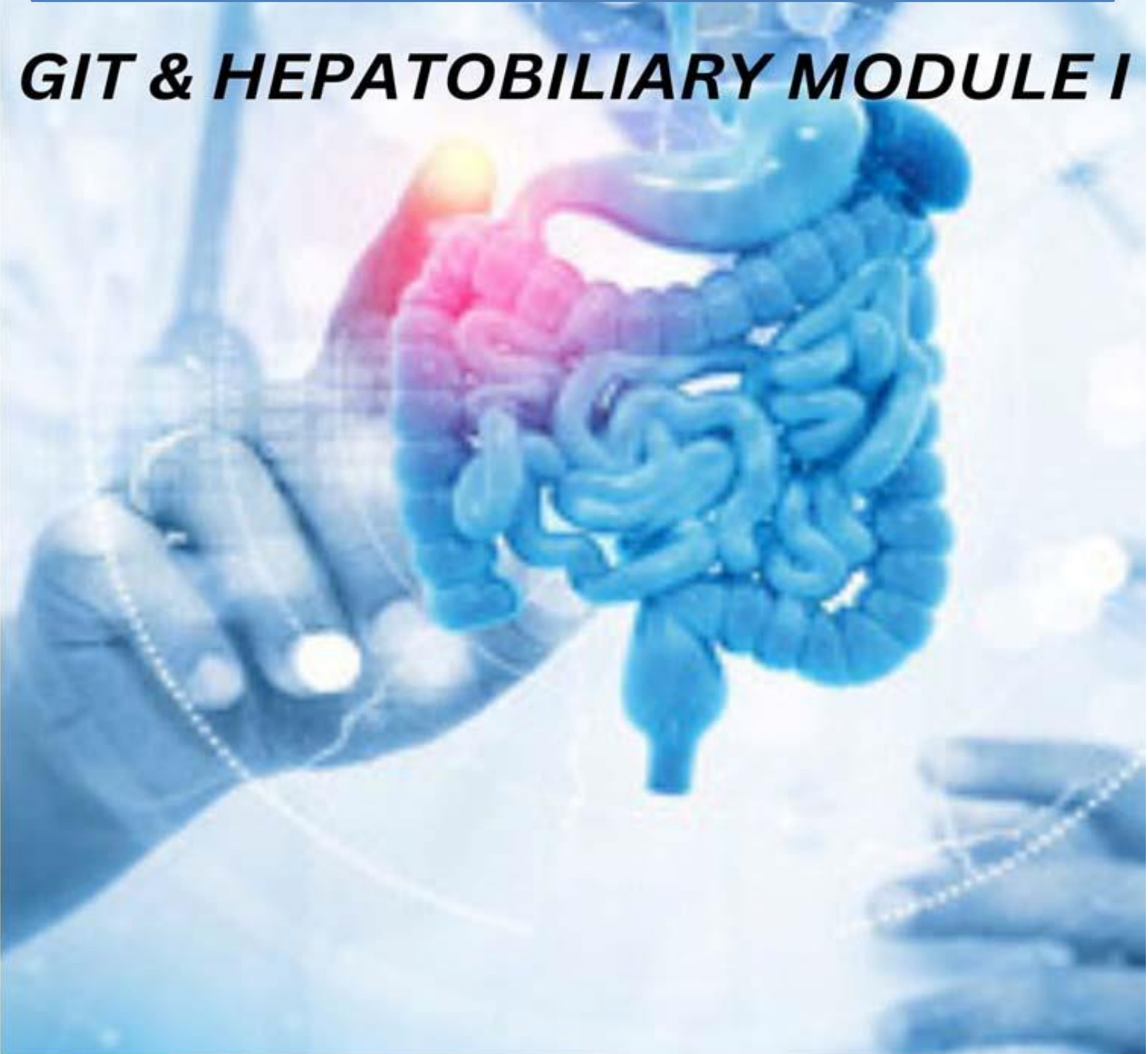


# **STUDY GUIDE-2ND YEAR MBBS**

20<sup>th</sup> January 2025 – 1<sup>st</sup> March 2025

Duration: 6 Weeks

## ***GIT & HEPATOBILIARY MODULE I***



**STUDY GUIDE FOR GASTROINTESTINAL TRACT& LIVER MODULE-I**

<b>S. No.</b>	<b>CONTENTS</b>	<b>Page No</b>
1	Overview	3
2	Introduction to Study Guide	4
3	Learning Methodologies	5
4	Module1: GIT & Liver-I	6
4.1	Importance of GIT & Liver	6
4.2	Objectives and Learning strategies	7
5	Learning Resources	19
6	Assessment Methods	20
7	LNMC Examination Rules and Regulations	21
8	Schedule	22

Module name: Gastro-Intestinal Tract (GIT) & Liver-I

Year: Two

Duration: 6 weeks (20<sup>th</sup> January 2025– 1<sup>st</sup> March 2025)

Time table hours: Interactive Lectures, Case-Based Learning (CBL), Self-Study, Practical's, Skills, Demonstrations

### MODULE INTEGRATED COMMITTEE

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<b>LNH&amp;MC MANAGEMENT</b>	
Professor Karimullah Makki, Principal LNH&MC Dr. Shaheena Akbani, Director A.A & R.T LNH&MC	
<b>STUDY GUIDE COMPILED BY: Department of Health Professions Education</b>	

## **INTRODUCTION**

### **WHAT IS A STUDYGUIDE?**

It is an aid to:

- Inform students how student learning program of the module has been organized
- Help student's organize and manage their studies throughout the module
- Guide students on assessment methods, rules and regulations

### **THE STUDYGUIDE:**

- Communicates information on organization and management of the module.  
This will help the student to contact the right person in case of any difficulty.
- defines the objectives which are expected to be achieved at the end of the module.
- identifies the learning strategies such as Interactive Lectures, small group teachings, clinical skills, demonstration, tutorial and case based learning that will be implemented to achieve the module objectives.
- provides a list of learning resources such as books, computer assisted learning programs, web- links, and journals, for students to consult in order to maximize their learning.
- Highlights information on the contribution of continuous and examinations on the Student's overall performance.
- Includes information on the assessment methods that will be held to determine every student's Achievement of objectives.
- focuses on information pertaining to examination policy, rules and regulations.

