MODULE
Gastro-Intestinal Tract (GIT) & Uro-Genital System (UGS)
1st Year BDS

Contents

Vision & Mission

Khyber Medical University (KMU) Vision:

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

Khyber Medical University (KMU) Mission:

Khyber Medical University aims to promote professional competence through learning and innovation for providing comprehensive quality health care to the nation.

Institute of Health Professions Education & Research (IHPER) Mission:

To produce leaders, innovators and researchers in health professions education who can apply global knowledge to resolve local issues.

Teaching Hours Allocation

S. No	Subject	Hours
1.	Anatomy (Gross Anatomy & Histology)	14
2.	Oral Biology & Tooth Morphology	17
3.	Physiology	36
4.	Biochemistry	36
5.	General Pathology	3
7.	Community & Preventive Dentistry	2
8.	Medicine	2
9.	Pharmacology	2
Total		**112**

Themes

S. No	Theme	Duration in week (hrs)
1.	Difficulty in Swallowing	1.5 week (47 hrs)
2.	Abdominal Pain	
3.	Jaundice	
4.	Vomiting & Diarrhea	
5.	Obesity and beyond	1 week (32hrs)
6.	Loin pain/ Flank Pain	1.5 week (33hrs)
7.	Edema	
Total		**4 weeks (112hrs)**

Learning Objectives

By the end of this Module, 1st year BDS students will be able to:

1. Discuss the anatomy, development, histological structure, and functions of salivary glands.
2. Describe the gross anatomy of the esophagus, stomach, small intestine, large intestine, rectum, and anal canal.
3. Discuss the histological structure of the esophagus.
4. Explain the movements, secretions, and regulations of gastrointestinal functions.
5. Describe the structure and functions of the hepatobiliary system and pancreas.
6. Discuss the mechanisms of digestion and absorptions of carbohydrates, proteins, fats, and other nutrients.
7. Discuss the chemistry and functions of gastric, hepatic, & pancreatic secretions.
8. Describe common pathological conditions like peptic ulcers, viral hepatitis, obstructive jaundice, and liver cirrhosis.
9. Describe the mechanism of drug detoxification and metabolism in the liver.
10. Explain the basic metabolic processes related to carbohydrates, fats, and proteins.
11. Describe the anatomy and physiological functions of the kidneys, ureters, bladder, and urethra.
12. Discuss the role of the kidneys in filtration, reabsorption, and secretion, along with their structural details.
13. Identify and explain the roles of the renal corpuscle, glomerulus, nephron, and collecting-duct system.
14. Describe the structure, cell types, and functions of the juxtaglomerular apparatus, focusing on granular cells.
15. Differentiate between glomerular filtration, tubular reabsorption, and tubular secretion.
16. Describe Auto Regulation Mechanisms of Renal Blood Flow.
17. List common symptoms associated with renal disorders and classify different types of renal diseases.
18. Explain the processes involved in the reabsorption and secretion of substances in the renal tubules.
19. Describe the effects of hormones such as aldosterone, angiotensin-II, ADH, and parathyroid hormone on tubular reabsorption.
20. Explain the Regulation of Water and Electrolyte Balance by the Kidneys

Theme 1: Difficulty in Swallowing			
Subject	**Topic**	**Hours**	**Learning Objectives**
Anatomy	Esophagus	2hrs	1. Describe the extent, course, relations, and gross structure of esophagus. 2. Describe the histological features of the esophagus.
Oral Biology & Tooth Morphology	Development of salivary glands	1hr	3. Describe the development of salivary glands.
	Salivary glands	3hrs	4. Describe anatomical features of major & minor salivary glands. 5. Describe histology of Parotid gland. 6. Describe histology of Submandibular gland. 7. Describe histology of Sublingual gland. 8. Describe histology of minor salivary glands. 9. Describe modification of saliva and ductal system of salivary glands 10. Describe functions of saliva and its role in maintenance of healthy oral cavity. 11. Discuss age changes in salivary glands. 12. Define xerostomia & ptyalism. 13. Enumerate different diseases affecting salivary glands.
Physiology	Swallowing	1hr	14. Explain the process of swallowing and its stages
	Alimentary tract	1hr	15. Classify and describe alimentary tract glands. 16. Describe the mechanism of stimulation of alimentary tract glands.
	Functions of Mucus and Saliva	1hr	17. Describe the secretion of saliva and its nervous regulation. 18. Describe the plasma and saliva concentrations of Na^+, Cl^-, and HCO_3^- at low secretion rates and at high secretion rates and the principal cell types involved in each secretion rate.

