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

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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)	18
2.	Oral Biology & Tooth Morphology	11
3.	Physiology	36
4.	Biochemistry	36
5.	General Pathology	3
6.	Oral Pathology	1
7.	Community & Preventive Dentistry	2
8.	Medicine	3
9.	Pharmacology	2
Total		**112**

Themes

S. No	Theme	Duration in week (hrs)
1.	Difficulty in Swallowing	1.5 week (41hrs)
2.	Abdominal Pain	
3.	Jaundice	
4.	Vomiting & Diarrhea	
5.	Obesity and beyond	1 week (34hrs)
6.	Loin pain/ Flank Pain	1.5 week (37hrs)
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	Development of salivary glands	1hr	1. Describe the development of salivary glands.
	Esophagus	2hrs	2. Describe the extent, course, relations, and gross structure of esophagus. 3. Describe the histological features of the esophagus.
Oral Biology & Tooth Morphology	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 functions of saliva and its role in maintenance of healthy oral cavity. 10. Discuss age changes in salivary glands. 11. Define xerostomia & ptyalism. 12. Enumerate different diseases affecting salivary glands.
	Oral Mucous Membrane	2hrs	13. Explain types of Oral mucous membrane. 14. Explain functions of Oral mucous membrane.
Physiology	General principles of gastrointestinal motility	1hr	15. Describe electrical activity of gastrointestinal smooth muscle. 16. Describe the mechanism of excitation of smooth muscle of gastrointestinal tract.

	Neural control of GIT function (Enteric Nervous system) GIT Hormones	3hrs	17. Differentiate between mesenteric and submucosal plexus. 18. Classify the following: enteric nervous system neurotransmitters as excitatory or inhibitory: norepinephrine, acetylcholine, CCK, VIP, histamine, and somatostatin. 19. Describe the role of autonomic nervous system in regulation of GIT's function. 20. Differentiate between sympathetic and parasympathetic modulation of the enteric nervous system and the effector organs of the GI tract. 21. Describe three types of gastrointestinal reflexes.
	Functional types of movements in the gastrointestinal tract	1hr	22. Describe the functional types of movements in the gastrointestinal tract.
	Role of mucus and saliva	1hr	23. Describe the secretion of saliva and its nervous regulation. 24. Describe the plasma and saliva concentrations of Na+, Cl-, and HCO3- at low secretion rates and at high secretion rates and the principal cell types involved in each secretion rate. 25. Identify the stimuli and cell types involved in GI secretion of mucous, and identify the function of salivary mucus. 26. Describe three types of stimuli that increase salivary secretion. 27. State the components of the saliva important in oral hygiene, and identify the role of salivary secretions in eliminating heavy metals.
Biochemistry	Salivary composition and function	1hr	28. State the substrates and digestion products of salivary amylase (ptyalin). 29. Describe the composition of salivary secretions. 30. Describe the formation and characteristics of salivary secretions. 31. Elaborate the functions of saliva.

Oral Pathology	Abnormalities of salivary secretions	1hr	32. Discuss clinical abnormalities of Salivary secretions.
Medicine	Disorders of swallowing and esophagus	1hr	33. Enlist the clinical abnormalities of swallowing mechanism (Oral dysphagia).
Theme 2: Abdominal Pain			
Anatomy	Abdominal Surface Anatomy	1hr	34. Describe the quadrants and regions of abdomen. 35. Discuss the applied anatomy of nine quadrants of abdomen. 36. Discuss the anatomical landmarks of abdomen.
	Stomach	1hr	37. Describe the gross structure of stomach. 38. Discuss the blood supply and venous drainage of stomach. 39. Discuss the nerve supply of the stomach.
	Duodenum	1hr	40. Describe the gross structure of duodenum. 41. Discuss the blood supply and venous drainage of duodenum. 42. Discuss the nerve supply of the duodenum.
	Pancreas	1hr	43. Describe the gross structure of pancreas and its ductal system. 44. Discuss the blood supply and venous drainage of pancreas. 45. Discuss the nerve supply of the pancreas.
Physiology	Motor function of Stomach	1hr	46. Describe the motor function of stomach. 47. Describe the regulation of gastric emptying
	Gastric secretion	1hr	48. Describe characteristics of the gastric secretions. 49. Describe the mechanism of secretion of different gastric glands. 50. Enumerate the reflexes that inhibit and increase gastric secretions

