



COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Mechanisms of sensation and perception	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: Prof. Osvaldas Rukšėnas (62 hours) Other(s): Asist. Evaldas Pipinis (60 hours); Assoc. Prof. M. Mitkus (28 hours).	Vilnius University, Department of Neurobiology and Biophysics, Sauletekio ave. 7, Vilnius, LT-10257

Study cycle	Type of the course unit (module)
Full-time studies (2nd stage)	Compulsary

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Lectures, project, laboratory work	First (autumn) semester	Lithuanian/English

Requirements for students	
Prerequisites: Neuroanatomy, Neurophysiology	Additional requirements (if any):

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
10	266	122	144

Purpose of the course unit (module): programme competences to be developed
<ul style="list-style-type: none"> • In-depth knowledge on principles and mechanisms of sensory systems in human and animal organisms • Ability to apply knowledge in independent scientific study

Learning outcomes of the course unit (module)	Teaching and learning methods	Assessment methods
<ul style="list-style-type: none"> • Ability to perform a task effectively while working in group i.e. to collect, systematize and present information. • Ability to take initiative to coordinate group work, to initiate discussion and to present joint results. • Ability to make the best decision based on available data. • Ability to develop a plan for the solution of a particular problem and to successfully execute it. • Ability to search for new or missing information from the field of study. • Ability to analyze and systemize information. • Ability to present collected information in a clear way • Ability to identify and evaluate areas where knowledge, gained during the study period, might be applied • Will understand and be able to explain the principles of communication and information processing in living systems. 	Combined teaching and learning methods: lectures, seminars and consultations; investigative method (information search and filing, report arrangement and presentation) in small groups (up to 2 students), self-study.	Group presentation; written colloquiums and exam.

<ul style="list-style-type: none"> • Will be able to organize and set-up experiments, to choose appropriate methods and study objects (subjects). • Will be able to analyze data, present both orally and in written form, to prepare reports based on the research findings. • Will know the principles and limitations of the main biophysical techniques. 		
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Content: breakdown of the topics	Contact hours						Self-study work: time and assignments		
	Lectures	Tutorials	Seminars	Exercises	Laboratory work	Internship/work placement	Contact hours	Self-study hours	Assignments
1. Introduction to the course. Introduction to the sensory systems. Review of sensation and perception. <i>O. Rukšēnas – 2 h, E. Pipinis – 2 h</i>	4						4	6	Self-study: general principles of sensory systems
2. General principles of sensory systems. Reaction time. <i>O. Rukšēnas – 4 h, E. Pipinis – 12 h</i>	8				8		16	6	Self-study: vision
3. Vision. Eye types. Structure of retina. Phototransduction. Visual projections. Mechanisms of color vision. Adaptation. Lateral inhibition. Perception of colors. <i>M. Mitkus – 8 h, E. Pipinis – 6 h</i>	8		6				14	4	Self-study: visual attention
4. Visual attention. Perception of object, form, space, movement. <i>E. Pipinis – 10 h</i>	6		4				10	4	Self-study: hearing
5. Hearing. Ear structure. Corti organ. Auditory projections. Hearing impairment. Perception of sound and timbre. Speech. Music. Localization of sound source. <i>O. Rukšēnas – 4 h, E. Pipinis – 6 h</i>	8		2				10	4	Self-study: balance
6. Balance. Structure of labyrinth. Mechanisms of balance. Balance projections. <i>O. Rukšēnas – 4 h</i>	4						4	4	Self-study: chemoreception
7. Chemoreception. Olfaction, taste, inner chemosensation. Chemotransduction. Systems of olfaction. Structure of the main olfactory system. Olfactory projections. Taste. Structure and projections of taste system. Impairments of olfaction and taste. <i>M. Mitkus – 10 h, E. Pipinis – 2 h</i>	10		2				12	6	Self-study: somatosensory system
8. Somatosensory systems. Thermosensation. Thermoreceptors, mechanisms of thermosensation. Pain. Receptors, mechanisms, “gate mechanism”, projections. Mechanoreception. Mechanoreceptors, mechanisms. Projections. Perception of somatosensations. <i>O. Rukšēnas – 8 h, E. Pipinis – 4 h</i>	10		2				12	6	Self-study: interoception
9. Interoception. <i>E. Pipinis – 4 h</i>	2		2				4	4	Self-study: lateral line