			19. Identify the stimuli and cell types involved in GI secretion of mucous, and identify the function of salivary mucus. 20. Describe three types of stimuli that increase salivary secretion. 21. State the components of the saliva important in oral hygiene, and identify the role of salivary secretions in eliminating heavy metals. 22. Describe the lubricating and protective properties of mucus in GIT.
	GIT Smooth muscles	1hr	23. Discuss the characteristics of GIT smooth muscles. 24. Explain the electrical activity of GIT smooth muscles. 25. Describe the mechanism of excitation of smooth muscle of GIT.
	Neural control of GIT functions – Enteric nervous system	2hrs	26. Differentiate between mesenteric and submucosal plexus 27. Classify neurotransmitters secreted by enteric neurons: a. Excitatory b. Inhibitory 28. Describe the role of autonomic nervous system in regulation of GIT's function. 29. Differentiate between sympathetic and parasympathetic modulation of the enteric nervous system and the effector organs of the GI tract. 30. Describe Gastrointestinal reflexes.
	Hormonal control of GIT motility	1hr	31. Describe the actions of GIT hormones 32. Tabulate stimuli of secretion, site of secretion and the specific function of each GIT hormones.
	Disorders of swallowing and esophagus	1hr	33. Enlist the clinical abnormalities of swallowing mechanism (Oral dysphagia).

Biochemistry	Salivary composition and function	1hr	34. State the substrates and digestion products of salivary amylase (ptyalin). 35. Describe the composition of salivary secretions. 36. Describe the formation and characteristics of salivary secretions. 37. Elaborate the functions of saliva.
Oral Bio & Tooth Morpho	Maxillary 2nd and 3rd Molar	3 hrs	38. Indicate initiation of calcification, crown completion age, age of eruption and root completion age, arch position, general outline. 39. Describe various aspects (buccal, lingual, mesial, distal, and occlusal) of crowns of maxillary 2nd and 3rd molars. 40. Describe number, shape, and inclination of roots. 41. Describe number, location and significance of pulp horns, chamber, and canals.
	Mandibular First Molar	4 hrs	42. Indicate initiation of calcification, crown completion age, age of eruption and root completion age, arch position, general outline. 43. Describe various aspects (buccal, lingual, mesial, distal, and occlusal) of crowns of mandibular first molar. 44. Describe number, shape, and inclination of roots. 45. Describe number, location and significance of pulp horns, chamber, and canals. 46. Differentiate between mandibular and maxillary molars.

Theme 2: Abdominal Pain			
Anatomy	Abdominal Surface Anatomy	1hr	47. Describe the quadrants and regions of abdomen. 48. Discuss the applied anatomy of nine quadrants of abdomen. 49. Discuss the anatomical landmarks of abdomen.
Physiology	Motor function of Stomach	1hr	50. Describe the motor function of stomach. 51. Describe the regulation of gastric emptying
	Gastric secretion	1hr	52. Classify and Describe characteristics of the gastric glands: a. Oxyntic (gastric) glands b. Pyloric glands 53. Discuss the mechanism of secretion of HCl from gastric mucosa. 54. Describe the role of Intrinsic factor from gastric parietal cells. 55. Discuss the secretions of pyloric glands – mucus and gastrin 56. Enumerate the phases of gastric secretions 57. Enumerate the reflexes that inhibit and increase gastric secretions
	Pancreatic secretions	1hr	58. Describe the role of pancreatic secretions in digestion. 59. Describe the secretion and function of bicarbonate ions from pancreatic ductules. 60. Enumerate the regulation and phases of pancreatic secretion.
Biochemistry	Gastric secretions	1hr	61. Describe the chemical composition of gastric secretions. 62. Describe the functions of HCl and other constituents of gastric secretions.

