COURSE UNIT DESCRIPTION - SYSTEMS BIOLOGY

Course unit (module) title	Code
SYSTEMS BIOLOGY	

Lecturer(s)	Department(s)
Coordinator: Assoc. prof. Saulius SERVA	Faculty of Natural Sciences, Department of Biochemistry and Molecular Biology, Čiurlionio 21ბLT 03101

Cycle	Level of the course unit	Type of the course unit
Full-time studies (2nd stage)	1 out of 1	Elective

Mode of delivery	Period of delivered	Language(s) of instruction
Face to face	1st semester, autumn	Lithuanian

Prerequisites and corequisities	
Prerequisites: Genetics, Biochemistry, Molecular Biology	**Corequisities (if any):**

Number of credits allocated to the course unit	Student's total workload	Contact hours		Self-study and research hours
4	107	Lectures	32	59
		Seminars	16	

Purpose of the course unit: programme competences to be developed		
Subject specific competences: • knowledge in system biology, its achievements and perspectives; • knowledge of the methods of system biology and their application in solving problems at the level of whole cell and organism; *General competences:* • skills for self-development, study skills in order to study molecular biology; • skills to present in written and verbal forms the knowledge in systems biology; • skills to participate in the scientific discussion;		
Learning outcomes of the course unit	**Teaching and learning methods**	**Assessment methods**
• Describes the structure and functions of biological macromolecules from organisms of different domains of life at the molecular level; • Approaches cell as a united system; • Explains methods of molecular and cellular system analysis and their application; • Has relevant skills in Systems Biology to solve problems at the levels of whole cell and organism; • Identifies challenges and describes novel methods in Systems Biology to address them; • Integrates knowledge of the different areas of science.	Lectures, seminars, self-study.	Midterm exam; Topic-related seminar presentation; Final exam.

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. Object of Systems Biology	**4**						**4**	**6**	Analysis of the topic-related scientific papers; self-directed learning.
Description of an object	1						**1**	2	
Need and premises	2						**2**	2	
Horizons of development. Information sources	1						**1**	2	
2. **Methods and achievements of DNA sequencing**	**5**		**2**				**7**	**8**	Analysis of the topic-related scientific papers; seminar presentation, self-directed learning.
Description and source for DNA sequencing	1						**1**	2	
Pre-industrial sequencing	1						**1**	2	
Modern methods and future developments	2						**2**	2	
Significance of massive DNA sequencing	1		2				**3**	2	
3. **Epigenetics**	**4**		**2**				**6**	**8**	Analysis of the topic-related scientific papers; seminar presentation, self-directed learning.
Description of an object	1						**1**	2	
Epigenetics aspects and components	2						**2**	3	
Significance and perspectives	1		2				**3**	3	
4. **Transcriptomics**	**4**		**2**				**6**	**8**	Analysis of the topic-related scientific papers; seminar presentation, self-directed learning.
Description of an object	1						**1**	2	
Methods in transcriptomics	2						**2**	3	
Application and future perspectives	1		2				**3**	3	
5. **Proteomics: object and methods**	**5**		**2**				**7**	**8**	Analysis of the topic-related scientific papers; seminar presentation, self-directed learning.
Object and premises of proteomics	1						**1**	2	
Principles and methods	2						**2**	3	
Application, challenges, perspectives	2		2				**4**	3	
6. **Bioinformatics in Systems Biology**	**5**		**2**				**7**	**10**	Analysis of the topic-related scientific papers; seminar presentation, self-directed learning.
Object of Bioinformatics. Application in Systems Biology	1		2				**3**	2	
Premises of Bioinformatics	1						**1**	2	
Research levels and modelling issues	2						**2**	3	
Bioinformatics resources	1						**1**	3	
7. **Functional analysis of a cell. Interacting cell**	**5**		**6**				**11**	**11**	Analysis of the topic-related scientific papers; seminar presentation, self-directed learning.
Raise of Cell Theory	1						**1**	3	
Content and significance of Cell Theory	2						**2**	4	
Inside the cell	2		6				**8**	4	

Total	**32**		**16**				**48**	**59**	

Assessment strategy	**Weight,%**	**Assessment period**	**Assessment criteria**
Midterm exam I	40	9th week of the course	Test of 20 questions from topics I -IV. <10 answered questions - 2-4 (insufficient) 10 answered questions - 5 (sufficient) 11-12 answered questions - 6 (satisfactory) 13-14 answered questions - 7(highly satisfactory) 15-16 answered questions - 8 (good) 17-18 answered questions - 9 (very good) 19-20 answered questions - 10 (excellent) It is obligatory to answer to at least 10 questions, otherwise test is failed and has to be repeated.
Topic-related seminar presentation	20	6-12th week of the course	Evaluated as equal parts basing on: Scientific content; Quality of presentation; Answering to questions
Exam	40	Exam session	Test of 20 questions from topics I -IV. <10 answered questions - 2-4 (insufficient) 10 answered questions - 5 (sufficient) 11-12 answered questions - 6 (satisfactory) 13-14 answered questions - 7(highly satisfactory) 15-16 answered questions - 8 (good) 17-18 answered questions - 9 (very good) 19-20 answered questions - 10 (excellent) It is obligatory to answer to at least 10 questions.
Total	100		Sum of midterm exam, seminar presentation and exam, all normalized according to weight.

Author	**Year of publica-tion**	**Title**	**Issue of a periodical or volume of a publication**	**Publishing place and house or web link**
Compulsory reading				
Lectures in PDF	2013	Systems Biology		Provided directly to the students
Eberhard O. Voit	2013	A First Course in Systems Biology	ISBN 978-0-8153-4467-4	Garland Science, Taylor & Francic Group, LLC
Topic-related scientific reviews.	2008-2013	Nature Reviews		Nature Publishing Group
Optional reading				
Edda Klipp *et al.*	2009	Systems Biology	ISBN: 978-3-527-31874-2	Wiley-VCH Verlag GmbH & Co. KGaA
Bernhard O. Palsson	2010	Systems Biology. Properties of Reconstructed Networks	ISBN: 978-0-521-85903-5	Cambridge University Press