

Subject card

Subject name and code	Molecular evolution, PG_00153622						
Field of study	Biotechnology						
Date of commencement of studies	October 2024	Academic year of realisation of subject				2024/2025	
Education level	Master's studies	Subject group					
Mode of study	full-time studies	Mode of delivery				at the university	
Year of study	1	Language of instruction				Polish English	
Semester of study	2	ECTS credits				3.0	
Learning profile	academic	Assessment form					
Conducting unit	Laboratory of Evolutionary Biochemistry -> UG Institute of Biotechnology -> Intercollegiate Faculty of Biotechnology UG-MUG -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Jarosław Marszałek				
	Teachers		prof. dr hab. Jarosław Marszałek				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		5.0		40.0	75
Subject objectives	To familiarize students with the molecular basis of evolution and the experimental and bioinformatic methods used in evolutionary research. Demonstrating that the theory of evolution constitutes the basis of biological knowledge, allowing seemingly distant fields of bio-medical research to be linked into a unified system.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BIOTECHMU2_U05] The graduate is able to use English language in the scope enabling the understanding of statements and reading with comprehension of literature and scientific studies in the fields of science and scientific disciplines relevant to biotechnology; is able to prepare a short written study and an oral presentation in English	Lecture is conducted in English, as well as discussions during the lecture, quizzes before each lecture and the final exam.	[SU1] oral statement/conversation/discussion [SU4] test/exam - oral or written [SU5] implementation of a problem task
	[BIOTECHMU2_W04] The graduate knows and understands selected problems of biotechnology currently discussed in the literature	Students will gain knowledge in the field of: - interpretation of research results in the context of the theory of molecular evolution, - interpretation of phylogenetic trees - creating evolutionary scenarios of biological phenomena occurring at the molecular level	[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion [SW3] text preparation/written work
	[BIOTECHMU2_U04] The graduate is able to use scientific information fluently, including English-language information on biotechnology; analyse and select information critically; use electronic sources; use appropriate databases	The student prepares for classes and the final exam by reading original scientific publications.	[SU1] oral statement/conversation/discussion [SU4] test/exam - oral or written [SU5] implementation of a problem task
[BIOTECHMU2_W01] The graduate knows and understands complex biological phenomena at the molecular level, their importance for biotechnology	The student will learn how to use evolutionary methods, including natural selection, in biotechnological processes such as obtaining desired strains of microorganisms and new activities of proteins and enzymes.	[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion [SW3] text preparation/written work	
Subject contents	Genetic variability at the molecular level: genes, genetic code, mutations. Genetic variability at the population level. Natural selection and neutral evolution. Dynamics of DNA sequence changes and the molecular clock. Molecular phylogeny and taxonomy: application of bioinformatic methods. Protein evolution. Evolution of genomes. Ancient DNA research. The practical applications of the natural selection: evolution in the laboratory		
Prerequisites and co-requisites	Basic knowledge in the field of: Genetics, Biochemistry, Molecular Biology, Microbiology, Biophysics, General Chemistry, Organic Chemistry.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Examination	51.0%	100.0%
Recommended reading	Basic literature	<p>Łatwe drzewa filogenetyczne. Hall Barry (2008) Warszawa, Wyd. UW</p> <p>Markery molekularne, historia naturalna i ewolucja. Avise John C (2008) Warszawa. Wyd. UW</p> <p>Bioinformatyka i ewolucja molekularna. Paul G. Higgins, Tersa K. Attwood (2008) Warszawa, PWN</p> <p>Bioinformatyka-podręcznik do analizy genów i białek. A.D. Baxevanisa i B.F.F. Ouellettea (2004) Warszawa</p> <p>PWN</p> <p>The lecturer provides a set of PDF files containing current review and selected experimental publications related to the content of the lecture. This set changes every year as the lecture is updated.</p>	
	Supplementary literature	not applicable	
	eResources addresses	Adresy na platformie eNauczanie:	

<p>Example issues/ example questions/ tasks being completed</p>	<p>A bacterial protein responsible for an antibiotic resistance of a hospital strain has two amino acid substitutions (S1 and S2) in comparison to the same protein from the non-resistant strain. When researchers introduced substitution S1 to the protein from the non-resistant strain and tested its effect in vivo, no increase of resistance was observed. When substitution S2 was introduced a little increase of resistance was observed in vivo. However, when both S1 and S2 substitutions were introduced to the protein from the non-resistant strain the resistance in vivo was as high as in the hospital isolate.</p> <p>A) What evolutionary phenomenon could explain the observed results?</p> <p>B) What is the possible biochemical effects of the S1 substitution?</p>
<p>Work placement</p>	<p>Not applicable</p>

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