

SUBJECT CARD

Faculty of Medicine and Health Sciences

Field of studies: Medicine

Form of studies: Full-time

Degree: long-cycle Master's program

Specializations: No specialization

Academic year: 2022/2023

THE GASTROINTESTINAL SYSTEM	
SUBJECT	The gastrointestinal system
NUMBER OF ECTS POINTS	6
LANGUAGE OF INSTRUCTION	English
TEACHER(S)	Professor Jadwiga Mirecka, MD, PhD Professor Antoni Stadnicki, MD, PhD Assoc. Professor Piotr Kopiński, MD, PhD Martyna Jastrzębska, MD, PhD Maciej Krupiński, MD, PhD Marcin Lipski, MD, PhD Izabela Zamojska, MD, PhD Maciej Wierzbicki, MSc
PERSON RESPONSIBLE	Assoc. Professor Piotr Kopiński, MD, PhD
NUMBER OF HOURS	
LECTURES	42 h
CLASSES	34 h
SEMINARS	6 h
GENERAL OBJECTIVES	
OBJECTIVE 1	Getting to know the gastrointestinal (GI) structure and function, including the gut, the liver and the pancreas, as well as a local circulation and innervation.
OBJECTIVE 2	Combining anatomical and histological structure with the function of the GI tract both at the microscopic and submicroscopic level.
OBJECTIVE 3	Making students familiar with the structure of the human body in terms of topography, functional features and some selected clinical problems in order to build up the background for GI tract pathology and clinics.
LEARNING OUTCOMES	
MK1	Knowledge: After completing the course students can describe the structure and function of the abdomen organs, including secretory mechanisms of the venter, liver and pancreas.

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MK2	Knowledge: Students know characteristic features and functions of GI tract tissues, associates the structure of the gut and GI tract exocrine organs with their function.
MK3	Knowledge: Students can use the anatomical, histological and functional nomenclature in fluent English.
MK4	Knowledge: Students know anatomical structures, including image diagnostics (X-ray, CT, ultrasound); they recognize tissue components under optical microscope and on electron micrographs.
MS1	Skills: Students understand the unique functions of GI tract and its role for human homeostasis.
MS2	Skills: Students can correctly interpret the results of the basic tests applied to assess GI tract normal function.
MS3	Skills: Students can identify and name correctly the anatomical details, including radiological imaging of the GI tract and some specific histological features.
MS4	Skills: Students can find out the relations between the functions of GI tract (intestine, pancreas, gall bladder, liver) and others, extra-abdominal organs and tissues.
MS5	Skills: Students understand the specific anatomical and physiological features of GI tract, including circulation (portal circulation) and enervation (enteric nervous system).
MS6	Skills: Students associate macroscopic and microscopic structures with organ/tissue specific functions in GI tract.
MC1	Social Competency: Students work in a group, cooperates with other students in the preparation / presentations and in solving tasks.

INTRODUCTORY REQUIREMENTS

Adequate knowledge of three-dimensional organization of body structure, as well as basic knowledge of cells / tissues normal function and structure.

COURSE PROGRAM

DETAILED DESCRIPTION OF THE TOPIC BLOCKS

LECTURE 1	Upper part of the digestive system. Oral fissure. Isthmus of fauces (oropharyngeal isthmus). Oral vestibule, oral cavity proper. Teeth, gum, tongue, hard palate, soft palate, palatine tonsils, salivary glands. Area A, 2 hours
LECTURE 2	Pharynx. Parts: nasopharynx, oropharynx, laryngopharynx. Syntopy, topographical spaces. Blood supply. Innervation. Pharyngeal lymphoid ring. Pharyngeal constrictors. Pharyngeal levators. Muscles of the soft palate. Oesophagus. Parts of the oesophagus and its syntopy. Area A, 2 hours

