MBBS
Year-II

Revised Curriculum
(Version-III)

National University of Medical Sciences
Pakistan

LIST OF CONTRIBUTORS

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1. Preamble

Integration has been accepted as an important educational strategy in medical education. NUMS believes in continuous curriculum revision through regular reviews and feedback of stakeholders. This curriculum has been updated with Correlation as a minimum level of integration in MBBS. This curriculum is outcome based, patient centered, community relevant, promotes health and prevents disease. It has been revised by the faculty of basic and clinical sciences from constituent/affiliated colleges in collaboration with NUMS Academic Directorate and NUMS department of Health Professions Education.

2. Curriculum perspective

NUMS curriculum is evolved taking into consideration constructivist and behaviorist with some element of cognitivist approach. It allows students to construct their own knowledge based on what they already know and to use that knowledge in purposeful activities requiring decision making, problem solving, and judgments.

3. Level of integration

NUMS will follow Correlation i.e level 7 of Harden's level of Integration in first four years. The emphasis remains on disciplines or subjects with subject-based courses taking up most of the curriculum time. Within this framework, an integrated teaching session or course is introduced in addition to the subject-based teaching. This session brings together areas of interest common to each of the subjects. Though the teaching is discipline based, topics are correlated and taught with clinical context for better understanding and application of concepts. However clinical teaching increases gradually with advancing years. MBBS Year V is for clerkships

4. Curricular organization and structure

a. NUMS MBBS curriculum in the first four years shall be delivered in a System Based Modular Format with clinical relevance. However, in year III & IV, students shall get clinical exposure through rotations in the wards and OPDs and in Year V through clerkships

b. There will be three blocks in year III, each will have modules, duration of which depends upon the number and complexity of the objectives to be achieved in that module

c. The curriculum will be delivered by modular teams of multidisciplinary basic science faculty and relevant clinical faculty.

d. The planning and delivery will be coordinated by year coordinators who will guide module coordinators of their respective years for efficient implementation

e. Modular Coordinator- responsible for teaching and assessment during each module. To be appointed by HoDs in coordination with HPE team

f. Clinical Coordinator - responsible for placement, teaching and assessment during clinical rotations

g. All NUMS colleges will provide study guides of each module to the students

h. To attain the integration in MBBS program, teaching shall be done in three spirals followed by Clerkships in final year

1) **Basics of Medicine (Spiral I -Years I & II):** The syllabus will be integrated horizontally around systems of the body in which Anatomy, Physiology and Biochemistry will be taught with clinical relevance. Additional chunks of content will be added in a module that exactly does not fit in the central theme of the module.
2) Longitudinal themes (Behavioral Sciences and Research Methodology & EBM) are an integral part of year I & II
3) Islamiat and Pakistan Studies are compulsory subjects taught throughout the year in first and second year respectively
4) Apart from attending daily scheduled sessions, students should engage in self-directed learning to achieve the desired objectives
5) Professional Exams are discipline based. In first Prof, Anatomy, Physiology and Biochemistry and in second prof, Anatomy, Physiology, Biochemistry and Islamiat/Pakistan Studies will be assessed

5. Competencies The focus of this curriculum is on the roles of a general physician as identified by PMC. These are skillful, knowledgeable, community health promoter, critical thinker, professional and role model, researcher and leader. Competencies focused in year I and II are: -

a. Medical Knowledge

b. Procedural skills

c. Problem solving

d. Communication skills

e. Professionalism

f. Research

6. Outcomes

By the end of years, I & II, students should be able to:

a. Correlate the developmental and anatomical knowledge of different organ systems of human body to their physiological and biochemical basis.

b. Comprehend the significance of behavioural sciences for medical students

c. Analyze multiple perspectives of Islamic studies or ethics and Pakistan studies

d. Discuss the basic principles of research

7. Academic Calendar Year II

Blocks	**I (13 weeks)**			II **(09 weeks)**		III **(12 weeks)**		
(34 wks)	05	07	01	08	01	06	05	01
Modules	Digestive System & Metabolism - I	Genitourinary System - I	**EOB**	Genetics & Neurosciences - I	**EOB**	Maxillofacial & Special Senses	Endocrinology	**EOB**
***Integration**:* Anatomy, Physiology, Biochemistry, relevant clinical disciplines								
***Across the year** : Behavioral Sciences, Research Methodology and Pakistan Studies*								

8. Proposed Contact Hours Distribution Year-II

SUBJECTS	**CONTACT HOURS**
Anatomy	250
Physiology	225
Biochemistry	125
Medicine & Allied	30

Surgery & Allied	30
Research Methodology & EBM	20
Pakistan Studies	15
*Behavioral Sciences **(Curriculum Separately Attached)**	75
Self-Directed Learning	100
Co-curricular activities	40
Total Hours	**910**

9. **Educational Strategies (These are proposed, but institutes can use other evidence-based teaching methodologies that suit their context)**
   a. Interactive Lectures
   b. Small group discussion
   c. Lab practical
   d. Skill lab
   e. Problem based learning/ Case based learning
   f. Tutorials
   g. Integrated sessions using any of the above strategies
   h. Self-directed learning (SDL) and directed self-learning(DSL)
10. **Resources**. To be filled in by the institute
    a. Faculty
    b. Facilities
    c. Administration for Course
    d. Administrative structure
    e. Communication with students

11. **Internal Assessment**

    Formative assessment (low stake) is at faculty discretion like mid module test and other class tests. There will be three end of blocks and one pre-annual examination in year II, which contributes towards the weighting of internal assessment i.e 20% in second professional MBBS Examination.

12. **Annual Professional Examination**.

    The University will take the first professional Examination at the end of the academic year. Annual Theory & Practical Examination will be of 200 marks for Anatomy, Physiology and Biochemistry each and 50 marks theory paper each of Islamiat and Pakistan Studies. The passing score is 50% in theory and practical separately.

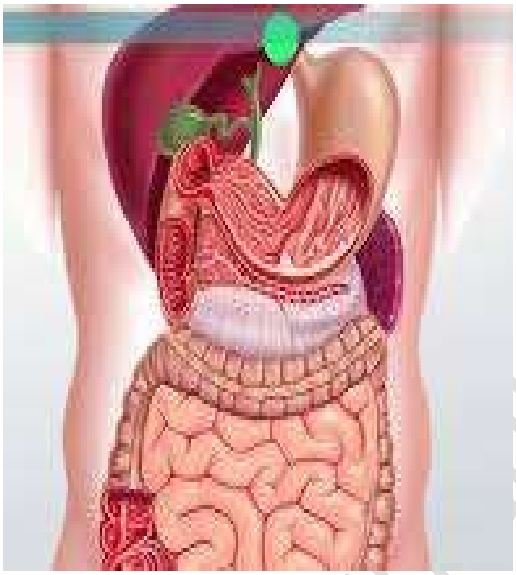
13. **Evaluation of the Course.** To be filled in by the institute.

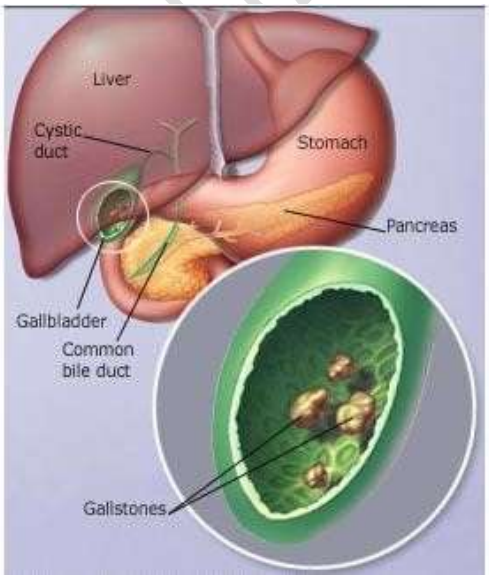
a. The major goals of the evaluation are to monitor quality of and improve curriculum
b. Student portfolio shall be maintained in the departments in which students will give their feedback either by name or anonymously. Feedback may be taken at the end of module, online and informal student feedback during the running module
c. Faculty suggestions if any, for improvement of training may be incorporated in the next session

14. Implementation of curriculum

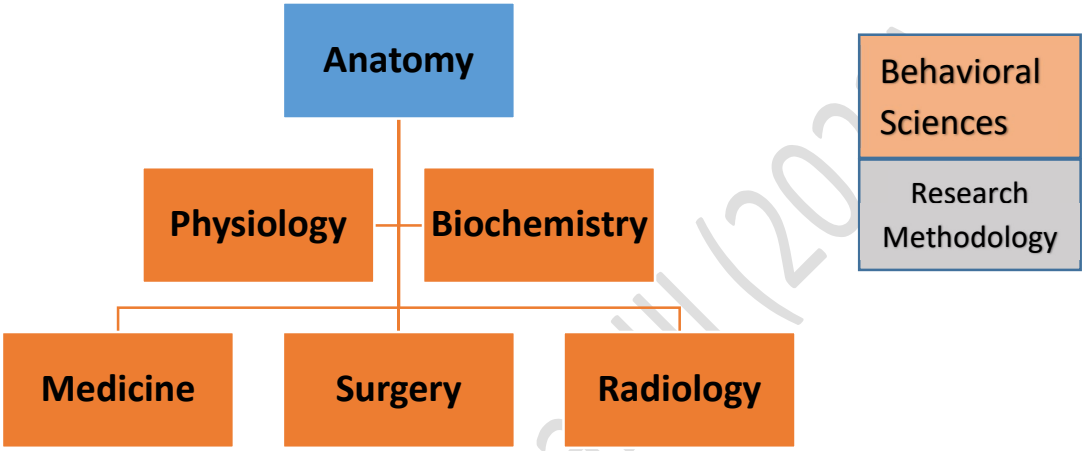
a. The university will give details of all content including learning outcomes, assessment blueprints, and table of specifications, distribution of which across the whole years and rotations is upon the discretion of the medical college/institute
b. Early clinical exposure may be achieved by allocating hours to skill labs, Medicine & Surgery ward visits in each module or patient may be brought before the students as per the decision of institute

MBBS YEAR II
BLOCK IV
MODULE VIII
Digestive system and Metabolism - I
Duration : 05 weeks





Integration of Disciplines in this Module



MODULE PLANNING COMMITTEE

Module Coordinator	***To be filled by the institutes***
Members	

Preamble

This module focuses on histo-morphological and embryological structure as well as physiological and biochemical functioning of digestive system. It also emphases on the carbohydrates' chemistry, metabolism, nutrition and role of vitamins in different metabolic disorders. It allows students to appraise integration and regulation of metabolic pathways in different tissues.

Learning process involves delivering the content with clinical relevance. At the very outset medical student should understand the importance of gastrointestinal system in the fields of Medicine. The Pakistan Studies, Research methodology and Behavioral Sciences will be taught as a part of the longitudinal theme.

Outcomes. By the end of this module, student should be able to:

1. Relate the gross anatomical, developmental & light microscopic features of GIT and Hepatobiliary system with their physiological functions and biochemical basis
2. Appraise the importance of carbohydrates' chemistry, metabolism, nutrition and vitamins in different metabolic disorders
3. Apply their relevant knowledge of this module in subsequent years of clinical training and practice

ANATOMY

Topic/ Theme	Learning outcomes	Learning Objectives/Contents	Instructional Strategies	Assessment tool
	By the end of this block, students should be able to:			
SPECIAL HISTOLOGY				
Introduction to GIT histology	Relate the normal microscopic structure of tubular digestive tract and associated glands with their functions and common clinical disorders.	**Knowledge** • Describe the general structural plan of alimentary canal	LGIS	MCQ SEQ SAQ
Histology of esophagus		**Knowledge** • Describe the histomorphological features of esophagus • Differentiate between 3 parts of esophagus microscopically	LGIS	MCQ SEQ SAQ Viva Voce
		Skill • Identify a slide of esophagus under a microscope • Illustrate its section on the journal • List two points of identification	Lab	OSPE SAQ Viva Voce
Histology of Stomach		**Knowledge** • Differentiate between a gastric gland and pit • Enumerate cells forming gastric glands • Describe the structure and function of cells forming gastric glands • Compare the histological structure of cardia, fundus and pylorus of stomach • Correlate a case of gastritis with pernicious anemia on basis of histology	LGIS	MCQ SEQ SAQ Viva Voce

		Skill • Identify slides of different regions of stomach under light microscope • Illustrate its section (fundus and pylorus) on the journal • List two points of identification	Lab	OSPE SAQ Viva Voce
Histology of small intestine		**Knowledge** • Describe the mucosal modifications of small intestine for carrying out its functions effectively (adaptive measures) • Describe the light microscopic structure of duodenum, jejunum and ileum • Tabulate the histological differences between duodenum, jejunum and ileum	LGIS	MCQ SEQ SAQ Viva Voce
		Skill • Identify the slides of duodenum, jejunum and ileum under microscope. • List two points of identification of each. • Illustrate the microscopic structure of these structures in the journal	Lab	OSPE SAQ Viva Voce
Histology of large intestine		**Knowledge** • Describe the histological structure of large intestine • Justify the increase in number of goblet cells in comparison with the decrease in the absorptive cells down the tract	LGIS	MCQ SEQ SAQ Viva Voce
		Skill • Identify the slides of appendix, and colon under microscope • List two points of identification of each • Illustrate the microscopic sections of colon and appendix in the journal	Lab	OSPE SAQ Viva Voce

Histology of liver & gall bladder		**Knowledge** • Describe the histological structure of liver & gall bladder • Correlate the common clinical conditions of liver and gall bladder with their normal histological features	LGIS	MCQ SEQ SAQ Viva Voce
		Skill • Identify the slides of liver and gall bladder under microscope • List two points of identification of each • Illustrate the microscopic structure of liver and gall bladder in journal.	Lab	OSPE SAQ Viva Voce
Histology of Pancreas		**Knowledge** • Describe the light microscopic structure of of pancreas	LGIS	MCQ SEQ SAQ Viva Voce
		Skill • Identify the section of pancreas on given slide under microscope • List two points of identification. • Illustrate the histological structure of pancreas in journal	Lab	OSPE SAQ Viva Voce
SPECIAL EMBRYOLOGY				
Development of foregut	Relate the developmental events of Gastrointestinal system and associated glands with embryological basis of relevant congenital anomalies	**Knowledge** • List derivatives of foregut • Describe the development of esophagus • Explain the embryological basis of the trachea- esophageal fistula, esophageal atresia and hiatal hernia • Describe the development of stomach with special reference to its rotations and relocation of both vagi • Enlist derivatives of ventral and dorsal mesentery of foregut • Explain the formation of lesser sac	LGIS	MCQ SEQ SAQ Viva Voce

		• Explain the embryological basis of pyloric stenosis • Describe the development of duodenum • Describe the development of liver, biliary apparatus and spleen • Explain the embryological basis of accessory hepatic ducts, duplication of gall bladder, extra and intra hepatic • Explain the development of pancreas • Explain the embryological basis of Annular pancreas and accessory pancreatic tissue.		
Development of midgut		**Knowledge** • List derivatives of mid gut • Describe physiological herniation with emphasis upon rationale behind its occurrence and reduction • Correlate the rotation of midgut loop with definitive positioning of mid gut derivatives in abdomen • Correlate development of midgut with abnormalities of mesenteries, vitelline duct abnormalities, gut rotation defects, gut atresia & stenosis • Differentiate between omphalocele, umbilical hernia and gastroschisis on the basis of embryology	LGIS	MCQ SEQ SAQ Viva Voce
Development of hindgut		**Knowledge** • List derivatives of hindgut • Describe the partitioning of cloaca and its consequences • Describe the development of derivatives of anorectal canal		MCQ SEQ SAQ Viva Voce
Development of digestive system	Correlate the knowledge of	**Skill**	SGD	OSPE Viva Voce

	development of digestive tract with three-dimensional spatial arrangement of developing structures with help of models.	• Identify parts of developing digestive system on given models and diagrams		
GROSS ANATOMY				
Anterior abdominal wall	• Correlate the topographic anatomy of Abdomen, Pelvis & Perineum with their functions and biochemical features and apply this knowledge for analyzing relevant clinical scenarios • Apply the knowledge and skill gained through dissection of cadavers & study of models and prosected specimens of abdomen, pelvis and perineum to learn the related basic surgical procedures, in subsequent years of training and practice • Outline the abdominal Viscera & main vessels on the surface of given subject by applying the gross anatomical	**<u>Knowledge</u>** • Identify nine regions of abdominal cavity to locate the topographic arrangement of underlying abdominal organ. • Explain the clinical importance of membranous layer of superficial fascia with anatomical reasoning. • Describe the attachments, & nerve supply and actions of muscles of anterolateral abdominal wall. • Describe the formation of rectus sheath at different levels of abdomen and enlist its contents. • Describe the blood supply, nerve supply & lymphatic drainage • of anterolateral abdominal wall • Describe various types of abdominal hernias	SGD	MCQ SEQ SAQ OSPE Viva Voce

	knowledge for evaluating the relevant clinical presentations • Comprehend the normal radiographic appearance of soft and bony tissues of abdomen & pelvis			
Inguinal Canal		**<u>Knowledge</u>** • Describe the extent and enlist the structures forming various walls of inguinal canal • Analyze the functions & mechanics of inguinal canal • List the structures passing through the inguinal canal in males and females • Differentiate between direct & indirect inguinal hernia with regards to their relation with age, predisposing factor, frequency, coverings on exit from abdominal cavity, course, & exit from anterior abdominal wall • Describe extent, coverings & contents of spermatic cord	SGD	MCQ SEQ SAQ OSPE Viva Voce
External Male genitalia		**<u>Knowledge</u>** • Explain the significance of pampiniform plexus • Describe the blood supply, lymphatic drainage and innervation of testis. • Trace the route for the involvement of different group of lymph nodes in the carcinoma of testis and scrotum • Define hydrocele, hematocele & varicocele • Justify the more common occurrence of varicocele on left	SGD	MCQ SEQ SAQ OSPE Viva Voce

		side of body with anatomical reasoning		
Peritoneum		**Knowledge** • Describe Peritoneum and its modifications • Enumerate intraperitoneal, extrapertinoeal, & secondarily retropertoneal organs. • Define following with one example each: Mesentry, Omentum, Ligaments, Folds, Recesses, Pouches, Gutters • Demonstrate the vertical and horizontal disposition of peritoneum on the model of abdomen and pelvis. • Demonstrate the attachment of greater & lesser omentum in the given model. • Demonstrate the differences in arrangement of peritoneum in males and females in the given model of pelvis • Explain peritoneal infection, adhesions & anatomical basis of spread of pathological fluid in various peritoneal compartments along with their surgical approach • Describe the basis of peritoneal pain with reference to its parietal and visceral layers	SGD	MCQ SEQ SAQ OSPE Viva Voce
Abdominal esophagus		**Knowledge** • Describe abdominal esophagus regarding its relations, blood supply, nerve supply and lymphatic drainage • Describe the anatomical basis of bleeding esophageal varices	SGD	MCQ SEQ SAQ OSPE Viva Voce
Stomach		**Knowledge** • Demonstrate the position & gross features of stomach on	SGD	MCQ SEQ SAQ OSPE Viva Voce

		the given model and identify the omenta attached • Describe the blood supply, nerve supply and lymphatic drainage of stomach • Enumerate the structures lying in stomach bed • Explain gastric and peptic ulcers with reference to their common locations and blood vessels endangered as a consequence of perforation		
Small Intestine		**<u>Knowledge</u>** • Describe the gross features relations, blood supply nerve supply and lymphatic drainage of various parts of small intestine • Differentiate between gross features of jejunum and ileum in tabulated form • Explain the common sites and the effects of perforation of ulcers affecting different parts of duodenum applying your knowledge of gross anatomy	SGD	MCQ SEQ SAQ OSPE Viva Voce
Large intestine		**<u>Knowledge</u>** • Differentiate between small and large intestine on gross inspection • Explain the topographic Anatomy of large intestine with the help of a model • Explain the clinical importance of variable positions of appendix with anatomical reasoning. • Analyze the clinical presentation of a scenario of appendicitis applying your knowledge of gross anatomy	SGD	MCQ SEQ SAQ OSPE Viva Voce

