

Subject card

Subject name and code	Application of genetic engineering in biotechnology, PG_00207474						
Field of study	Biology						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2028/2029		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		Polish		
Semester of study	6		ECTS credits		1.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Faculty of Biology -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Marian Sętkas				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		1.0		9.0	25
Subject objectives	Introduction to basic concepts of gene expression and protein overproduction and genetic engineering. 2. Principles of using DNA restriction and modification enzymes and the proper selection of DNA vectors. 3. Localization and importance of prokaryotic transcriptional and translational signals. 4. Protein and non-protein regulatory factors of gene expression 5. Understanding the functioning and control of expression of basic gene expression systems in Escherichia coli cells. 6. Specialized plasmid vectors						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[BIOLL3_W07] knows the development of biology as a science, its connections with other disciplines and the principles of using biological knowledge in the economy and social life, including ways that are entrepreneurial						
	[BIOLL3_W05] has advanced knowledge of experimental methods, laboratory and field techniques, and the principles of planning and conducting biological research						
	[BIOLL3_U03] is able to search for, select and critically analyze information from various sources, including scientific literature and electronic databases, as well as read and understand scientific texts in Polish and English						
	[BIOLL3_K01] is ready to critically evaluate her/his biological knowledge and continuously update and develop it, taking into account scientific advances and the needs of practice						

Subject contents	Methods of genetic engineering and molecular cloning. DNA restriction and modification enzymes, in vitro DNA recombination. Features of Escherichia coli bacterial strains useful in biotechnology. Homologous and non-homologous recombination as a tool in bacterial genetics. Characterization of plasmids as DNA vectors. Stability of plasmid maintenance and regulation of their copy number. Expression of prokaryotic genes - regulation of transcription, control of initiation and termination of this process. Transcription signals - structure of the gene and promoter. Vectors enabling strict control of gene expression. Factors influencing mRNA stability. Translation signals encoded in DNA. Polymerase chain reaction (PCR) in site-specific gene mutagenesis. Overproduction of proteins in a system based on T7 phage regulatory elements. Review of specialized plasmid vectors and their applications.		
Prerequisites and co-requisites	Basics of Microbiology and Biochemistry		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	the assessment includes material from the lecture term I: written test with closed questions sit-up term – written test or oral assessment the written test is assessed according to the percentage	51.0%	100.0%
Recommended reading	Basic literature	Marian Sętkas: Zastosowanie inżynierii genetycznej w biotechnologii. Molekularne podstawy ekspresji genów. Wydawnictwo Uniwersytetu Gdańskiego , Gdańsk 2000	
	Supplementary literature	Selected scientific publications available in the database https://pubmed.ncbi.nlm.nih.gov	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. When does transcription and translation become asynchronous? 2. What do typical type II restriction enzymes require to function? 3. What is meant by the term polarity of transcription? 4. The transcription start point (+1) in promoters recognized by the sigma 70 RNA polymerase subunit is located in the DNA region preceding the coding sequence of the E. coli gene:		
Work placement	Not applicable		

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