COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Biophysics	

Lecturer(s)	Department(s) where the course unit (module) is delivered
Coordinator: prof. dr. Saulius Bagdonas **Other(s):**	Faculty of Chemistry and Geosciences, Institute of Chemistry Naugardukas str. 24, LT-03225 Vilnius

Study cycle	Type of the course unit (module)
First cycle	Optional

Mode of delivery	Period when the course unit (module) is delivered	Language(s) of instruction
Face to face	5th semester	Lithuanian

Requirements for students	
Prerequisites: It is recommended to complete courses in Mathematics, Biology, Physics, Physical Chemistry, Biochemistry, Physiology.	**Additional requirements (if any):**

Course (module) volume in credits	Total student's workload	Contact hours	Self-study hours
5	140	48	92

Purpose of the course unit (module): program competences to be developed		
Deep understanding of basic concepts of biochemistry, physics and biology and their intersection on the molecular level. Ability to apply concepts of physics and mathematics for describing molecular reactions and interactions in non-living and living systems. Ability to select appropriate methods for the investigation of the properties of inorganic and organic compounds, biological molecules and biological systems. Ability to apply theoretical knowledge in solving quantitative and qualitative problems of both familiar and unfamiliar nature. Ability to identify problems and propose problem-solving approaches. Ability to draw science-based conclusions. Ability to present scientific information to specialist and non-specialist audiences. Skills to undertake further studies with high degree of autonomy.		
Learning outcomes of the course unit (module)	**Teaching and learning methods**	**Assessment methods**
After successful completion of this course student should be able to: • Use the concepts of physics and mathematics dealing with processes in living systems, • Discuss on the phenomena of self-assembly, regulation and control occurring on the molecular level and their roles in biological systems, • Understand the biological role of photoinduced processes in biological systems at various levels,	Problem-oriented teaching, demonstrations, active learning (group discussion), elements of investigation (search for information, reading of scientific literature)	Interim tests, oral presentation and final written exam (open and multiple-choice questions)

• Discuss the possibilities of biophotonic techniques in the studies of biological systems		

Content: breakdown of the topics	Contact hours					Total contact hours	Self-study hours	Self-study work: time and assignments
	Lectures	Seminars	Exercises	Laboratory work	Internship/work placement			Assignments
1. Intermolecular forces. Thermodynamics of biological processes. Life as a dissipative system. Kinetics of biological processes. Introduction to kinetics of linear and nonlinear systems. Chaos, fractals.	6	3				9	8	Self-study of lecture materials and literature. Computer simulations.
2. Introduction to the theory of the organized systems. Regulation and control. Principles of signals theory. Coding, decoding. Biological examples.	2	2				4	6	Self-study of lecture materials and literature.
3. Principles of self-assembly. Cell as a self-organized system. Minimal cell models. Intracellular systems of molecular regulation and control. Cell bioelectricity.	8	2				10	10	Self-study of lecture materials and literature.
4. Basic principles of photobiology. Hierarchy of living systems and light-induced responses. Concept of an action spectrum. Light as a regulatory signal of molecular processes and a tool for their studies. Current molecular concepts of photomedicine.	6	4				10	6	Self-study of lecture materials and literature.
5. Concepts of biophotonics. Bioluminescence and photoluminescence of color-fluorescing proteins, physical principles, registration methods and applicability areas in molecular biology and biomedicine.	6	3				9	8	Self-study of lecture materials and literature.
6. Living organisms as adaptive bio-informational systems. Modern concepts of origin and evolution of life.	4	2				6	6	Self-study of lecture materials and literature.
7. Preparation for tests and examination.							32	Self-study of lecture materials and literature.
8. Preparation of oral presentation.							16	Analysis of the topic-related popular and scientific publications
Total:	32	16				48	92	

Assessment strategy	Weight,%	Deadline	Assessment criteria
Oral presentation	10	During the course	Oral presentation on the selected topic, criteria – content and references (6), clarity of presentation (2), ability to answer the questions (2)
3 written tests	60	During the course	5 open questions in each. Completely correct answer – 2 points, incomplete answer – 1 point, incorrect answer – 0 points
Final exam	30	After the course	10 open questions and problem-solving tasks. Completely correct answer – 2 points, incomplete answer – 1 point, incorrect answer – 0 points

Total:	100		Final mark is based on cumulative score. <50 % of possible points – failed (insufficient) 50-55 % – 5 (weak) 56-60 % – 6 (satisfactory) 61-70 % – 7 (average) 71-80 % – 8 (good) 81-90 % – 9 (very good) >90 % – 10 (excellent)

Author	**Year of publication**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsory reading				
Glaser R.	2012	Biophysics: An introduction	2nd edition	Springer
PHOTOBIOLOGICAL SCIENCES ONLINE		Selected topics		http://photobiology.info/#Intro
Optional reading				
Cotterill R.M.J.	2005	Biophysics: an introduction		A JOHN WILEY & SONS, INC.,
Kirvelis D.	2007	Biofizika		Vilnius: VUL
Paras N. Prasad	2003	Introduction to Biophotonics		A JOHN WILEY & SONS, INC.,
ed. by Lars Olof Björn	2015	Photobiology The Science of Life and Light,	3nd ed.,	Springer