		• Define diverticulosis, volvulus, intussusception, cecostomy, & colostomy		
Blood supply of intestinal tract		**<u>Knowledge</u>** • Describe coeliac trunk with reference to its origin, branches and distribution • Describe superior mesenteric artery with reference to its origin, branches and distribution • Describe inferior mesenteric artery with reference to its origin, branches and distribution • Correlate the clinical problems occurring due to occlusion of GIT blood vessels with anatomical basis	SGD	MCQ SEQ SAQ OSPE Viva Voce
Hepatic portal system		• Describe the formation, relations, significance & tributaries of portal vein. • Describe the sites of porto-systemic shunts mentioning the names of veins involved. • Explain the role of porto-systemic anastomosis in portal hypertension	SGD	MCQ SEQ SAQ OSPE Viva Voce
Liver		**<u>Knowledge</u>** • Describe the position, lobes, size, shape, coverings and ligaments of liver. • Describe the dual • blood supply lymph drainage and nerve supply of liver • Correlate the concept of hepatic lobectomies and segmentectomy with • anatomical reasons • Identify the preferred site for liver biopsy and justify this preference with anatomical reasoning	SGD	MCQ SEQ SAQ OSPE Viva Voce

Hepatic biliary apparatus		**Knowledge** • Enumerate the components of Intra & Extra Hepatic Biliary Systems • Describe the gross features, relations and blood supply of gall bladder • Describe the formation, course and termination of common bile duct • Correlate the clinical presentation of gall stones and cholecystitis with anatomical knowledge	SGD	MCQ SEQ SAQ OSPE Viva Voce
Pancreas		**Knowledge** • Describe the location, parts relations and ducts of pancreas • Describe the blood supply, nerve supply, lymphatic drainage of pancreas. • Correlate the clinical scenario of obstructive jaundice with pancreatitis, obstruction of hepatopancreatic ampulla, cancer of head of pancreas & bile duct. • Justify the referred • pain of acute pancreatitis with anatomical reasoning	SGD	MCQ SEQ SAQ OSPE Viva Voce
Spleen		**Knowledge** • Describe location, relations, blood supply, nerve supply & lymphatic drainage of spleen, • Justify the direction of splenomegaly with anatomical knowledge of its ligaments • Justify the possibility of splenic rupture in case of fracture of lower left ribs	SGD	MCQ SEQ SAQ OSPE Viva Voce

Skills		• Identify the various organs, impressions, ligaments, nerves, muscles, blood vessels related to digestive system on given models and specimens.	SGD	OSPE Viva
Surface Anatomy		• Mark transpyloric, intercristal, subcostal and midclavicular planes on the abdomen of subject/model for delineation of abdominal regions • Mark the following on the surface of given subject: o Stomach o Liver o Pancreas o Duodenum o Spleen o Large intestine o McBurney's point	SGD	Viva Voce

LIST OF PRACTICALS:

S.No.	Practicals
Identify and illustrate the microscopic structure of following:	
1	Esophagus and Stomach
2	Cardiac end of stomach
3	Small Intestine
4	Colon and Appendix
5	Liver
6	Gall bladder and Pancreas
7	Anal canal

LEARNING RESOURCES:

a. Clinical Anatomy for Medical Students by Richard Snell (9th edition).
b. Basic Histology Text and Atlas by Luiz Carlos and Junqueira (14th edition)
c. Basic Histology by Laiq Hussain Siddiqui (5th Revised edition)
d. Medical Embryology by Langman (14th edition).
e. Essential Clinical Anatomy by Keith Moore (7th edition).
f. The Developing Human by Keith Moore (10th edition).

PHYSIOLOGY				
CONTENT AREAS	**LEARNING OUTCOMES**	**LEARNING OBJECTIVES**	**Instructional Strategies**	**ASSESSMENT TOOLS**
	By the end of the session, students will be able to			
Introduction to GIT physiology	Appraise physiologic anatomy of gastrointestinal tract with specific focus on role of interstitial cells of **Cajal**	• Discuss the physiologic anatomy of gastrointestinal tract • Identify the role of interstitial cells of Cajal in the electrical activity of G.I smooth muscle	LGIS CBL	MCQ SEQ/SAQ Viva voce
Action Potential in GIT smooth muscle	Link the role of different factors in in the generation of action potential in GI smooth muscle	• Differentiate between slow wave potentials and spike potentials in GIT • Explain the role of other factors like stretch, & paracrine hormones in the generation of action potential in GI smooth muscle	LGIS CBL	MCQ SEQ/SAQ Viva voce
Enteric Nervous system	Analyze the interplay of autonomic and enteric nervous system in GI functions	• Describe the organization of enteric nervous system and elaborate its role in control of G.I function • Appraise the role of ANS in controlling the gut motility and secretions. • Differentiate between myenteric and sub mucosal plexuses • Explain the autonomic control of G.I tract	LGIS CBL	MCQ SEQ/SAQ Viva voce

Mastication & **Swallowing**	Correlate the Pathophysiology of Mastication and deglutition with specified clinical presentations	The mechanism of chewing eflex • Describe the process of swallowing • Enumerate different phases of swallowing reflex and be able to make its flow diagram • Elaborate different steps occurring in the involuntary phase of swallowing • Identify the effects of pharyngeal phase of swallowing on respiration • Discuss how different types of peristalsis in oesophagus are taking place • Identify the importance of esophageal sphincter • Discuss the disorders of swallowing (dysphagia, achalasia) • Explain the pathophysiology of achalasia cardia	LGIS CBL	MCQ SEQ/SAQ Viva voce
Functions of stomach/ **Gastric emptying**	Correlate physiological basis of gastric functions with specified clinical conditions	• Enlist and discuss different functions of stomach • Discuss the role of basic electrical rhythm in regulation of G.I motility • Discuss the process and phases of stomach emptying • Explain the different factors regulating stomach emptying • Enlist different hormones secreted in stomach • Explain disorders of the stomach • Describe the mechanism of development of peptic ulcers • State the mechanism for damage to the gastric mucosal barrier by aspirin, bile acids, and Heliobacter pylori.	LGIS CBL	MCQ SEQ/PBQ Viva voce

Movements of small intestine	Categorize movements and functions of each part of small intestinal in detail	• Enlist secretory functions of small intestine • Differentiate between propulsive and mixing movements of small intestine • Identify the role of ileocecal valve • Describe different disorders of small intestine	LGIS CBL	MCQ SEQ/SAQ Viva voce
Movements of Large intestine	Correlate physiology of colon with specified clinical conditions	• Categorize different functions of large intestine • Compare the propulsive and mixing movements taking place in colon • Identify the role of gastrocolic and duodenocolic reflexes in regulation of mass movements • Enlist the secretory functions of large intestine and its nervous control	LGIS CBL	MCQ SEQ/SAQ Viva voce
Physiology of Gall bladder	Relate digestive functions of gall bladder with known diseases	• Enlist and explain the main functions of Gall bladder • Identify the factors affecting emptying of the gall bladder • Explain known diseases of Gall bladder	LGIS CBL	MCQ SEQ/SAQ Viva voce
Defecation Reflex	Explain the process and reflexes of defecation	• Explain the process of defecation • Explain the pathway of defecation reflex with the help of a flow diagram • Enlist and explain different types of defecation reflexes • Describe the pathophysiological basis of megacolon	LGIS CBL	MCQ SEQ/SAQ Viva voce
Hormones of GIT	Discuss different hormones from G.I.T and their regulation	• Classify different types of G.I hormones • Discuss the sites of secretion and stimuli for secretion of different hormones from G.I.T and their regulation	LGIS CBL	MCQ SEQ/SAQ Viva voce

Vomiting Reflex	Describe mechanism (stimuli, pathways, center) and clinical significance of vomiting reflex	• Enumerate the factors leading to the process of vomiting • Identify the location of vomiting center in the brain • Comprehend the vomiting reflex and make its flow diagram • Discuss the role of chemoreceptor trigger zone for initiating vomiting	LGIS CBL	MCQ SEQ/PBQ Viva voce
Functions of liver	Relate metabolic and non-metabolic functions of liver with different functions of GIT	• Enlist different functions of liver • Elaborate the metabolic and non-metabolic functions of liver and correlate with different functions of GIT	LGIS CBL	MCQ SEQ/SAQ Viva voce
Jaundice	Differentiate between types of jaundice on the basis of its physiology	• Identify and differentiate the types of jaundice and discuss physiological basis of each type.	LGIS CBL	MCQ SEQ/SAQ Viva voce
PRACTICALS	• Calculate BMI & Waist Circumference on SP and determine the Mean, Mode and Median for the batch • Examine abdomen on SP following correct sequence of inspection, palpation, percussion and auscultation			

BIOCHEMISTRY				
Topic/ Theme	**Learning Outcomes**	**Learning Objective/ Course Content**	**Instructional Strategies**	**Assessment Tool**
Biochemistry of Digestive Tract	Relate the biochemical knowledge of Gastrointestinal secretions to relevant disorders	• Elaborate the role of liver in the metabolism of bilirubin • Describe the composition, functions, daily secretion, stimulants and depressants of Saliva Gastric Juice, HCl Pancreatic Juice, Bile juice & Succus entericus, GIT hormones (gastrin, secretin, CCK) • Discuss the digestion and absorption of Carbohydrates, Proteins, Lipids & Nucleic acids in human body • Describe the biochemical disorders of GIT, e.g. achlorhydria, peptic ulcers, lactose intolerance, cholelithiasis andrelated disorders	Lectures/ SGD	MCQ SAQ/SEQ
Nutrition	• Appraise the nutritional requirements of each food constituent for better understanding of relevant disorders • Outline nutritional requirement in different commonly occurring disorders • Review hazards of under and over nutrition	• Give the caloric requirements of the human body • Define Balanced Diet and elaborate various DRIs (EAR, DA, AI, UL), AMDR • Explain the nutritional requirements in Pregnancy, Lactation, new-born and nutritional disorders, hypertension, diabetes, cirrhosis, end stage renal disease • Describe Protein turnover, amino acid Pool, Nitrogen Balance, BMR, BMI, Respiratory quotient, Protein Quality and Glycemic Index. • Describe the nutritional requirement and biomedical	• LECTURES • SGD • PBL • CBL	• MCQ • SAQ/SEQ

		importance of CHO, lipid & protein in human body • Define Malnutrition. Discuss Protein Energy Malnutrition in particular • Compare and contrast between Marasmus and Kwashiorkor		
Digestion and absorption of Carbohydrates	Discuss the digestion and absorption of Carbohydrates		• Lectures/ • SGD	• MCQ • SAQ/SEQ
Carbohydrate Chemistry	Analyze the significance of different carbohydrates in medicine	• Classify Carbohydrates and explain their Biochemical functions • Discuss the structure and functions of Monosaccharides and enumerate their various derivatives • Explain the structure and functions of Disaccharides with examples • Describe Oligosaccharides and their combination with other macromolecules • Enumerate important examples of Polysaccharides and give their biochemical role	• Lectures/ • SGD	• MCQ • SAQ/SEQ
Metabolism of Carbohydrates	Apply the knowledge of carbohydrate metabolism for understanding relevant metabolic disorders	• Outline the Phases reactions of Glycolysis and regulation of Glycolysis • Describe the bioenergetics of Aerobic and Anaerobic glycolysis and their biochemical importance • Discuss fate of Lactic acid & Pyruvate • Draw Cori's cycle • Outline the Citric Acid Cycle-Reactions • Describe the energetics, regulation, importance and	• Lectures/ • SGD	• MCQ • SAQ/SEQ

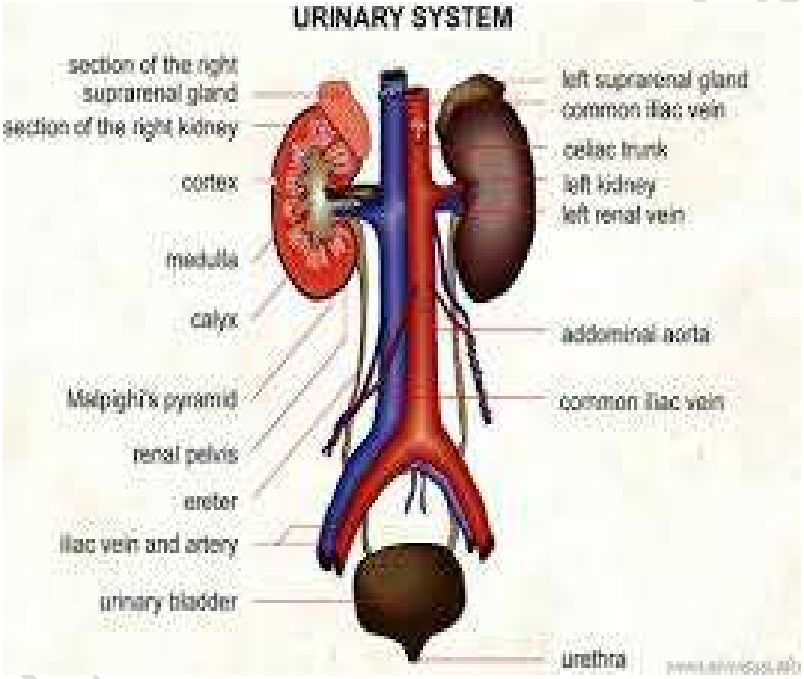
		amphibolic nature of citric acid cycle. • Discuss Gluconeogenesis & state the three important bypass reactions & significance of gluconeogenesis • Compare and contrast Glycolysis & gluconeogenesis • Discuss the Glycogen Metabolism & Write down the reactions of Glycogenesis and glycogenolysis. • Outline the importance of UDP-Glucose & regulation of Glycogen metabolism • Describe the disorders of Glycogen metabolism (Glycogen Storage Diseases) • Compare and contrast Glycogenesis and glycogenolysis • Describe Hexose Mono Phosphate Shunt, its reactions and importance • Explain Glucuronic acid pathway, its reactions and importance • Describe the metabolism of Fructose, Galactose and Lactose		
Integration and regulation of Metabolic Pathways in Different Tissues-Metabolism	Compare the role of different body organs in integration of metabolism in health and disease	• Discuss regulatory effects of Insulin and Glucagon on CHO metabolism. • Describe the regulation of Blood Glucose in human body • Explain Hyperglycemia, hypoglycemia and their regulating factors • Describe the Diabetes Mellitus, its Laboratory findings, Diagnosis and biochemical complications	• LECTURES • SGD • PBL • CBL	• MCQ • SAQ/SEQ

		• Describe Feed fast cycle and explain its adaptation by different tissues to changing energy conditions of the body • Describe the Integration and regulation of Metabolic Pathways in Different Tissues		
Practicals	Perform and interpret the results	• Estimation and clinical interpretation of Glucose in blood • Estimation and clinical interpretation of plasma enzyme Amylase • Experiments on Carbohydrates qualitative analysis-I • Molisch test • Experiments on Carbohydrates qualitative analysis-II • Benedicts test • Fehlings test • Experiments on Carbohydrates qualitative analysis-III • Iodine test • Seliwanoff test • Interpretation of Diet Chart and calculations of BMI • HbA1c Interpretation	Practical	