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LECTURE 3	Stomach: curvatures. Constrictions, parts and surfaces. Blood supply and innervation. Lymphatic drainage. External structures. Syntopy. Fixation: hepatogastric, gastrosplenic, gastrophrenic, gastrocolic ligaments. Area A, 2 hours
LECTURE 4	Small intestine. Parts. Fixation: mesentery, root of the mesentery. Anatomy: Small intestine: Duodenum. Parts. Structure. Blood supply. Innervation. Jejunum. Ileum. Syntopy. Blood supply. Innervation. Area A, 2 hours
LECTURE 5	Large intestine: parts, appearance, innervation, blood supply. Lymphatic system of the gastrointestinal tract. Area A, 2 hours
LECTURE 6	Liver. Lobes. Segments. External structures. Fixation. Syntopy. Gall bladder. Intrahepatic bile ducts. Blood supply. Innervation. Area A, 2 hours
LECTURE 7	Peritoneum. Parietal peritoneum. Visceral peritoneum. Peritoneal reflections. Omentum (lesser omentum, greater omentum). Mesenteries: mesentery of the small intestine, transverse mesocolon, sigmoid mesocolon, sigmoid mesocolon, mesoappendix. Area A, 2 hours
LECTURE 8	Peritoneal ligaments: Phrenicocolic ligament, falciform ligament, ligamentum teres hepatis, coronary ligament, ligamentum venosum. Peritoneal folds: umbilical folds, rectouterine fold, ileocecal fold. Peritoneal cavity. Lesser sac. Greater sac. Gastrointestinal viscera. Relations. Area A, 2 hours
LECTURE 9	Development of digestive system. Primitive gut tube. Foregut. Midgut. Hindgut. Area A, 2 hours
LECTURE 10	Radiology of the abdomen cavity. Examinations of GI tract, including HRCT, ultrasounds and the X rays, normal physiological presentations. Area A, 2 hours
LECTURE 11	Histology I: Histological structure of the oral cavity: mucous membrane, tongue, lingual papillae. Tooth and the periodontal membrane. Histological structure of the minor and major salivary glands. Microscopical and submicroscopical features of cells secreting serous and mucous products. Area B, 2 hours
LECTURE 12	Histology II: General outline of microscopical structure of the digestive tube. Detailed structure of the oesophagus, and stomach. Characteristics of the gastric glands. Microscopical structure of intestines: duodenum, jejunum, ileum, colon and appendix. Gut associated lymphatic tissue (GALT). Area B, 2 hours

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LECTURE 13	<p>Histology III: Histological structure of the liver. Hepatocytes and their polarity. Intrahepatic blood and bile flow. Anatomical and physiological basis of liver division into lobules/ acini. The gallbladder. The exocrine pancreas -structure of the pancreatic acinus and excretory ducts. Area B, 2 hours</p>
LECTURE 14	<p>Structure of the GI tract, its role in hemostasis. GI innervation: parasympathetic, sympathetic and enteric nervous system (ENS). Neurotransmitters and neuromodulators of ENS. Gastrointestinal regulatory substances. Characteristics of GI peptides, including hormones, paracrine and neurocrine factors. Gastrin, secretin, CCK, Glucose-dependent insulintropic peptide. The role of histamine, somatostatin and prostaglandins in the gut. The satiety and anorexigenic centers and their function. Area B, 2 hours</p>
LECTURE 15	<p>The saliva production, regulation and modification – the effect of flow rate on saliva composition. Slow waves as a pacemaker of GI tract motility: origin, mechanisms and frequency. The mechanisms of receptive relaxation. Retropulsion, stomach slow waves and gastric emptying. Functional structure of gastric mucosa. Gastric secretion. The mechanisms of HCl secretion. The processes appearing on the apical and basolateral membrane of parietal cells. The regulation of HCl secretion. Phases of gastric secretion. Area B, 2 hours</p>
LECTURE 16	<p>Peptic ulcer disease – introduction. Mechanisms of gastrinoma. Pepsinogen secretion in the stomach. The concept of diarrhea. Vagovagal reflexes in the upper GI tract. Small intestine motility. Migrating myoelectric complexes. The mechanisms of peristalsis – the role of nervous stimuli and paracrine factors, summary. Area B, 2 hours</p>
LECTURE 17	<p>Pancreatic secretion – its role and composition. Functional structure of exocrine pancreas. Formation of pancreatic secretion. Enzymatic component and aqueous component of pancreatic secretion. Effect of flow rate on pancreatic juice composition. The phases of pancreatic secretion. The regulatory mechanisms – nervous, hormone and paracrine factors. Area B, 2 hours</p>
LECTURE 18	<p>Bile secretion. Functional overview of the biliary system. The composition of the bile, the bile components, their origin, role and their load modification. Functions of the gallbladder – its filling and bile ejection. The physiological role of the sphincter of Oddi. Enterohepatic circulation of bile salts. The concept of enterohepatic circulation. Area B, 2 hours</p>