	Pancreatic secretions	1hr	63. Describe the composition of pancreatic secretions. 64. Describe the action of pancreatic enzymes.
Pharmacology	Drugs used in Peptic ulcer	1hr	65. Enlist the drugs used in Peptic ulcer disease.
Medicine	GERD and Peptic ulcer	1hr	66. Enumerate the etiology and clinical features of GERD and peptic ulcer disease. 67. Enumerate the etiology and clinical features of pancreatitis.

Theme 3: Jaundice			
Anatomy	Liver	1hr	68. Describe the gross anatomy of liver
	Extra hepatic billiary apparatus		69. Describe the gross anatomy of gall bladder. 70. Describe the gross anatomy of extra hepatic billiary tree.
Physiology	Liver & Biliary secretion	2hr	71. Describe the metabolic functions of liver. 72. Describe the mechanism of secretion of bile by the liver. 73. Describe the function of bile salts in fat digestion and absorption. 74. Describe the liver secretion of cholesterol and gallstone formation.

Biochemistry	Bile	1hr	75. Describe the constituents of bile. 76. Describe the functions of bile. 77. Describe jaundice and its types.
General Pathology	Acute/ Chronic Viral Hepatitis	1hr	78. Enumerate the different viruses causing acute and chronic hepatitis.
Pharmacology	Hepatotoxic drugs	1hr	79. Enlist some of the commonly used hepatotoxic drugs.
Community & Preventive Dentistry	Occupational Hazards (Hepatitis A, B, C and E virus infection)	1hr	80. Describe the epidemiology of Viral hepatitis and its control measures. 81. Describe hepatitis as an occupational hazard in dentistry. 82. Differentiate between water-borne and blood borne hepatitis.

Theme 4: Vomiting & Diarrhea			
Anatomy	Development of GIT	1hr	83. Enlist the derivatives of foregut, mid gut, hind gut.
Anatomy	Gross Anatomy of Small intestine	2hrs	84. Describe the gross features of jejunum, ileum, and appendix.
	Gross Anatomy of Large intestine		85. Describe the gross features of cecum, ascending, transverse and descending, sigmoid colon, and anal canal.
Physiology	Secretions and Movements of Small intestine	1hr	86. Describe different types of movements of small intestine. 87. Describe the control of peristalsis by nervous and hormonal signals. 88. Describe the function of mucus secreted by Brunner's glands in duodenum 89. Describe the secretion of intestinal digestive juices by crypts of lieberkuhn. 90. Describe the secretion of mucus by large intestine.
	Movement of colon & Defecation reflex	1hr	91. Describe different types of movements of colon. 92. Discuss the mechanism of defecation and defecation reflex
	GIT disorders	1hr	93. Describe general GIT disorders: a. Gastritis and its causes b. Peptic ulcer, its basic and specific causes c. Pancreatitis d. Malabsorption by small intestinal mucosa – Sprue e. Disorders of large intestine: Constipation, Megacolon, Diarrhea and its causes f. Vomiting & Nausea
Biochemistry	Digestion and absorption	1hr	94. Describe the mechanism of digestion and absorption of fats in the intestines. 95. Describe the mechanism of digestion and absorption of proteins in the intestines. 96. Describe the mechanism of digestion and absorption of carbohydrates in the intestines. 97. Describe the mechanism of absorption of Iron, Vitamin-B12 and Folate in

			the intestines.
Medicine	Seasonal diarrhea & vomiting	1hr	98. Enlist the Seasonal Gastrointestinal Infections.
Lab work			
Anatomy (Histology)	Histology of small intestine	2hrs	99. Discuss the general histological features of small intestine.