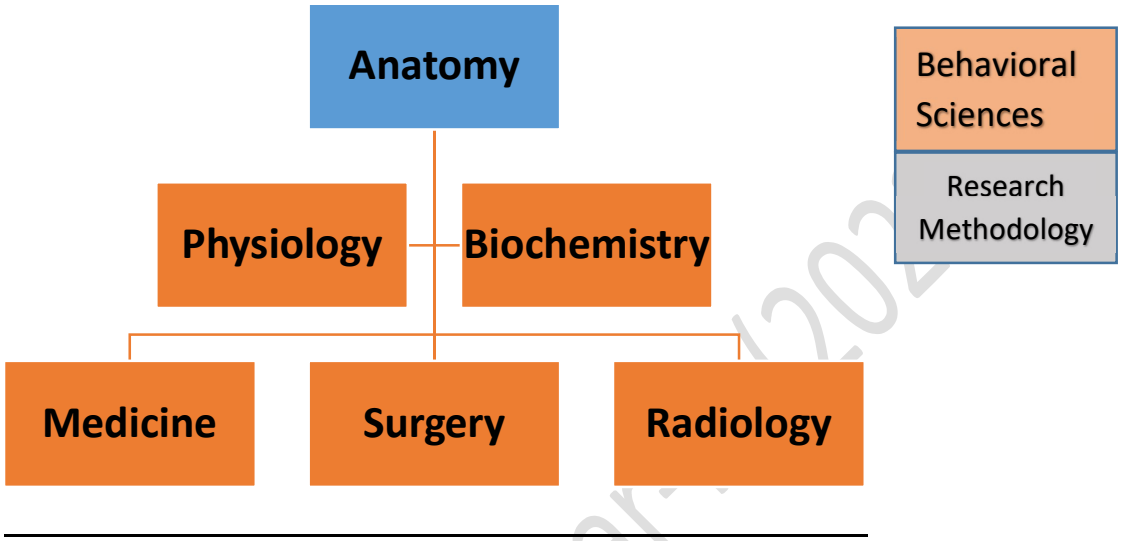
SURGERY				
Topic/ Theme	**Learning outcomes**	**Learning Objectives/Contents**	**Instructional strategies**	**Assessment tool**
Abdomen	• Apply anatomical knowledge in deciding about the preferred route of approaching the abdominal cavity in different clinical scenarios in practice • Correlate anatomical knowledge of abdominal wall in differentiating between different types of abdominal / groin hernias • Apply anatomical knowledge in formulating the differential diagnosis of abdominal pain • Correlate the anatomical knowledge of abdomen with relevant radiological presentation • Discuss presentations of anorectal abnormalities	• ABDOMINAL INCISIONS INCLUDING SPLENIC RUPTURE • ABDOMINAL/GROIN HERNIAS INCLUDING OMPHALOCELE • ACUTE ABDOMEN I 1. Cholecystitits 2. Diverticulitis 3. Appendicitis 4. Pancreatitis • ACUTE ABDOMEN II 1. Peritonitis (perforated ulcers/abdominal abscesses) 2. Intessusception 3. Mesenteric ischemia • DEVELOPMENTAL ANOMALIES OF GUT (INCLUDING ANORECTAL ANOMALIES/PANCREAS) • IMAGING OF THE ABDOMEN • DYSPHAGIA & TPN	• SGD • CBL/PBL	MCQ/ SAQ/SEQ/OSCE
MEDICINE				
Dyspepsia	Identify clinical presentation of GERD and Acid peptic disease	GERD Acid peptic disease	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Peptic ulcer	Identify clinical presentation of peptic ulcer	Peptic ulcer	Video clips / Lectures/	Formative assessment

			SGD/ CBL/PBL	
Malabsorption /chronic diarrhoea	Identify manifestations of malabsorption	• Coeliac disease • Chronic pancreatitis	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Jaundice	Differentiate between hemolytic, hepatocellular and obstructive jaundice with lab investigations and clinical presentation	Introduction to types of jaundice along with its investigation	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Cirrhosis liver	Identify clinical features of portal hypertension	Clinical features of portal hypertension	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Visit to ward	Observe the patient with relevant disorders Perform abdominal examination on patient		CBL	Formative assessment
RADIOLOGY				
Imaging of Abdomen and pelvis	Correlate the anatomical knowledge of abdomen with relevant radiological presentation	Identify normal appearance of GIT on: • Anteroposterior radiograph • Barium meal • Barium enema Identify cross sectional anatomy of GIT on: • CT scan • MRI scan	Video clips / Lectures/ SGD/ CBL/PBL	OSPE/ Formative assessment

MBBS YEAR II
BLOCK IV
MODULE IX
Genitourinary System Module
Duration : 07 weeks



Integration of Disciplines in this Module



MODULE PLANNING COMMITTEE

Module Director	***To be filled by the institutes***
Members	

Preamble

This module includes basic understanding of histo-morphological embryological and physiological basis of genitourinary system Learning process involves delivering the content with clinical relevance. Learning process involves delivering the content with clinical relevance. At the very outset medical student should understand the importance of genitourinary system in the fields of Medicine. The research methodology and Behavioral Sciences will be taught as a part of the longitudinal theme.

Learning Outcome:

By the end of this module, student should be able to correlate the physiological and biochemical concepts related to genitourinary system with their anatomical knowledge and apply their relevant knowledge of this module in subsequent years of clinical training and practice

ANATOMY				
Title/Theme	**Learning outcomes**	**Learning Objectives/Contents**	**MIT**	**Assessment tool**
	By the end of this block, students should be able to:			
SPECIAL HISTOLOGY				
Histology of Kidney	• Correlate the normal microscopic structure of urinary systems with its functions and apply this knowledge in understanding their altered structure in subsequent years of training and practice • Examine the slides of urinary system under light microscope at different magnifications and recognize their points of identification. • Relate the histomorphological features of reproductive system with their functions • Identify the histomorphological features of reproductive system under light microscope by focusing the slides at different magnifications	**<u>Knowledge</u>** • List parts of a uriniferous tubule and glomerulus • Locate the different parts of uriniferous tubule in cortex and medulla of kidney topographically • Describe the light microscopic structure of different parts of uriniferous tubule with special reference to epithelium • List the components forming filtration membrane and juxtaglomerular apparatus • Differentiate between cross section of PCT and DCT	LGIS	MCQ SEQ SAQ Viva Voce
		<u>Skill</u> • Identify the histological features of kidney on a slide under microscope • Write two points of identification • Draw a labeled diagram of identified tissue in journal	Lab	OSPE SAQ Viva Voce
Histology of ureter and urinary bladder		**<u>Knowledge</u>** • Describe the light microscopic structure of ureter (upper and lower parts) and urinary bladder	LGIS	MCQ SEQ SAQ Viva Voce
		<u>Skill</u> • Identify the histological features of Ureter & Urinary bladder under microscope • Write two points of identification • Draw a labeled diagram of identified tissue on histology notebook	Lab	OSPE SAQ Viva Voce

Histology of male reproductive system		**Knowledge** • Describe the histological features of testes and correlate the blood-testes barrier with its functions. • Explain the light microscopic features of male genital ducts. • Explain the light microscopic features of accessory glands of the male reproductive system • Apply the knowledge of histology to explain the clinical scenarios of Immotile cilia syndrome, benign prostatic hypertrophy and carcinoma of prostate	LGIS	MCQ SEQ SAQ Viva Voce
		Skill • Identify, differentiate and illustrate the light microscopic structure of o Testis o Epididymis o Vas deferens o Seminal vesicle o Prostate	Lab	OSPE SAQ Viva Voce
Histology of female reproductive system		**Knowledge** • Describe the light microscopic features of following female reproductive organs o Ovaries o Fallopian tubes o Uterus o Cervix o Vagina o Mammary gland	LGIS	MCQ SEQ SAQ Viva Voce
		Skill • Identify, differentiate and illustrate following components of female reproductive system. o Ovaries o Fallopian tubes o Uterus o Cervix o Vagina	Lab	OSPE SAQ Viva Voce

		○ Mammary gland		
SPECIAL EMBRYOLOGY				
Development of urinary system	• Correlate the developmental process of urinary system with embryological basis of relevant congenital anomalies • Compare the developmental events of male and female reproductive system and interpret the embryological basis of relevant congenital anomalies	• List the sources of urinary system • Interpret the following stages of development of kidneys briefly a. Pronephros b. Mesonephros c. Metanephros • Describe the development of definitive kidney with reference to the sources of different parts of uriniferous tubule, rotation and ascent of kidneys • Correlate following congenital anomalies with normal development a. Wilm's tumour b. Horseshoe kidney c. Pelvic kidney d. Poly cystic kidneys e. Ectopic/accessory kidney f. Malrotated kidney g. Agenesis of kidney • Enumerate different parts and derivatives of urogenital sinus • Enlist the sources of ureter, urinary bladder and urethra • Describe the development of urinary bladder • Explain the anatomical relationship of ductus deferens with ureter with embryological reasoning • Correlate various urachal anomalies, exstrophy of bladder and exstrophy of cloaca with normal development	LGIS	MCQ SEQ SAQ Viva Voce
Development of reproductive system		• Explain the indifferent stage of gonad development. • Explain the development and descent of testis.	LGIS	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		• Describe the embryological basis of cryptorchidism • Explain the development of ovaries • Describe the indifferent stage of genital ducts • Enumerate the derivatives of mesonephric duct, paramesonephric duct and urogenital sinus in males and females. • Explain the development of genital ducts in the male and female. • Apply the knowledge of embryology to explain the following congenital anomalies: ➢ Uterus didelphys ➢ Uterus arcuatus ➢ Uterus bicornis. ➢ Vaginal atresia • Describe the indifferent stage of external genitalia. • Explain the development of external genitalia in the male and female. • List common anomalies of the male genitalia. • Describe the embryological basis of hypospadias and epispadias. • Apply the knowledge of embryology to explain the basis and clinical presentation of following disorders of sexual development: ➢ Ambiguous genitalia ➢ Hermaphrodites ➢ Congenital adrenal hyperplasia. ➢ Gonadal dysgenesis.		

Skills	Correlate the knowledge of development of genitourinary system with three-dimensional spatial arrangement of developing structures	**Skill** Identify parts of developing genitourinary system on given models and diagrams showing different developmental phenomena	SGD	OSPE Viva Voce
GROSS ANATOMY				
Kidney and suprarenal glands	Correlate the topographic anatomy of posterior abdominal wall, urinary system, reproductive system, pelvis and perineum with presentation of relevant clinical scenarios	• Describe the gross features of kidney, relations, and its coverings • Draw and label the relations of anterior and posterior surfaces of both kidneys • Identify the impressions of surrounding structures on both kidneys in the given model. • Describe the blood supply, nerve supply, & lymphatic drainage of kidney • Describe the possible routes of spread of perinephric abscess • Explain the anatomical basis of typical renal colic • Describe location, gross features, relations, blood supply, nerve supply, & lymphatic drainage of suprarenal glands • Explain surgical significance of renal fascia and separate compartment for suprarenal gland	SGD	MCQ SEQ SAQ OSPE Viva Voce
Ureter		• Describe the gross features, relations, & course of both ureters on the model / specimen while emphasizing upon its constrictions. • Describe the blood and nerve supply of ureter. • Explain the anatomical basis of ureteric stone impaction	SGD	MCQ SEQ SAQ OSPE Viva Voce

		• Justify referred pain of ureteric colic with anatomical reasoning		
Lumbar vertebral column and nerves of posterior abdominal wall		• Describe the fascia of posterior abdominal wall • Distinguish lumbar vertebrae from cervical & thoracic vertebrae • Describe anatomical features of a typical lumbar vertebra	SGD	MCQ SEQ SAQ OSPE Viva Voce
Muscles of posterior abdominal wall		• Explain the origin, insertion, nerve supply and actions of muscles of posterior abdominal wall • Describe the fascial lining of the abdominal walls • Analyze the anatomical basis of a case of psoas abscess and its spread	SGD	MCQ SEQ SAQ OSPE Viva Voce
Major vessels of posterior abdominal wall		• Describe the extent, relations, and branches of abdominal aorta along with their distribution. • Describe the obliteration of abdominal aorta & iliac arteries. • Explain formation, & tributaries of inferior vena cava • Identify the abdominal relations of inferior vena cava in the given model. • Explain the collateral routes for abdominopelvic venous blood & compression of inferior vena cava. • Define aortic aneurysm. Identify the common site of abdominal aortic aneurysm	SGD	MCQ SEQ SAQ OSPE Viva Voce
Lymphatic drainage of abdomen		• Name the groups of lymph nodes draining the abdomen. • Describe the terminal group of lymph nodes around abdominal aorta	SGD	MCQ SEQ SAQ OSPE Viva Voce

		• Describe the lymphatic trunks, cisterna chili & commencement of the thoracic duct. • Differentiate between the location and area of drainage of pre and para-aortic lymph nodes • Explain the continuity of abdominal lymphatic system with other regions with reference to spread of malignancy and infection of various abdominal organs		
Pelvic walls		• Describe the boundaries of true and false pelvis. • Explain the bony landmarks & sites of muscular attachments on sacrum • List the anatomical landmarks measured while performing internal pelvimetry • Justify occurrence of low back pain in sacroiliac joint disease • Describe the type, articulations, ligaments & movements of joints of pelvis. • List the structures commonly injured in a patient of pelvic fracture. • Enumerate the structures forming pelvic diaphragm. • Describe the origin, insertion, nerve supply & actions of muscles of pelvic walls & floor • Explain the functional significance of pelvic floor in females • Analyze the clinical presentation of a case of injury to pelvic floor with anatomical reasoning	SGD	MCQ SEQ SAQ OSPE Viva Voce
Pelvic organs		• Describe relation, blood supply, lymphatic drainage and nerve supply of sigmoid colon • Describe the relations, peritoneal reflections, curvatures, blood	SGD	MCQSEQ SAQ OSPE Viva Voce

		supply, lymphatic drainage & nerve supply of rectum • List the structures palpated in males and females while performing rectal examination • Describe the gross features, peritoneal covering, blood supply nerve supply and lymphatic drainage of urinary bladder • Identify the anatomical routes of possible spread of bladder cancer • Differentiate between the relations of urinary bladder in models of both genders. • Enumerate the structures visualized during cystoscopy • Identify the site commonly selected for suprapubic aspiration of urine • Define vasectomy and its clinical importance • Explain the Anatomy of prostate with reference to its surfaces, lobes, relations, blood supply, nerve supply and lymphatic drainage of prostate • Identify the parts of prostate most likely to be involved in benign and malignant growths of prostate • Justify the metastasis of carcinoma of prostate to vertebral column & cranial cavity on basis of venous drainage • Describe the blood supply, nerve supply, lymphatic drainage of ovaries and fallopian tubes • Correlate the anatomy of female genital tract with hysterosalpingography, ligation of uterine tubes, ectopic tubal pregnancy • Describe the parts, ligaments, relations and support of uterus		

		• Describe blood supply, nerve supply, & lymphatic drainage of uterus • Comprehend a case of uterine prolapse on the basis • of gross anatomy of uterus and its supports • Define hysterectomy and explain the precautionary measures to be taken necessarily during this procedure • Identify the anatomical routes for spread of malignancies of uterus, cervix and ovary • Illustrate sacral plexus showing its branches • List the branches of internal iliac artery • Enumerate different groups of lymph nodes of pelvis. • Explain the role of lymphatics and lymph nodes in spread of malignancies of pelvis		
Perineum		• Define perineum. Identify its borders, relations & divisions • Explain the boundaries of superficial and deep perineal pouches and enumerate their contents in both genders • Illustrate the cutaneous nerves of the perineum. • Define perineal body. List structures attached with it. Justify its clinical importance • Describe the relations, internal features, blood supply, lymphatic drainage, & innervation of anal canal • Differentiate between clinical presentation of internal and external hemorrhoids on anatomical basis	SGD	MCQ SEQ SAQ OSPE Viva Voce

		• Elucidate perianal hematoma, fissure, abscess and fistulas of anal canal with anatomical basis of their occurrence and presentation • Justify the anatomical reasoning of anorectal incontinence • Describe the boundaries, contents & recesses of ischiorectal fossa • Justify the possible routes of spread of ischiorectal abscess with anatomical reasoning • Explain area of anesthesia, indications, & list steps of • pudendal nerve block • Describe the gross features of vagina including relations, blood supply, nerve supply & supports • Apply the anatomical knowledge in analyzing a case of vaginal prolapse (cystocele and rectocele, and vaginal fistula • Define culdocentecis and describe its diagnostic and therapeutic importance • Explain gross features of all parts of male & female urethra, its arterial supply, venous drainage & nerve supply • Apply anatomical reasoning in justifying the route of extravasation of urine in case of injury to different parts of male urethra • List the anatomical structures encountered while performing urethral catheterization • List parts of external genitalia and describe their blood and nerve supply • Provide the anatomical basis of presentation of Bartholin cyst		

Application of knowledge on models/specimen		**Skills** • Identify the various organs, impressions, ligaments, nerves, muscles, blood vessels related to renal system, pelvis and perineum on given models and specimens. • Differentiate b/w anatomical features of male & female pelvis in the given model • Demonstrate the orientation of pelvic girdle. • Demonstrate the features of bony pelvis in the given model • Demonstrate boundaries of pelvic inlet and pelvic outlet	SGD	OSPE Viva
Surface Anatomy		**Skill** • Mark the following on the surface of given subject: • Kidneys • Suprarenal glands • Ureter • Abdominal aorta • Inferior vena cava	SGD	Viva Voce

Practicals	
Identify and illustrate the microscopic structure of following:	
1	Kidney
2	Ureter & urinary bladder
3	Testis & Epididymis
4	Ductus deferens & Prostate
5	Ovary & Fallopian tube
6	Uterus ,and Vagina
7	Mammary gland

LEARNING RESOURCES:

a. Clinical Anatomy for Medical Students by Richard Snell (9th edition).
b. Basic Histology Text and Atlas by Luiz Carlos and Junqueira (14th edition)
c. Basic Histology by Laiq Hussain Siddiqui (5th Revised edition)
d. Medical Embryology by Langman (14th edition).
e. Essential Clinical Anatomy by Keith Moore (7th edition).
f. The Developing Human by Keith Moore (10th edition).

