<table>
<tr><td>Course title</td><td colspan="5">Structure and function of the human body II</td></tr>
<tr><td>Course code</td><td colspan="5">MD-202</td></tr>
<tr><td>Course type</td><td colspan="5">Required</td></tr>
<tr><td>Level</td><td colspan="5">1st cycle: undergraduate</td></tr>
<tr><td>Year / Semester</td><td colspan="5">Year 2 / Semester 3 (Fall)</td></tr>
<tr><td>Teacher’s name</td><td colspan="5">Chloe Antoniou</td></tr>
<tr><td rowspan="2">ECTS</td><td rowspan="2">11</td><td>Large Group Learning
per Week</td><td>Tutorials
per Week</td><td>Small group work
per Week</td><td>Laboratories
per Week
**Includes basic sciences laboratories and anatomy practicals</td></tr>
<tr><td>10</td><td>4</td><td>4</td><td>2</td></tr>
<tr><td>Course purpose and objectives</td><td colspan="5">Gastrointestinal system
1. Describe the gross anatomy and microscopic organization of the gastrointestinal tract and accessory organs, including the mouth, pharynx, esophagus, stomach, small intestine, large intestine, anus, liver, pancreas, and gallbladder.
2. Explain the histological characteristics of the layers of the gastrointestinal wall (mucosa, submucosa, muscularis propria, serosa) and relate these features to their specific functions in digestion and absorption.
3. Outline the physiological roles of the gastrointestinal system, emphasizing digestion, absorption, and the regulation of motility.
4. Describe how gastrointestinal motility and secretions are regulated, including the role of the enteric nervous system.
5. Apply principles of physics, such as pressure gradients and smooth muscle contraction, to understand gastrointestinal motility processes, including peristalsis and sphincter control.
6. Discuss the secretory functions of the gastrointestinal tract, including saliva, gastric secretions, pancreatic exocrine functions, bile, and small bowel secretions, and explain their regulatory mechanisms and roles in digestion.
7. Explain how the gastrointestinal system contributes to the homeostasis of nutrients, water, and electrolytes.
8. Describe the immune functions of the gastrointestinal system, including the role of gut-associated lymphoid tissue (GALT) and the microbiome in immune regulation and pathogen defense.
9. Outline the interpretation of common gastrointestinal function tests (e.g., liver function tests, endoscopy, imaging studies) and understand how to assess these tests.</td></tr>
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10. Describe the liver's microscopic structure and function, including its roles in vitamin and ferritin storage, coagulation pathway synthesis, and metabolism of hormones and drugs.
11. Explain pharmacokinetic processes (absorption, distribution, metabolism, excretion) and define terms such as first-pass effect, bioavailability, and volume of distribution.
12. Understand the impact of CYP450 inducers or inhibitors on drug metabolism and how the liver plays a central role in this process.
13. Explain the pancreatic microscopic structure and its correlation with its various functions.
14. Discuss key biochemical processes in carbohydrate, lipid, and protein metabolism, their regulation, and adaptations in fed and fasting states.
15. Describe processes involved in steroid metabolism, emphasizing cholesterol synthesis and lipoprotein transport.
16. Discuss the significance of essential nutrients, including essential lipids, amino acids, vitamins, and minerals.
17. Explore the genetic basis of lactose intolerance and its ancestral links.
18. Describe the metabolic pathways for ethanol metabolism, including enzyme roles, physiological effects of ethanol and its metabolites, and genetic variations affecting enzyme activity related to ethanol flushing.

Renal System

19. Describe the anatomy and histology of the kidneys and associated structures, including their gross and microscopic features, nerve supply, blood supply, and lymphatic drainage, along with the relevance of these elements to clinical practices.
20. Discuss the use of imaging techniques, such as ultrasound and other radiological modalities, to visualize the kidneys and urinary bladder.
21. Explain the embryological development of the renal system and its clinical implications, as well as the physiological roles of the gastrointestinal and renal systems in digestion and homeostasis.
22. Understand the processes involved in urine formation, including glomerular filtration, tubular reabsorption, and secretion, encompassing the principles of fluid dynamics and regulation by the nervous system.
23. Describe the mechanisms of micturition and the anatomical structures involved in this process.
24. Interpret common renal function tests, including the significance of plasma urea, creatinine, and the glomerular filtration rate.
25. Explain the role of the kidneys in maintaining homeostasis, including regulation of extracellular fluid osmolarity, acid-base balance, and electrolyte concentrations such as sodium and potassium.