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LECTURE 19	Digestion and absorption in GI tract. Mechanisms of carbohydrates digestion. The example of starch digestion. The participation of alpha-amylase and disaccharydases. Absorption of monosaccharydases, contransport mechanisms. Digestion of proteins. The cascade of gastrointestinal proteases. Protein digestion in GI tract – summary. The mechanisms of amine acid / oligopeptides intestinal absorption. Digestion of lipids – mechanisms. The absorption of lipids, the role of the portal and lymphatic transport. The types of plasma lipoproteins and their role in lipid metabolism – summary. Area B, 2 hours
LECTURE 20	Intestinal fluid and electrolyte transport. Metabolism of hem, types of bilirubin, hepatocyte conjugation, bilirubin function, urobilinogen circulation. Comparison of jejunum, ileum and colon absorption. The concept of transcellular and paracellular intestinal transport, the role of enterocyte apical and basolateral pole. The differences in cryptal and villous transport. The intestinal secretion – summary. Gastrocolic reflexes. Area B, 2 hours
LECTURE 21	Liver physiology. Functional structure of hepatocyte. Portal circulation. Bile formation and secretion – summary. Metabolic functions of the liver – role in carbohydrate and lipid metabolism. Proteins produced by the hepatocyte – physiological role. The liver as endocrine organ. Detoxification mechanisms: phase I and phase II of hepatic biotransformation. Detoxification of ammonia and ethanol in the liver. The concept of portal acinus – comparison of metabolic functions in the zone I and zone III. Area B, 2 hours
CLASS 1	Superior part of the digestive system. Oral cavity. Palate. Tongue. Teeth and gums. Salivary glands. Area A, 2 hours
CLASS 2	Pharynx. Subdivision of the pharynx. Innervation and blood supply of the pharynx. Muscles of the pharynx. Area A, 2 hours
CLASS 3	Tonsils. Fascia and space of the pharynx. Pharyngeal apparatus (pharyngeal arches, pharyngeal pouches). Nasal cavity. Area A, 2 hours
CLASS 4	Esophagus. Blood and lymphatic vessels and innervation of the esophagus. Area A, 2 hours
CLASS 5	Abdomen. Fasciae and ligaments of the anterior abdominal wall. Arrangement of the rectus sheath. Inguinal region: Hesselbach's triangle, inguinal rings, inguinal canal. Inner surface of the anterior abdominal wall. Nerves of the anterior abdominal wall. Area A, 2 hours
CLASS 6	Lymphatic drainage of the anterior abdominal wall. Blood vessels of the anterior abdominal wall. Peritoneum and peritoneal cavity. Lesser and greater omentum. Mesenteries. Area A, 2 hours
CLASS 7	Peritoneal cavity. Oesophagus. Stomach. Blood supply. Innervation. Lymphatic drainage. Area A, 2 hours

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CLASS 8	Small intestine. Large intestine. Rectum. Blood supply. Innervation. Lymphatic drainage and blood supply. Area A, 2 hours
CLASS 9	Accessory organs of the digestive system. Liver, gall bladder, pancreas, spleen. Blood supply. Innervation. Lymphatic drainage. Area A, 2 hours
CLASS 10	Accessory organs of the digestive system – summary. Embriology of the GI tract. Area A, 2 hours
CLASS 11	Histology 1. Histological structure of the oral cavity: Lip, tongue, lingual papillae. Structural elements of the tooth and periodontal membrane. Histological structure of major salivary glands: parotid, submandibular and sublingual. Area B, 2 hours
CLASS 12	Histology 2. Histological structure of the oesophagus, gastric fundus and pylorus. The cells of the gastric glands. Characteristic histological features of the various segments of intestines: duodenum, jejunum, ileum, colon and appendix. Area B, 2 hours
CLASS 13	Histology 3. structure of the liver: various types of liver acini. Submicroscopical characteristics of hepatocytes. Liver sinusoids and the Disse space. Bile canaliculi and further pathways of the bile flow. The gallbladder. The pancreas -exocrine acini and excretory ducts. Practical test (identifications of slides from the digestive system) Area B, 2 hours
CLASS 14	GI motility, concept of BER. Cajal cells – physiology of smooth muscle contraction. Physiology of chewing and swallowing. The role of the upper and the lower esophageal sphincter, Esophageal peristalsis – types and regulation. Protective mechanisms against reflux. Motor and electrical activity of the stomach, including potential types, its regulation and gastric emptying. Area B, 2 hours
CLASS 15	Motor activity of small and large intestine. GI reflexes, examples. Segmentation contractions and mass movements. Defecation. Methods for testing electrical activity and gastrointestinal motility – esophageal manometry, electrogastrography (EGG). Area B, 2 hours
CLASS 16	Salivation, saliva role and properties, primary and secondary saliva, its composition and regulation. Methods to evaluate gastric secretory function (MAO, BAO, pH-metry). Gastric juice, composition, secretion regulation, the role of histamine and gastrin. Area B, 2 hours
CLASS 17	Participation of specific cell types (including chief cells, parietal and APUD ones). The concept of the gastric barrier. Pancreatic juice – the methods of examination. Area B, 2 hours
SEMINAR 1	Radiology of the stomach and intestine. Area A, 2 hours