PHYSIOLOGY				
Topics	**Learning Outcomes**	**Learning Objectives**	**MIT**	**ASSESSMENT TOOLS**
	By the end of the session, students will be able to			
Body fluid compartments -I	1. Relate pathophysiological basis of water balance in the body with its clinical implications (dehydration, vomiting, hemorrhage, SIADH) 2. Elucidate edema types, clinical significance and factors responsible for causing edema 3. Recognize functions of kidneys. 4. Correlate plasma clearance methods to quantify kidney functions 5. Explain regulation of BP 6. Analyze the mechanical and Neural control of micturition process. 7. Analyze the process of urine formation, concentration and dilution 8. Diagnose acid base disorders on clinical scenarios and arterial blood gas analysis	**KNOWLEDGE** • Explain total body water content and its distribution in different body compartments • Quantify daily intake and output of water from body • Compare and contrast the ionic composition of ECF and ICF • Explain the indicator dilution principle for the measurement of fluid volumes in the different body fluid compartments	LGIS CBL	MCQ SEQ/SAQ Viva voce
Regulation of fluid exchange between ICF &ECF		**KNOWLEDGE** • Given the capillary and Bowman's capsule hydrostatic and oncotic pressures, calculate the net filtration force at the glomerular capillaries. • Predict the changes in glomerular filtration caused by increases or decreases in any of those pressures • Explain the effects of adding isotonic, hypotonic and hypertonic solution (to ECF) on ICF and ECF compartments	LGIS CBL	MCQ SEQ/SAQ Viva voce

Edema		**KNOWLEDGE** • Explain the role of Starling forces in the development/ prevention of edema • Correlate role of lymphatics with prevention of edema • Appreciate the significance of edema safety factor • Discuss the mechanism of fluid accumulation in the potential spaces • Compare and contrast the intracellular and extracellular edema	LGIS CBL	MCQ SEQ/SAQ Viva voce
Functional anatomy of renal system		**KNOWLEDGE** • Given a cross section of a kidney, identify the renal cortex, medulla, calyces, medullary pyramids, renal pelvis, renal artery, renal vein, and ureter. • Describe in sequence the tubular segments through which ultrafiltrate flows • Distinguish between cortical and juxtamedullary nephrons. • Identify the structures of the glomerular tuft: the afferent and efferent arterioles, glomerular capillary network, mesangium, Bowman's capsule, and the juxtaglomerular apparatus (including macula densa). • Enlist the functions of kidneys	• LGIS • CBL	• MCQ • SEQ/SAQ • Viva voce
Micturition		**KNOWLEDGE** • Identify the physiological anatomy and nervous connections of the bladder	LGIS CBL	MCQ SEQ/SAQ Viva voce

		• Explain the filling of the bladder and bladder wall tone; the cystometrogram • Discuss the micturition reflex and facilitation or inhibition of micturition by the brain • Describe the abnormalities of micturition		
GFR		• Describe the three layers comprising the glomerular filtration barrier, and identify podocytes, foot processes, slits, and the basement membrane. • Describe the composition of the glomerular filtrate • Discuss the determinants of the GFR • Explain the physiological control of glomerular filtration and renal blood flow	LGIS CBL	MCQ SEQ/SAQ Viva voce
Renal Blood Flow		**KNOWLEDGE** • Describe in sequence the blood vessels through which blood flows when passing from the renal artery to the renal vein, including the glomerular blood vessels, peritubular capillaries, and the vasa recta.	LGIS CBL	MCQ SEQ/SAQ Viva voce
Auto regulation of GFR		**KNOWLEDGE** • Describe the myogenic, humoral and tubuloglomerular feedback mechanisms that mediate the autoregulation of renal plasma flow and glomerular filtration rate.	LGIS CBL	MCQ SEQ/PBQ Viva voce
Processing of Glomerular Filtrate & Regulation of tubular reabsorption		**KNOWLEDGE** • Describe reabsorption and secretion by the renal tubules • Describe the function of the following renal transporters and their predominant localization along the tubules	LGIS CBL	MCQ SEQ/SAQ Viva voce

		with regard to nephron segment and apical versus basolateral membranes • Transport ATPases (Na+/K+-ATPase, --H+/K+-ATPase, H+-ATPase, and Ca2+-ATPase), • Ion and water channels (K+, ENaC, Cl, Ca2+, aquaporins) , • Coupled transporters (Na+-glucose, Na+/H+-antiporter, Na+-K+-2Cl--symporter, Na+-phosphate symporter, Na+-Cl--symporter, Na+-HCO3--symporter, Cl-/HCO3--antiporter) • Describe the effects of different hormones on renal tubules		
Renal Clearance		**KNOWLEDGE** • Identify the use of clearance methods to quantify kidney function • Describe the estimation of GFR by inulin clearance, and plasma creatinine clearance • Discuss PAH clearance for estimation of renal plasma flow • Be able to calculate filtration fraction, tubular reabsorption and secretion from renal clearance	LGIS CBL	MCQ SEQ/SAQ Viva voce
Formation of Dilute Urine		**KNOWLEDGE** • Define the obligatory urine volume • To be able to explain the formation of dilute urine • Discuss the control of extracellular fluid osmolarity and sodium concentration by kidneys	LGIS CBL	MCQ SEQ/PBQ OSPE Viva voce
Renal Regulation of Osmolarity I			LGIS CBL	MCQ SEQ/PBQ Viva voce

		• Elaborate osmoreceptor-ADH feedback system • Identify role of thirst in controlling extracellular fluid osmolarity and sodium concentration		
Renal Regulation of blood volume		**KNOWLEDGE** • Describe the role of angiotensin II and aldosterone in controlling extracellular fluid osmolarity, blood volume and sodium concentration	LGIS CBL	MCQ SEQ/PBQ Viva voce
Acid base disorders I		**KNOWLEDGE** • Discuss the Renal Correction of acidosis—increased excretion of hydrogen ions and addition of bicarbonate ions to the extracellular fluid	LGIS CBL	MCQ SEQ/SAQ Viva voce
Acid base disorders II		**KNOWLEDGE** • Discuss the renal correction of alkalosis—decreased tubular secretion of hydrogen ions and increased excretion of bicarbonate ions • Identify and explain causes of acid base disorders • Gain concept of anion gap	LGIS CBL	MCQ SEQ/SAQ Viva voce
Reulation of K+ Concentration		**KNOWLEDGE** • Discuss the regulation of internal potassium distribution • Describe the mechanism of potassium secretion by principal cells of late distal and cortical collecting tubules • Describe the factors that regulate K+ secretion in the collecting duct (i.e., aldosterone, plasma K+) and distinguish these from factors that alter K+ secretion at this site (i.e., luminal fluid flow rate, acid-base disturbances, anion delivery).	LGIS CBL	MCQ SEQ/SAQ Viva voce

Regulation of calcium, phosphate and magnesium (Ca+ PO+4 & Mg++)		**KNOWLEDGE** • To be able to comprehend the regulation of calcium by renal tubules • Be able to explain the role of parathyroid hormone in calcium regulation • Discuss the renal regulation of phosphate and magnesium.	LGIS CBL	MCQ SEQ/SAQ Viva voce
Formation of Concentrated Urine I		**KNOWLEDGE** • Enumerate requirements for excreting a concentrated urine—high ADH levels and hyperosmotic renal medulla • Discuss the countercurrent mechanism for generating a hyperosmotic renal medullary interstitium • Identify and explain the role of distal tubule and collecting ducts in excreting a concentrated urine	LGIS CBL	MCQ SEQ/SAQ Viva voce
Formation of Concentrated Urine II		**KNOWLEDGE** • Discuss the role of urea and explain urea cycle for generating hyperosmotic renal medullary interstitium and in the formation of concentrated urine • Describe the countercurrent exchange in the vasa recta in preservation of hyperosmolarity of the renal medulla • Explain the concentrating mechanisms and changes in osmolarity in different segments of the tubule • To be able to quantify renal urine concentration and dilution: "Free Water" and osmolar clearances	LGIS CBL	MCQ SEQ/SAQ Viva voce

		• Discuss the disorders of urine concentrating ability		
Renal Failure		**KNOWLEDGE** • To be able to explain acute & chronic renal failure (including nephritic and nephrotic sysndrome) • Explain the basics of dialysis • Differentiate between peritoneal and hemodialysis.	LGIS CBL	MCQ SEQ/SAQ Viva voce
PHYSIOLOGY - REPRODUCTIVE SYSTEM				
Male reproductive physiology	Describe the male reproductive functions and related abnormalities.	• Explain the functional anatomy of the male reproductive organs • Describe the process of spermatogenesis • Explain the function of the seminal vesicles and prostate gland • Explain the abnormalities of spermatogenesis and male fertility and their pathophysiological basis • Describe the secretion and functions of testosterone and feedback loop regulating its secretion.	• Lectures • SGD • CBL	MCQ/SAQ/ SEQ/ structured Viva
Female reproductive system	Describe the female reproductive functions and the related abnormalities.	• Summarize the functional anatomy of the female sexual organs • Enlist the ovarian hormones • Describe the functions of estrogen and progesterone • Explain the monthly ovarian cycle and the role of the gonadotropic hormones • Summarize the regulation of the female monthly rhythm and the interplay between the ovarian	• Lectures • SGD • PBL/CBL	MCQ/SAQ/ SEQ/ Viva

		and hypothalamic-pituitary hormones in the feedback regulation of monthly ovarian cycle • Explain puberty and menarche and menopause		
Pregnancy	Appreciate the physiological phenomenon underlying pregnancy, parturition and lactation	• Describe maturation and fertilization of the ovum • Explain the process of transport of the fertilized ovum in the fallopian tube • Describe the implantation of the blastocyst in the uterus and early nutrition of the embryo • Summarize the response of the mother's body to pregnancy • Explain the changes in the maternal circulatory system during pregnancy • Explain the role of human chorionic gonadotropin in pregnancy • Describe the placental hormones and their significance	• Lectures • SGD • PBL/CBL	MCQ/SAQ/ SEQ/ Viva
Parturition & Lactation		• Explain parturition and onset of labor and the hormones regulating it • Explain the mechanism of lactation and the hormones regulating it	• Lectures • SGD • PBL/CBL	MCQ/SAQ/ SEQ/ Viva
Neonatal physiology	Appreciate the physiological basis of fetal growth and neonatal adjustment to extra-uterine life	• Summarize the growth and functional development of the fetus • Explain the adjustments of the infant to extra-uterine life • Describe circulatory readjustments at birth	• Lectures • SGD • PBL/CBL	MCQ/SAQ/ SEQ/ Viva

PRACTICALS

- Interpret metabolic acidosis and alkalosis on an Arterial Blood Gases report
- Estimate urine specific gravity on a given sample
- Perform pregnancy test by kit and urinary dipstick method

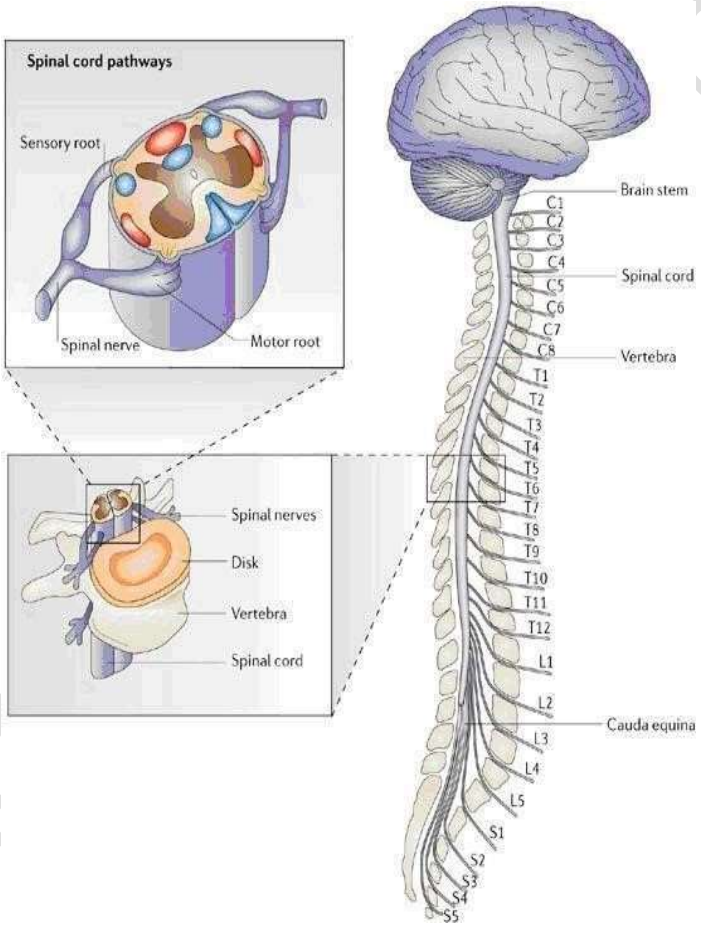
BIOCHEMISTRY				
Body Fluids + Water & Electrolyte	Appraise the impact of water and electrolyte imbalances on human health	➢ Discuss biochemistry of water, fluid haemostasis, electrolyte balance and acid base haemostasis ➢ Describe Ionization of water & weak acids, bases, pH pK values, pH scale, Dissociation constant & titration curve of weak acids ➢ Apply Henderson-Hasselbalch Equation ➢ Explain the mechanism of Buffering and pH homeostasis ➢ Enumerate various types of particles and solutions in relation to the importance of selectively permeable membranes ➢ Describe the importance of selectively permeable membranes, osmosis, osmotic pressure, surface tension, viscosity & their importance related to body fluids ➢ Explain the Distribution of body water in various compartments ➢ Enlist different functions of water in human body ➢ Explain Regulation of water balance in body. ➢ Explain clinical conditions of Hyper and hyponatremia, hypo/hyperkalemia and hypo/hyper magnesemia ➢ Describe the role of buffer system, lungs & kidney in PH maintenance in human body	• LECTURES • PBL • CBL • SGD	MCQ/ SAQ/SEQ
Acid base balance	Appraise the impact of Acid base balance	➢ Comprehend Acid base disorders and blood pressure	• Lecture/ SGD/ CBL	MCQ/ SAQ/ SEQ

	imbalances on human health	➢ Discuss various Disorders of acid base balance ➢ Describe Anion Gap and its clinical significance		
Biochemistry of Reproductive System	Appraise the basic principles of sex hormones along with the biochemical basis and related abnormalities	➢ Explain the Site of synthesis, stimulus for secretion, mechanism of action, receptors, intracellular effects, target cells, tissues and biochemical role & hypo/hyper secretion Androgens & Estrogens.	• LECTURES • SGD • PBL • CBL	• MCQ SAQ/SEQ
Practical	• Urine analysis (physical, chemical and microscopic examination) • Physical examination of urine • Chemical examination of Urine-Ehrlich's test • Chemical Examination of Urine - Rothera's • Nitropruside Test		Practical	OSPE
	• Justify the use of different solutions in clinical practice			
	• Demonstrate the working and application of pH metery			
	• Interpret the Urine report			
	• Interpretation of ABGs			

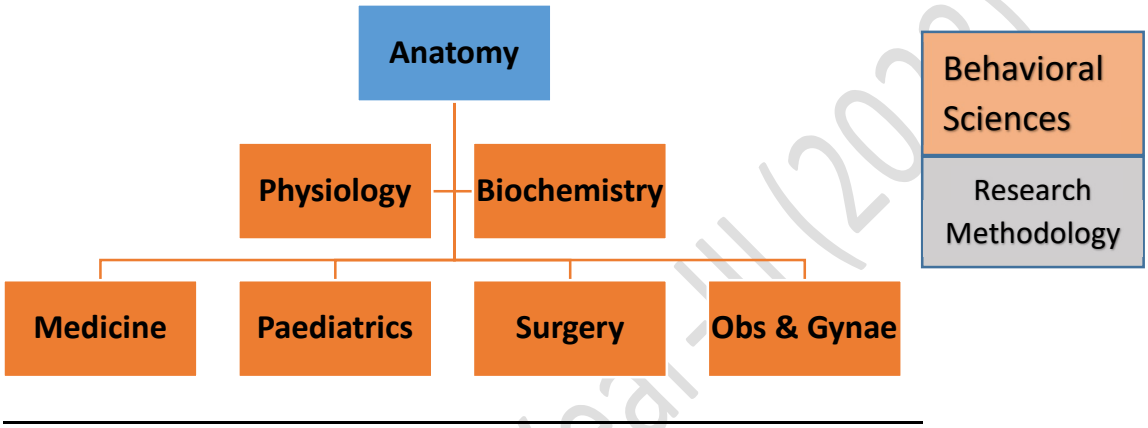
Surgery				
Ureteric colic		• Identify the typical clinical presentation of urological colic • List risk factors for the most common types of kidney stones Explain the rationale behind referred pain of ureteric colic • List common sites of impaction of renal stone	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Benign Prostate Hyperplasia	Relate the clinical presentation of Benign Prostate Hyperplasia with their basic relevant knowledge	• Discuss the clinical presentation of Benign Prostate Hyperplasia on the basis of their basic relevant knowledge	Video clips / Lectures/ SGD/ CBL/PBL	
Visit to ward	• Observe the patient with relevant disorders		CBL	
Medicine				
Renal Failure	Identify clinical presentations of renal failure	Clinical presentation of: • Ac Renal Failure • Ch Renal Failure	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Visit to medical ward	Observe the patient with relevant disorders		CBL	
RADIOLOGY				
Imaging of Abdomen and pelvis	Correlate the anatomical knowledge of pelvis and perineum with relevant radiological presentation	• Identify different parts of urinary tract on IVP • Identify normal appearance of viscera of pelvis on radiographs • Identify normal appearance of viscera in pelvis on ➢ CT scan ➢ MRI scan	LGIS	• MCQ • OSPE • Viva Voce

		• Identify normal appearance of viscera in pelvis in ➢ USG RADIOGRAPHS (hysterosalpingogram)		

MBBS YEAR II
BLOCK V
MODULE X
Genetics & Neuroscience I
Duration: 09+01=10 weeks



Integration of Disciplines in this Module



MODULE PLANNING COMMITTEE

Module Director	***To be filled by the institutes***
Members	

Preamble

The Neurosciences module is 08 weeks' module that focuses on the study of nervous system. It is a cross-disciplinary field that evolves around the development and functioning of the nervous system along with the mechanisms that underlie neurological disease. This module provides exposure to the field in depth and breadth. Through this module, students will develop an integrated, scientific knowledge that will help them in clinical setting, plus creative and problem-solving skills.

