COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Human Physiology I	ZFIZ2115

Academic staff	Core academic unit(s)
Coordinating: Prof. Dr. Vaiva Hendrixson **Other:** Jun. Assist. Mantas Radzevičius; Lectr. Mykolas Udrys	Institute of Biomedical Sciences, Faculty of Medicine of Vilnius University. Department of Physiology, Biochemistry, Microbiology and Laboratory Medicine; M.K.Čiurlionio g. 21, Vilnius

Study cycle	Type of the course unit
Integrated studies	Compulsory

Mode of delivery	Semester or period when it is delivered	Language of instruction
Face-to-face, remote, blended (hybrid)	II semester	Lithuanian and English

Requisites	
Prerequisites: The student must have knowledge of general biology, morphology and biochemistry and an understanding of the structure of human cells, tissues, organs and organ systems, and of the biochemical processes occurring in the living organism	**Co-requisites (if relevant):**

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	134	67	67

Purpose of the course unit
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 studies. Students should gain an overall understanding of the physiology of membranes, peripheral and central nervous systems, hormones, kidneys, gastrointestinal system, metabolism, and nutrition. 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, skills and attitudes in medical practice.

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
• To be able to work independently and in teams, think critically be creative, take the initiative, and actively take part in discussions • To act honestly and according to ethical obligations, be emphatic • To be able to work in diverse and multicultural environments and	• Lectures (including virtual and pre-recorded) • Seminars • Small groups discussions • Peer-to-peer teaching/learning (with supervision and facilitation of the teacher)	• Formative assessment: feedback, reflection • Summative assessment: midterm examination (written quiz) • Credit (pass/fail)

communicate appropriately with peers and educators • To demonstrate the capability to collaborate in intercultural environment, to manage time and resources effectively, to foster an inclusive and respectful work culture • To be able to explain the functions of membranes, peripheral and central nervous systems, endocrine, renal and gastrointestinal systems, and to be able to discuss and make conclusions on the particular topics of human physiology • To be able to apply knowledge and understanding of neurophysiology, renal, endocrine, and gastrointestinal physiology in solving particular clinical cases • To be able to think critically, to analyze 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 (e.g., testing human stretch reflexes, investigating peripheral vision, and calculating BMR) • To demonstrate ability to engage in peer-to-peer reflection and feedback • To be able to work with scientific literature and to use scientifically based biomedical evidence, including the latest knowledge in Human Physiology, and to present them to peers • To demonstrate knowledge and understanding of diverse communication models and techniques to effectively handle complex information, and to demonstrate the ability to use communication forms and techniques that are appropriate for the context • To demonstrate knowledge and understanding of learning skills and strategies required for self-directed learning	• Flipped-classroom • Presentations • Computer simulations • Laboratory tasks • Feedback • Consultations • Independent work	

Content	Contact hours							Individual work: time and assignments	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship	**Contact hours, total**	**Individual work**	**Tasks for individual work**
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. Autonomous nervous system, functional characteristics of sympathetic	1		3				**4**	**8**	To work on the computer simulation task "Neurophysiology of Nerve Impulses". To do obligatory reading on *Interactive Physiology*, to complete exercise 3 on *PhysioEx*, and

and parasympathetic nervous system. Characteristics of autonomic reflex loop. Examples of autonomic reflexes.									according to outlines to be prepared for the discussion on the topic of membrane physiology and physiology of peripheral nervous system.
2. Chemical and electrical synapses. Synaptic transmission. Functions of the muscles. Sliding filament theory of contraction. Relaxation of the muscle. Types of muscle contraction: single twitch, summation, unfused and fused tetanus. Metabolism in the muscle. Features of membrane and action potentials of the smooth muscle.	1		3				**4**	**8**	To work on computer simulation task "Skeletal Muscle Physiology". To do obligatory reading on *Interactive Physiology*: Muscular System, and to complete exercise 2: Skeletal Muscle Physiology on *PhysioEx*. According to outlines to be prepared for the discussion on the topic of synapses and muscle physiology.
3. Discussions on peripheral nervous system and muscle physiology issues.			3				**3**	**6**	According to outlines to be prepared for teamwork and PBL discussion on peripheral nervous system and muscle physiology issues.
4. General functions of the central nervous system. Functions of the neurons. Functions of neuroglia. Neural reflexes. Conditioned reflexes. Concept of neural center. Features of the neural center. Types and mechanisms of inhibition. The principles of neural coordination.	2				4		**6**	**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.
5. 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.	4				5		**9**	**2**	To be prepared for the laboratory tasks: "Determination of visual acuity'' and "Peripheral vision". To learn to test the visual acuity. To be prepared for the discussions on the topic of physiology of sensory systems.