	26. Discuss the renal mechanisms of blood pressure regulation, including the renin-angiotensin-aldosterone system (RAAS), and the kidneys' roles in drug metabolism and excretion. 27. Analyze the connections between renal function and the immune system, including the involvement of gut-associated lymphoid tissue (GALT) and the microbiome. 28. Summarize the key biochemical processes in metabolism related to carbohydrates, lipids, and proteins, along with the impact of essential nutrients on health.
Learning outcomes	**Gastrointestinal system** **<u>Theme 1. The gastrointestinal tract</u>** 1. Describe the gross anatomy of the gastrointestinal tract, including the mouth, pharynx, oesophagus, stomach, small intestine, large intestine & anus, and the accessory organs (liver, pancreas, gallbladder), and explain the microscopic organization of tissues within these structures. 2. Describe the microscopic anatomy and histology of the gastrointestinal tract and the accessory organs. 3. Identify and explain the histological characteristics of the layers of the gastrointestinal wall (mucosa, submucosa, muscularis propria, and serosa) and relate them to their specific functional roles in digestion and absorption. 4. Outline the major physiological roles of the GI system, including digestion & absorption of nutrients and the regulation of gastrointestinal motility. 5. Describe the regulation of gastrointestinal motility and secretions and explain the role of the enteric nervous system. 6. Apply principles of physics, such as pressure gradients and smooth muscle contraction, to understand the process of peristalsis and other forms of gastrointestinal motility, as well as the regulation of sphincter control. 7. Describe the secretory function of the gastrointestinal tract, including the secretion of saliva, gastric secretions, the exocrine function of the pancreas, the secretion of bile & the small bowel secretions, discuss the role of these secretions in digestion and explain the regulation of this secretory function. 8. Explain how the GI system contributes to nutrient, water, and electrolyte homeostasis. 9. Describe the immune functions of the gastrointestinal system, including the role of gut-associated lymphoid tissue (GALT) in immune surveillance and the prevention of pathogen entry, as well as the role of the microbiome in immune regulation. 10. Outline the interpretation of common gastrointestinal function tests, such as liver function tests, endoscopy, and imaging studies. 11. Describe the social experiences of patients with IBD.

Theme 2. Accessory Organ: The liver

12. Explain how the microscopic structure, the different cell types, and their arrangement within the organs correlate with the different functions of the liver and pancreas.
13. Describe the role of the liver in the storage of vitamins and ferritin and outline the synthesis of components of the coagulation pathway.
14. Describe the role of the liver in the metabolism of substances such as hormones and drugs and their excretion in bile.
15. Describe the four main processes of pharmacokinetics (absorption, distribution, metabolism and excretion)
16. Define the terms first-pass effect, bioavailability and volume of distribution.
17. Understand the role of the liver in drug metabolism and how CYP450 inducers or CYP450 can affect overall drug metabolism.

Theme 3. Accessory Organ: The pancreas

18. Explain how the microscopic structure, the different cell types, and their arrangement within the organs correlate with the different functions of the liver and pancreas.

Theme 4. Aspects of GI function: Metabolism and nutrition

19. Explain the key biochemical processes involved in carbohydrate, lipid and protein metabolism, their regulation and their adaptations in the fed and fasting state.
20. Explain the processes involved in steroid metabolism with an emphasis on the synthesis of cholesterol and the role of lipoproteins in cholesterol transport.
21. Discuss the role of essential nutrients (essential lipids and amino acids, vitamins, and minerals).
22. Discuss and explore experimentally, the genetic basis of lactose intolerance and its link to ancestry.
23. Describe the metabolic pathways involved in ethanol metabolism, including the enzymes responsible for its breakdown, the physiological effects of ethanol and its metabolites, and the phenomenon of ethanol flushing, particularly in relation to genetic variations affecting enzyme activity.

Renal System

Theme 1 Formation of urine

24. Describe the gross anatomy of the kidneys, including structure, key anatomical relationships, surface anatomy, nerve supply, blood supply and lymphatic drainage and explain the relevance of these elements to clinical examination and medical procedures.
25. Discuss the use of ultrasound to visualise the kidneys and the urinary bladder and outline the use of other radiological modalities to visualise the renal system.