Learning Outcome:

By the end of this module, student should be able to correlate the physiological and biochemical concepts related to nervous system with their anatomical knowledge and apply their relevant knowledge of this module in subsequent years of clinical training and practice

ANATOMY				
Topic/ Theme	**Learning outcomes**	**Learning Objective/ Content**	**Instructional strategies**	**Assessment tool**
Introduction & organization of the nervous system	• Interpret the anatomical basis of common neurological clinical presentations by correlating the structures forming the nervous system with their functions • Demonstrate the structure of brain and spinal cord on prosected specimens and models • Identify the normal structure of brain and spinal cord in the images of CT scan & MRI • Correlate the developmental process of nervous system with embryological basis of relevant congenital anomalies • Correlate the histomorphological features of nervous system with its functions and predict functional outcomes of their altered structure • Identify the histomorphological features of nervous system under light microscope by focusing the H&E stained	**<u>Knowledge</u>** • List the major divisions, components and functions of the central nervous system. • Enumerate ventricles and coverings of brain and spinal cord with special emphasis on intracranial hemorrhages. • Explain the process of lumbar puncture and enumerate the structures through which a needle will pass while performing spinal tap in an order.	SGDs	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE
Gross Anatomy of skull		**<u>Knowledge and Skill</u>** • Demonstrate the anatomical position of skull with special emphasis on planes of anatomical position. • Describe and demonstrate the boundaries and gross features of cranial fossae. • List and demonstrate foramina along with structures passing through them in anterior, middle and	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

	slides at different magnifications	posterior cranial fossae. • Recognize and demonstrate the important sutures, fontanelle and impressions on the interior of cranial vault • Identify important bony landmarks on the bones as viewed from lateral, superior, inferior, anterior and posterior views. • Identify the bones forming the boundaries of orbit, nasal cavity, oral cavity, temporal, infratemporal fossa & pterygopalatine fossa on the given bone. (Details to be done with relevant topics). • Explain the clinical presentations relevant to fracture of various bones of skull		
Gross Anatomy of Spinal cord		**Knowledge** • Explain the gross appearance and the nerve cell groups in the anterior, posterior and lateral gray columns of spinal cord • Enumerate and illustrate the arrangements of ascending and	SGD	MCQs/ SEQs/ SAQs/ OSPE VIVA VOCE

		descending tracts (white matter) in spinal cord at various levels.
		• Explain the given clinical conditions related to ascending and descending tracts of spinal cord.
		  ○ Pyramidal tracts (upper motor neuron) lesions
		  ○ Extrapyramidal tracts (upper motor neuron) lesions
		  ○ Lower motor neuron lesions
		  ○ Acute spinal cord injuries
		  ○ Spinal shock syndrome
		  ○ Destructive spinal cord syndromes
		  ○ Complete cord transection syndrome
		  ○ Anterior cord syndrome
		  ○ Central cord syndrome
		  ○ Brown sequard syndrome
		  ○ Syringomyelia
		  ○ Poliomyelitis
		  ○ Multiple sclerosis
		  ○ Amyotrophic lateral sclerosis
		• Trace all ascending and descending pathways		

		of spinal cord with emphasis on location of first, second and third order neurons, functions and effects of lesions.		
Gross anatomy of the brainstem		**<u>Knowledge</u>** • Describe the gross appearance and internal structure of the medulla oblongata. • Illustrate the cross sections of medulla oblongata at different levels. • Explain the effects of raised pressure in posterior cranial fossa on the structures contained within it. • Apply the knowledge of neuroanatomy to explain the following clinical conditions: o Arnold-chiari malformation o Medial medullary syndrome o lateral medullary syndrome of Wallenberg. • Describe the gross features and internal structure of pons. • Illustrate cross section of pons at different levels showing major structures at each level.	SGD	MCQs/ SEQs/ SAQs/ VIVA VOCE

		• Analyze the anatomical basis of clinical presentation in case of tumors of pons, Pontine hemorrhage and Infarction of pons. • Describe the gross appearance and internal structure of mid brain. • Describe vascular lesions of the midbrain • Illustrate cross sections at the level of superior colliculus and inferior colliculus showing major structures at each level. • Justify the clinical presentation of blockage of cerebral aqueduct with anatomical basis. **Skill** • Identify the gross features of medulla, mid brain and pons on a given model.		
Gross anatomy of cerebellum & its connections		**Knowledge** • Describe the gross features of cerebellum. • Enumerate afferent and efferent fibers of superior, middle and inferior cerebellar peduncles. • List intracerebellar nuclei and types of	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		fibers constituting white matter of cerebellum and explain their routes of entry and exit. • Explain the pathways carrying afferent and efferent fibers to and from the cerebellum. • List disturbances of voluntary movements, reflexes, ocular movements, speech, posture and gait resulting due to lesions of cerebellum. • Apply the knowledge of anatomy to explain the cerebellar syndromes **Skill** • Demonstrate different parts of cerebellum on given model		
Gross anatomy of cerebrum		**Knowledge and Skill:** • Describe the topographic anatomy of diencephalon and demonstrate its gross features on a given model. • List main sulci and gyri of cerebral hemispheres and describe the extent of each of them. • Explain the divisions of cerebral lobes on superolateral, medial	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		and inferior surfaces of cerebral hemispheres. • Enumerate fibers making up the white matter of cerebral hemispheres and describe each of them. • Explain the effects of lesions of different parts of internal capsule • Explain the signs, symptoms, microscopic changes, diagnosis and treatment of Alzheimer disease. • Mark main sulci and gyri on lobes of cerebral hemispheres. • Identify commissural, projection and association fibers on brain prosected specimen • Describe and demonstrate the cortical functional areas in different lobes of cerebral hemispheres. • Describe the effects of lesions in the motor cortex on voluntary movements and speech. • Describe the changes in personality due to lesions in the frontal		

		eye field of cerebral hemisphere. • Enumerate types of aphasia and describe the lesions of speech areas responsible for producing aphasia. • Explain the sign and symptoms due to lesions of sensory cortex, prefrontal cortex and somesthetic association areas. • Explain the effects of lesion in the primary and secondary visual cortex. • Illustrate diagrams showing probable pathways involved in reading a sentence and repeating it out loud. • Illustrate diagrams showing probable pathways involved in hearing a question and answering it. • Illustrate the lateral and medial views of cerebral hemispheres showing motor and sensory areas.		
Gross anatomy of reticular formation & limbic system		**<u>Knowledge:</u>** • Describe the general arrangement and functions of reticular formation.	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		• List afferent and efferent projections of reticular formation • Enumerate components of limbic system and explain hippocampal formation with reference to its afferent and efferent connections • Explain the effects of destruction of amygdaloid complex on behavior. **Skill:** • Identify different components of limbic system on given model.		
Gross anatomy of basal nuclei & their connections		**Knowledge:** • List terminology commonly used to describe the basal nuclei. • Describe connections and functions of different nuclei constituting basal ganglia • List hyperkinetic disorders related with various basal nuclei like chorea, hemiballismus and athetosis • Describe Parkinson disease regarding etiology, characteristics signs	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		and symptoms and treatment **Skill:** • Identify different components of basal ganglia on given model/specimen		
Gross anatomy of cranial nerves		**Knowledge:** • Enumerate the cranial nerves and classify them into sensory, motor and mixed nerves. • Describe the nuclei and intracranial course of all cranial nerves. • Apply the knowledge of neuroanatomy to explain the following clinical conditions regarding the lesions of various cranial nerves: ✓ Unilateral/bilateral anosmia ✓ Lesions of visual pathway o Circumferential blindness o Total blindness of one eye o Nasal hemianopia o Bitemporal hemianopia o Contralateral homonymous hemianopia ✓ Diplopia ✓ Ptosis	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		✓ Internal and external ophthalmoplegia ✓ Double vision and its causes ✓ Trigeminal neuralgia ✓ Strabismus ✓ Facial nerve lesions from brainstem to face ✓ Bell`s palsy ✓ Vertigo, nystagmus, tinnitus and deafness ✓ Manifestations of IX, X, XI, XII cranial nerve lesions **Skill:** Identify different cranial nerves on given model /specimen		
Gross anatomy of thalamus, Hypothalamus & their connections		**Knowledge:** • Enlist the divisions, nuclei and connections of thalamus. • List nuclei, functions and connections of hypothalamus. • Describe the hypothalamohypophyial portal system and tract. • List the functions of main hypothalamic nuclei. • Describe the clinical presentation of following clinical disorders associated	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		with lesions of diencephalon: ○ Obesity and wasting ○ Sexual disorders ○ Hyper and hypothermia ○ Diabetes insipidus • Emotional disorders ○ Thalamic pain ○ Thalamic hand		
Gross anatomy of meninges and Dural venous sinuses of brain & spinal cord		**<u>Knowledge:</u>** • Define meninges of brain and describe the dural reflections in brain. • Explain the meninges of spinal cord • Enumerate the nerves and blood vessels supplying the meninges. • Define and enumerate paired and unpaired Dural venous sinuses along with their attachments. • Describe the location, important relations, communications of cavernous sinus and enumerate structures passing through it. • Describe the clinical presentation of following clinical disorders associated with meninges and Dural venous sinuses:	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		○ Epidural hemorrhage ○ Subdural hemorrhage ○ Subarachnoid hemorrhage ○ Cerebral hemorrhage **Skill:** • Demonstrate the supratentorial and infratentorial compartments of tentorium cerebelli in a prosected specimen.		
Gross anatomy of ventricular system, the CSF, & the blood-brain & blood-CSF barriers		**Knowledge:** • Describe the anatomical organization of ventricular system of brain and explain the boundaries of each ventricle along with their choroid plexus. • Explain formation, circulation and absorption of CSF. • Define arachnoid villous and explain the role of arachnoid villi in absorption of CSF. • List the structures forming blood brain and blood CSF barriers • Explain causes & varieties of Hydrocephalus **Skill:**	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		• Identify the features of various ventricles on models and prosected specimen. • Illustrate the floor of fourth ventricle.		
Blood supply of the brain & spinal cord		**<u>Knowledge:</u>** • Describe the blood supply of different parts of brain and spinal cord. • Explain the formation and importance of veins of brain. • Enumerate the vessels taking part in the formation of circle of Willis and summarize its importance. • Relate the interruption of cerebral circulation to cerebral artery syndromes due to anterior, middle and posterior cerebral artery occlusion. **<u>Skill:</u>** • Identify various blood vessels of brain and spinal cord on models and prosected specimen. • Illustrate circle of Willis.	SGD	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE
Development of central nervous system and skull		**<u>Knowledge:</u>** • Describe the development of neural tube with reference to neurulation, vesicles,	LGIS	MCQs/ SEQs/ SAQs/ OSPE/ VIVA VOCE

		brain flexures and ventricles. • Describe the development and positional changes of spinal cord. • Describe the formation and developmental changes in alar and basal plates. • Comprehend the embryological basis of various types of Spina bifida. • Enumerate the derivatives of rhombencephalon, mesencephalon and prosencephalon. • Summarize the characteristic developmental events of the following o Medulla oblongata o Midbrain o Pons o Cerebellum o Pituitary gland o Supra renal gland o Diencephalon o Telencephalon • Apply the knowledge of embryology to explain the clinical scenarios regarding: o Craniopharyngiomas o Meningoceles o Meningoencephalocele		

		○ Meningohydroencephaloceles ○ Holoprosencephaly ○ Craniorachiscisis ○ Pheochromocytomas ○ Congenital megacolon ○ Anencephaly ○ Schizencephaly ○ Holoprosencephaly ○ Exencephaly ○ Hydrocephaly ○ Microcephaly • Describe the development of skull • Describe the importance of fontanelle of skull in new born with reference to: ○ Changes in intracranial pressure ○ Newborn Cranium. ○ Closure of different fontanelle • Explain the embryological basis of cranioschisis and various types of craniosynostosis **Skill:** • Identify different parts of developing brain and spinal cord on the given model / diagrams.		
Histology of nervous tissue		**Knowledge:** • Summarize the histological features	LGIS	MCQs/ SEQs/ SAQs/

		and functions of neuron and neuroglia. • Classify neurons according to their morphology and functions with one example of each. • Define neuroglia and list its main types. • Explain the histomorphological composition of peripheral nerve. • Define ganglia. Differentiate between sensory and autonomic ganglia in tabulated form. • Describe the histological features of white and grey matter of spinal cord. • Enumerate layers of cerebral and cerebellar cortices and different cell types of these layers.		OSPE/ VIVA VOCE
		Skill: • Recognize various slides of nervous system by focusing them under the light microscope at various magnifications. • illustrate histological features of peripheral nerve, ganglia, spinal cord, cerebrum and cerebellum under light microscope and enlist two points of identification for each.	Practicals	OSPE/ Long slides

PHYSIOLOGY				
Topic/ Theme	**Learning outcomes**	**Learning Objective/ Content**	**Instructional strategies**	**Assessment tool**
Processing of information in neuronal pool	Interpret the physiological mechanisms controlling the neuronal signals transmitting through synapse	• Differentiate between various types of synapses • Identify physiologic anatomy of the synapse • Elucidate the electrical events during neuronal excitation and inhibition (EPSPs& IPSPs) • Summarize the transmission and processing of signals in neuronal pools (summation, facilitation, convergence divergence, after discharge, synaptic delay and fatigue)	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Sensory receptors & receptor Potential	Interpret the physiological mechanisms controlling the functions of sensory system**.**	• Classify the various types of sensory receptors. • Explain the sensory stimuli and differential sensitivity of receptors. • Explain the sensory transduction into nerve impulses. • Describe the local electrical currents at nerve endings—receptor potentials, adaptation of receptors • Classify the nerve fibers that transmit different types of signals on the physiological basis.	• Lectures • SGD • CBL	• MCQ • SAQ/SE • Structured Viva
Sensory tracts and cortex	Explain the dorsal column medial leminiscal system and anterolateral pathways	• Identify the sensations carried by different sensory tracts • Differentiate between different sensory tracts • Describe the somatosensory cortex and somatosensory association areas	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva

		• Explain the various thermal sensations, thermal receptors and their excitation and transmission of thermal signals in the nervous system • Discuss the pathophysiology and features of Brown Sequard syndrome • Explain clinical features of spinal shock and recovery of spinal functions after spinal shock		
Brain analgesia system	Correlate the pathophysiological basis of pain pathways to their clinical significance	• Classify the different types of pain. • Compare and contrast the perception and transmission of the different types of pain. • Explain the pain suppression system in the brain and spinal cord. • Describe the brain's opiate system. endorphins and enkephalins. • Describe the clinical abnormalities of pain and other somatic sensations	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Motor system / Spindle / stretch reflex	Interpret the physiological mechanisms controlling the functions of motor system and higher mental functions	• Relate the organization of grey and white matter in spinal cord to the pathophysiology of various spinal cord injuries. • Explain the role of proprioceptors (muscle spindles and Golgi tendon organs) in motor movements • Explain dynamic and static stretch reflex • Describe the flexor reflex and the crossed extensor reflex.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva

		• Explain the reciprocal inhibition and reciprocal innervation. • Identify the reflexes of posture and locomotion in the spinal cord.		
Cerebral Cortex	Correlate the clinical presentations resulting from damage to different areas of cerebral cortex to their anatomical and functional cortical areas.	• Identify the various • Brodmann's areas of cerebral cortex. • Explain the functions of the various areas of the cerebral cortex.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Pyramidal tract/ extra pyramidal tract	Differentiate between the Pyramidal and extrapyramidal system for voluntary motor control	• Explain the role of • primary motor cortex, premotor area, and supplementary motor area in control of voluntary motor movements. • Identify the various pathways for transmission of signals for voluntary motor control from the motor cortex to the muscles. • Explain the significance of anterior motor neurons as the lower motor neurons. • Compare and contrast the upper and lower motor neurons and their lesions. • Identify the role of the brain stem in controlling motor function and role in posture of the body against gravity.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Cerebellum	Analyse the role of the cerebellum in executing motor movements.	• Explain the functional anatomy of cerebellum and basal ganglia. • Describe the neuronal circuits of the cerebellum. • Describe the pathophysiological basis of the clinical	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva

		abnormalities of the cerebellum and basal ganglia. • Justify the clinical presentation on with reasoning of cerebellar diseases.		
Basal ganglia	Explain the function of the basal ganglia in Executing patterns of motor activity.	• Identify the role of the basal ganglia for cognitive control of sequences of motor patterns. • Explain the direct and indirect circuits of basal ganglia • Explain the role of various specific neurotransmitter substances in the basal ganglia and the pathophysiological disorders related to their deficiency. • Describe the pathophysiology, clinical features and treatment of Parkinsonism. • Justify the clinical presentation of Parkinsonism with underlying pathophysiology	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Vestibular system	Explain the vestibular system	• Explain the vestibular apparatus and function of the utricle and saccule in the maintenance of static equilibrium. • Describe the detection of head rotation by the semicircular ducts. • Explain the vestibular mechanisms for stabilizing the eyes.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Cerebrovascular Accidents	Correlate the presentation of CVA with the concerned affected area.	• Explain the causes of CVAs. • Correlate the clinical presentation of stroke with the sites of lesion.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Physiology of Speech	Correlate the 1mechanism of normal coherent speech with speech disorders	• Explain the functions of specific cortical areas and association areas in the physiology of speech. • Identify the function of the Wernicke's and Broca's Area. • Explain the pathophysiological disorders related to speech.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva

Memory	Distinguish memory types in detail	• Classify memories on the basis of: • type of sensory experience • time of retention • synaptic facilitation and habituation • Explain the process of consolidation and chemical and anatomical changes occurring at the synapse leading to it. • Compare various types of amnesia including retrograde, anterograde amnesia, Alzheimer's and dementia.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Sleep	Explain mechanism of sleep in detail	• Define Sleep • Differentiate between slow-wave sleep and REM Sleep • Describe the basic theories of sleep and physiologic effects of sleep. • Identify the different types of brain waves and their origin • Explain the changes in EEG at different stages of wakefulness and sleep.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
EEG/epilepsy	Differentiate between various types of epilepsy in detail	• Explain the effect of varying levels of cerebral activity on the frequency of the EEG. • Define Epilepsy. • Differentiate between Grand mal, petit mal epilepsy a and focal epilepsy	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Functions of thalamus and hypothalamus	Explain the functions of thalamus and hypothalamus in detail with specific emphasis on temperature control and limbic system.	• Explain the functional anatomy of thalamus. • Describe the functions of thalamus. • Identify the role of limbic system. • Describe the functional anatomy and functions of hypothalamus.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva

		• Identify the normal body temperatures. • Explain the mechanisms of heat production and heat loss. • Describe the regulation of body temperature and role of the hypothalamus • Explain the mechanisms that decrease or increase body temperature. • Appreciate the concept of a "set-point" for temperature control. • Appraise the behavioural control of body temperature. • Interpret the various abnormalities of body temperature regulation with special focus on fever.		
Higher Mental Functions	Associate functions of prefrontal and other cortical association areas to various psychiatric and organic illnesses.	• Discuss the higher intellectual functions of the prefrontal areas and the various cortical association areas. • Describe the functions of corpus callosum. • Discuss the pathophysiology and clinical presentations of depression, bipolar disorders, schizophrenia • Demonstrate understanding of basic concepts of Alzheimer's disease • Justify the clinical presentation with underlying pathophysiology of Alzheimer's disease	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
CSF and blood brain barrier		• Discuss the synthesis and trace the pathway of CSF circulation. • Explain the physiological significance of blood brain barrier. • Discuss hydrocephalus.	• Lectures • SGD • CBL	• MCQ • SAQ/SEQ • Structured Viva
Temperature Regulation 1	Summarize the Effects of Temperature Regulation in body.	• Know about the normal body temperatures • Enumerate mechanisms of heat production and heat loss	• Lectures/SG • D/ CBL	• MCQ/SAQ/ • structured • viva

		• Explain the role of hypothalamic centers in regulation of body temperature • Explain the neuronal effector mechanisms and behavioral adjustments that decrease or increase body temperature • Discuss the concept of a "set-point" for temperature control		
Temperature Regulation 2		Discuss the abnormalities of body temperature regulation i.e. hypothermia, gangrene, frost bite, hyperthermia and fever	• Lectures/SG • D/ CBL	• MCQ/SAQ/ • structured • viva