	Pancreatic secretions	1hr	51. Describe the role of pancreatic secretions in digestion. 52. Describe the phases and regulation of pancreatic secretion. 53. Discuss the mechanism of secretion of HCl from gastric mucosa. 54. Discuss the role of Intrinsic factor from gastric parietal cells.
Biochemistry	Gastric secretions	1hr	55. Describe the chemical composition of gastric secretions. 56. Describe the functions of HCl and other constituents of gastric secretions.
	Pancreatic secretions	1hr	57. Describe the composition of pancreatic secretions. 58. Describe the action of pancreatic enzymes.
Pharmacology	Drugs used in Peptic ulcer	1hr	59. Enlist the drugs used in Peptic ulcer disease.
Medicine	GERD and Peptic ulcer	1hr	60. Enumerate the etiology and clinical features of GERD and peptic ulcer disease. 61. Enumerate the etiology and clinical features of pancreatitis.
Theme 3: Jaundice			
Anatomy	Liver	1hr	62. Describe the gross anatomy of liver
	Extra hepatic billiary apparatus		63. Describe the gross anatomy of gall bladder. 64. Describe the gross anatomy of extra hepatic billiary tree.
Physiology	Physiology of liver	1hr	65. Describe metabolic functions of liver. 66. Describe Bilirubin formation and excretion .
	Secretion of bile by liver	1hr	67. Describe the mechanism of secretion of bile by the liver. 68. Describe the function of bile salts in fat digestion and absorption. 69. Describe functions of the biliary tree in digestion.

Biochemistry	Bile	1hr	70. Describe the constituents of bile. 71. Describe the functions of bile. 72. Describe jaundice and its types.
General Pathology	Acute/ Chronic Viral Hepatitis	1hr	73. Enumerate the different viruses causing acute and chronic hepatitis.
Pharmacology	Hepatotoxic drugs	1hr	74. Enlist some of the commonly used hepatotoxic drugs.
Community & Preventive Dentistry	Occupational Hazards (Hepatitis A, B, C and E virus infection)	1hr	75. Describe the epidemiology of Viral hepatitis and its control measures. 76. Describe hepatitis as an occupational hazard in dentistry. 77. Differentiate between water-borne and blood borne hepatitis.
Theme 4: Vomiting & Diarrhea			
Anatomy	Gross Anatomy of Small intestine	2hrs	78. Describe the gross features of jejunum, ileum, and appendix.
	Gross Anatomy of Large intestine		79. Describe the gross features of cecum, ascending, transverse and descending, sigmoid colon, and anal canal.
Anatomy (Histology)	General microscopic plan of alimentary canal	1hr	80. Discuss the general histological features of alimentary canal.
Physiology	Movements of the small intestine Movements of the Colon General Disorders of the gastrointestinal tract	1hr	81. Describe different types of movements of small intestine. 82. Describe the control of peristalsis by nervous and hormonal signals. 83. Describe the secretions of small intestine. 84. Describe different types of movements of colon. 85. Describe the mechanism of defecation reflex. 86. Explain mechanism of diarrhea and its causes. 87. Describe the mechanisms of Vomiting and Nausea.

			88. Describe Vomiting Act. 89. Describe Gastrointestinal Obstruction. 90. Describe gases in the gastrointestinal tract (flatus).
Biochemistry	Digestion and absorption	1hr	91. Describe the mechanism of digestion and absorption of fats in the intestines. 92. Describe the mechanism of digestion and absorption of proteins in the intestines. 93. Describe the mechanism of digestion and absorption of carbohydrates in the intestines. 94. Describe the mechanism of absorption of Iron, Vitamin-B12 and Folate in the intestines.
Medicine	Seasonal diarrhea & vomiting	1hr	95. Enlist the Seasonal Gastrointestinal Infections.
Theme 5: Obesity and beyond			
Physiology	Insulin	2hrs	96. Describe the functions of insulin. 97. Discuss metabolic effects of insulin on carbohydrate, fats, and protein metabolism. 98. Discuss the mechanism of insulin secretion.
	Glucagon	1hr	99. Describe the glucagon function. 100. Discuss the regulation of glucagon secretion.
	Blood glucose regulation	1hr	101. Discuss the summary of blood glucose regulation. 102. Define the diabetes. 103. Enlist the types of diabetes.