	26. Outline the embryological development of the renal system and identify relevant clinical correlates. 27. Describe the histology of the kidneys, ureters, urinary bladder and urethra. 28. Explain how the microscopic anatomy of the kidney and the histological features of the components of the nephron correlate with urine formation. 29. Describe the process of glomerular filtration and the way it is closely interrelated with renal blood flow, and discuss the regulation of the latter. 30. Apply principles of physics, such as fluid dynamics, hydrostatic and oncotic pressure and diffusion, to explain the function of the kidney. 31. Describe the processes of tubular reabsorption and secretion and their regulation. 32. Outline the neural and muscular mechanisms involved in the control of micturition, including the roles of the bladder, urethral sphincters and the nervous system. 33. Outline the interpretation of common renal function tests (e.g. plasma urea and creatinine and glomerular filtration rate). **<u>Theme 2. The role of the kidneys in homeostasis</u>** 34. Explain how the microscopic anatomy of the kidney and the histological features of the components of the nephron correlate with the homeostatic functions of the kidney. 35. Describe the juxtaglomerular apparatus and correlate structure with function. 36. Outline the importance of the excretion in the urine of waste products, such as urea and creatinine, as well as toxins, drugs and their metabolites. 37. Discuss the role of the kidney in drug excretion and overall drug elimination 38. Define the terms: clearance, steady-state, zero-order and first-order kinetics as they relate to drug action and understand their clinical relevance. 39. Explain the terms half-life, infusion rate, loading dose and maintenance dose as they relate to drug action. 40. Explain the role of the kidneys in the homeostasis of extracellular fluid osmolarity and discuss how this is related to the regulation of urine concentration. 41. Describe the role of the kidneys in the regulation of plasma sodium and potassium concentrations and discuss the hormonal control of these processes. 42. Explain the renal mechanisms of blood pressure regulation, including the renin-angiotensin-aldosterone system (RAAS). 43. Explain the role of the kidneys in acid-base homeostasis and correlate this to clinical conditions of acidosis and alkalosis. 44. Explain the role of the kidneys in calcium and phosphate homeostasis. 45. Outline the role of the kidneys in erythropoiesis.

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<tr><td></td><td colspan="3">46. Explain how the renal system interacts with other systems (e.g. cardiovascular, respiratory and endocrine) to maintain overall physiological homeostasis.
47. Explain the ethical principles and cultural competencies for working with diverse patients, in terms of gender identity and cultural health beliefs. (Cultural Competence integrated with Medical Ethics).
48. Discuss and practise the ethical principles and cultural competencies for working with diverse patients, such as gender identity and cultural health beliefs. (Cultural Competence integrated with Medical Ethics).
Medical Ethics/Cultural Competence
49. Explain the ethical principles and cultural competencies for working with diverse patients, in terms of gender identity and cultural health beliefs.
50. Discuss and practise the ethical principles and cultural competencies for working with diverse patients, such as gender identity and cultural health beliefs.</td></tr>
<tr><td>Prerequisites</td><td>None</td><td>Required</td><td>None</td></tr>
<tr><td>Course content</td><td colspan="3">Gastrointestinal System Themes:
1. The gastrointestinal tract
2. Accessory Organ: The liver
3. Accessory Organ: The pancreas
4. Aspects of GI function: Metabolism and nutrition

Renal System Themes:
• Formation of urine
• The role of the kidneys in homeostasis</td></tr>
<tr><td>Teaching methodology</td><td colspan="3">Lectures
Tutorials
Laboratory Practical Sessions
Flipped learning
Directed self-study
Group Work</td></tr>
<tr><td>Bibliography</td><td colspan="3">Required Textbooks/Reading:
<table>
<tr><th>Authors</th><th>Title</th><th>Edition</th><th>Publisher</th><th>Year</th><th>ISBN</th></tr>
<tr><td>Arthur F. Dalley,
Anne M. R. Agur</td><td>Moore’s Clinically oriented anatomy</td><td>9th Int’l Edition</td><td>Wolters Kluwer Health</td><td>2024</td><td>9781975209544</td></tr>
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	Sadler, Thomas	Langman's Medical Embryology	15th Edition	Wolters Kluwer	2024	9781975180010
	Pawlina, Wojciech	Histology: A Text and Atlas with correlated cell and molecular biology	9th Edition	Wolters Kluwer	2024	9781975181574
	David L. Nelson and Michael M. Cox	Lehninger Principles of Biochemistry	8th Edition	W. H. Freeman and Company	2021	9781319381493

Recommended Textbooks/Reading:

Authors	**Title**	**Edition**	**Publisher**	**Year**	**ISBN**
Costanzo, Linda	BRS: Physiology	8th Edition	Wolters Kluwer	2023	9781976963467
Halliday, N.L. & Chung, H. M	BRS Gross Anatomy	10th Edition International	Lippincott Williams & Wilkins	2023	9781975181482

Assessment	Final exam (80%) Coursework (20%)
Language	English