOGY OF SEMINAL VESICLES, PROSTATE & BULBOURETHRAL GLANDS .

1. Explain the histology of Seminal Vesicle.
2. Explain the histology of Prostate gland.
3. Describe the histology of Bulbourethral glands of Cowper.

HISTOLOGY OF OVARY AND FALLOPIANTUBES

1. Explain the histological organization of the ovaries.
2. Identify ovary and ovarian follicles under microscope.
3. Identify layers and cells of fallopian tubes under microscope.

HISTOLOGY OF UTERUS, CERVIX AND VAGINA

1. Identify layers of uterus under the microscope.
2. Describe the phases of menstruation of uterus.
3. Identify cervix histologically.

EMBRYOLOGY

DEVELOPMENT OF MALE REPRODUCTIVE SYSTEM

1. Describe the development of parts of male reproductive system..
2. Describe the descent of testes
3. Explain the developmental anomalies of male reproductive system.

Undescended testes (cryptorchidism)

Micropenis

Bifid penis

Abnormal urethral orifices

Meatal stenosis

Ambiguous genitalia

Hermaphrodites

DEVELOPMENT OF PARTS OF FEMALE REPRODUCTIVE SYSTEM

1. Explain the precursor and migration of primordial germ cell.
2. Describe the location and division genital ridge.
3. Differentiate development of male and female genital tract. Describe the development of female genital ducts.
4. Discuss the development and differentiation of Paramesonephric ducts and development uterus and vagina.
5. Explain the developmental anomalies of female reproductive system.

Duplication of uterus

Cervical atresia

Vaginal atresia

Congenital adrenal hyperplasia

PLACENTA

1. Explain the placental barrier.
2. Describe a chorionic villus.
3. Explain the formation and structure of the mature placenta.
4. Discuss the maternal and fetal blood flow in the placenta.
5. Describe placental hormone production and identify the cellular components of the placenta that produce the hormones.

Physiology

1. MALE REPRODUCTIVE SYSTEM

Describe the Physiologic anatomy of the male reproductive system

Describe the process of spermatogenesis

Describe hormonal factors that stimulate spermatogenesis

Explain physiology of mature sperm

Describe function of seminal vesicles

Describe function of prostate gland

Describe the composition of seminal fluid

Describe the process of capacitation

Describe the acrosome reaction

Enlist factors effecting male fertility sperm count, morphology and motility

Describe the role of nervous, psychogenic stimuli in performance of male sexual act

Enumerate functions of testosterone :

- a. during fetal development

- b. during development of primary and secondary sexual characteristics in an adult male on other body tissues

Identify control functions of hypothalamus and anterior pituitary hormones

Discuss feedback regulation of hypothalamo-pituitary testicular axis in males

Diagrammatically represent the feedback regulation of hypothalamo-pituitary testicular axis in males

Briefly describe abnormalities of male sexual function

Describe briefly the role of pineal gland in sexual function

2, FEMALE REPRODUCTIVE SYSTEM

Describe the Physiologic anatomy of female reproductive organs

Name the female hormonal system

Describe the ovarian cycle

Illustrate the ovarian cycle diagrammatically

Describe the hormonal profile during the ovarian cycle

Label the graph of hormonal profile during the ovarian cycle

Describe the follicular and secretory phases of the menstrual cycle

Draw a labelled diagram of the endometrial cycle

Describe the Gonadotropic hormonal effects on the ovaries

Describe the process of ovulation

Describe the effects of ovulation on basal body temperature

Correlate the changes in the hormonal profile in order to initiate ovulation

Describe the physiological functions of corpus luteum

Describe the effects of estrogen on the female primary and secondary sexual characteristics

Describe the effects of estrogen on other body tissues

Describe the functions of progesterone

Describe the feedback regulation of the hypothalamic-pituitary-ovarian axis in the females

Diagrammatically represent the feedback regulation of hypothalamo-pituitary-ovarian axis in females

Briefly describe menarche puberty and menopause

Briefly describe abnormalities of the ovarian cycle

Briefly describe female fertility with regard to various methods of contraception

