COURSE UNIT DESCRIPTION

Course unit title	Code
Human Physiology	

Lecturer(s)	Department(s)
Coordinating: Prof. Dr. Vaiva Hendrixson Others: Assist. Mantas Radzevičius; Assoc. Prof. Sandra Meidutė-Abaravičienė; Lectr. Elvira Malyško	Institute of Biomedical Sciences, Faculty of Medicine of Vilnius University. Department of Physiology, Biochemistry, Microbiology and Laboratory Medicine; M.K.Čiurlionio g. 21, Vilnius

Cycle	Level of the course unit	Type of the course unit
Integrated studies	-	Compulsory

Mode of delivery	Period of delivery	Language of instruction
Lectures (including e-lectures), seminars, laboratory tasks and consultations	II semester	Lithuanian and English

Prerequisites and corequisites	
Prerequisites: A student must have completed the following courses: Human Histology; Biochemistry	**Corequisites (if any): none**

Number of ECTS credits allocated to the course unit	Student's total workload	Contact hours	Self-study hours
5	134	67	67

Purpose of the course unit Programme competences to be developed
The main objectives of this course are to learn about the functions of human organs and systems, including the processes of interaction between different physiological systems and the mechanisms of physiological regulations, in order to apply the fundamental theoretical knowledge in further clinical dentistry studies. After the course, students should be able to discuss, analyze and make conclusions regarding physiological processes taking place in the human body and to be able to apply the acquired knowledge in health care practice.

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Generic competences		
To act honestly and according to ethical obligations, be emphatic, think critically and self-critically, be creative, take the initiative, and communicate with others. Be able to perform the Human Physiology laboratory tasks, work in teams and individually, and actively take part in discussions during the seminars.	Blended-teaching methods: • Lectures (including virtual) • Seminars • Practice • Small groups discussions • Peer-to-peer teaching (with supervision and	• Continuous assessment and evaluation of seminars and laboratory tasks • written quiz (10-point scale) • exam

	facilitation of the teacher) • Flipped-classroom • Presentations • Computer simulations • Laboratory tasks • Feedback • Consultations • Independent work using library database	
Subject-specific competences		
• To be able to explain the main functions of human organs and systems, including the processes of interaction between different physiological systems and the mechanisms of physiological regulations; • To be able to discuss and make conclusions on various topics of human physiology; • To be able to think critically, to analyse the interaction between various physiological mechanisms of the human body, and be able to integrate acquired knowledge and apply it in practice; • To be able to independently perform particular laboratory tasks; • To be able to work with scientific literature and to use scientifically based biomedical evidence, including the latest knowledge in Human Physiology, in dentistry practice.	• Lectures (including virtual) • Seminars • Practice • Small groups discussions • Peer-to-pear teaching (with supervision and facilitation of the teacher) • Flipped-classroom • Presentations • Computer simulations • Laboratory tasks • Feedback • Consultations • Independent work using library database	• Continuous assessment and evaluation of seminars, practice and laboratory tasks • written quiz (10-point scale) • written exam (10-point scale)