LIST OF PRACTICALS

1.	Examine motor system on an SP
2.	Performs Deep tendon reflexes
3.	Examine the Cerebellar Functions on an SP
4.	Examine the autonomic nervous system on an SP
5.	Examine the Sensory system on an SP
6.	Perform Superficial reflexes on an SP
7.	Record the normal body temperature
8.	Examine the Cranial nervous on SP

BIOCHEMISTRY				
Topic/ Theme	**Learning outcomes**	**Learning Objective/ Content**	**Instructional strategies**	**Assessment tool**
Nucleotide Chemistry	Relate the significance of different nucleotides in medicine	➢ Demonstrate the understanding of Chemistry and structure of nucleotides and their biochemical role ➢ Explain Nucleotides, structure, their derivatives and their biochemical role ➢ Discuss the synthetic derivatives of purine and pyrimidines, their role in health and disease ➢ Describe Nucleic acids, their types, structure and functions	• LECTURES • PBL • CBL • SGD	• MCQ • SAQ/SEQ
Nucleotide Metabolism	Apply the knowledge of nucleotide metabolism for understanding relevant metabolic disorders	➢ Outline the Synthesis of Purine nucleotides and deoxyribonucleotides ➢ Explain the Salvage pathway of nucleotides ➢ Describe the degradation of purines with related diseases and discuss the formation of Uric acid & Hyperuricemia ➢ Explain synthesis & degradation of pyrimidines and state related diseases	• LECTURES • PBL • CBL • SGD	• MCQ • SAQ/SEQ
Molecular Genetics	Apply the knowledge of molecular medicine, genetics, and biotechnology in health and disease	➢ Describe DNA Structure & types ➢ State organization of Eukaryotic DNA ➢ Explain replication of prokaryotic DNA & Eukaryotic DNA ➢ Explain Super coiling of DNA ➢ Describe DNA Repair Mechanisms	• LECTURES • PBL • CBL • SGD	• MCQ • SAQ/SEQ

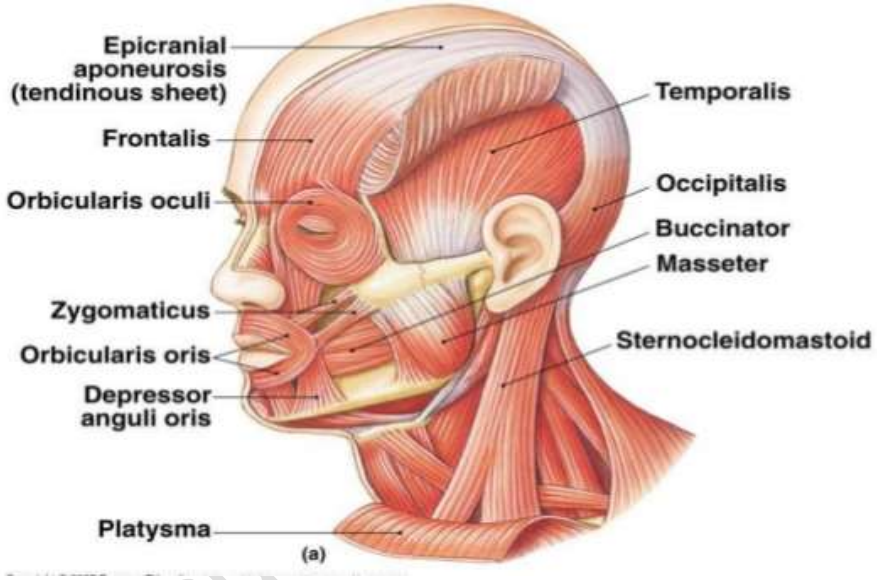
		➢ Explain Xeroderma Pigmentosum ➢ Discuss various Genetic Diseases ➢ Give Structure of three types of RNA ➢ Outline Prokaryotic and Eukaryotic transcription ➢ Explain Reverse transcription ➢ Describe translation, Post Translational Modification & translation of genetic code ➢ Write a note on Mutations ➢ Outline regulation of Gene expression ➢ Write a note on PCR& Southern blotting techniques ➢ Explain Probes ➢ Explain Prenatal Diagnosis ➢ Discuss Gene therapy & gene expression ➢ Summarize DNA Cloning ➢ Explain Restriction fragment length polymorphism		
Neurotransmitters	Relate the importance of various neurotransmitters to its clinical significance	➢ Write a note on Catecholamines, their chemistry, synthesis and degradation ➢ Explain synthesis and role of Acetyl choline, Dopamine, Serotonin and Histamine ➢ Discuss the Dopaminergic neurotransmission (Including site of synthesis, stimulus for secretion, mechanism of action, receptors, intracellular effects, target cells, tissues and biochemical role/functions)	• LECTURES • PBL • CBL • SGD	• MCQ • SAQ/SEQ

		➢ Explain synthesis and biochemical role of Glutamate, GABA & NO		
Practicals	Perform and interpret the results of given examination	➢ Collection and preservation of clinical specimens ➢ Estimation and clinical interpretation of Uric Acid in blood ➢ DNA Extraction ➢ PCR	Practical	OSPE

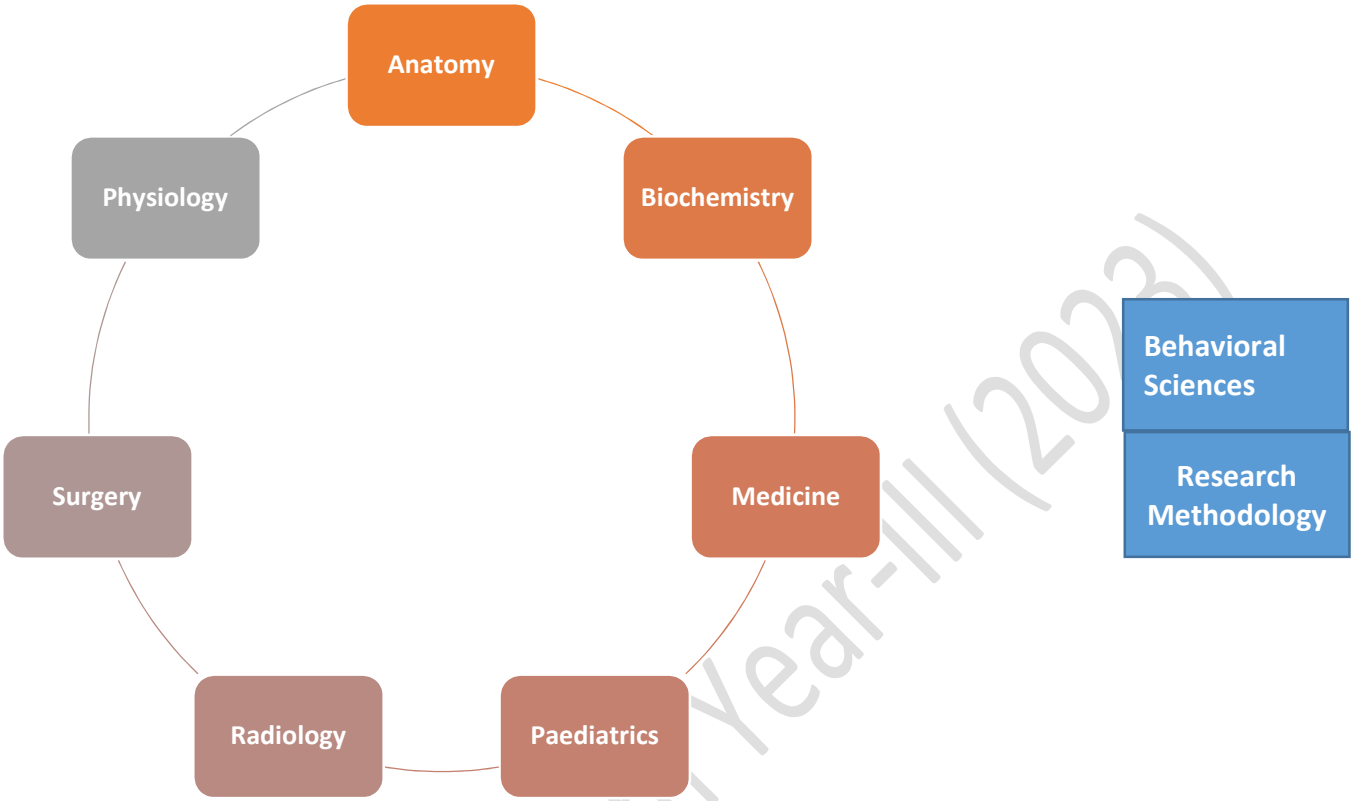
Surgery				
Topics	**Learning Outcomes**	**Learning objectives**	**MIT**	**Assessment tool**
	By the end of session, student should be able to:			
Spinal trauma and injuries	Correlate the relevant basic knowledge with clinical presentations	Clinical presentation of: • Spinal trauma and injuries • Comminuted frontal complex skull fracture • Neural tube defects • Brain tumors • Vascular lesions and hemorrhages • Spinal nerve compressions • Developmental anomalies of brain	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Comminuted frontal complex skull fracture				
Neural tube defects				
Brain tumors				
Vascular lesions and hemorrhages				
Spinal nerve compressions				
Developmental anomalies of brain				
Visit to ward	Observe the patient with relevant disorders		CBL	

MEDICINE				
Brown Sequard Syndrome (Neurosurgery)	Correlate the relevant basic knowledge with clinical presentations	Clinical presentation of Brown Sequard Syndrome	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Upper and Lower motor neuron lesions	Differentiate between clinical features of upper and Lower motor neuron lesions	Differences between upper and Lower motor neuron clinical features		
Visit to ward	Observe the patient with relevant disorders		CBL	
PAEDIATRICS				
Genetic counselling	List general rules of genetic counselling	Rules of genetic counselling	LGIS	MCQ SEQ SAQ Viva Voce
Genetic disorders	Identify clinical manifestations of genetic diseases; chromosomes, chromosomal abnormalities, and the clinical features of common chromosomal disorders; population genetics; inborn errors of metabolism.	Clinical manifestations of genetic diseases; chromosomes, chromosomal abnormalities, and the clinical features of common chromosomal disorders; population genetics; inborn errors of metabolism.	SGD, Self-Directed Learning, OPD	OSCE SAQs/ MCQs

MBBS YEAR II
BLOCK VI
MODULE XI
Maxillofacial & Special Senses
Duration : 06 weeks



Integration of Disciplines in this Module



MODULE PLANNING COMMITTEE

Module Director	***To be filled by the institutes***
Members	

Preamble

The Maxillofacial & Special Senses module for 2nd year MBBS aims to integrate both basic and clinical sciences. In basic sciences, students will be able to explain developmental, gross and microscopic anatomy of the Head Region & Special Senses along with relevant physiology and biochemistry. Learning process involves delivering the content with clinical relevance. The research methodology and Behavioral Sciences will be taught as a part of the longitudinal theme.

Learning Outcome:

By the end of this module, student should be able to correlate the physiological and biochemical concepts related to maxillofacial and special senses with their anatomical knowledge and apply their relevant knowledge of this module in subsequent years of clinical training and practice

ANATOMY				
MAXILLOFACIAL				
Theme/Topics	**Learning outcome**	**Content**	**Instructional strategies**	**Assessment tool**
Skull	• Apply the knowledge of Gross Anatomy of head & special sense organs in interpreting the anatomical basis of relevant clinical scenarios. • Demonstrate the topographic anatomy of structures of head and special senses on the prosected specimens and models • Outline the main glands, nerves and vessels in the region of head on the surface of given subject exhibiting effective communication, professionalism and ethics. • Identify the normal radiographic appearance of tissues in the region of head on the given radiographs in interpreting the anatomical basis of relevant clinical scenarios.	• Revisit the general plan of studying skull from different views. • Identify Individual bones of maxillofacial region • Revisit important bony landmarks on the bones as viewed from lateral, superior, inferior, anterior and posterior views. • List structures traversing the foramina in these bones • Identify the bones forming the boundaries of orbit, nasal cavity, oral cavity, temporal, infratemporal fossa &pterygopalatine fossa on the given bone. (Detail to be done with relevant topics. Already covered with neurosciences)	SGD (Small Group Discussion)	MCQ/ SAQ/OSPE Viva
Mandible		• Identify parts of mandible • Describe ramus and body of mandible with respect	SGD (Small Group Discussion)	MCQ/ SAQ/OSPE Viva

		to its bony features and attachments. • Explain the anatomical basis of Clinical presentation of different fractures of mandible		
Scalp		• Enumerate layers of scalp in a sequential order • Correlate gross features of each layer with anatomical basis of black eye, profuse bleeding, gaping wound, spread of scalp infection and shape of hematoma.	SGD and dissection	MCQ/ SAQ/OSPE Viva
Face		• Elucidate the cutaneous innervation of face • Group facial muscles according to the orifices they are guarding • Describe the nerve supply of muscles of facial expressions. • Describe the course of arteries, veins, lymphatics and nerves of the face with the help of model. • Correlate gross features of face with anatomical basis of danger area, trigeminal neuralgia, facial/Bell's palsy. • Explain the anatomical basis of following clinical conditions relevant to face. o Facial lacerations and incisions o Compression of facial artery **Skill:**	SGD and dissection	MCQ/ SAQ/OSPE Viva

		• Identify muscles of facial expressions • Illustrate the cutaneous innervation of face • Feel the pulsation of arteries on face		
Parotid region		• List contents of parotid region • Elucidate the surfaces, borders, shape, location, parts, relations and drainage of parotid gland • Trace the pathway of autonomic supply of parotid gland. • Enumerate structures embedded in parotid gland in a sequential order. • Correlate the extracranial course of facial nerve with Bell's palsy. • Interpret the following clinical conditions related to face: o Infection, tumor and stone of parotid gland o Frey's Syndrome	SGD and dissection	MCQ/ SAQ/OSPE Viva
Facial nerve		• Revisit the course and distribution of facial nerve • Revisit the relationship of facial nerve with pterygopalatine and submandibular ganglia • Revisit the effects of lesion of facial nerve at different levels	LGIS	MCQ/ SAQ/OSPE Viva
Temporomandibular joint		• Describe the type, articular surfaces, capsule, ligaments, supporting	SGD and dissection	MCQ/ SAQ/OSPE Viva

		factors, movements and nerve supply of TMJ • Describe movements of TMJ with reference to axes and muscles producing them • Correlate a case of dislocation and reduction of TMJ with anatomical knowledge of TMJ. • Apply the knowledge of anatomy to explain following nerve blocks o Mandibular and o inferior alveolar nerve block		
Temporal and Infra-temporal region		• Identify the location, boundaries, contents and communications of temporal and infratemporal fossa on a given model and skull. • Describe the course and distribution of mandibular nerve from origin to distribution • Tabulate the attachments, actions and nerve supply of muscles of mastication. • Trace location, various routes and distribution of otic ganglion • Justify role of lateral pterygoid as a peripheral heart on anatomical basis of pterygoid venous plexus • Elucidate importance of pterygoid venous plexus in case of intracranial spread	SGD and dissection	MCQ/ SAQ/OSPE Viva

		of infection to cavernous sinus. • Trace origin and distribution of superficial temporal, First and second parts of maxillary artery • Trace origin and distribution of Chorda tympani from origin to till it joins the lingual nerve.		
Pterygopalatine fossa		• Identify the location of pterygopalatine fossa on skull • List bones forming walls of pterygopalatine fossa • Enumerate its contents and communications • Describe the distribution of third part of maxillary artery, nerve and pterygopalatine ganglion • Justify the role of pterygopalatine ganglion in hay fever/allergies	SGD and dissection	MCQ/ SAQ/OSPE Viva
Pharynx		• Differentiate extent, anatomical features, vascular supply, nerve supply of three parts of pharynx on anatomical basis • List muscles of pharynx with nerve supply and action • Enumerate structures passing through the spaces between muscles of pharynx • Describe anatomical route of spread of infections	SGD and dissection	MCQ/ SAQ/OSPE Viva

		from nasopharynx to middle ear. • Relate boundaries of tonsillar fossa and tonsillar bed with significant structures that must be protected during tonsillectomy		
Cranial nerves		Apply the knowledge of anatomy to explain the extracranial course of - cranial nerves (V, VII, IX, XII)	SGD and dissection	MCQ/ SAQ/OSPE Viva
Radiography		Identify the important bony landmarks of skull and mandible on X ray.	SGD and dissection	MCQ/ SAQ/OSPE Viva
Surface marking		• Mark following structures on subject • Parotid Gland and duct • Facial artery and nerve • External jugular vein	SGD and dissection	MCQ/ SAQ/OSPE Viva
SPECIAL SENSES: **Oral Cavity and tongue**		• Identify the floor, roof, lateral walls and vestibule of oral cavity. • Describe topographic features of tongue. • Tabulate the actions and nerve supply of muscles (intrinsic and extrinsic) of tongue • Differentiate a case of UMN and LMN lesion of hypoglossal nerve (course and branches) • Correlate Lymphatic drainage of different parts of tongue with spread of malignancy and infection of tongue.	SGD and dissection	MCQ/ SAQ/OSPE Viva

		• Tabulate the attachments, nerve supply, actions of muscles of soft palate.		
Salivary glands		• Describe the location of major salivary glands (anatomical relations) along with opening of their ducts. • Trace the secretomotor nerve supply of major salivary glands. • Discuss the anatomical basis of clinical presentation of mumps • Justify involvement of facial nerve in various clinical conditions of Parotid gland • Enumerate the structure endangered by the stone in submandibular duct and its surgical removal	SGD and dissection	MCQ/ SAQ/OSPE Viva
Nose and paranasal sinuses		• Describe the skeletal framework of different walls of nose • Describe the features, vascular supply, nerve supply and openings in lateral wall of nose • Describe the features, vascular supply, nerve supply of medial wall of nose • Highlight the significance of little's area in a case of epistaxis • Apply the knowledge of anatomy to explain clinical presentation of sinusitis	SGD and dissection	MCQ/ SAQ/OSPE Viva

External Ear		• Describe the gross anatomical features of auricle, external auditory meatus and tympanic membrane. • Correlate nerve supply of external ear and tympanic membrane with clinical significance (perforation of tympanic membrane)	SGD and dissection	MCQ/ SAQ/OSPE Viva
Middle ear		• Describe the gross anatomical features, boundaries, structures and contents of middle ear cavity. • Describe the structures forming the walls of middle ear cavity on the given model. • Highlight the importance of infection in middle ear cavity in relation to its communications. • Apply the knowledge of anatomy to explain following clinical conditions - Otitis media and mastoiditis, Blockage of pharyngotympanic tube	SGD and dissection	MCQ/ SAQ/OSPE Viva
Inner ear		• Identify the bony and membranous parts of inner ear on model • Apply the knowledge of anatomy to explain following clinical conditions - Motion sickness, Hearing loss, Meniere disease	SGD and dissection	MCQ/ SAQ/OSPE Viva