10. Lateral line system – main and specialized. Neuromasts. Electrorceptors. <i>O. Rukšēnas – 2 h</i>	2						2	4	Self-study: hunger
11. Hunger. Mechanisms. Eating disorders. <i>O. Rukšēnas – 2 h</i>	2						2	4	Self-study: thirst
12. Thirst. Mechanisms. Osmoreceptors. Disorders of water consumption. <i>O. Rukšēnas – 2 h</i>	2						2	4	Self-study: magnetoreception
13. Magnetoreception. Mechanisms. Receptors. <i>O. Rukšēnas – 2 h</i>	2						2	4	Self-study: proprioception and kinesthesia
14. Proprioception and kinesthesia. Proprioception in invertebrates. Proprioceptors in vertebrates. Projections. <i>O. Rukšēnas – 4 h</i>	4						4	4	Preparation for group project
15. Project. Presentation and defence of projects. <i>O. Rukšēnas – 10 h, E. Pipinis – 14 h, M. Mitkus - 10</i>			24				24	80	
Total	72		42		8		122	144	

O. Rukšēnas: lectures - 52, seminars – 10 val., E. Pipinis: lectures - 22, seminars – 30, laboratory works – 8, M. Mitkus: lectures - 18, seminars – 10.

Assessment strategy	Weight, %	Deadline	Assessment criteria
Three colloquiums	70	During the term	<p>Each colloquium consists of 25 questions. Evaluation is proportional: correct answer to 1 question gives a 0.4 point to the colloquium mark. The final mark is average of 3 colloquium marks.</p> <p>If the average of colloquiums grades is less than five or student wants, student can take an exam. Exam consists of 25 questions. Evaluation is proportional: correct answer to 1 question gives a 0.4 point to the exam mark. In this case the final grade is exam grade.</p> <p>Accumulative score. For project presentations, all group members are given the same evaluation. 10 (excellent) - excellent, exceptional knowledge and abilities, 91-100 percentile of the intended learning outcome; 9 (very good) - very good knowledge and abilities, 81-90 percentile of the intended learning outcome; 8 (good) - knowledge and abilities are above average, 71-80 percentile of the intended learning outcome; 7 (average) - average knowledge and abilities; there are few not essential mistakes, 61-70 percentile of the intended learning outcome; 6 (satisfactory) - knowledge and abilities are below average, there are mistakes, 56-60 percentile of the intended learning outcome; 5 (weak) - knowledge and abilities meet the minimum requirements, 51-55 percentile of the intended learning outcome; 4,3,2,1 (insufficient) - the minimum requirements are not met, 0-50 percentile of the intended learning outcome.</p>
Project report	30	End of term	<p>Groups of 1-2 students prepare and execute small research projects. Topics of projects are discussed collectively, every month progress reports are presented and by the end of semester results are presented in written form and defended presenting PowerPoint presentation. Each presentation is evaluated by students and teacher in 5 grades scale. Grades are averaged and it gives 30% of final grade.</p>

Author	Year of publication	Title	Issue of a periodical or volume of a publication	Publishing place and house or web link
Compulsary reading				
Kandel E. R., Schwartz J. H., Jessell M.	2012	Principles of Neural sciences	5 th ed.	Appleton & Lange
E. Bruce Goldstein	2013	Sensation and Perception	9 th ed.	Wadsworth Cengage Learning
Siegel, George J.	2006	Basic Neurochemistry	3 rd ed.	Boston: Little, Brown
Squire, Larry R.	2003	Fundamental Neuroscience	2 nd ed.	San Diego, Calif: Academic
Rukšėnas O, Griškienė R.	2007	Sensorinių sistemų biofizika	224 p.	VU leidykla
Optional reading				
Shepherd G.	2000	Neurobiology		
Withers, Philip C.	1992	Comparative Animal Physiology		International edition. Fort Worth ; London : Saunders College Pub
Scientific papers				