Topics	Contact work hours							Time and tasks of self-study	
	Lectures	Consultations	Seminars	Practice	Laboratory work	Practical training	**Total contact hours**	**Self-study**	**Tasks**
1. Introduction to Human Physiology course. Physiology of membranes. Concept of excitable tissue. Membrane and action potentials. Mechanism of propagation of nerve impulse in myelinated and unmyelinated nerve fibers. Chemical and electrical synapses. Synaptic transmission.	2		2				**4**	**4**	To be prepared for the seminar and computer simulation task "Stimulation and inhibition of the frog's *n. ischiadicus* using various stimuli. Measuring velocity of nerve impulse conduction".
2. Discussion on peripheral nervous system physiology issues.			2				**2**	**2**	To be prepared for the discussion on the topic of membrane physiology and physiology of peripheral nervous system, and synapses.
3. General functions of the central nervous system. Functions of the neurons. Functions of neuroglia. Neural reflexes. Conditioned reflexes. Concept of neural centre. Features of the neural centre. Types and mechanisms of inhibition. The principles of neural coordination.	2			2			**4**	**4**	To be prepared for the laboratory session "Evaluation of human stretch reflexes". To learn to test knee-jerk, elbow and Achilles reflexes. To be prepared for the discussions on the topic of reflexes and reflex loop.
4. Functions of the spinal cord, medulla oblongata, pons, midbrain, cerebellum and diencephalon. Cerebral cortex: sensory and motor cortex, and association areas. Functions of basal nuclei. Limbic system. Motivations. Instincts. Emotions. Integrative functions of the nervous system. Neurophysiology of language. Learning and memory. Physiology of sleep. Physiology of sensory systems.	2			1			**3**	**3**	To be prepared for the laboratory tasks: "Determination of visual acuity'' and/or "Peripheral vision". To learn to test the visual acuity and/or peripheral vision. To be prepared for the discussions on the topic of physiology of sensory systems.
5. Discussion on central nervous system physiology issues.			2				**2**	**2**	To be prepared for assessment, discussion & quiz on neurophysiology issues.
6. Written quiz (physiology of peripheral and central nervous system)			1				**1**	**2**	
7. Concept of the hormone. Classification of the hormones. Action mechanisms of water soluble and lipid soluble hormones. Regulation of secretion of hormones. Functions of hormones of hypothalamus, hypophysis, thyroid and parathyroid glands, pancreas, sexual and adrenal gland hormones.	2		2				**4**	**4**	To be prepared to give the presentations about the functions of particular endocrine gland and hormone. To be prepared to discuss on the topic of endocrine physiology.
8. Functions of the kidneys. Mechanisms and regulation of urine production. Micturition.			2				**2**	**2**	To be prepared for the seminar and virtual experiment "Investigation of kidneys functions". To be prepared for the discussions on the topic of renal physiology.
9. Assessment and discussion on endocrine system and renal physiology issues.			2				**2**	**2**	To be prepared for discussion & assessment on endocrine system and renal physiology issues.

10. Functions of the gastrointestinal system. Digestion in the mouth. Functions of saliva. Digestion in the stomach and small intestine. Absorption of nutrients. Regulation of gastrointestinal secretion and motility. Functions of large intestine. Functions of the liver.	4		1				**5**	**5**	To be prepared for the discussion on the topic of gastrointestinal system physiology.
11. Metabolism and energy balance. Energy stores and control. Food intake control. Dietary guidelines. Essential dietary components (protein, carbohydrates, fats, minerals, water, and vitamins); their intake and impact on the functions of the teeth.	4			1			**5**	**5**	To be prepared for the laboratory task "Evaluation of energy requirements and basic nutrient calculations of daily food ration". To learn to calculate the daily energy requirements. To be prepared for discussions on the topic of metabolisms and nutrition physiology.
12. Assessment and discussion on gastrointestinal system physiology, metabolism and nutrition physiology issues. Written quiz.			2				**2**	**2**	To be prepared for assessment, discussion & quiz on gastrointestinal system physiology, metabolism and energy balance, and nutrition physiology issues.
13. Functions of blood. Physical indices of blood: haematocrit, erythrocyte sedimentation rate (ESR), osmotic equilibrium, pH. Blood plasma water, electrolytes, glucose and control of its level. Plasma protein functions, non-protein nitrogenous substances. Blood plasma lipids and lipoproteins.	4		1				**5**	**5**	To be prepared for the seminar "Haematocrit". To be prepared for the discussions on the topic of physical indices of blood, pH, osmosis, and ESR. To be prepared for the discussion on the issues of components of blood plasma.
14. Functions of red blood cells, white blood cells, and platelets. Functions of haemoglobin. Haematopoiesis. Haemostasis. Anticoagulants. Blood types.	4				2		**6**	**6**	To be prepared for laboratory tasks "Determination of haemoglobin concentration in the blood" and "Determination of ABO and RhD blood types". To be prepared for discussions on the topic of physiology of blood cells and blood types.
15. Assessment and discussions on the topic of blood physiology. Written quiz.			2				**2**	**2**	To be prepared for assessment, discussion & quiz on blood physiology issues.
16. Functional characteristics of the heart. Stroke volume and cardiac output. Regulation of cardiac functions.	2		2				**4**	**4**	To be prepared for the seminar and computer simulation task "Cardiovascular dynamics". To be prepared for the discussions on the issues of heart physiology.
17. Structural and functional properties of blood vessels. Blood flow and vascular resistance. Arterial blood pressure. Regulation of arterial pressure. Pulse. Microcirculation and the lymphatic system. Characteristics of regional circulation	4			2			**6**	**6**	To be prepared for the practice "Measure of arterial blood pressure and evaluation of arterial blood pressure and pulse during exercise". To learn to measure the arterial blood pressure using palpatory and auscultatory methods. To be prepared for discussions on the topic of vascular physiology.
18. Assessment and discussions on the topic of cardiovascular physiology. Written quiz.			2				**2**	**2**	To be prepared for assessment, discussion & quiz on

