COURSE UNIT DESCRIPTION - MOLECULAR EVOLUTION

Course unit title	Code
MOLECULAR EVOLUTION	

Lecturer(s)	Department(s)
Coordinator: Assoc. Prof. Jurga TURČINAVIČIENĖ **Other(s):** Dr. Remigijus Skirgaila	Faculty of Natural sciences, Department of Zoology, M.K.Čiurlionio g. 21/27, LT-03101 Vilnius; Thermo Fisher Scientific, Vilnius Division, V. A. Graičiūno Str. 8, LT-02241 Vilnius

Cycle	Level of the course unit	Type of the course unit
Full-time studies (1st stage)	1 out of 1	Compulsory

Mode of delivery	Period of delivered	Language(s) of instruction
Face to face	7th semester, autumn	Lithuanian

Prerequisites and corequisities	
Prerequisites: None	**Corequisities (if any):** None

Number of credits allocated to the course unit	Student's total workload	Contact hours	Self-study and research hours
5	133	48	85

Purpose of the course unit: programme competences to be developed

Upon the successful completion of this course, students will acquire:

Subject-specific competences:

- the modern research-based knowledge of the principles of molecular evolution,
- knowledge of the research methods used in reserach of molecular evolution and their application;
- skills to analytically, critically and systemically analyze and evaluate information in the area of molecular evolution;
- skills to present in written and verbal forms the knowledge and concepts of molecular evolution;

General competences:

- skills for self-development, skills to study general science resourses;
- skills to participate in the scientific discussion;

Learning outcomes of the course unit	Teaching and learning methods	Assessment methods
Explains and applies basic methods of molecular evolution.	Problem-based teaching lecture, discussion in seminars, self-study.	Test (open questions), Seminar presentation
Explains molecular features of organisms and relates it with evolution of these organisms.		
Discuss and compares data of molecular phylogeny and relates taxa according similarity of genomes, understands basic principles of phylogeny.		
Explains principles of evolution of proteins and nucleic acids, describes practical application of knowledge in evolution of macromolecules.		

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. Genes and mutations. Dynamics of genes in populations. Nucleotide substitution in DNA. Neutral mutation hypothesis.	2		2				**4**	**6**	Self-directed learning of scientific literature and lecture material, preparation for discussion and seminar presentation.
2. Evolutionary change in nucleotide sequences. Alignment of sequences and homology. Neutral theory and molecular data. Differences within and between species.	2		2				**4**	**6**	
3. Nucleotide substitution in different regions. Rates of substitution in nuclear and organelle DNA.	2		2				**4**	**6**	
4. Molecular clock. Local clocks.	2		1				**3**	**6**	
5. Molecular data in phylogeny. Types of data. Methods of tree reconstruction. Parsimony and maximum likelihood methods. Phylogenetic approach. Divergence time.	3		2				**5**	**6**	
6. Molecular methods in phylogeography and research of populations.	2		1				**3**	**6**	
7. Molecular data and morphology. Homology and similarity. Gene trees and phylogeny of organisms.	3		2				**5**	**6**	
8. Genome evolution. Comparative genomics.	8		2				**10**	**7**	
9. Protein evolution *in vitro*	8		2				**10**	**8**	
10. Exam.								**28**	Praparation for exam.
Total	**32**		**16**				**48**	**85**	

Assessment strategy	**Weight, %**	**Assessment period**	**Assessment criteria**
Quizzes during lectures and seminars	10	During semester	Points for correct answers 2 points – correct answer 1 point – partly correct answer 0 point - no correct or do not present
Presentation during seminars	20	During semester	2-4 (insufficient)) 5 (sufficient) 6 (satisfactory) 7(highly satisfactory) 8 (good) 9 (very good) 10 (excellent)
Exams	70	Mid and end of semester	2 tests (open questions) of 50 questions. Every question – 1 point. 50-60 answered questions -5 (sufficient) 60-70 answered questions - 6 (satisfactory) 70-80 answered questions -7(highly satisfactory) 80-90 answered questions -8 (good) 90-100 answered questions --9 (very good) and10 (excellent)
Final assessment	100		The final assessment consists of the class participation, seminar presentation and examination score.

Author	**Year of publica-**	**Title**	**Issue of a periodical**	**Publishing place and house or web link**

	tion		or volume of a publication	
Compulsory reading				
Scott O. Rogers.	2012	Integrated Molecular Evolution		Tailor&Francis Group
Optional reading				
Claus Nielsen	2012	Animal Evolution: Interrelationships of the Living Phyla		
James Alan Shapiro	2011	Evolution: A View from the 21st Century		