Orbit		• Describe the skeletal framework of bony orbit and its communications • List the contents of orbit • Identify the parts of eyeball on a model • Tabulate the attachments, nerve supply and actions of extraocular muscles • Justify the movements of extraocular muscles based on their attachments • Trace the course and distribution of 3, 4 and 6 CNs • Trace the route and distribution of ciliary ganglion. • Describe the course and distribution of ophthalmic nerve • Enumerate different components of lacrimal apparatus • Describe the nerve supply of Lacrimal gland • Define Horner's Syndrome • Apply the knowledge of anatomy to explain retinal detachment	SGD and dissection	MCQ/ SAQ/OSPE Viva
EMBRYOLOGY				
Development of Head Region	• Correlate the development events of head and neck and special sense organs with embryological basis of their related congenital anomalies	• List embryological sources of head and neck structures • List components of pharyngeal apparatus. • Tabulate the nerve supply and derivatives of all	LGIS	MCQS/ SAQS/ SEQS/ OSPE Viva

	• Explain the development events of integumentary system and embryological basis of their related congenital anomalies	arches, pouches, clefts and membranes • Describe the embryological basis of first arch syndromes (Treacher Collins , Pierre Robin , DiGeorge and Goldenhar) • Apply the knowledge of developmental anatomy to explain Branchial fistulas, sinuses and cysts • Correlate the normal development of tongue with its congenital anomalies (tie, macro- and micro- glossia and bifid tongue) • Correlate the normal development and descent of thyroid gland with its associated anomalies • Justify the relative anatomical location of parathyroid gland • Apply the knowledge of developmental anatomy to explain ectopic thyroid tissue • Outline the development of nose and paranasal sinuses • Enumerate the prominences of facial development • Elucidate the embryological phenomenon of development of face, and palate		

		• Correlate various facial and palatal clefts including anterior and posterior clefts of lip and palate with normal development • Apply the knowledge of developmental anatomy to explain anomalies of nasolacrimal duct • Justify the association of Neural crest cells and craniofacial defects		
Special Senses: Development of Ear		• Revisit the role of first and second pharyngeal apparatus in development of ear. • Describe the differentiation of otic capsule into inner ear • Correlate the anomalies of external ear with neural crest cells (deafness and external ear abnormalities)	LGIS	MCQS/ SAQS/ SEQS/ OSPE Viva
Development of Eye		• Describe the development of the optic cup • Relate the differentiation of wall of optic cup into definitive structures • Correlate the common congenital anomalies of eye (colobomas, congenital cataracts, cyclopia) with normal development. • Describe the development of various layers of eyeball	LGIS	MCQS/ SAQS/ SEQS/ OSPE Viva
Development of Integumentary System		• Describe the development of skin, hair, nails, mammary gland	LGIS	MCQS/ SAQS/ SEQS/ OSPE Viva

		• Describe the embryological basis of relevant congenital anomalies (vitiligo, ichthyoses, disorders of keratinization, Hypertrichosis, hemangiomas and dermatoglyphics and mammary gland anomalies)		

HISTOLOGY

Topic/ theme	Learning outcomes	Course content/learning objectives	Instructional strategies	Assessment tool
Histology of Lip & Tongue	• Explain the histomorphological features of lips, tongue, salivary glands and special sense organs and corelate with their function. • Identify the slides of special sense organs, lip, tongue, salivary glands under light microscope at different magnifications • Explain the normal histomorphological features of integumentary system • Identify the slides of integumentary system under light microscope at different magnifications	• Describe the histological features of lip, with emphasis on transition in structure from cutaneous to vermillion to mucosal zone. • Explain the histological features of dorsal and ventral surfaces of tongue, with particular focus on tongue papillae, their shape, location, keratinization, number and presence or absence of taste buds. • Identify H&E Stained slides of lip and tongue and draw their labelled diagrams.	LGIS Practical	MCQs/SAQs / SEQs/OSPE Viva
Histology of Salivary Glands		• Classify salivary glands on basis of morphology and nature of secretion • Describe the histo-morphological features of salivary glands with regards to their secretory and ductal systems	LGIS Practical	MCQs/SAQs / SEQs/ OSPE Viva

		• Identify H&E Stained slides of parotid gland, submandibular gland and sublingual glands and draw their labelled diagrams.		
Histology of Ear		• Identify the histological structure of different parts of ear, particularly the external and internal ear. • Describe the histological structure of sensory receptor areas of internal ear like Organ of Corti, maculae acousticae and crista ampullaris. • Identify H&E Stained slide of pinna and cochlea and draw their labelled diagrams	LGIS Practical	MCQs/SAQs / SEQs/ OSPE Viva
Histology of Eye		• Describe the detailed structure and function of sclera and cornea, with special emphasis on corneal transparency and its fusion with sclera at corneoscleral junction. • Describe the light microscopic structure of uveal tract, different layers of retina, correlating the arrangement of neuronal cells and processes with their functions. • Describe and correlate the gross anatomical structure of eyelid with its histological structure.	LGIS Practical	MCQs/SAQs / SEQs/ OSPE Viva

		• Identify H&E Stained slide of cornea and draw their labelled diagrams.		
Histology of Integumentary system		• Describe the components of skin, its epithelium (epidermal cells with functions) and appendages (nails, hair and mammary gland) • Explain histological differences between thick and thin skin. • Describe histological basis of psoriasis, vitiligo, albinism, blister disorders and cancers of skin • Describe the histological differences of mammary gland between inactive, active and lactating phase • Describe the involution of mammary gland in old age • Describe the histological basis of carcinoma of mammary gland (part of parenchyma mostly involved- intraductal carcinoma). • Identify an H&E Stained slides of thick and thin skin and mammary gland (inactive and active phases) and draw their labelled diagrams	LGIS Practical	MCQs/SAQs / SEQs/ OSPE Viva

PHYSIOLOGY				
Topic/ Theme	**Learning outcomes**	**Learning Objective/ Content**	**Instructional strategies**	**Assessment tool**
Special Senses				
Physiology of Eye	Explain the physiology of eye and the visual pathway and appraise the pathophysiological basis of abnormalities related to eye.	Explain refraction and concept of convergence and divergence.	• Lectures • SGD • CBL • Practical demonstration and performance	MCQ/SAQ/SEQ/ structured Viva/OSPE
		Define focal length, focal point and power of lens.		
		Differentiate between emmetropia, myopia, hyperopia, astigmatism, presbyopia and describe their treatment		
		Discuss the concept of reduced eye and depth perception.		
		Explain the process of its formation, circulation and regulation of aqueous humor.		
		Describe intraocular pressure and pathophysiology of glaucoma.		
		Describe accommodation reflex, light reflex and their pathway.		
		Describe physiological anatomy of retina		
		Explain rhodopsin visual cycle and role of vitamin A in night blindness.		
		Describe phototransduction in photoreceptors		
		Explain the mechanism of regulation of retinal sensitivity (light and dark adaptation).		
		Discuss and draw the visual pathway and its lesions		

		EXPLIAN THE IMPORTANCE OF VISUAL EVOKED POTENTIALS		
		Explain the visual cortex and its functional units.		
		Describe the mechanism of different types of eye movements		
		Discuss pathophysiology of strabismus, Horner's syndrome and Argyll Robertson pupil.		
		Discuss the effects of sympathetic and parasympathetic innervation of eye.		
		Determine the visual acuity of the subject for far and near vision.		
		Demonstrate the field of vision of the subject.		
Physiology of Ear	Explain the physiology of ear and the auditory pathway and the abnormalities related to ear.	Describe the physiological Anatomy of ear	• Lectures • SGD • CBL • Practical demonstration and performance	MCQ/SAQ/SEQ/ structured Viva/OSPE
		Explain the mechanism of conduction of sound waves through the ear to the cochlea		
		Describe "Impedance Matching" and its importance		
		Describe the process of attenuation of sounds		
		Explain the Place Principle		
		Describe the functions of Organ of Corti		
		Explain the mechanism of determination of loudness		
		Recall the auditory pathway		
		Recognize the function of cerebral cortex in hearing		
		Explain the process of determination of direction from which sound is coming		

		Describe various hearing Abnormalities DISCUSS THE VARIOUS HEARING TESTS INCLUDING AUDITORY EVOKED POTENTIALS (ESPECIALLY IN REFERENCE TO MENIER'S DISEASE)		
Physiology of taste	Explain the physiology of taste sensation and its pathway.	Describe the primary sensations of taste Describe the mechanism of stimulation of taste buds and the transmission of signals to CNS	• Lectures • SGD • CBL • Practical demonstration and performance	MCQ/SAQ/SEQ/ structured Viva/OSPE
Physiology of olfaction	Explain the physiology of olfaction and its visual pathway.	Explain the physiological anatomy of olfactory membrane. Explain the mechanism of stimulation of olfactory cells. Identify the primary sensations of smell Describe the transmission of signals of olfaction into the central nervous system	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva

Practicals

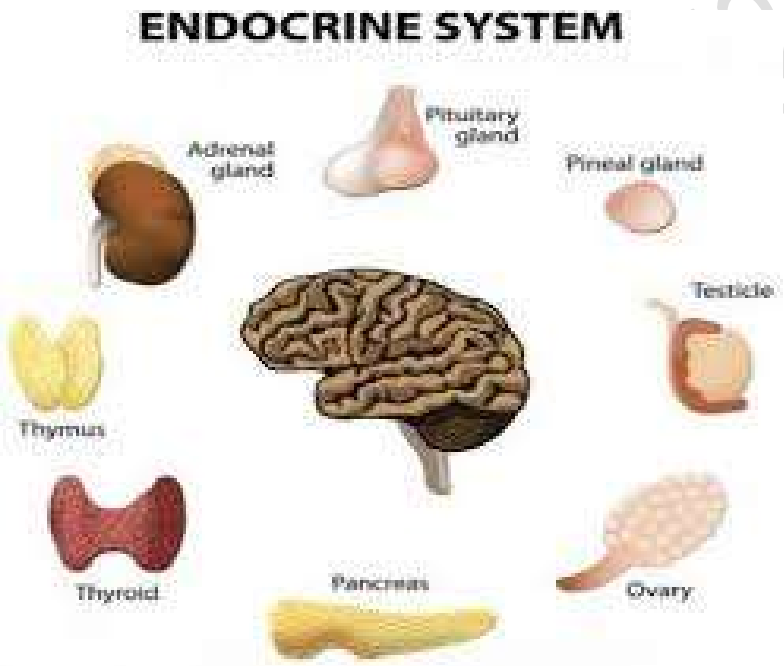
- Perform Perimetry and map the visual fields on SP
- Check visual acuity (far & near vision) on SP using Snellen's and jaeger's chart
- Check the color vision of an SP Ishihara chart
- Demonstration of reflexes of the eye
- Perform hearing test to check the hearing in SP

BIOCHEMISTRY				
Topic/ Theme	**Learning outcomes**	**Learning Objective/ Content**	**Instructional strategies**	**Assessment tool**
Cancer and tumor markers	Correlate tumor markers in different malignancies Outline the genetic basis of cancer	Comprehend genetic basis of cancer Discuss different tumor markers	• LECTURES • PBL • CBL • SGD	• MCQ • SAQ/SEQ
Aging & free radicals	➢ Outline the essential feature of aging and genetic factors of aging ➢ Co-relate the effect of reactive oxygen species with cell injury and aging ➢ Mechanism of mitigation of ROS by human body	Different reactive oxygen species (ROS) produced by the human body Mechanism of production of reactive oxygen species (ROS) Effect of ROS on health and disease Mechanism of Scavenging of ROS	• LECTURES • PBL • CBL • SGD	• MCQ • SAQ/SEQ
Xenobiotics	Elaborate the role of reactive oxygen species and xenobiotics	Describe xenobiotics Outline phase 1 and phase 2 reactions Discuss the properties of Cytochrome P450, its functions and clinical importance	• LECTURES • PBL • CBL • SGD	• MCQ SAQ/SEQ
Practicals		ELISA		

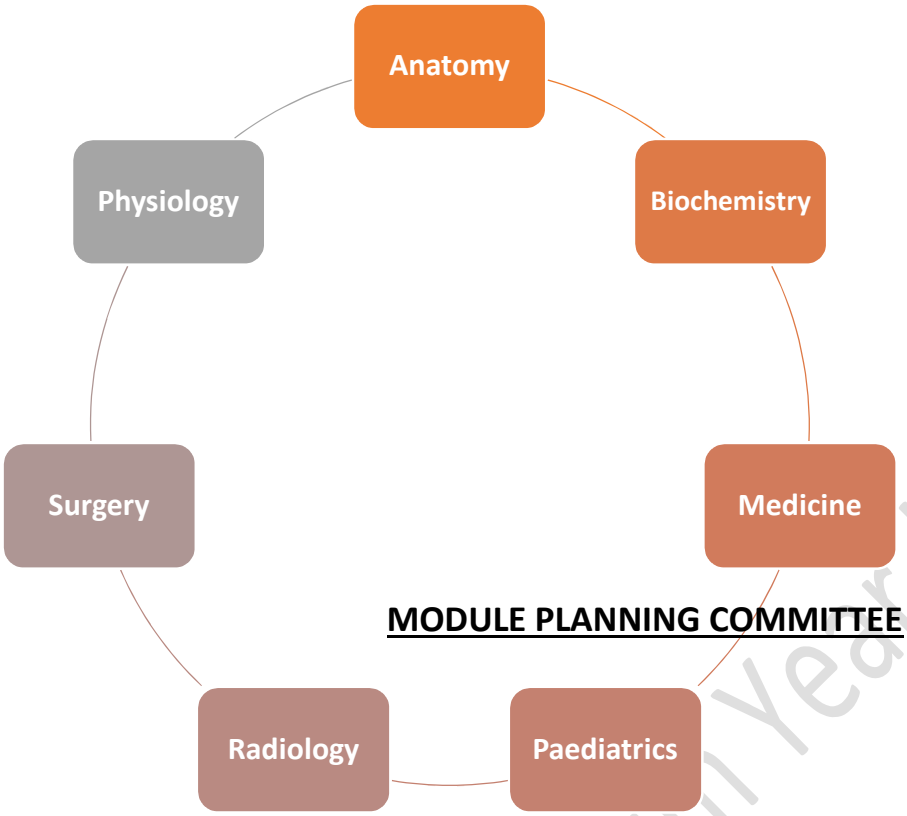
Surgery				
Topics	**Learning Outcomes**	**Learning objectives**	**MIT**	**Assessment tool**
	By the end of session, student should be able to:			
Maxillofacial Trauma	Correlate various types of faciomaxillary trauma with anatomy	Integrate the concepts basic sciences to solve clinical problems	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Epistaxis	Discuss various causes of epistaxis			
Cervical Lymphadenopathy	Identify clinical features of various cervical lymphadenopathies			
Oral Malignancies	Recognize the features of malignant lesions of oral cavity including salivary glands			
Vertigo and dizziness	Discuss causes of Vertigo and dizziness(ENT)			
Errors of refraction	Identify different errors of refraction (Eye)			
Visit to medical ward	• Observe the patient with relevant disorders			Formative assessment
Medicine				
Examination of cranial nerve	Examine cranial neve VII, IX and XI on patients	Cranial neve VII, IX and XI examinations	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Cranial Nerve VII palsy	Recognize clinical features of facial palsy			
Visit to medical ward	Observe the patient with relevant disorders			
PAEDIATRICS				
CLEFT PALATE / CLEFT LIP	Correlate cleft lip and palate anomalies with	Embryologic basis of cleft lip and palate.	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment

	embryological development of face			
Radiology				
Role of Radiology in Maxillofacial	Apply basic sciences to understand and discuss the role of radiology in head and neck	Identify and describe the radiological anatomy of the following structures on all relevant imaging modalities: • Cranial vault including bones • Anterior, middle and posterior cranial fossae, skull base, foramina and contents • Facial bones, sutures and foramina • Temporal bone and surrounding structures • Orbit including boundaries and compartments. • Nasal cavity and paranasal sinuses including bones and foramina/canals • Mandible and temporomandibular joint	Video clips / Lectures/ SGD/ CBL/PBL	OSPE/ Formative assessment

MBBS YEAR II
BLOCK VI
MODULE XII
Endocrinology
Duration : 05 weeks



Integration of Disciplines of this Module



Research Methodology

Behavioral Sciences

MODULE PLANNING COMMITTEE

Module Director	***To be filled by the institutes***
Members	

Preamble

The emphasis of this module is on histo-morphological and embryological structure of endocrinology system as well as the mechanisms involved in regulating hormone levels in an integrated manner. Similarly, this module of endocrine system will enable the students to recognize the clinical presentations of common endocrinological and metabolic disorders and relate clinical manifestations to basic sciences. This Endocrine module will be revisited in the following years. The research methodology and Behavioral Sciences will be taught as a part of the longitudinal theme.