									cardiovascular physiology issues.
19. Functions of respiratory system. Stages of respiration. Lung volumes and capacities. Mechanisms of inspiration and expiration. Gas exchange in the lungs and blood. Gas transport in the blood. Gas exchange in the lungs and tissues. Regulation of respiration. Assessment and discussions on the topic of respiratory system physiology.	2		1	1			**4**	**4**	To be prepared for the seminar "Spirometry". To learn how to measure and calculate the lung volumes and capacities using spirometer. To be prepared for the discussion on the topic of respiratory system physiology.
20. The finalization of activities during the entire course: remarks and conclusions		1	2				**3**	**3**	To be prepared for wrap-up of the course activities and final feedback of the course.
Total:	**32**	**1**	**25**	**7**	**2**		**67**	**67**	

Assessment strategy	**Weight (%)**	**Assessment period**	**Assessment criteria**
Activity during seminars and laboratory tasks and the assessment of written quizzes (the average grade of all the quizzes taken during the entire course)	40%	Entire course (2nd semester)	**The student must be able:** • to perform laboratory tasks, evaluate study data, and summarize the information received; • to use theoretical knowledge and be able to apply them in practice; • to be creative, to take initiative, to share the knowledge with classmates, to be actively involved in discussions and presentations, to think critically, and to be able to give a constructive opinion on issues of human physiology; • to be able to work individually and in groups as a team member; • to know how to use electronic library sources and to review, summarize and present scientific knowledge to classmates. All of quizzes have to be successfully passed with a grade of at least 5 (50%) in the grading scale from 0 to 10. Written quizzes are measured by the completeness and consistency of the responses to the quiz. Each quiz consists of multiple-choice questions and 3-5 open questions. Open questions account for no less than 60% of the mark.
Written examination	60%	The exam session; at the end of the course	Measured by the completeness and consistency of the responses to the exam. The exam (final test) consists of multiple-choice questions and 5 open questions. Open questions account for no less than 60% of the mark. The exam is evaluated using grades on a scale from 0 to 10. The meaning of the grades: 10: Excellent knowledge and capabilities (> 92%). 9: Very good knowledge and capabilities (82–91%). 8: Good knowledge and capabilities. Insignificant mistakes can be allowed (74–81%). 7: Moderate knowledge and capabilities. Nonessential mistakes are identified (66–73%). 6: Satisfactory knowledge and capabilities. Mistakes are identified (58–65%). 5: Weak knowledge and capabilities that still fulfil minimal requirements. Many mistakes are identified (50–57%). 0–4: Does not fulfil minimal requirements (<49%).

Author	Year of publication	Title	No of periodical or vol. of publication	Publication place and publisher or Internet link
Required reading				
Hall, John E.; Guyton, Arthur C.	2011	Guyton and Hall Textbook of medical physiology, 12th ed.	12th edition	Philadelphia, Elsevier Saunders
MasteringA&P for Silverthorn: Human Physiology 8e	2019	Human Physiology: An Integrated Approach	8th edition	Pearson Education
Zao, Peter	2014	PhysioEx 9.0: laboratory simulations in physiology with 9.1 update		Pearson Education
Silbernagl S, Despopoulos A.	2009	Color Atlas of Physiology		Thieme, Stuttgart
Recommended reading				
Mann, Jake P. Marples, David	2015	Physiology: core science and clinical cases in one book		Eureka, JP Medical Ltd, London
Hendrixson, V.; Valiūnienė, J.; Abaravičius, J. A.; Jablonskienė, V.	2013	Žmogaus fiziologijos laboratoriniai darbai; II dalis: mokomoji priemonė.		VU Leidykla
Hendrixson, V.; Valiūnienė, J.; Abaravičius, J. A.; Jablonskienė, V.	2007	Žmogaus fiziologijos laboratoriniai darbai; I dalis: mokomoji priemonė.		VU Leidykla
Electronic databases				
https://www.interactivephysiology.com/login/index.html				
https://www.clinicalkey.com/#!/				
https://www.clinicalkey.com/student/login?target=%2Fstudent				
http://accessmedicine.mhmedical.com/				