Physiology of sleep. Physiology of sensory systems.									
6. Midterm assessment (Written quiz): Neurophysiology and Muscle Physiology.			1				**1**	**7**	To be prepared for assessment, discussion & quiz on central nervous system physiology issues.
7. Feedback on the knowledge and understanding on the topic of neurophysiology and muscle physiology			3				**3**		To reflect on the quiz
8. 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		6				**8**	**6**	According to the template to be prepared to give the presentations about the functions of particular endocrine gland and hormone. To reflect on the peer presentation and to be prepared to discuss on the topic of endocrine physiology.
9. Functions of the kidneys. Mechanisms and regulation of urine production.			3				**3**	**5**	To work on virtual experiment "Investigation of kidneys functions". To do obligatory reading on *Interactive Physiology*: Urinary System and to complete the exercise 9 on *PhysioEx*.
10. Teamwork. Problem-based discussion on endocrine system and renal physiology issues.			4				**4**	**5**	According to outlines to be prepared for teamwork and PBL discussion on endocrine system and renal physiology issues.
11. Functions of the gastrointestinal system. Digestion in the mouth. Functions of saliva. Digestion in the stomach and small intestine. Composition and functions of bile. Regulation of bile secretion. Absorption of nutrients. Regulation of gastrointestinal secretion and motility. Functions of large intestine. Functions of the liver.	4		4				**8**	**5**	According to outlines to be prepared for teamwork and PBL discussion on the topic of gastrointestinal system physiology.

12. 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 functions. Biological active ingredients of food. Thermoregulation.	2				5		**7**	**3**	To be prepared for assessment, discussion & quiz on gastrointestinal system physiology, metabolism and energy balance, and nutrition physiology issues.
13. Midterm assessment (Written quiz): Endocrine, Renal, and Gastrointestinal System Physiology, Metabolism and Nutrition Physiology			1				**1**	**8**	According to outlines to be prepared for quiz on endocrine, renal and gastrointestinal system physiology, metabolism and energy balance, and nutrition physiology issues.
14. Feedback on the knowledge and understanding on the topics of endocrine, renal, and gastrointestinal systems, and metabolism and nutrition physiology			3				**3**		To reflect on the quiz
15. Finalization of the outcomes of the entire semester: remarks and conclusions			3				**3**		To reflect and to give final feedback of the semester.
Total	**16**		**37**		**14**		**67**	**67**	

Assessment strategy	Weight %	Deadline	Assessment criteria
Formative assessment during seminars and laboratory tasks, and participation at the discussions, and **Summative** assessment: Written quizzes (midterm tests).	70%	2nd semester	**The student must be able:** • To perform laboratory tasks, evaluate study data, summarize the information received and make conclusions. All the laboratory tasks should be completed. • To be actively engaged in teamwork, to be able to apply theoretical knowledge in solving clinical cases (PBL); • 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 in culturally diverse groups. • To be able to prepare a presentation and to clearly present it to the classmates • To know how to use electronic library sources and to review, summarize and present scientific knowledge to classmates. • To be able to test human stretch reflexes, peripheral vision, and visual acuity; to calculate daily caloric value of the diet, and to interpret the findings applying knowledge, understanding and skills in human physiology.

			Two written quizzes (midterm tests) per semester are scheduled (four in total). Each quiz consists of 30 single-choice (SCQ), multiple-choice (MCQ), and/or short open questions. No more than 6 choices are given per question/task (SCQ, MCQ), and no more than 3 possible correct answers/choices in MCQ. 45 minutes is given to complete the quiz (1.5 minutes average to spend on one question) All four test (quiz) scores are cumulative and account for 70% of the final grade (at the end of the course).
Credit (pass/fail)	100%	At the end of 2nd semester (the 1st day of the exam session period)	"Pass" is given when all the laboratory tasks and the assignments of the semester are completed, and all written quizzes (midterm tests) are taken. No retakes of quizzes are organized. The score of any failed quizzes will be part of the average score of all the quizzes. Any quiz missed due to a very important reason (e.g., illness) could be taken at the end of semester on a date scheduled in advance

Author (-s)	Publishing year	Title	Issue of a periodical or volume of a publication	Publishing house or web 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		8th edition	Pearson Education
https://www.interactivephysiology.com/login/index.html				
Recommended reading				
Mann, Jake P. Marples, David	2015	Physiology: core science and clinical cases in one book		Eureka, JP Medical Ltd, London
Silbernagl S, Despopoulos A.	2009	Color Atlas of Physiology		Thieme, Stuttgart
https://www.clinicalkey.com/#!/				
https://www.clinicalkey.com/student/login?target=%2Fstudent				
http://accessmedicine.mhmedical.com/				