Briefly describe the etiological factors of female subfertility

2. PREGNANCY

Describe the process of fertilization of the ovum

Describe the factors that determine the sex of the fetus

Briefly describe the process of transportation and implantation of the fertilized ovum

Describe the hormonal functions of the placenta

Compare the normal corpus luteum to the corpus luteum of pregnancy

Briefly describe the hormonal changes in the mother in response to pregnancy

Describe the physiological effects on the body system of the mother during pregnancy

Describe parturition and the hormones effecting it

Briefly describe factors effecting uterine contractility

3. LACTATION

Describe the hormones effecting the structural development of breast during pregnancy

Describe the process of lactation

Describe the hormonal profile of a lactating mother

Briefly describe advantages of mothers' milk

FETAL AND NEONATAL PHYSIOLOGY

Briefly describe the physiology of development of organ systems in the fetus

Briefly describe the respiratory and circulatory adjustments of the infant to extra uterine life

Name the functional problems of the neonate due to immature development of various organ systems

Enumerate the special problems of prematurity in an infant

Biochemistry

1. Enumerate the gonadal hormones and explain chemistry and biosynthesis of androgens
2. Describe the mechanism of action and biochemical role of testosterone
3. Describe the chemistry, biosynthesis , mechanism of action and biochemical role estrogen
4. Discuss progestogenic hormones their chemistry, biosynthesis, mechanism of action and metabolic role
5. Enumerate the placental hormones .their chemistry and biosynthesis of
6. placental hormone
7. Describe chemistry , mechanism of action and metabolic role of relaxin
8. Describe chemistry , mechanism of action and role of human chorionic gonadotropin
9. Describe chemistry , mechanism of action and role of chorionic somatomammotropins
10. Describe chemistry,mechanism of action and role of FSH
11. Describe chemistry,mechanism of action and role of LH
12. Describe chemistry,mechanism of action of Prolactin

Practicals

1. Perform Beta HCG measurement for confirmation of pregnancy (urine and blood)
2. Interpret Blood assay of testosterone
3. Interpret Blood assay of estrogen
4. Interpret Blood assay of progesterone
5. Interpret serum level of FSH and LH
6. Interpret serum level of prolactin

Community Medicine

1. Outline the different family planning methods.
2. Describe appropriate use of different contraceptive methods in different scenarios.
3. Describe the importance of birth spacing.
4. Describe the three types of reproductive tract infections.
5. Describe the reproductive health issues of both male and female in adolescence.
6. Identify the global burden of reproductive health related diseases in adolescent and its preventive strategies.

Forensic medicine

1. Define Prematurity
2. Define Infanticide
3. Describe the differences between male and female pelvis
4. Define virginity, Defloration and false virgin
5. Describe the various types of Hyman
6. Describe the anatomical differences between virgin and non-virgin

7. Discuss the circumstances under in which the question of virginity would assume importance (Medico legal Importance).

Pathology

Male reproductive System:

1. Describe various congenital anomalies of male genital tract including
 - a. Penile malformations
 - b. Testicular malformation (cryptorchidism)
2. Describe inflammatory lesions of male reproductive tract including
 - a. Penile inflammatory lesions
 - b. Inflammatory lesions of testes
 - c. Prostatitis and etiopathogenesis of its types

B. Female reproductive system:

- a. **Lab work:** Histopathology of teratoama

Pharmacology

Hypothalamus:

1. Identify the hypothalamic hormones
2. Describe Pharmacological importance of Gonadotropin releasing hormone (GnRH)

Anterior Pituitary:

1. Pharmacological importance of Follicle stimulating hormone (FSH) and its clinical use
2. Pharmacological importance of Luteinizing hormone (LH) and its clinical use

Posterior pituitary:

Identify Prolactin and prolactin antagonists and its clinical use

Ovarian hormones

1. Identify estrogen and progesterone
2. Identify Anti estrogen and Anti progesterone
3. Pharmacological importance of estrogen and progesterone and their clinical use

Androgens

1. Describe and classify Androgens
2. Classify Anti Androgens
3. Pharmacological importance of testosterone and its clinical use

OBSTETRICS AND GYNAE

1. Define abnormalities of the menstrual cycle.i.e heavy menstrual bleeding, abnormal uterine bleeding and dysmenorrhea
2. Describe different anatomical developmental abnormalities of the female genital tract.
3. Co-relate irregularities of the menstrual cycle with the female hormone system.i.e amenorrhea and oligomenorrhoea
4. Enumerate the different methods of contraception.