### **CURRICULUM FRAME WORK:**

Students will experience *integrated curriculum* in the module at LNMC in accordance with the JSMU guidelines and most recent developments that have an impact on individual health.

### **INTEGRATED CURRICULUM:**

Comprises of system-based modules such as Neuroscience, Head & Neck Renal & Excretory System-I and Reproduction-I which links basic science knowledge to clinical problems. Integrated teaching means that subjects are presented as a meaningful whole. Student will be able to have better understanding of basic sciences when they repeatedly learn in relation to clinical examples.

**LEARNING METHODOLOGIES**

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

- Interactive Lectures
- Small Group Discussion
- Case- Based Learning
- Practical
- Skills session
- Self-Study
- E-Learning

**INTERACTIVE LECTURES**

In large group, the Interactive Lecturer introduces a topic or common clinical conditions and explains the underlying phenomena through questions, pictures, videos of patients 'interviews, exercises, etc. Students are actively involved in the learning process.

**SMALL GROUP DISCUSSION (SGD):** This format helps students to clarify concepts acquire skills or attitudes. Sessions are structured with the help of specific exercises such as patient case, interviews or discussion topics. Students exchange opinions and apply knowledge gained from Interactive Lectures, tutorials and self-study. The facilitator role is to ask probing questions, summarize, or rephrase to help clarify concepts.

**CASE-BASED LEARNING:** A small group discussion format where learning is focused around a series of questions based on a clinical scenario. Students' discuss and answer the questions applying relevant knowledge gained in clinical and basic health sciences during the module.

**PRACTICAL:** Basic science practical related to anatomy, biochemistry, pathology, pharmacology and physiology are scheduled for student learning.

**SKILLSSESSION:** Skills relevant to respective module are observed and practiced where applicable in skills laboratory.

**SELF-STUDY:** Students' assume responsibilities of their own learning through individual study, sharing and discussing with peers, seeking information from Learning Resource Center, teachers and resource persons within and outside the college. Students can utilize the time within the college scheduled hours of self-study.

**E-LEARNING:** E-Learning is a strategy by which learning occurs through the utilization of electronic media, typically the Internet. The basic aspects of medical professionalism and ethics will be addressed through an e-learning course.

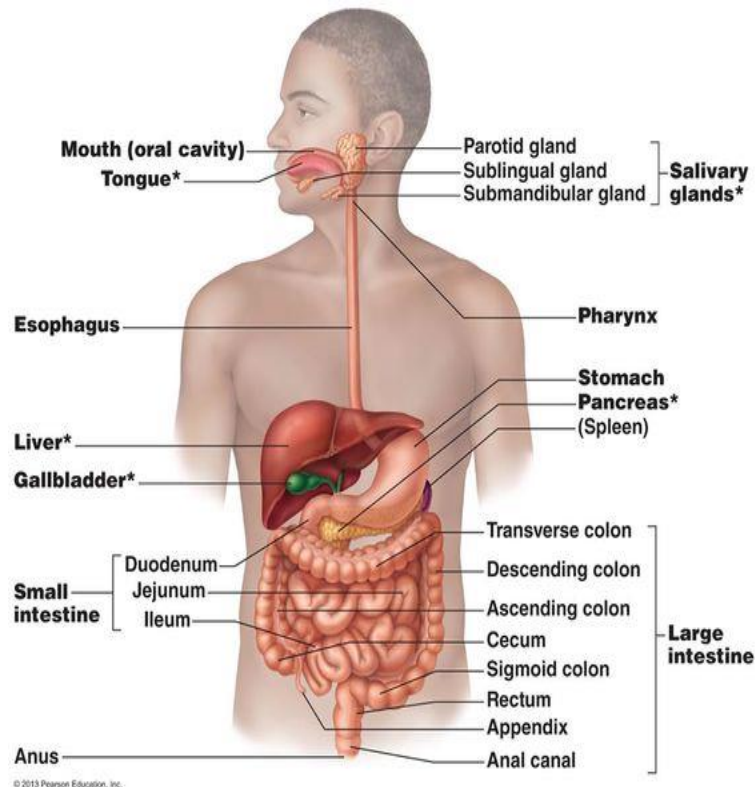
## MODULE 1 : GIT & LIVER

### INTRODUCTION

In this module, medical students will learn in detail the normal structure, function and diseases GI Tract and hepatobiliary system. From Pakistan's context, the prevalence and significance of GIT and liver illnesses can be judged from the total days that adults and children are affected and remain absent from schools or work; number of admissions to hospitals ; and in numbers of surgical procedures performed.

Children and adults present to general practice, or hospitals with signs and symptoms of some of very common illnesses related to GIT & Liver including vomiting, chronic diarrhea, constipation, peptic ulcers, enteric fever, malnutrition, jaundice etc. This module will provide students opportunities to understand the basis of these illnesses including the mechanism involved in the development of these pathologies and integrate basic medical science knowledge to clinical problem-solving.

Students will identify how GI structure (Embryology, Microscopic Anatomy and Gross Anatomy) integrates with function (physiologic mechanisms of GI motility, digestion and absorption, and liver and pancreatic function). During the module, students will acquire a wider, more generally applicable knowledge of immunology, metabolism, infectious disease and pathology related to the GI system. Therefore, the overall objective of this course is to provide an integrative understanding of the structure and functions of the gastrointestinal tract.



**COURSE OBJECTIVES AND STRATEGIES**

At the end of the module the students will be able to:

**ANATOMY**

<b>TOPICS &amp; OBJECTIVES</b>	<b>LEARNING STRATEGIES</b>
<b>1. Introduction &amp; divisions of GIT &amp; abdominal quadrants</b>	Interactive Lecture/ Tutorial
<ul style="list-style-type: none"> <li>Describe the divisions and parts of digestive tract</li> <li>List the abdominal quadrants &amp; regions of GIT</li> </ul>	
<b>2. Esophagus (Abdominal Part), Stomach {GROSS ANATOMY}</b>	
<ul style="list-style-type: none"> <li>Explain gross features of abdominal part of esophagus &amp; stomach</li> <li>List their peritoneal &amp; visceral relations</li> <li>Explain their blood supply, lymphatic drainage &amp; nerve supply</li> </ul>	
<b>3. General Plan of G.I.T and Esophagus (HISTOLOGY )</b>	
<ul style="list-style-type: none"> <li>List the divisions of digestive tract</li> <li>Describe the general histological features of GIT, specially of esophagus</li> </ul>	
<b>4. Development of GIT -I (derivatives of fore gut) {EMBRYOLOGY}</b>	
<ul style="list-style-type: none"> <li>Describe the divisions of primitive gut</li> <li>Enumerate the derivatives of foregut</li> <li>Describe the development of foregut</li> <li>Describe the clinical aspect of derivatives of foregut</li> <li>Enumerate the congenital anomalies of foregut</li> <li>Discuss the features of the following congenital anomalies of foregut:               <ol style="list-style-type: none"> <li>Hernias</li> <li>Esophageal atresia, esophageal stenosis, congenital hypertrophic pyloric stenosis, duodenal stenosis &amp; atresia, anomalies of liver, extrahepatic, biliary atresia, annular pancreas, accessory pancreatic tissue, &amp; accessory spleen</li> </ol> </li> </ul>	
<b>5. Stomach {HISTOLOGY}</b>	
<ul style="list-style-type: none"> <li>Describe the functions of the layers, component and cells in the wall of the digestive tract</li> <li>Explain how they differ in the pharynx, esophagus and stomach.</li> <li>Describe the microscopic features of gastric glands, their constituent cells and secretory product.</li> <li>Differentiate cardiac, fundic and pyloric glands</li> </ul>	
<b>6. Peritoneum {GROSS ANATOMY}</b>	Interactive Lecture/ Tutorial
<ul style="list-style-type: none"> <li>Describe the extent of peritoneum horizontally</li> <li>Define peritoneal layers, cavity, folds/mesenteries, omentum &amp; ligaments</li> <li>Explain the attachment and reflection of peritoneum</li> <li>Explain the attachment of peritoneum on liver</li> <li>Describe the boundaries of lesser sac</li> </ul>	

<b>7. Small Intestine &amp; large intestine {GROSS ANATOMY}</b>	Interactive Lecture/ Tutorial
• Explain different parts of small and large intestine	
• Describe the blood supply of intestine	
• Describe the nerve supply of intestine	
• List the structural differences between small and large intestine	
• Discuss the lymphatic drainage of small and large intestine	
<b>8. Development Anatomy of GIT- II (derivatives of mid and hind gut ) {EMBRYOLOGY}</b>	Interactive Lecture/ Case-Based Learning
• List the developmental derivatives of primitive gut tube (pharynx, esophagus, stomach, intestine)	
• Describe the derivatives of midgut and hindgut	
• Describe rotation of gut	
• Describe the formation of greater, lesser omentum and omentobursae	
• Describe the congenital anomalies of gut	
• List the special features associated with common anomalies related to gut including: <ul style="list-style-type: none"> <li>✓ Congenital omphalocele</li> <li>✓ umbilical hernia</li> <li>✓ gastroschisis</li> <li>✓ anomalies of midgut</li> <li>✓ internal hernia</li> <li>✓ stenosis</li> <li>✓ atresia of intestine</li> <li>✓ Mal-rotation of gut</li> <li>✓ Ileal diverticulum</li> <li>✓ duplication of intestine</li> <li>✓ anomalies of hindgut</li> <li>✓ Hirschsprung disease</li> <li>✓ imperforate anus</li> <li>✓ anal stenosis</li> <li>✓ rectal atresia</li> </ul>	
<b>9. Small intestine {HISTOLOGY}</b>	
• Explain the different layers of small intestine	
• Discuss the cells present in the small intestine	
• Describe the different glands present in the small intestine	
• Define and explain Payers patches	
• Differentiate the parts of small intestine histologically	
<b>10. Large intestine {HISTOLOGY}</b>	
• Enumerate the different layers of large intestine	
• Describe the cells and glands present in large intestine	
• Explain the difference between small and large intestine	
<b>11. Liver and Gall bladder {GROSS ANATOMY}</b>	Interactive Lecture/ Tutorial
• Describe liver with its anatomical positions	
• Identify lobes and surfaces of liver and visceral relations and impression.	
• Identify the segments of liver	
• Discuss the different components of biliary tract	
<b>12. Hepatic Portal System</b>	
• Identify the venous drainage of the organs of GI tract, and veins of hepatic portal system	



• Describe the venous drainage of the organs of GI tract and the veins of hepatic portal system		
• Describe the clinical importance of the hepatic portal system and its connections		
<b>13. Development of liver, Gall bladder and Pancreas {EMBRYOLOGY}</b>		
• Describe the development of liver		
• Discuss the formation of bile & hepatic cells		
• Discuss the molecular regulation of liver induction		
• Explain the formation of gallbladder & cystic duct		
• Enumerate the anomalies of Liver & gallbladder		
• Discuss the formation of pancreatic bud and islet of Langerhan		
• Discuss molecular regulation of pancreas development		
• Describe Pancreatic abnormalities		
<b>14. Liver and gall bladder {HISTOLOGY}</b>		Interactive Lecture /Tutorial/Pra ctical
• Explain the histology of liver		
• Explain the arrangement of liver parenchyma		
• Describe the general concepts underlying classical hepatic lobule, portal lobule and hepatic acinus		
• Describe the microscopic structure of gall bladder		
<b>15. Pancreas {GROSS ANATOMY}</b>		
• Discuss the gross features of different parts of pancreas		
• Describe the location, relations, and morphological and secretory parts of Pancreas		
• Describe the arterial supply, venous drainage and nerve supply of pancreas		
• Discuss the clinical relevance of pancreas		
<b>16. Pancreas {HISTOLOGY}</b>	Interactive Lecture/ Tutorial	
• Explain the histology of Pancreas		
• Explain the arrangement of Pancreatic parenchyma		
<b>17. Posterior abdominal wall (boundaries, lumbar vertebrae, muscles, fascia)</b>		
• Identify the level of vertebrae with respect to the three major orifices in the diaphragm		
• Identify the location of these orifices with respect to vertebral level		
• Enumerate the structures forming the posterior abdominal wall		
• Identify the boundaries of posterior abdominal wall		
• Discuss the general characteristics of lumbar vertebrae	Interactive Lecture	
• Describe the muscles and fasciae of posterior abdominal wall		
• Discuss the clinical conditions associated with the posterior abdominal wall		
<b>18. Anal Canal</b>		
• Describe the Ano-rectal junction		
• Describe the Nerve supply and blood supply of anal canal		
• Describe Ano-rectal fistula, Polyps and diverticulum	Tutorial	
NOTE: Anal sphincters (External and internal) will be discussed with pelvis & perineum		
<b>19. Anterior Abdominal wall</b>		
• Enumerate the structures forming anterior abdominal wall		
• Identify the boundaries of anterior abdominal wall		
• Describe the muscles and fasciae of anterior abdominal wall		
• Discuss the clinical conditions associated with the anterior abdominal wall		