Theme 5: Obesity and beyond			
Physiology	Insulin	2hrs	100. Describe the functions of insulin. 101. Discuss metabolic effects of insulin on carbohydrate, fats, and protein metabolism. 102. Discuss the mechanism of insulin secretion.
	Glucagon	1hr	103. Describe the glucagon function. 104. Discuss the regulation of glucagon secretion.
	Blood glucose regulation	1hr	105. Discuss the summary of blood glucose regulation. 106. Define the diabetes. 107. Enlist the types of diabetes.
Biochemistry	Glycolysis	1hr	108. Define Glycolysis 109. Describe the entry of glucose into different kinds of cells through various GLUT transporters.

			110. Describe the transportation of NADH to Mitochondria via various Shuttles. 111. Describe the energetics of glycolysis. 112. Describe the fates of pyruvate. 113. Describe the types of glycolysis especially the anaerobic glycolysis. 114. Describe the key enzymes and regulation of glycolysis. 115. Discuss the glycolysis in RBC. 116. Describe the biomedical Significance and clinical disorders of glycolysis.
	Oxidation of Pyruvate	1hr	117. Describe the conversion of pyruvate into acetyl CoA. 118. Enumerate the enzymes & coenzymes of PDH complex. 119. Describe the regulation of PDH complex. 120. Discuss the clinical aspects of PDH complex especially the congenital lactic acidosis.
	Tricarboxylic Acid Cycle	1hr	121. Define citric acid cycle. 122. Describe the sources of acetyl CoA in mitochondria. 123. Discuss the energetics of TCA. 124. Discuss the energy yield of one molecule of glucose when it is converted into carbon dioxide and water. 125. Name the vitamins that play a key role in TCA. 126. Describe the amphibolic nature of TCA. 127. Discuss the regulation of TCA. 128. Enumerate the inhibitors of TCA and their sites of inhibition.
	Gluconeogenesis	2hrs	129. Define Gluconeogenesis. 130. Name the organs and sub cellular location where Gluconeogenesis occurs. 131. Describe the substrates or precursors of Gluconeogenesis. 132. Describe the three bypass reactions.

			133. Describe the Gluconeogenesis from Fatty Acids. 134. Discuss the Cori's cycle. 135. Discuss the regulation of Gluconeogenesis. 136. Name the key enzymes of Gluconeogenesis.
	Hexose Mono Phosphate shunt	1hr	137. Discuss the Role of Pentose Phosphate Pathway. 138. Name the tissues where Hexose Mono Phosphate shunt occurs. 139. Describe the Role of thiamine in Hexose Mono Phosphate shunt. 140. Discuss the functions of NADPH (produced in Hexose Mono Phosphate shunt) in various tissues and cells. 141. Discuss G6PD deficiency and its effects in various tissues and cells.
Community & Preventive Dentistry	Epidemiology of oral diseases related to Diabetes	1hr	142. Discuss the epidemiology of oral diseases related to Diabetes.
Biochemistry	Fatty acid (FA) synthesis (De Novo)	1hr	143. Enumerate the organs where fatty acid occurs with sub cellular sites. 144. Discuss how acetyl CoA comes out of mitochondria for the synthesis of FA. 145. Discuss lipo-proteins.
	Mobilization of stored fats (oxidation of FA)	1hr	146. Describe how fats are mobilized from adipose tissues to the organs where they will be used for oxidation. 147. Enumerate the various methods of oxidation of FA. 148. Discuss the stages of beta oxidation with its reactions. 149. Calculate the no. of ATP obtained when one molecule of palmitic acid is oxidized completely.
	Diseases of GIT	1hr	146. Discuss BMI. 147. Define BMR. 148. Enlist causes of high and low BMR. 150. Discuss nutritional diseases.