Learning Outcome:

By the end of this module, student should be able to correlate the physiological and biochemical concepts related to genitourinary system with their anatomical knowledge and apply their relevant knowledge of this module in subsequent years of clinical training and practice

ANATOMY				
TOPICS	**OUTCOMES**	**Course content**	**Learning Strategies**	**Assessment tools**
GROSS ANATOMY OF NECK: ***Hyoid bone &*** **Cervical vertebrae**	• Apply the knowledge of Gross Anatomy of neck & endocrine organs in interpreting the anatomical basis of relevant clinical scenarios. • Demonstrate the topographic anatomy of structures of neck on the prosected specimens and models • Outline the main glands, nerves and vessels in the region of neck, on the surface of given subject exhibiting effective communication, professionalism and ethics. • Identify the normal radiographic appearance of tissues in the region of neck on the given radiographs	• Explain the gross features and attachments of hyoid bone • Give distinguishing features of each cervical vertebra. • Enumerate structures passing through foramina • Identify type and movements of atlantoaxial and atlantooccipital joints • Outline ligamentous attachments on cervical vertebrae.	SGD (Small Group Discussion)	MCQ/ SAQ/OSPE Viva
Superficial Fascia		• Outline contents of superficial fascia of neck (platysma, external jugular vein) • Illustrate cutaneous innervation of neck	SGD and dissection	MCQ/ SAQ/OSPE Viva
Deep cervical fascia		• Enumerate the layers of deep cervical fascia. • Trace the attachments of investing, pre-tracheal, carotid sheath and prevertebral layers of fascia. • Identify various modifications and neck spaces formed by fascial attachments. • Comprehend the clinical importance of neck	SGD and dissection	MCQ/ SAQ/OSPE Viva

		spaces in spread of infection		
Triangles of neck		• Tabulate the attachments, nerve supply, actions of superficial and deep muscles of neck (sternocleidomastoid, suprahyoid, infrahyoid, sub occipital, prevertebral muscles,). • Identify boundaries and contents of triangles of neck on model • Describe the origin, course and distribution of vessels and nerves of neck (cervical plexus, Ansa cervicalis, Common carotid artery, Internal jugular vein, subclavian vessels) • Analyze a case of lesion of accessory, glossopharyngeal and vagus nerve on anatomical basis. • Describe the clinical features of torticollis	SGD and dissection	MCQ/SAQ/OSPE Viva
Submandibular region		• Revisit boundaries of submandibular triangle • Describe the parts, relations, neurovascular supply of submandibular gland. • Trace the roots of submandibular ganglion • Describe the distribution of	SGD and dissection	MCQ/ SAQ/OSPE Viva

		submandibular ganglion • Correlate the anatomy of submandibular fascial space with Ludwig's angina		
Larynx		• Describe laryngeal wall in detail with emphasis on cartilages, ligaments, muscles, vascular supply and nerve supply. • Analyze mechanism of abduction and adduction of vocal cords • Distinguish clinical presentations of injury to external, internal and recurrent laryngeal nerves. • Recognize Clinical significance of piriform fossa • Apply the knowledge of anatomy to explain: ○ Laryngoscopy ○ Aspiration of foreign body from laryngopharynx	SGD and dissection	MCQ/ SAQ/OSPE Viva
Cervical part of trachea, esophagus and cervical chain		Identify gross features of Cervical part of trachea, esophagus and cervical chain and relevant clinical conditions	SGD and dissection	MCQ/ SAQ/OSPE Viva
Thyroid and parathyroid glands		• Identify gross features of thyroid and parathyroid glands on models. • Describe capsule, relations and blood	Lecture, SGD, CBL and dissection	MCQ/ SAQ/OSPE Viva

		supply of thyroid and parathyroid gland • Justify anatomical basis of movement of thyroid gland during deglutition • Discuss surgical precautions in thyroid surgery while ligating vessels and enucleation • Correlate the compression/shifting of surrounding structures in case of benign and malignant enlargement of thyroid gland in various directions		
Lymphatic drainage of neck		• Enumerate the groups of lymph nodes draining the neck. • Describe their location and areas of drainage. • Describe the formation of jugular lymph trunk. • Describe the clinical importance of `lymphatic drainage of neck.	SGD and dissection	MCQ/ SAQ/OSPE Viva
Great Vessels of Neck		• Describe the course and branches/tributaries of the respective vessels: ○ Common carotid artery ○ External carotid artery ○ Internal carotid artery ○ Internal Juglar vein	SGD and dissection	MCQ/ SAQ/OSPE Viva
Cranial nerves		Revisit the course of X & XI CNs and their distribution along with injuries	SGD and dissection	MCQ/ SAQ/OSPE Viva

Radiography		Identify the important bony landmarks of hyoid bone cervical vertebrae on x ray.	SGD and dissection	MCQ/ SAQ/OSPE Viva
Surface marking		• Mark following structures on subject: ➢ Thyroid Gland ➢ Common carotid artery ➢ Internal jugular vein	SGD	MCQ/ SAQ /OSPE Viva
Gross Anatomy of endocrine glands	•	• Define and classify the glands • Describe the location structure and function of all endocrine glands in the body	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Pituitary gland		Describe the gross anatomy, neurovascular supply and clinical importance of pituitary gland	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Parathyroid glands		Describe the gross anatomy, neurovascular supply and clinical importance of parathyroid glands	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Adrenal cortex		Describe the gross anatomy, neurovascular supply and clinical importance of adrenal gland	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Pancreas		Describe the gross anatomy, neurovascular supply and clinical importance of endocrine portion of pancreas	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
EMBRYOLOGY				
ENDOCRINE GLANDS:				
Pituitary gland	Explain the development events of endocrine organs/system and	Describe the development and congenital anomalies of pituitary gland	• LGIS	MCQ/SAQ/ SEQ/ structured Viva

Thyroid gland	embryological basis of their related congenital anomalies	Describe the development and congenital anomalies of thyroid gland (thyroglossal duct and other congenital abnormalities as congenital hypothyroidism, accessory thyroid and thyroid agenesis)	• LGIS	MCQ/SAQ/ SEQ/ structured Viva
Parathyroid glands		Describe the development and congenital anomalies of parathyroid glands	• LGIS	MCQ/SAQ/ SEQ/ structured Viva
Adrenal glands		Describe the development and congenital anomalies of adrenal gland	• LGIS	MCQ/SAQ/ SEQ/ structured Viva
HISTOLOGY				
Endocrine Glands: **Pituitary gland**	• Relate the histomorphological features of endocrine system with its functions • Identify the slides of endocrine system under light microscope at different magnification	• Describe the microscopic features of pituitary gland • Illustrate pituitary gland and write two points of identification	• LGIS • Practical	MCQ/SAQ/ SEQ/ OSPE Viva
Thyroid gland		• Describe the microscopic features of thyroid gland • Identify the slide of thyroid gland under light microscope and illustrate thyroid gland and write two points of identification	• LGSI • Practical	MCQ/SAQ/ SEQ/ OSPE Viva
Parathyroid gland		• Describe the microscopic features of parathyroid gland • Identify the slide of parathyroid gland under light microscope and illustrate parathyroid gland and write two points of identification	• LGIS • Practical	MCQ/SAQ/ SEQ/ OSPE Viva

Adrenal gland		• Describe the microscopic features of adrenal gland • Identify the slide of adrenal gland under light microscope and illustrate adrenal gland and write two points of identification	• LGIS • Practical	MCQ/SAQ/ SEQ/ OSPE Viva
Endocrine part of pancreas		• Revisit the microscopic features of endocrine part of pancreas • Identify the slide of pancreas under light microscope and illustrate pancreas gland and write two points of identification	• LGIS • Practical	MCQ/SAQ/ SEQ/ OSPE Viva

PHYSIOLOGY				
TOPICS	**OUTCOMES**	**Course objectives**	**Learning Strategies**	**Assessment tools**
Basics of endocrinology	• Discuss the synthesis, secretion and functions of different hormones • Summarize the regulation of different hormone secretion Identify the disorders of different gland and their pathophysiological basis	• Appreciate the coordination of body functions by chemical messengers • Explain the hormone secretion, transport, and clearance from the blood • Describe the feedback control of hormone secretion	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Hormones of hypothalamus and Pituitary gland		• Summarize the hypothalamic-hypophysial portal blood vessels of the anterior pituitary gland and its significance • DISCUSS THE FUNCTIONS OF HYPOTHALAMIC HORMONES • Recall the functions of growth hormone • Differentiate between hypopituitarism and hyperpituitarism and its pathophysiological basis • Explain the posterior pituitary gland and its relation to the hypothalamus • Describe the physiological functions of ADH and oxytocin Hormone	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Hormones of thyroid gland		• Explain the functions of the thyroid hormone • Identify the disorders of the Thyroid gland and their pathophysiological basis	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva

Calcium regulating hormones		• Enlist the actions of vitamin D • Explain the effect of parathyroid hormone on calcium and phosphate concentrations in the extracellular fluid • Describe the actions of calcitonin • Explain the pathophysiology of parathyroid hormone, vitamin D, and bone diseases	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Hormones of adrenal cortex		• Enlist the functions of MINERALOCORTICOIDS • Enlist functions of the glucocorticoids • Describe the disorders of adrenocortical secretion and their pathophysiological basis AND EFFECTS	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Hormones of pancreas		• Summarize the metabolic effects of insulin • Describe functions of Glucagon • Describe the types and pathophysiology of diabetes mellitus	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Pineal gland and thymus		• Summarize the endocrine functions of thymus and pineal gland	• Lectures • SGD • CBL	MCQ/SAQ/SEQ/ structured Viva
Practicals	Measure the blood glucose levels using the glucometer		Practical	OSPE

Biochemistry				
Topic/ Theme	**Learning outcomes**	**Learning Objective/ Content**	**Instructional strategies**	**Assessment tool**
Basis Endocrine System	• Describe the general principles of endocrine system • Classify the hormones according to their chemical nature & Mechanism of Action • Explain Cell surface receptors with special emphasis on G protein coupled receptors • Discuss Intracellular second messenger signaling cascade • Describe the Intracellular ligand receptors	• General principles of endocrine system • Classification of hormones • Cell surface receptors • Intracellular second messenger signaling cascade • Intracellular ligand receptors	• LECTURES • SGD • CBL	• MCQ • SAQ/SEQ
Growth Hormone	• Explain the Site of synthesis, stimulus for secretion, mechanism of action, receptors, intracellular effects, target cells, tissues and biochemical role & hypo/hyper secretion of Growth Hormone	Biochemical role of Growth Hormone	• LECTURES • SGD • PBL • CBL	• MCQ • SAQ/SEQ
Thyroid hormone	• Explain the Site of synthesis, stimulus for secretion, mechanism of action, receptors, intracellular effects, target cells, tissues and biochemical role & hypo/hyper secretion of Thyroid hormone	Biochemical role of Thyroid hormone	• LECTURES • SGD • PBL • CBL	• MCQ • SAQ/SEQ

Adrenal hormones	Explain the Site of synthesis, stimulus for secretion, mechanism of action, receptors, intracellular effects, target cells, tissues and biochemical role & hypo/hyper secretion adrenal hormones	Biochemical role of adrenal hormones	• LECTURES • SGD • PBL • CBL	• MCQ • SAQ/SEQ
Pancreatic hormones	Describe the Site of synthesis, stimulus for secretion, mechanism of action, receptors, intracellular effects, target cells, tissues and biochemical role & hypo/hyper secretion pancreatic hormones	Biochemical role of Pancreatic hormones	• LECTURES • SGD • PBL • CBL	• MCQ • SAQ/SEQ
Parathyroid hormone	Explain the Site of synthesis, stimulus for secretion, mechanism of action, receptors, intracellular effects, target cells, tissues and biochemical role & hypo/hyper secretion of parathyroid hormone	Biochemical role of Parathyroid hormones	• LECTURES • SGD • PBL • CBL	• MCQ • SAQ/SEQ
Practicals	Interpret the results of given examination	• Thyroid profile • OGTT • Interpretation of Sex hormones	Practical	OSPE
SURGERY				
Diabetic foot	Relate the basic knowledge of diabetes to identify its complication of diabetic foot	Diabetic foot	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Parathyroid anomalies	Describe presentation and complications of hypercalcemia with relation to Parathyroid anomalies	Parathyroid anomalies		

Thyroid and Parathyroid gland	• Identify disorders of Thyroid gland presenting as Goitre • Identify presentation and causes of hyper- and hypo- thyroidism • Correlate clinical condition of Thyroid and Parathyroid gland with their gross anatomy	Thyroid and Parathyroid gland		
Visit to ward	• Observe the patient with relevant disorders		CBL	Formative assessment
Medicine				
Pituitary abnormalities	• Identify clinical presentations of hyper and hypopituitarism	Clinical presentations of: • hyperpituitarism • hypopituitarism	Video clips / Lectures/ SGD/ CBL/PBL	Formative assessment
Thyroid Gland	• Identify clinical presentations of hyper and hypothyroidism	Clinical presentations of • hyperthyroidism • hypothyroidism		
Calcium disorder	Identify clinical presentations of hyper and hypocalcaemia	Clinical presentations of: • Hypercalcaemia • hypocalcaemia		
Adrenal Disorder	Identify clinical presentations of Cushing's syndrome and Addison's disease	clinical presentations of Cushing's syndrome and Addison's disease		
Diabetes Mellitus	Identify clinical presentations of type II DM	Type II DM		
Visit to medical ward	Observe the patient with relevant disorders		CBL	Formative assessment
RADIOLOGY				

Thyroid gland	• Discuss the role of radiology to differentiate between hot and cold nodule	Identify hot and cold nodule	Video clips / Lectures/ SGD/ CBL/PBL	OSPE/ Formative assessment

Research Methodology

Research Methodology					
Block-I	**Topic/ Theme**	**Learning Outcomes**	**Learning Objectives/Contents**	**Instructional strategies**	**Assessment Tool**
	Quantitative and qualitative research	Differentiate quantitative and qualitative research methodology and its applications.	Quantitative research and its applications Qualitative research methodology	LGIS/ SGD	MCQ/ SEQ
	Study designs	Classify study designs with relation to hierarchy of evidence	Observational study Cross-sectional study Case-control study Interventional study	LGIS/ Group assignment	MCQ/ SEQ
	Study population and its selection	Able to select study population and sample as per defined criteria	Population Sample Inclusion and exclusion criteria for selection of patients	LGIS/ SGD	MCQ/ SEQ
Block-II	**Topic/ Theme**	**Learning Outcomes**	**Learning Objectives/Contents**	**Instructional strategies**	**Assessment Tool**
	Sampling techniques	Use different sampling techniques in research	Probability and non-probability sampling. Types of sampling techniques	LGIS/ Group assignment	MCQ/ SEQ
	Ethical issues in research	Apply ethical principal to resolve issues for human research	Helsinki declaration, Hippocratic oath Ethical issues in research Elements of informed consent	LGIS/ SGD	MCQ/ SEQ
	Research ethics	Understand ethical concerns relating to different aspects of research orgationzations	Ethical issues relating to researcher, participants and sponsoring organization Institutional review board	LGIS/ SGD	MCQ/ SEQ
	Topic/ Theme	**Learning Outcomes**	**Learning Objectives/Contents**	**Instructional strategies**	**Assessment Tool**
Block-III	**Data collection method**	• Formulate research questionnaire	Data collection procedure Study questionnaire	LGIS/ SGD	MCQ/ SEQ

		• Develop tool/ procedure for data collection	Interview		
	Descriptive data analyses	Enter data and do descriptive data analysis on SPSS	Introduction to SPSS data entry and analyses software, data frequency tables, graphs, charts	workshop	MCQ/ SEQ
	Statistical Data analyses,	Apply basic state tests on the research data	Parametric tests Non -parametric tests	Statistical Data analyses,	Able to do descriptive f data analysis SPSS Apply basic state tests
	Proposal writing	Prepare a research proposal	Introduction, Objectives Hypothesis methodology, Statistical analysis	Group assignment	Internal assessment by community dept

Pakistan Studies

Course Content of Pakistan Studies

1. **Scope** To impart basic concept of ideology of Pakistan with reference to historical backdrop of Muslims' struggle for the establishment of Pakistan, importance of Pakistan's geographical and strategic position and its relations with other countries.

2. **Course Objectives.** To enable the students to:
   a. To develop the sense of belongingness to their motherland
   b. To develop strong faith in the basic concepts of ideology of Pakistan and its historical background.
   c. To aware about the historical background of Muslims' struggle in the making of Pakistan.
   d. To sensitize students about the importance of Pakistan's geographical and strategic position in South Asia.
   e. To aware the students with the meaning and significance of Pakistan's foreign policy.
   f. To promote the knowledge of Pakistani culture and civilization.
   g. To aware new generation about the current affairs and important pillars of Pakistan's political system.
   h. To develop the qualities of patriot Pakistani for understanding and fullfilling their duties and responsibilities.

3. **Course Outcome**. On completion of the course, the students will be able to:
   a. Develop the sense of belongingness to their motherland.
   b. Apply knowledge of the historical background of Muslims' struggle in the making of Pakistan.
   c. Understand about the importance of Pakistan's geographical and strategic position in South Asia.
   d. Know the meaning and significance of Pakistan's foreign policy.
   e. Develop the qualities of patriot Pakistani for understanding and full filling their duties and responsibilities.

4. **Course Contents**

Serial	Chapter/Topic
	Basic Concept for Establishment of Pakistan
1	Introduction to Pakistan Studies
2	Ideology, Aims and Objectives for the establishment of Pakistan

3	Historical, Geo-political and Socio-cultural Background of Pakistan
Role of Muslim Reformers	
4	Hazrat Mujadid Alf Sani
5	Hazrat Shah Wali Ullah Muhadis Delhvi
6	Syed Ahmed Shaheed Barailvi
7	Sir Syed Ahmad Khan
Muslim Political Struggle	
8	Legislative Council Act - 1816, Indian Council Act - 1892, Hindi Urdu Controversy, Partition of Bengal, Simla Deputation.
9	Formation of All India Muslim League, Minto-Morley Reforms, Lucknow Pact - 1916, Montague-Chelmsford Reforms.
10	Khilafat Movement
Pakistan Movement	
11	Two Nation Theory
12	Problems of Indian Independence and the Muslims, Change in Muslim Politics, Delhi Proposal, Simon Commission, Nehru Report, Fourteen Points of Quaid e Azam, Allama Iqbal's Residential Address at Allahabad, Round Table Conference,
	Communal Awards, Government of India Act - 1935, Elections - 1937.
13	**P**.nnnrR*^ **AtrnritiRs** anain^t Mu^lim^ Muslim Leaoue Role during Congress Rule.
14	Chaudhry Rehmat Ali and Pakistan Movement, Pakistan Kesoiunon, August urrer, onpps Mission, uun inaia Movement, Gandhi-Jinnah Talks, Wavell Plan.
15	Simla Conference, Cabinet Mission Plan, Formation of Interim Government, June 3 Plan, RadCliffe Award, Independence Act 1937.
Establishment of **Pakistan**	
16	Initial Difficulties and Important Events
17	The Constitution of 1956, The Constitution of 1973
18	The Land of Pakistan - Geography
19	Natural Resources of Pakistan
20	Foreign Policy of Pakistan
21	Pakistan and the Muslim World
22	The Kashmir Problem

5. **Reference/Text Books**

a. **Essential Readings**

(1) "Pakistan Studies" by Ikram Rabbani, Carvan Book House, Lahore.
(2) "Pakistan Studies" by Dr Zafar, Aziz Book Depot, Lahore.
(3) "Mutala e Pakistan (Lazmi), Allama Iqbal Open University, Umar Printing Press, Lahore.
(4) "Essential Book of Pakistan Studies" by Dr Rashid Ahmad Khan.
(5) "Oxford Atlas of Pakistan".