<b>20. Inguinal Canal</b>	Case- Based Discussion
<ul style="list-style-type: none"> <li>Describe the boundaries and content of the inguinal canal</li> <li>Discuss clinical correlation of the inguinal canal</li> </ul>	
<b>21. Abdominal Aorta &amp; blood supply of abdomen</b>	Interactive Lecture
<ul style="list-style-type: none"> <li>Describe the course of abdominal aorta</li> <li>Enumerate the paired and unpaired branches of abdominal aorta</li> <li>Discuss the arteries which supply the abdominal walls</li> </ul>	
<b>22. Inferior vena cava &amp; venous drainage of abdomen</b>	
<ul style="list-style-type: none"> <li>Describe the formation of inferior vena cava</li> <li>List the tributaries of inferior vena cava</li> <li>Explain the relations of inferior vena cava</li> <li>Discuss the clinical conditions associated with inferior vena cava</li> </ul>	
<b>23. Lymphatic drainage and innervation of abdomen</b>	
<ul style="list-style-type: none"> <li>Explain the groups of lymph nodes draining the abdomen</li> <li>Describe the lymphatic trunks, cistern chili, the thoracic duct and nerves supply of abdomen</li> <li>Discuss the sympathetic trunk, splanchnic nerves, prevertebral plexus &amp; ganglia supplying the abdomen</li> </ul>	
<b>24. Surface anatomy of Abdomen</b>	
<ul style="list-style-type: none"> <li>Identify the bony landmarks of the abdomen</li> <li>Discuss the abdominal regions and quadrants</li> <li>List the abdominal organs in each quadrant</li> <li>Discuss the surface anatomy of stomach and spleen in relation to anterior abdominal wall</li> <li>Discuss the surface anatomy of kidneys, ureters and spleen in relation to posterior abdominal wall</li> <li>Identify the surface anatomy of liver</li> <li>Discuss the surface anatomy of diaphragm</li> </ul>	
<b>25. Esophagus and stomach</b>	
<ul style="list-style-type: none"> <li>Identify the slides of esophagus and stomach under microscope</li> <li>Discuss the structure of the gastrointestinal tract, Histological features of layers of GIT</li> <li>Describe the microscopic features of esophagus</li> <li>Discuss the histological structure of each layer of esophagus</li> <li>Discuss the distribution of esophageal glands and muscles</li> <li>Elaborate the different regions of stomach, grossly and histologically</li> <li>Discuss the various layers of the wall of stomach</li> <li>Discuss the different glands and the various kind of cells present in esophagus and stomach</li> </ul>	
<b>26. Large Intestine</b>	Practical
<ul style="list-style-type: none"> <li>Identify large intestine under microscope</li> <li>Describe the important histological features of large intestine.</li> <li>Identify the appendix on the basis of its distinguished features</li> <li>Identify the histological features of anorectal region</li> <li>Differentiate between basic histological features of small and large intestines</li> </ul>	

**BIOCHEMISTRY**

<b>TOPICS &amp; OBJECTIVES</b>	<b>LEARNING STRATEGIES</b>
<b>DIGESTION &amp; ABSORPTION</b>	Interactive Lecture/ Tutorial/Prac tical
<b>1. Digestion &amp; Absorption of Carbohydrates</b>	
<ul style="list-style-type: none"> <li>• Classify dietary carbohydrates with examples</li> <li>• Explain the significance of the glycemic index</li> <li>• Describe the importance of dietary fiber</li> <li>• List the main digestive enzymes and describe their action on carbohydrate</li> <li>• Discuss the chain due to digestive enzyme deficiency</li> <li>• Explain the absorption of monosaccharides by the intestinal mucosal cells</li> <li>• Discuss the clinical significance of abnormalities of digestion and absorption (e.g. lactose intolerance)</li> <li>• Correlate the interpretation of laboratory investigations with relevant clinical conditions</li> </ul>	
<b>2. Digestion &amp; Absorption of Proteins</b>	
<ul style="list-style-type: none"> <li>• List the various sources of dietary protein</li> <li>• Discuss the digestion of protein</li> <li>• List and explain the functions of the proteolytic enzymes</li> <li>• Explain the mechanism of absorption of amino acids</li> <li>• Discuss the significance of amino acid pool</li> <li>• Explain the significance of nitrogen balance.</li> <li>• Discuss the clinical significance of protein allergy, celiac sprue and cystinuria</li> </ul>	
<b>3. Digestion &amp; Absorption of Lipids</b>	
<ul style="list-style-type: none"> <li>• List the constituents of dietary lipids</li> <li>• Discuss the digestion of lipids</li> <li>• Explain the role of lipases in lipid digestion</li> <li>• Discuss the digestion of dietary cholesterol and phospholipids</li> <li>• Explain the hormonal regulation of lipid digestion</li> <li>• Discuss the absorption of lipids by the intestinal mucosal cells</li> <li>• Discuss the re-synthesis and secretion of lipids by the enterocytes</li> <li>• Discuss the secretion of chylomicrons by the enterocytes</li> <li>• Define Steatorrhea</li> <li>• List causes of Steatorrhea</li> <li>• Discuss the abnormalities of lipid digestion and absorption with especial reference to cystic fibrosis</li> </ul>	
<b>4. Serum Glucose Estimation</b>	
<ul style="list-style-type: none"> <li>• List and explain the biochemical investigations done for Diabetes Mellitus</li> </ul>	

