<table>
<tr><td>Course title</td><td colspan="5">Structure and function of the human body I</td></tr>
<tr><td>Course code</td><td colspan="5">MD-201</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">Soulla Nicolaou</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">Cardiovascular System
1. Describe the development of the heart, including key events such as the formation of the cardiac tube, chamber development, and adult heart configuration, while outlining common developmental abnormalities.
2. Explain foetal circulation and the adaptations that occur at birth and identify the main chambers of the heart along with their regional characteristics.
3. Detail the normal flow of blood through the heart, the function and characteristics of heart valves, and describe the pericardium and myocardium.
4. Discuss the histology of the heart wall and understand the physics relevant to cardiac ultrasound, including the production and detection of ultrasound beams, echo detection, and imaging techniques.
5. Demonstrate proficiency in cardiac ultrasound techniques, including probe selection, patient positioning, and identification of anatomical structures, as well as understanding the cardiac cycle and determinants of cardiac function.
6. Outline the anatomy and branching of the thoracic aorta and its major relations, as well as the anatomy of the coronary circulation, structures supplied, and the venous drainage of the heart.
7. Compare microscopic features of arteries and veins, and explain blood flow dynamics, flow regulation, and the relationship between blood pressure, flow, and vascular resistance.
8. Describe the mechanisms of haemostasis, including primary and secondary processes, the coagulation cascade, the role of vitamin K, and natural inhibitors in regulating coagulation.
9. Detail the anatomy and blood supply of the cardiac conducting system, describe action potential phases in cardiac tissue, and understand the role of the SA node as the heart's pacemaker.</td></tr>
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	10. Explain the physiological concept of blood pressure, its determinants, and regulation by the autonomic nervous system, as well as the role of renal mechanisms in blood pressure control. **Respiratory System** 11. Describe the normal anatomy of the upper airways, diaphragm, and thoracic skeleton, including significant anatomical landmarks and structures involved in respiration. 12. Explain the histology of both the conducting and respiratory portions of the respiratory system, distinguishing between different components such as the trachea, bronchi, bronchioles, and alveoli. 13. Discuss the overall functions of the respiratory system, including its respiratory and non-respiratory roles. 14. Describe the mechanics of airflow to the alveoli and the concept of alveolar ventilation, including factors that influence airway resistance in a healthy lung. 15. Illustrate the structure and function of the pleural membranes and mediastinum, including an understanding of their anatomical relationships. 16. Interpret normal chest X-ray findings and identify key thoracic structures and mediastinal contours. 17. Explain the principles of pulmonary gas exchange, particularly the diffusion of oxygen and carbon dioxide across the respiratory membrane and their transport in the bloodstream. 18. Understand the physiology of pulmonary circulation, including blood pressure, flow, resistance, and the mechanisms of autoregulation of pulmonary blood flow. 19. Describe lung volumes and capacities, explaining the significance of measures such as FEV1, FVC, and their ratios in evaluating lung function through spirometry.
Learning outcomes	**Cardiovascular System** **<u>Theme 1: The heart as a pump</u>** 1. Describe key events in heart development, including the development of the cardiac tube, looping and septation to form the heart chambers and outflow tract, and the configuration of the adult heart. 2. Outline the common abnormalities in heart development that lead to pathologies. 3. Outline foetal circulation and describe the adaptations taking place at birth. 4. Identify the main chambers of the heart, their regional characteristics and the surfaces of the heart. 5. Describe the normal flow of blood through the heart. 6. Identify the different heart valves, their function and characteristics (including location, structure, site of auscultation).

