University of Gdańsk

Subject card

Subject name and code	Application of genetic engineering in biotechnology, PG_00146066		
Field of study	Biology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	undergraduate 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 polish
Semester of study	6	ECTS credits	1.0
Learning profile	academic	Assessment form	
Conducting unit	Faculty of Biology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Marian Sęktas	
	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	2.0	8.0	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_K01] The graduate is prepared to evaluate their own knowledge, understand the need for continuous learning and development, and is open to new ideas	The student understands that biotechnology improves its methods and sets new directions, therefore he knows the limitations of his own knowledge and understands the need for continuous learning and development and is opened to new ideas B_K01	[SK4] test/exam - oral or written
[BIOLL3_U07] The graduate should be able to independently search for and use available sources of biological information, including electronic sources	Independently searches for and uses available sources of biological information, including electronic sources B_U07	[SU3] text preparation/written work [SU4] test/exam - oral or written
[BIOLL3_W14] The graduate knows the theoretical basis of experimental methods and the most important techniques of the biological sciences	The student explains the theoretical foundations of experimental methods and lists the most important genetic engineering techniques B_W14	[SW4] test/exam - oral or written
[BIOLL3_W10] The graduate is familiar with the development and current state of knowledge and the latest trends in biology, as well as their relationship with other natural disciplines	The student is familiar with the development of genetic engineering and the latest trends in molecular biology and indicates their relationship with other natural sciences B_W10	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion

<table>
<tr><td>Subject contents</td><td>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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Basics of Microbiology and Biochemistry</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>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</td><td>51.0%</td><td>100.0%</td></tr>
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</td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Marian Sęktas: Zastosowanie inżynierii genetycznej w biotechnologii. Molekularne podstawy ekspresji genów. Wydawnictwo Uniwersytetu Gdańskiego , Gdańsk 2000</td></tr>
<tr><td>Supplementary literature</td><td>Selected scientific publications available in the database https://pubmed.ncbi.nlm.nih.gov</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>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:</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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