Teaching and learning strategies:

The following teaching / learning methods are used to promote better understanding:

- Interactive Lectures
- Hospital / Clinic visits
- Small Group Discussion
- Skills session
- Self-Directed Study



Interactive lectures:

An interactive lecture is an easy way for instructors to intellectually engage and involve students as active participants in a lecture-based class of any size. Interactive lectures are classes in which the instructor breaks the lecture at least once per class to have students participate in an activity that lets them work directly with the material.

- The instructor might begin the interactive segment with an engagement trigger that captures and maintains student attention.
- Then the instructor incorporates an activity that allows students to apply what they have learned or give them a context for upcoming lecture material.
- As the instructor feels more comfortable using interactive techniques he or she might begin to call upon a blend of various interactive techniques all in one class period.

Hospital / Clinic visits:

In small groups, students observe patients with signs and symptoms in hospital or clinical settings. This helps students to relate knowledge of basic and clinical sciences of the relevant module.

Small group discussion (SGD):

The shy and less articulate are more able to contribute. Students learn from each other. Everyone gets more practice at expressing their ideas. A two way discussion is almost always more creative than individual thoughts. Social skills are practiced in a 'safe' environment e.g. tolerance, cooperation. This format helps students to clarify concepts acquire skills or attitudes. Students exchange opinions and apply knowledge gained from lectures, tutorials and self-study. The facilitator role is to ask probing questions, summarize, or rephrase to help clarify concepts.

Skills/Practical session:

Skills relevant to respective module are observed and practiced where applicable in skills laboratory or Laboratories of various departments.

Self-Directed learning (SDL):

Self-directed learning, which involves studying without direct supervision in a classroom/Library, is a valuable way to learn and is quickly growing in popularity among parents and students. Students' assume responsibilities of their own learning through individual study, sharing and discussing with peers, seeking information from Learning Resource Centre, teachers and resource persons within and outside the college. Students can utilize the time within the college scheduled hours of self-study.

Time tables:

The timetables for the module will be shared via Edmodo and the notice boards in advance.

Assessment tools:

Theoretical knowledge is tested by a written examination system constituted by multiple choice questions (MCQs). The assessment of practical knowledge involves oral, spot, or objective structured practical examinations (OSPE).

Multiple Choice Questions (MCQs):

- Multiple choice questions (MCQs) are a form of assessment for which students are asked to select the best choice from a list of answers.
- MCQ consists of a stem and a set of options. The stem is usually the first part of the assessment that presents the question as a problem to be solved; the question can be an incomplete statement which requires to be completed and can include a graph, a picture or any other relevant information. The options are the possible answers that the student can choose from, with the correct answer called the key and the incorrect answers called distractors.
- Correct answer carries one mark, and incorrect ‘zero mark’. There is NO negative marking.
- Students mark their responses on specified computer-based sheet designed for the college.

- The block exam will comprise of 120 MCQs and will be compiled according to the shared blueprint.

Objective Structured Practical Examination (OSPE):