	7. Describe the pericardium and pericardial cavity. 8. Identify the special characteristics of the myocardium. 9. Describe the histology of the three layers of the heart wall (i.e. endocardium, myocardium and epicardium), considering in particular the heart musculature (i.e. myocardium). 10. Discuss the physics of sound waves, including the production of an ultrasound beam and its interaction with materials. 11. Explain the detection of echoes using a transducer and describe A, B, and M mode imaging, as well as Doppler imaging of blood flow and elastography. 12. Outline the importance of safety and quality assurance in ultrasound. 13. Explain and demonstrate probe selection, patient positioning and scanning technique for cardiac ultrasound. 14. Identify key anatomical structures using ultrasound and applications in clinical practice. 15. Identify the four chambers of the heart and heart valves using ultrasound (apical view). 16. Identify the four chambers of the heart, heart valves and major vessels using ultrasound (parasternal long, parasternal short and subcostal view). 17. Demonstrate a thorough understanding of the functioning of the heart, including: 18. The cardiac cycle (i.e. the Volume-Pressure [“Wiggers”] Diagram). 19. The origin of normal and abnormal heart sounds in relation to the cardiac cycle. 20. The physiology and biochemistry of cardiac muscle contraction and relaxation. 21. The relation of the cardiac cycle to the electrocardiogram. 22. The determinants of cardiac contractility including intrinsic regulation (the Frank-Starling mechanism), extrinsic regulation (the role of the autonomic nervous system) and the effect of serum ion levels on heart function. 23. Explain what is meant by Cardiac Output and Venous Return to the heart. 24. Describe the concepts of ‘preload’, ‘afterload’, ‘contractility’ and ‘stroke volume’ in the context of optimum cardiac function. 25. State Laplace's law and explain the link to heart work and mural tension. 26. Describe what is meant by the term ‘’Excitation-contraction coupling’’. *Cultural competence* 27. Explain the basic models and definitions of cultural competence. 28. Describe the importance of cultural competence and identify the core competencies necessary for ensuring cultural competence in healthcare practice. 29. Outline organisational cultural competence.

30. Explain the practise of cultural competence across cultures.

Medical Ethics

31. Identify and discuss the ethical challenges of practising medicine in diverse communities and multicultural contexts

Theme 2: Circulation and Haemostasis

32. Identify the anatomy of the thoracic aorta and its main branches, as well as the structures they supply
33. Identify the branches of the descending thoracic aorta and the structures they supply.
34. Describe the major relations of the ascending, arch, and descending thoracic aorta.
35. Describe the common variations of the branches of the arch of the aorta and their clinical significance.
36. Identify the azygos venous system and describe its communications with the caval system of veins.
37. Describe the location of the oesophageal and pulmonary plexuses and superficial and deep cardiac plexuses.
38. Describe the coronary circulation.
39. Describe the venous drainage of the heart.
40. Outline the different microscopic features of arteries and veins.
41. Identify the differences between different types of arteries (from elastic artery to arteriole) and veins (from large vein to venule).
42. Identify laminar and turbulent flow to explain how blood behaves under different conditions, such as in various vessel sizes and during exercise.
43. Describe the dynamics and control of coronary blood flow, heart muscle oxygen consumption and biochemistry and explain events leading to ischaemia.
44. Demonstrate a thorough understanding of the functioning of the vascular system, including:
45. The major differences between the arterial and venous systems.
46. How systemic circulation is maintained, in terms of the relationship between blood pressure, blood flow, and vascular resistance.
47. The autoregulation of blood flow to different organs and tissues.
48. The role of the lymphatic system in augmenting the circulation and in maintaining overall fluid balance.
49. Describe the significance of haemostasis and outline the key elements of primary and secondary haemostasis.
50. Outline the coagulation cascade and distinguish between the extrinsic and intrinsic pathways.

51. Explain the role of vitamin K in the production and function of clotting factors.
52. Outline how the natural inhibitors, tissue factor pathway, antithrombin III, proteins C and S regulate the coagulation cascade and prevent thrombosis.
53. Describe the fibrinolytic pathway, its regulators and its products.
54. Explain how a balance is maintained between the opposing mechanisms of coagulation (coagulation and fibrinolysis).

Professionalism

55. Consider what Professionalism is and why it is vital for you as students and future doctors
56. Review role of the General Medical Council and guidance for the medical profession

Theme 3: The heart as an electrical conductor

57. Provide a detailed description of the anatomy of the conducting system of the heart, including the sinoatrial (SA) node, atrioventricular (AV) node, bundle of His, bundle branches, and Purkinje fibers.
58. Provide a detailed description of the blood supply of the conducting system, including the right coronary artery and its branches, and the left coronary artery, where applicable.
59. Describe the phases and ion channels involved in the action potential in cardiac tissue
60. Explain why the SA Node is often termed the 'pacemaker' of the heart.
61. Explain what is meant by the term 'pacemaker potential'.
62. Describe how and why various electrolyte disturbances (e.g., potassium and calcium) might impact on cardiac conduction.
63. Outline the function of the electrocardiogram, its basic components, and how these relate to cardiac electrical activity.
64. Describe the steps of reading an electrocardiogram.
65. Explain how the ECG leads correspond to the anatomical location of the heart and its blood supply.