	Proteins	3hrs	150. Define proteins. 151. Describe structure of amino acids. 152. Enumerate the seven classes of proteins. 153. Differentiate the four levels of protein structure. 154. Describe functions and properties of protein. 155. Discuss the diseases related to protein metabolism. 149. Discuss separation of proteins.
	Ammonia transport and effects of ammonia toxicity on brain	1hr	157. Discuss how ammonia is formed in various tissues and transported to liver. 156. Discuss the effects of ammonia toxicity in brain.
	Urea cycle & its associated inherited disorders	1hr	159. Describe The Krebs-Henseliet Cycle of Urea Formation in Liver. 158. Describe the clinical significance of various enzymes involved in urea formation.
	Energy requirement of human body	1hr	161. Discuss the daily energy requirement of a human body in health and disease. 162. Discuss vitamins. 163. Describe the daily requirements of common vitamins, Iron, Calcium, Iodine, and other minerals. 164. Describe the daily requirements, uses, symptoms Vitamin C deficiency.
Lab Work			
Anatomy	Esophagus	2hrs	166. Identify the epithelium of esophagus and esophageal glands in mucosa. 167. Differentiate between musculature in different parts of the esophagus.
Oral Biology & Tooth Morphology	Parotid, submandibular, and Sublingual glands	4hrs	168. Identify the histological features of Parotid, submandibular and Sublingual glands under the microscope.

Biochemistry	Protein	4hrs	169. Identify proteins in a solution.

Theme 6: Loin pain/ Flank Pain			
Anatomy	Overview of the urinary system	1hr	171. Describe the main components of the urinary system.
Physiology	Physiological Anatomy Of the kidneys and structure of nephron	2hrs	172. State major functions of the kidneys & brief physiological anatomy of kidney.
			173. Define the components of the nephron and their interrelationships: renal corpuscle, glomerulus, nephron, and collecting-duct system. 174. Define juxtaglomerular apparatus and describes its 3 cell types; states the function of the granular cells.
	Glomerular filtration rate (GFR), its determinants and autoregulation	3hrs	175. Define the basic renal processes: glomerular filtration, tubular reabsorption, and tubular secretion. 176. Discuss the physiological anatomy of glomerular capillary membrane. 177. State the formula for determinants of GFR. 178. Discuss the determinants of GFR and their effects on GFR. 179. Enlist the determinants of GFR and their physiological causes in tabulated form. 180. Discuss renal blood flow and its determinants. 181. Describe the effects of sympathetic nervous system activation on GFR. 182. Describe the hormonal control of renal circulation.

			183. Discuss the importance of autoregulation of GFR and renal blood flow
Biochemistry	Acid-base balance & imbalance	1hr	184. Describe Carbonic acid, protein, and phosphate buffer. 185. Describe Transporting acid and mitigating pH changes. 186. Describe Respiratory Regulation of Acid Base Balance.
General Pathology	Smoky urine Renal disorders	1hr	187. List the common symptoms of renal disorders. 188. Classify renal diseases. 189. Enlist the Causes, types of renal stones.

Theme 7: Edema			
Physiology	Body fluid compartments	2hrs	190. Enlist the body fluid compartments. 191. Enlist the constituents of extra-cellular and intra-cellular fluids. 192. Describes principles of osmosis and osmotic pressure. 193. Discuss osmotic equilibrium between extra-cellular and intra-cellular fluids. 194. Define isosmotic, hyperosmotic, and hypo-osmotic fluids. 195. Describe clinical abnormalities of fluid volume regulation: hypernatremia and hyponatremia. 196. Define the edema and describe the types of edema. 197. Discuss the causes of extracellular edema.
	Reabsorption and Secretion along the different Parts of the Nephron Mechanisms of regulation of tubular reabsorption	3hrs	198. Discuss the general mechanism of tubular reabsorption and secretion. 199. Describe the proximal tubular reabsorption. 200. Describe the reabsorption of solutes and water along the loop of Henle and distal tubule. 201. Describe the reabsorption along the late distal tubules and cortical collecting tubules. 202. Explain the regulation of tubular reabsorption.