Biochemistry	Glycolysis	1hr	104. Define Glycolysis 105. Describe the entry of glucose into different kinds of cells through various GLUT transporters. 106. Describe the transportation of NADH to Mitochondria via various Shuttles. 107. Describe the energetics of glycolysis. 108. Describe the fates of pyruvate. 109. Describe the types of glycolysis especially the anaerobic glycolysis. 110. Describe the key enzymes and regulation of glycolysis. 111. Discuss the glycolysis in RBC. 112. Describe the biomedical Significance and clinical disorders of glycolysis.
	Oxidation of Pyruvate	1hr	113. Describe the conversion of pyruvate into acetyl CoA. 114. Enumerate the enzymes & coenzymes of PDH complex. 115. Describe the regulation of PDH complex. 116. Discuss the clinical aspects of PDH complex especially the congenital lactic acidosis.
	Tricarboxylic Acid Cycle	1hr	117. Define citric acid cycle. 118. Describe the sources of acetyl CoA in mitochondria. 119. Discuss the energetics of TCA. 120. Discuss the energy yield of one molecule of glucose when it is converted into carbon dioxide and water. 121. Name the vitamins that play a key role in TCA. 122. Describe the amphibolic nature of TCA. 123. Discuss the regulation of TCA.

			124. Enumerate the inhibitors of TCA and their sites of inhibition.
	Gluconeogenesis	2hrs	125. Define Gluconeogenesis. 126. Name the organs and sub cellular location where Gluconeogenesis occurs. 127. Describe the substrates or precursors of Gluconeogenesis. 128. Describe the three bypass reactions. 129. Describe the Gluconeogenesis from Fatty Acids. 130. Discuss the Cori's cycle. 131. Discuss the regulation of Gluconeogenesis. 132. Name the key enzymes of Gluconeogenesis
	Hexose Mono Phosphate shunt	1hr	133. Discuss the Role of Pentose Phosphate Pathway. 134. Name the tissues where Hexose Mono Phosphate shunt occurs. 135. Describe the Role of thiamine in Hexose Mono Phosphate shunt. 136. Discuss the functions of NADPH (produced in Hexose Mono Phosphate shunt) in various tissues and cells. 137. Discuss G6PD deficiency and its effects in various tissues and cells.
Community & Preventive Dentistry	Epidemiology pf obesity and related issues	1hr	138. Outline the epidemiology of obesity and related issues in respect of oral health.
Biochemistry	Fatty acid (FA) synthesis (De Novo)	1hr	139. Enumerate the organs where fatty acid occurs with sub cellular sites. 140. Discuss how acetyl CoA comes out of mitochondria for the synthesis of FA. 141. Discuss lipo-proteins.

	Mobilization of stored fats (oxidation of FA)	1hr	142. Describe how fats are mobilized from adipose tissues to the organs where they will be used for oxidation. 143. Enumerate the various methods of oxidation of FA. 144. Discuss the stages of beta oxidation with its reactions. 145. 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. 149. 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. 156. 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. 158. 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. 160. 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			
Histology	Alimentary canal	2hrs	165. Identify the general histological features of alimentary canal.
	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.
	Oral mucosa	2hrs	169. Identify the histological features of oral mucosa.
Biochemistry	Protein	4hrs	170. 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. 175. Define the basic renal processes: glomerular filtration, tubular reabsorption, and tubular secretion.
	Glomerular Filtration: Determinants and Equation	1hr	176. State the formula for the determinants of glomerular filtration rate. 177. Describe how arterial pressure, afferent arteriolar resistance, and efferent arteriolar resistance influence glomerular capillary pressure.
	Auto regulation of GFR and renal blood flow	1hr	178. Define auto regulation of renal blood flow and glomerular filtration rate. 179. Describe the myogenic and tubule-glomerular feedback mechanisms of auto regulation.
Biochemistry	Acid-base balance & imbalance	1hr	180. Describe Carbonic acid, protein, and phosphate buffer. 181. Describe Transporting acid and mitigating pH changes. 182. Describe Respiratory Regulation of Acid Base Balance.
General Pathology	Smoky urine Renal disorders	1hr	183. List the common symptoms of renal disorders. 184. Classify renal diseases. 185. Enlist the Causes, types of renal stones.
Theme 7: Edema			
Physiology	Body fluid compartments	2hrs	186. Enlist the body fluid compartments. 187. Enlist the constituents of extra-cellular and intra-cellular fluids. 188. Describes principles of osmosis and osmotic pressure. 189. Discuss osmotic equilibrium between extra-cellular and intra-cellular fluids.