Theme 4: The cardiovascular system as a pressure generator

66. Explain the concept of blood pressure to an intelligent non-medical adult, including an explanation of the systolic and diastolic components.
67. Describe the physiological determinants of blood pressure control.
68. Describe the relationship of vascular anatomy, radius, flow and pressure gradients and Poiseuille's Law.
69. Discuss how and why the blood pressure varies in different blood vessel types.
70. Describe the particular role of the autonomic nervous system in the regulation of blood pressure, blood flow and vascular resistance.

71. Explain the role of capacitance vessels and of distal arteries and arterioles in the genesis and maintenance of systolic and diastolic BP.
72. Outline the role of the kidneys and the renin-angiotensin-aldosterone axis in the regulation of blood pressure.
73. Outline the regulation of the systemic circulation and describe changes in response to cold, heat and shock.

Statistics and Epidemiology

74. Explain random error and its impact in research
75. Distinguish between population parameter and sample estimate
76. Distinguish between the different sampling methods (random, systematic, convenience)
77. Explain the rationale and interpretation of confidence interval

Respiratory System

<u>Theme 1: Respiratory Pathways and Ventilation</u>

78. Describe the normal anatomy of the upper airways (larynx, trachea) and the respiratory tree.
79. Describe the anatomy of the diaphragm and the phrenic nerve and identify the main structures crossing the diaphragm and the vertebral levels at which this happens.
80. Describe the surface anatomy of the thorax with reference to the upper airways and the lungs.
81. Describe the anatomy of the thoracic skeleton, including major anatomical landmarks, bones of the thoracic cage, and muscles of the thorax.
82. Describe the histology of the conducting portion of the respiratory system (nasal cavity, pharynx, larynx, trachea, bronchi).
83. Distinguish between the trachea, bronchi, and bronchioles in a microscopic specimen.
84. Explain the overall respiratory and non-respiratory functions of the respiratory system.
85. Describe inspired air gas content and the mechanics of airflow to the alveoli and alveolar ventilation.
86. Explain what determines airway resistance in the normal lung.
87. Describe the control/regulation of respiration.

<u>Theme 2: Gas Exchange and Circulation</u>

88. Describe the gross structure of the pleural membranes, the pleural subdivisions, and the parietal pleural surfaces.
89. Describe the subdivisions and levels of the mediastinum and identify the mediastinal structures and their anatomical relationships.

	90. Recognize a normal CXR, identifying all key thoracic structures and normal mediastinal contours. 91. Discuss the histology of the respiratory portion of the system (intrapulmonary bronchial tree, bronchioles, and alveoli). 92. Outline the physical nature of lung operating units, i.e., alveoli. 93. Describe the concepts of pulmonary gas exchange, including the diffusion of oxygen and carbon dioxide through the respiratory membrane and their transport in the blood. 94. Understand the physiology of the pulmonary circulation, defining pulmonary blood pressure, blood flow, and vascular resistance, and explain the autoregulation of pulmonary blood flow. 95. Describe lung volumes and capacities (FEV1, FVC, FEV1/FVC ratio, and TLC) and apply this knowledge to an explanation of what "lung function studies" (spirometry) measure. *Statistics and epidemiology* 96. Explain and apply the principles of hypothesis testing (formulating null/alternative hypotheses) 97. Select appropriate statistical tests/models such as t-test, ANOVA and chi-square, paired/unpaired) 98. Understand and interpret p values 99. Interpret measures of association for continuous outcomes (correlations, regression coefficients).
Prerequisites	None **Required** None
Course content	**Cardiovascular System Themes:** 1. The heart as a pump 2. Circulation and haemostasis 3. The heart as an electrical conductor 4. The cardiovascular system as a pressure generator **Respiratory System Themes:** 1. Respiratory pathways and ventilation 2. Gas exchange and circulation
Teaching methodology	Lectures Tutorials Flipped learning Directed self-study Group Work
Bibliography	**Required Textbooks/Reading:**

Authors	Title	Edition	Publisher	Year	ISBN

	Arthur F. Dalley, Anne M. R. Agur	Moore's Clinically oriented anatomy	9th Int'l Edition	Wolters Kluwer Health	2024	9781975209544
	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

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