			203. Discuss hormonal control of tubular reabsorption.
	Mechanism of diluted and concentrated urine formation	2hrs	204. Describe the influence of antidiuretic hormone (ADH) on water reabsorption. 205. Discuss the mechanism of excreting dilute urine from kidneys. 206. Discuss the mechanism of excreting concentrated urine from kidneys. 207. Describe central and nephrogenic diabetes insipidus. 208. Discuss osmoreceptor-ADH feedback mechanism for regulating extracellular fluid osmolarity in response to water deficit.
	Urinary bladder and micturition	1hr	209. Describe the functional anatomy of urinary bladder. 210. Explain the mechanism of micturition. 211. Explain the micturition reflex and nervous control of bladder functions. 212. Enlist abnormalities of micturition.
	Thirst	1hr	213. Describe the importance of thirst in controlling ECF osmolarity and sodium concentration. 214. Enumerate CNS centers for thirst. 215. Describe the stimuli for thirst. 216. Discuss the mechanism of thirst.
Biochemistry	Renal control of Calcium & Phosphorus	3hrs	217. State the normal total plasma calcium concentration and the fraction that is free. 218. Describe the distribution of calcium between bone and extracellular fluid and the role of bone in regulating extracellular calcium. 219. Describe and compare osteocytes, osteolysis and bone remodeling. 220. Describe renal handling of phosphate and its regulation by para-thyroid hormone.
	Constituents of urine		221. Describe the normal and abnormal constituents of urine.

	Water balance/ metabolism		222. Discuss mechanism & regulation of Water balance. 223. Explain disorders of water balance, such as dehydration & over hydration.
General Pathology	Renal failure	1hr	224. Enlist the causes of Renal failure/ uremia and abnormalities related to micturition including incontinence. 225. Define the terms Nephrotic syndrome, nephritic syndrome, Azotemia.
Lab Work			
Anatomy	Surface anatomy of the urinary system	2hrs	226. Identify the gross anatomic features of the kidneys, renal pelvis, ureter, urinary bladder, and urethra.
Physiology	Measuring blood pressure	2hrs	227. Perform the procedure of measuring blood pressure.
Biochemistry	Protein analysis	6 hrs	228. Perform the procedure of protein analysis.

Learning Resources

S#	Subjects	Resources
1.	Anatomy	**A. GROSS ANATOMY** 1. Last's Anatomy **B. EMBRYOLOGY** 1. Langman's Medical Embryology **C. HISTOLOGY** 1. Medical Histology By Laiq Hussain **Reference Books** 1. Netter Atlas of Human Anatomy 2. Gray's Anatomy
2	Biochemistry	**Text Books** 1. Lippincott illustrated reviews 8th 2. Harper's illustrated Biochemistry 30th 3. U. Satyanarayan and U. Chakarpani 4th **Reference Books** 1. Lippincott illustrated reviews 2. MLA. Harvey, Richard A., PhD. Lippincott's illustrated reviews: Biochemistry 3. U. Satyanarayana Biochemistry 4. U. satyanarayan and U. Chakarpani 4th edition 5. Harper's illustrated Biochemistry 6. Rodwell VW, Bender DA ,Botham KM., Kennelly PJ, Weil P. Eds. Victor W. Rodwell et al. 7. Fundamentals of Biochemistry 8. Donald V., Judith G. Voet, Charlotte W. John wiley and sons, New york 9. Netter's essential Biochemisty 10. Lippincott illustrated reviews 11. MLA. Harvey, Richard A., PhD. Lippincott's illustrated reviews: Biochemistry

3	Physiology	**Textbooks** 1. Guyton and Hall Textbook of Medical Physiology, 13th Edition by John E. Hall. 2. Human Physiology: From Cells to Systems, 8th Edition by Lauralee Sherwood
4	Oral Biology	**Textbook** 1. Ten Cate's Oral Histology 2. Orban's Oral Histology and Embryology **3.** Concise Dental Anatomy and Morphology by James L. Fuller **Reference Books** 1. Oral Anatomy, Histology and Embryology by B.K.B Berkovitz