<ul style="list-style-type: none"> <li>Outline the method for serum glucose estimation by spectrophotometer</li> </ul>	
<ul style="list-style-type: none"> <li>Estimate the serum glucose levels and give its interpretation</li> </ul>	
<ul style="list-style-type: none"> <li>Correlate the interpretation of laboratory investigations with relevant clinical conditions</li> </ul>	
<b>METABOLIC PATHWAYS OF CARBOHYDRATES</b>	
<b>5. Glycolytic pathway of Carbohydrates Metabolism</b>	
<ul style="list-style-type: none"> <li>Differentiate between aerobic and anaerobic glycolysis</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the role of insulin in transport of glucose inside the cells</li> </ul>	
<ul style="list-style-type: none"> <li>List the reactions of the two stages of glycolysis viz energy investment and energy generation</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the hormonal regulation of glycolysis</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the fate of pyruvate</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the process of glycolysis in RBC's</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the abnormalities of glycolysis</li> </ul>	
<b>6. TCA cycle of Carbohydrate metabolism</b>	
<ul style="list-style-type: none"> <li>Discuss the significance of TCA cycle as an amphibolic pathway</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the reactions of the TCA cycle and its regulatory steps</li> </ul>	
<ul style="list-style-type: none"> <li>Describe the energy produced from TCA cycle</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the disorders of TCA cycle</li> </ul>	
<b>7. Metabolism of Glycogen with its disorders</b>	
<ul style="list-style-type: none"> <li>Explain the structure and functions of glycogen</li> </ul>	
<ul style="list-style-type: none"> <li>Describe the mechanism of glycogen synthesis and its regulation</li> </ul>	
<ul style="list-style-type: none"> <li>Describe the mechanism of glycogenolysis and its regulation</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the maintenance of blood glucose level</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the various form of glycogen storage diseases</li> </ul>	
<b>8. Metabolic pathway of Gluconeogenesis</b>	
<ul style="list-style-type: none"> <li>Describe the mechanism of gluconeogenesis</li> </ul>	
<ul style="list-style-type: none"> <li>List the reactions which are unique to gluconeogenesis</li> </ul>	
<ul style="list-style-type: none"> <li>Describe the regulation of gluconeogenesis</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the Cori cycle</li> </ul>	
<b>9. Metabolic pathway of HMP Shunt</b>	
<ul style="list-style-type: none"> <li>Describe the significance of hexose monophosphate shunt</li> </ul>	
<ul style="list-style-type: none"> <li>Describe the oxidative and non-oxidative stages of HMP shunt</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the enzymes of the HMP shunt and its regulation.</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the abnormalities of the HMP shunt especially G6PD.</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the significance of reactive oxygen species</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the functions of NADPH and glutathione</li> </ul>	
<b>10. Metabolic pathways of Fructose, Galactose &amp; Uronic Acid</b>	
<ul style="list-style-type: none"> <li>List the sources of fructose</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the alternative mechanism of monosaccharide metabolism</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the important enzymes of fructose metabolism</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the metabolic pathway of fructose</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the disorders of fructose metabolism due to enzyme deficiencies</li> </ul>	
<ul style="list-style-type: none"> <li>Discuss the important enzymes of Galactose metabolism</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the metabolic pathway of Galactose metabolism</li> </ul>	

Interactive  
Lecture/  
Tutorial/  
Case-Based  
Learning/  
Practical

<ul style="list-style-type: none"> <li>• Explain the disorders of Galactose metabolism due to enzyme deficiencies</li> <li>• Explain the uronic acid pathway and its biochemical significance.</li> <li>• Describe the importance of uronic acid pathway in liver detoxification</li> </ul>	
<b>10.1. Disturbances in Carbohydrate Metabolism</b>	
<ul style="list-style-type: none"> <li>• Discuss the clinical importance of disturbances in carbohydrate metabolism (e.g. G6PD deficiency)</li> <li>• Correlate the interpretation of laboratory investigations with relevant clinical conditions</li> </ul>	Tutorial
<b>BIOLOGICAL OXIDATION</b>	
<b>11. Bioenergetics &amp; Biological Oxidation</b>	
<ul style="list-style-type: none"> <li>• List high energy and low energy phosphate</li> <li>• List the oxido-reductase enzymes</li> <li>• Define bioenergetics and explain the general laws of thermodynamics</li> <li>• Define free energy and equilibrium constant</li> <li>• Describe the coupling of endergonic &amp; exergonic reactions by high energy intermediates (e.g. ATP)</li> <li>• Describe the role of ATP as an energy carrier</li> <li>• Describe biologic oxidation and redox potential</li> </ul>	
<b>12. Oxidative Phosphorylation &amp; Electron Transport Chain</b>	
<ul style="list-style-type: none"> <li>• List the ion transporters in the inner mitochondrial membrane</li> <li>• Describe the organization of the electron transport chain</li> <li>• Discuss the functions of each complex of ETC</li> <li>• Explain the energy currency of the body</li> <li>• Explain the site and mechanism of synthesis of ATP</li> <li>• Describe how proton are pumped from the matrix to the intermembrane space</li> <li>• Discuss the significance of co-enzyme Q and the Q-cycle</li> <li>• Discuss the inhibitors and uncouplers of ETC and their mechanism of action</li> <li>• Discuss how electron transport chain releases free energy</li> <li>• Discuss the generation of proton gradient</li> <li>• Explain the significance of P.O. Ratio</li> <li>• Explain Mitchell's chemiosmosis theory of electrochemical gradient</li> <li>• Explain the glycerophosphate and malate shuttle</li> <li>• List the genetic defects of oxidative phosphorylation</li> <li>• Explain the clinical conditions which inhibit the electron transport chain</li> <li>• Discuss the clinical importance of disturbances of electron transport chain (e.g. Carbon monoxide poisoning)</li> <li>• Correlate the interpretation of laboratory investigations with relevant clinical conditions</li> </ul>	Interactive Lecture/ Tutorial
<b>BIOCHEMICAL FUNCTIONS OF LIVER</b>	
<b>13. Metabolic role of Liver &amp; its detoxification</b>	
<ul style="list-style-type: none"> <li>• Discuss the metabolic, synthetic, excretory, detoxification and storage functions of liver</li> <li>• List the liver function tests based on the five main functions of the liver</li> </ul>	Interactive Lecture/ Tutorial/Prac tical