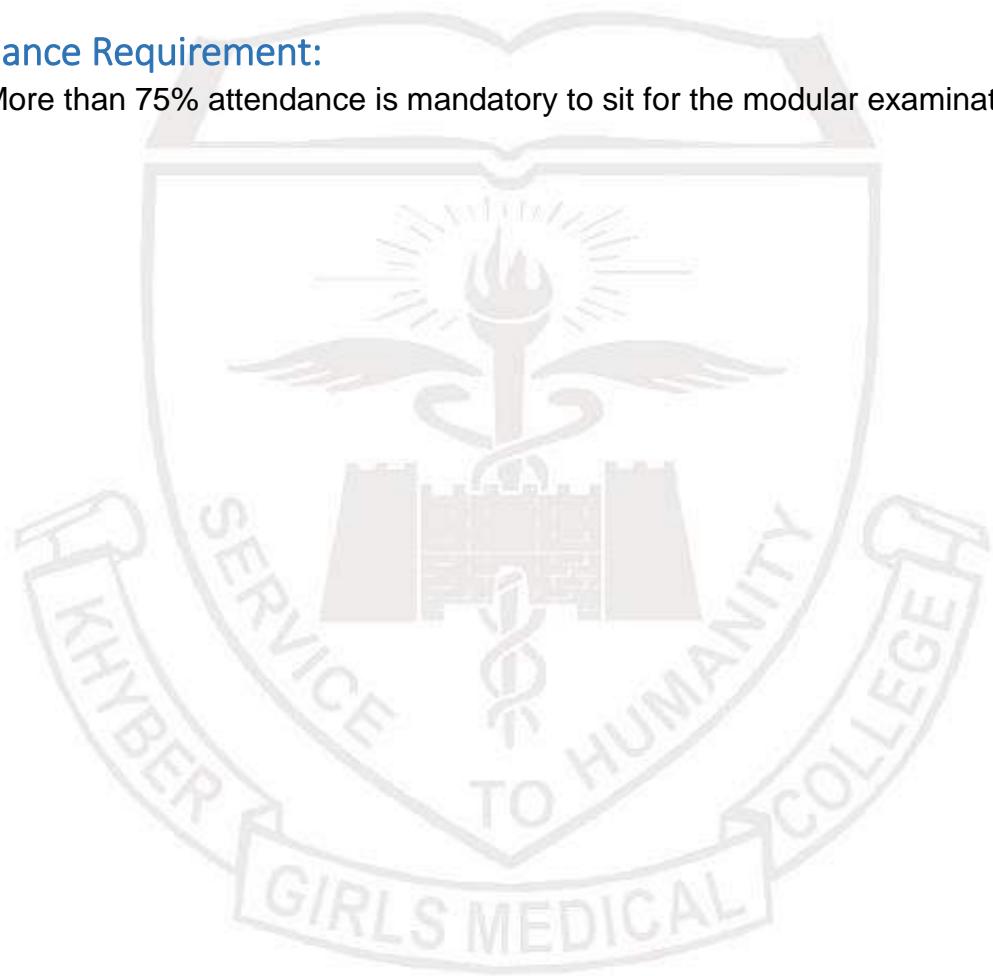
- The content may assess application of knowledge, or practical skills.
- Student will complete task in define time at one given station.
- All the students are assessed on the same content by the same examiner in the same allocated time.
- A structured examination will have observed, unobserved, interactive and rest stations.
- Observed and interactive stations will be assessed by internal or external examiners.
- Unobserved will be static stations in which students will have to answer the questions related to the given pictures, models or specimens the provided response sheet.
- Rest station is a station where there is no task given, and in this time student can organize his/her thoughts.
- The Block OSPE will be comprise of 18 examined station and 7 rest stations. The stations will be assigned according to the shred blueprint.

Internal Evaluation:

Internal evaluation is a process of quality review undertaken within an institution for its own ends. 10% marks of internal evaluation will be added to final marks. This 10% will be based on

Attendance Requirement:

More than 75% attendance is mandatory to sit for the modular examinations.



Learning resources:

The learning resources are as follows

Anatomy

- Clinical Anatomy by Regions by Richard S. Snell
- Gray's Anatomy for Students
- Langman's Medical Embryology-14thEdition
- The Developing Human "by Keith L Moore"-10thEdition
- Textbook of Histology by Juncqueira
- Atlas of human Histology by Wheaters. 11thEdition
- <http://www.anatomyzone.com/>,

<https://www.youtube.com/user/TheAnatomyZone>

Physiology

- Guyton and Hall Textbook of Medical Physiology
- Ganong's Review of Medical Physiology
- Human Physiology : Lauralee Sherwood

Biochemistry

- Textbook of medical biochemistry by Chatterjee-8thEdition
- Harpers Illustrated Biochemistry
- Lippincott's Illustrated Reviews: Biochemistry

Presentations for the classes and other relevant materials will be shared during the module via Edmodo.