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SEMINAR 2	Radiology of the liver, pancreas and spleen – summary of abdomen image examinations. Area A, 2 hours
SEMINAR 3	Summary of physiology classes concerning GI tract. Repetition. Area B, 2 hours
DIDACTIC METHODS (APPLIED)	
	Lectures including interactive part with discussion sessions; Small-group sessions (tutorials) including autopsy; Histological microscopic classes; Practical physiological classes.
STUDENTS WORKLOAD	
NUMBER OF HOURS UNDER SUPERVISION	Following the study plan, i.e. lectures, classes, seminars, as well as discussions sessions: 82 hours
NUMBER OF PREPARATION HOURS	Preparation for classes: 20 hours (including preparation for seminars, preparation of presentations, development of a given clinical case: 8 hours) Preparation for the exam: 60 hours
TOTAL NUMBER OF HOURS FOR THE COURSE	162 hours
CONDITIONS FOR COURSE COMPLETION	
	Attendance in all lectures, classes and seminars is obligatory. Assessment without mark: Acting as admission to the exam, based on the student's individual preparation for the tutorials and seminars. The condition of admission to the exam is: <ol style="list-style-type: none"> 1) Admission to module A area / passing all tutorials; 2) Passing all B area tutorials of the module, not later than one week before the first exam date. Absences may be taken after presenting a reliable medical certificate (admissible approach to classes/seminars with another group, provided that the final number does not exceed 120% of the state according to the dean's office). Lack of three credits results in the obligation to complete all the material from the seminars with the subject manager or an assistant appointed by him.
METHODS OF ASSESMENT	
IN TERMS OF KNOWLEDGE	Ongoing questioning of students at exercises (classes) and seminars, the need to pass all exercises and seminars at the lecturer.
IN TERMS OF SKILLS	Practical skills to recognize anatomy preparation details, particular cytological and histological microscopic preparations. Interpretation of basic physiological tests (as BAO/MAO pH-metry of oesophagus).

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IN TERMS OF SOCIAL COMPETENCY	Activity during classes, grading group work.
SUMMATIVE (I & II terms)	<p>I term (EXAM)*: Multiple choice test; Test questions with 4 answers to choose from, including 50% of correct answers from area A of the module and 50% of correct answers from area B of the module.</p> <p>II term (RETAKE EXAM)*: 10-14 open questions (including 5-7 questions from area A and 5-7 questions from area B).</p>
GRADING SCALE	
PREREQUISITE	It is necessary to provide at least 50% of correct answers in Area A and 50% of correct answers in Area B within the first deadline.
3,0 (SATISFACTORY)	55-60% correct answers of total score
3,5 (SATISFACTORY PLUS)	61-68% correct answers
4,0 (GOOD)	69-75% correct answers
4,5 (GOOD PLUS)	76-80% correct answers
5,0 (VERY GOOD)	81-100% correct answers
BASIC LITERATURE	
<p>[1] Kyung Won Chung, Harold M. Chung, <i>Gross Anatomy</i>, Philadelphia, 2015, Wolters Kluwer; [2] Linda S. Costanzo, <i>Physiology</i>, Oxford, 2018, Elsevier Ltd; [3] Keith L. Moore; Arthur F. Dalley; Anne M.R. Agur, <i>Clinically oriented anatomy</i>, Philadelphia, 2010, Wolters Kluwer.</p>	
SUPPLEMENTARY LITERATURE	
<p>[1] Radovan Hudak, David Kochlik, Ondrej Volny, <i>Memorix Anatomy</i> Edra Urban & Partner, 2017, 607 str; [2] Heddwen Brooks, Scott Boitano, Susan Barman, <i>Ganong`S Review of Medical Physiology</i>, Ed. McGraw-Hill 2016.</p>	

Notes:

* It was presumed that Covid-19 pandemic will be ended, if not, there will be separate rules for on-line examinations.

Area A - anatomy & radiology

Area B - physiology & histology

Seminars are the same as *Conversatories*