<ul style="list-style-type: none"> <li>• Explain the normal level of serum bilirubin (total, conjugated and unconjugated), urinary urobilinogen, urinary bilirubin, fecal stercobilinogen in different types of Jaundice</li> </ul>	
<ul style="list-style-type: none"> <li>• Discuss the importance of serum enzymes in the differential diagnosis of Jaundice (ALT, AST, ALP, LDH, GGT, and 5'-Nucleotidase)</li> </ul>	
<ul style="list-style-type: none"> <li>• Discuss the importance of albumin, total protein and prothrombin time in diagnosing liver disease</li> </ul>	
<b>14. Degradation of Hemoglobin and Bilirubin Metabolism</b>	
<ul style="list-style-type: none"> <li>• List the steps of heme degradation to bilirubin</li> </ul>	
<ul style="list-style-type: none"> <li>• Discuss the role of liver in bilirubin uptake and conjugation</li> </ul>	
<ul style="list-style-type: none"> <li>• Discuss the secretion of bilirubin in bile</li> </ul>	
<ul style="list-style-type: none"> <li>• Explain the fate of bilirubin in the intestine and its excretion in urine and stool</li> </ul>	
<b>15. Jaundice and its biochemical investigations</b>	
<ul style="list-style-type: none"> <li>• Describe the disorders of bilirubin metabolism</li> </ul>	
<ul style="list-style-type: none"> <li>• Explain the types of bilirubin in the blood</li> </ul>	
<ul style="list-style-type: none"> <li>• Classify jaundice</li> </ul>	
<ul style="list-style-type: none"> <li>• Explain the causes with examples and diagnostic investigations of pre-hepatic, hepatocellular &amp; post-hepatic and obstructive jaundice</li> </ul>	
<ul style="list-style-type: none"> <li>• List the causes of each type</li> </ul>	
<ul style="list-style-type: none"> <li>• Correlate the interpretation of laboratory investigations with relevant clinical condition</li> </ul>	
<b>16. Serum LFT's (Liver function test) profile</b>	
<ul style="list-style-type: none"> <li>• List and explain the Liver function tests</li> </ul>	
<ul style="list-style-type: none"> <li>• Identify the chemical tests and bio-techniques used to perform Liver function tests</li> </ul>	
<ul style="list-style-type: none"> <li>• Interpret the serum Liver function test</li> </ul>	
<ul style="list-style-type: none"> <li>• Correlate the interpretation of laboratory investigations with relevant clinical condition</li> </ul>	
<b>17. Serum Aminotransferase (ALT)</b>	
<ul style="list-style-type: none"> <li>• Identify the chemical tests and bio-techniques used to perform serum Aminotransferase</li> </ul>	
<ul style="list-style-type: none"> <li>• Estimate the serum Aminotransferase level (ALT)</li> </ul>	
<ul style="list-style-type: none"> <li>• Interpret the serum Aminotransferase level (ALT)</li> </ul>	
<ul style="list-style-type: none"> <li>• Correlate the interpretation of laboratory investigations with relevant clinical condition</li> </ul>	
<b>18. Serum Bilirubin</b>	
<ul style="list-style-type: none"> <li>• Explain the method used to perform Serum Bilirubin by Spectrophotometer</li> </ul>	
<ul style="list-style-type: none"> <li>• Estimate serum Bilirubin level (Total, Direct &amp; Indirect Bilirubin)</li> </ul>	
<ul style="list-style-type: none"> <li>• Interpret serum Bilirubin level</li> </ul>	
<ul style="list-style-type: none"> <li>• Correlate the interpretation of laboratory investigations with relevant clinical condition</li> </ul>	

## **GASTROENTEROLOGY**

<b>TOPICS &amp; OBJECTIVES</b>	<b>LEARNING STRATEGIES</b>
<ul style="list-style-type: none"> <li>• Describe the process of upper GI endoscopy</li> </ul>	Tutorial

**MICROBIOLOGY**

<b>TOPICS &amp; OBJECTIVES</b>	<b>LEARNING STRATEGIES</b>
<ul style="list-style-type: none"> <li>Describe Infectious Diarrhea</li> </ul>	Interactive Lecture

**PATHOLOGY**

<b>TOPICS &amp; OBJECTIVES</b>	<b>LEARNING STRATEGIES</b>
<ul style="list-style-type: none"> <li>Describe Inflammatory bowel disease</li> </ul>	Interactive Lecture

**PHARMACOLOGY**

<b>TOPICS &amp; OBJECTIVES</b>	<b>LEARNING STRATEGIES</b>
<ul style="list-style-type: none"> <li>Classify anti-diarrheal drugs with their pharmacokinetics and clinical uses</li> </ul>	Case-Based integrated learning (CBIL)
<ul style="list-style-type: none"> <li>Classify anti-emetics drugs with their pharmacokinetics and clinical uses</li> </ul>	Interactive Lecture

**PHYSIOLOGY**

<b>TOPICS &amp; OBJECTIVES</b>	<b>LEARNING STRATEGIES</b>
<b>1. Overview of Gastrointestinal tract and accessory glands.</b>	Interactive Lecture/ Case-Based Learning/ Tutorial
<ul style="list-style-type: none"> <li>Describe characteristics of gastrointestinal wall</li> </ul>	
<ul style="list-style-type: none"> <li>Explain functional types of movements in gastrointestinal tract: Propulsive and Mixing movements.</li> </ul>	
<ul style="list-style-type: none"> <li>Describe the Law of gut.</li> </ul>	
<ul style="list-style-type: none"> <li>Describe splanchnic circulation and nervous regulation of blood flow.</li> </ul>	
<b>2. Functions of the smooth muscle and their electrical properties</b>	
<ul style="list-style-type: none"> <li>List the electrical properties of smooth muscle</li> </ul>	
<ul style="list-style-type: none"> <li>Explain the mechanism of smooth muscle contraction</li> </ul>	
<ul style="list-style-type: none"> <li>Differentiate smooth muscle from skeletal muscle</li> </ul>	