			190. Discuss the interplay between various pressures. 191. Enlist the types of edemas.
	Reabsorption /Secretion along the different Parts of the Nephron Mechanisms of regulation of tubular reabsorption	4hrs	192. Discuss the general mechanism of tubular reabsorption and secretion. 193. Describe the proximal tubular reabsorption. 194. Describe the reabsorption of solutes and water along the loop of Henle and distal tubule. 195. Explain the regulation of tubular reabsorption. 196. Reabsorption and secretion by the renal tubules • Effect of arterial pressure on urine output • Hormonal control of tubular reabsorption • Aldosterone • Angiotensin-II • ADH • Parathyroid hormone 197. Nervous regulation of tubular reabsorption
	Concept Of Renal Clearance	1hr	198. Define the terms clearance, metabolic clearance rate, and differentiates between general clearance and renal clearance. 199. Describe how to use plasma concentrations of urea and creatinine as indicators of changes in glomerular filtration rate.
	Mechanism of diluted and concentrated urine formation	2hrs	200. Describe the process of "separating salt from water" and how this permits excretion of either concentrated or dilute urine. 201. Describe how antidiuretic hormone affects water reabsorption. 202. Describe the origin of antidiuretic hormone and the 2 major reflex controls of its secretion; define diabetes insipidus; state the effect of antidiuretic hormone on arterioles.

			203. Describe the pathways by which sodium and water excretions are altered in response to sweating, diarrhea, hemorrhage, high-salt diet, and low-salt diet.
	Urinary bladder and micturition	1hr	204. Describe the functional anatomy of urinary bladder 205. Explain the mechanism of micturition 206. Explain the micturition reflex and nervous control of bladder functions
	Renal regulation of Potassium	1hr	207. State the normal balance and distribution of potassium within different body compartments, including cells and extracellular fluid. 208. Describe the mechanism by which changes in potassium balance influence aldosterone secretion. 209. State the effects of most diuretic drugs and osmotic diuretics on potassium excretion.
	Regulation of extracellular fluid osmolality and sodium concentration	1hr	210. Discuss the homeostatic function of the kidneys. 211. Discuss the importance of thirst in controlling osmolality and sodium concentration.
	Short- and Long-term control of Blood pressure by Kidneys	2hrs	212. Describe the 3 temporal domains of blood pressure control and the major mechanisms associated with them. 213. Describe the relationship between renin and angiotensin II. 214. Describe the 3 detectors that can alter renin secretion. 215. Define pressure natriuresis and diuresis. 216. Define tubule-glomerular feedback and describe the mechanism for tubule-glomerular feedback and auto regulation of glomerular filtration rate.
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	4hrs	228. Perform the procedure of protein analysis.
	Serum urea Serum creatinine	4hrs	229. Perform the procedure of estimation of serum urea. 230. Perform the procedure of estimation of serum creatinine.

Learning Resources

S#	Subjects	Resources
1.	Anatomy	**A. GROSS ANATOMY** 1. BD Churasia 2. 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 **3.** Ganong's Review of Medical Physiology, 24th Edition (LANGE Basic Science) by Kim E. Barrett, Susan M. Barman, Scott Boitano, Heddwen Brooks. **REFERENCE BOOKS** 1. Manual of Experimental Physiology 4 th Edition Prof. Dr. Zafar Ali Choudry 2. Practical Physiology 1st Edition Prof. Dr. Shafiq Ahmed Iqbal 3. Basis of Clinical Physiology Volume 1 Prof. Dr. Muhammad Akram 4. Basis of Clinical Physiology Volume 2 Prof. Dr. Muhammad Akram 5. System wise SEQs and MCQs with key Reference: Physiology by Guyton 1 st Edition Prof. Dr. Samina Malik
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