<ul style="list-style-type: none"> <li>Describe genesis of BER and its role in GI motility</li> </ul>
<b>3. Neural control of GIT</b>
<ul style="list-style-type: none"> <li>Describe the neural control of Gastrointestinal function: Enteric Nervous system.</li> <li>Differentiate between the functions of Myenteric and Meissner's plexus.</li> <li>Explain the role of autonomic nervous system on GIT.</li> <li>Describe the Gastrointestinal reflexes (gastro-colic, entero-gastric, colono-ileal reflexes)</li> </ul>
<b>4. Hormonal control of GIT</b>
<ul style="list-style-type: none"> <li>Explain the functions of principal hormones of GIT (Gastrin, Secretin, CCK, GIP, Somatostatin, Ghrelin, Motilin)</li> </ul>
<b>5. Physiological anatomy of salivary glands and types of their secretions.</b>
<ul style="list-style-type: none"> <li>List the salivary glands, composition and their functions</li> <li>Describe the functions of various salivary glands and their types of secretions.</li> </ul>
<b>6. Functions of Saliva, its Composition and Regulation</b>
<ul style="list-style-type: none"> <li>Describe the composition of saliva and the mechanism of secretion.</li> <li>Explain the nervous regulation of salivary secretion.</li> <li>Discuss the effects of dryness of mouth in relation to salivary glands dysfunction.</li> </ul>
<b>7. Mastication &amp; Deglutition reflex</b>
<ul style="list-style-type: none"> <li>Describe mechanism of mastication (Chewing)</li> <li>Explain different phases of deglutition (Swallowing)</li> <li>Describe the importance of gag reflex and effects of its impairment.</li> </ul>
<b>8. Upper and lower esophageal sphincter</b>
<ul style="list-style-type: none"> <li>Explain the role of upper and lower esophageal sphincter in deglutition reflex.</li> <li>Discuss the types of movements in esophagus and motility defects.</li> <li>Describe Achalasia of cardia (Mega esophagus)</li> </ul>
<b>9. Motor Functions of stomach</b>
<ul style="list-style-type: none"> <li>Describe motor functions of stomach: Storage, Mixing and Emptying.</li> <li>Explain regulation of stomach emptying</li> </ul>
<b>10. Gastric secretion (composition, function and regulation)</b>
<ul style="list-style-type: none"> <li>Explain the characteristics and secretions of gastric and pyloric glands.</li> <li>Describe the mechanism of hydrochloric acid secretion.</li> <li>Describe the phases and the regulation of gastric secretion</li> </ul>
<b>11. Movements of small and large intestine</b>
<ul style="list-style-type: none"> <li>Describe the movements of small intestine: Segmentation, Peristalsis.</li> <li>Explain the movements in colon: Haustrations and Mass movement.</li> <li>Describe the effects of autonomic system in modulating intestinal motility.</li> <li>Discuss various disorders of small and large intestine: Paralytic ileus, Hirschsprung's disease.</li> </ul>
<b>12. Secretions of small and large intestine</b>
<ul style="list-style-type: none"> <li>List secretion of different enzymes in small and large intestines</li> <li>Describe the regulation of small and large intestinal secretions</li> </ul>



<ul style="list-style-type: none"> <li>Describe the composition, functions and control of small intestine juice (succus entericus).</li> </ul>	
<b>13. Defecation Reflex and Diarrhea</b>	
<ul style="list-style-type: none"> <li>Explain defecation reflex &amp; its nervous regulation.</li> <li>Discuss the effect of spinal cord injuries on defecation reflex</li> <li>List various causes of diarrhea: (Enteritis, Psychogenic diarrhea, Ulcerative colitis)</li> </ul>	
<b>14. Exocrine secretion and functions of Pancreatic enzymes</b>	
<ul style="list-style-type: none"> <li>Describe the exocrine role of pancreas and its secretions.</li> <li>Explain the composition of pancreatic juice.</li> <li>Discuss the role of pancreatic enzymes in food digestion.</li> </ul>	
<b>15. Secretion of pancreatic juice</b>	
<ul style="list-style-type: none"> <li>Explain the mechanism of bicarbonate ions secretion.</li> <li>Explain the phases of pancreatic secretion.</li> <li>Describe the regulation of pancreatic secretion.</li> </ul>	
<b>16. Functions of liver and types of Jaundice</b>	
<ul style="list-style-type: none"> <li>Define jaundice</li> <li>Describe the physiological anatomy and metabolic functions of liver.</li> <li>Differentiate between various types of jaundice.</li> </ul>	
<b>17. Bile secretion (composition, function and regulation)</b>	
<ul style="list-style-type: none"> <li>List the composition of bile and factors for its release</li> <li>Explain the mechanism of secretion of bile salts and its role in fat digestion and absorption.</li> <li>Describe enterohepatic circulation of bile salts.</li> <li>List the causes of gallstone formation.</li> </ul>	
<b>18. Disorders of gastro-intestinal tract</b>	
<ul style="list-style-type: none"> <li>Discuss the common disorders of GIT: Vomiting, GERD, Gastritis, Irritable Bowel Syndrome, Malabsorption, Constipation, GI obstruction.</li> </ul>	
<b>19. Nutrition and Malnutrition</b>	Interactive Lecture
<ul style="list-style-type: none"> <li>Describe various aspect of nutrition</li> <li>Describe malnutrition &amp; its types</li> </ul>	
<b>20. Assessment of Obesity I &amp; II</b>	Practical
<ul style="list-style-type: none"> <li>Perform various method to assess body weight with respect to height &amp; weight distribution</li> </ul>	
<b>21. Effects of peptic ulcer</b>	Tutorial
<ul style="list-style-type: none"> <li>Predict the effects of chronic Acid Peptic Diseases on Physiological functions of the body</li> </ul>	
<b>22. Effect of obstruction of common bile duct (CBD)</b>	Tutorial
<ul style="list-style-type: none"> <li>Identify the type of jaundice in the given scenario</li> <li>Predict the effects of CBD obstruction on Physiological functions of the body</li> </ul>	
<b>23. Xerostomia</b>	SDL
<ul style="list-style-type: none"> <li>Explain the pathophysiology of xerostomia and its relevance to gastrointestinal health.</li> </ul>	

**RADIOLOGY**

<i>TOPICS &amp; OBJECTIVES</i>	<i>LEARNING STRATEGIES</i>
<b>Radiological Anatomy</b>	
<ul style="list-style-type: none"> <li>Identify various parts of normal GIT on a plain X ray</li> </ul>	Practical

**RESEARCH & SKILLS DEVELOPMENT CENTER**

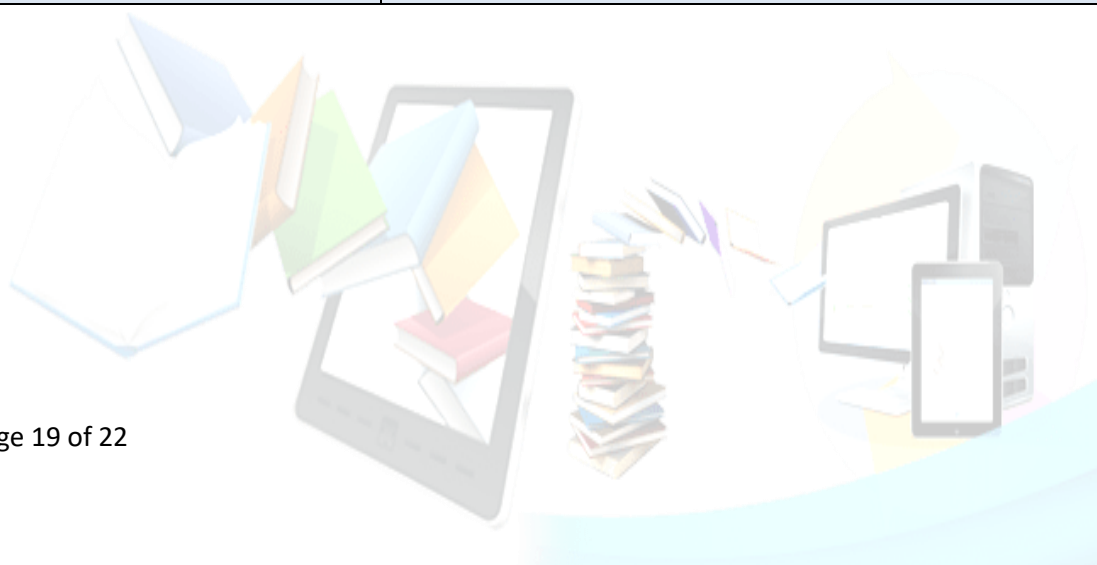
<i>TOPICS &amp; OBJECTIVES</i>	<i>LEARNING STRATEGIES</i>
<b>NG Tube Insertion</b>	
<ul style="list-style-type: none"> <li>Demonstrate NG tube insertion on mannequin</li> </ul>	Practical

**SKILLS**

<i>TOPICS &amp; OBJECTIVES</i>	<i>LEARNING STRATEGIES</i>
<ul style="list-style-type: none"> <li>Perform abdominal examination on mannequin or normal human subject based on standard protocols</li> </ul>	Practical

**LEARNING RESOURCES**

<b>SUBJECT</b>	<b>RESOURCES</b>
<b>ANATOMY</b>	<p><b>A. <u>GROSS ANATOMY</u></b></p> <ol style="list-style-type: none"> <li>1. K.L. Moore, Clinically Oriented Anatomy</li> <li>2. Neuro Anatomy by Richard Snell</li> </ol> <p><b>B. <u>HISTOLOGY</u></b></p> <ol style="list-style-type: none"> <li>1. B. Young J. W. Health Wheather's Functional Histology</li> </ol> <p><b>C. <u>EMBRYOLOGY</u></b></p> <ol style="list-style-type: none"> <li>1. Keith L. Moore. The Developing Human</li> <li>2. Langman's Medical Embryology</li> </ol>
<b>BIOCHEMISTRY</b>	<p><b>A. <u>TEXTBOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Harper's Illustrated Biochemistry</li> <li>2. Lehninger Principle of Biochemistry</li> <li>3. Biochemistry by Devlin</li> </ol>
<b>PHARMACOLOGY</b>	<p><b>A. <u>TEXTBOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Lippincot Illustrated Pharmacology</li> <li>2. Basic and Clinical Pharmacology by Katzung</li> </ol>
<b>PHYSIOLOGY</b>	<p><b>A. <u>TEXT BOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Textbook of Medical Physiology by Guyton and Hall</li> <li>2. Ganong's Review of Medical Physiology</li> <li>3. Human Physiology by Lauralee Sherwood</li> <li>4. Berne &amp; Levy Physiology</li> <li>5. Best &amp; Taylor Physiological Basis of Medical Practice</li> </ol> <p><b>B. <u>REFERENCE BOOKS</u></b></p> <ol style="list-style-type: none"> <li>1. Guyton &amp; Hall Physiological Review</li> <li>2. Essentials of Medical Physiology by Jaypee</li> <li>3. Text book of Medical Physiology by InduKhurana</li> <li>4. Short Text book of Physiology by Mrthur</li> <li>5. NMS Physiology</li> </ol>



**ASSESSMENT METHODS:**

- **Best Choice Questions (BCQs)** also known as MCQs (Multiple Choice Questions)
- **Objective Structured Practical / Clinical Examination (OSPE or OSCE)**

**Internal Evaluation**

- Students will be assessed comprehensively through multiple methods.
- 20% marks of internal evaluation will be added to JSMU final exam. That 20% may include class tests, assignment, practical and the internal exam which will all have specific marks allocation.

**Formative Assessment**

Individual department may hold quiz or short answer questions to help students assess their own learning.

The marks obtained are not included in the internal evaluation

**For JSMU Examination Policy, please consult JSMU website!**

More than 75% attendance is needed to sit for the internal and final examination



**LNH&MC EXAMINATION RULES & REGULATIONS**

- Student must report to examination hall / venue, 30 minutes before the exam.
- **Exam will begin sharp at the given time.**
- No student will be allowed to enter the examination hall after 15 minutes of scheduled examination time.
- Students must sit according to their roll numbers mentioned on the seats.
- **Cell phones are strictly not allowed in examination hall.**
- If any student is found with cell phone in any mode (silent, switched off or on) he/she will be not be allowed to continue their exam.
- No students will be allowed to sit in exam without University Admit Card, LNMC ID Card and Lab Coat
- Student must bring the following stationary items for the exam: Pen, Pencil, Eraser, and Sharpener.
- Indiscipline in the exam hall / venue is not acceptable. Students must not possess any written material or communicate with their fellow students.

**SCHEDULE:**

WEEKS	2 <sup>nd</sup> YEAR	MONTH
6 WEEKS	GIT & LIVER MODULE-I	20 <sup>th</sup> January 2025
		1 <sup>st</sup> March 2025
6 WEEKS	NEURO SCIENCE MODULE-I	3 <sup>rd</sup> March 2025
		19 <sup>th</sup> April 2025
6 WEEKS	HEAD AND NECK & SPECIAL SENSES MODULE	21 <sup>st</sup> April 2025
		31 <sup>st</sup> May 2025
Mid-Term Examination*		

\*Final dates will be announced later

