

Subject card

Subject name and code	Basis of genetic engineering, PG_00048688						
Field of study	Podstawy inżynierii genetycznej (Wykład)						
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025				
Education level	Bachelor's studies	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	5	ECTS credits	1.0				
Learning profile	academic	Assessment form	credit				
Conducting unit	Faculty of Biology -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Sabina Kędzierska-Mieszkowska					
	Teachers	prof. dr hab. Sabina Kędzierska-Mieszkowska					
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						
	Additional information: Dodatkowe informacje: Metody dydaktyczne: Wykład z prezentacją multimedialną, metoda projektów (teoretyczny projekt badawczy), dyskusja, praca w grupach, konsultacje organizowane w indywidualnych przypadkach.						
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	0.0	0.0	15		
Subject objectives	The main objective of the course is to familiarize students with the basic concepts and techniques of genetic engineering and its practical application in various areas of our lives. Participants have the opportunity to acquire skills in: (1) designing experiments related to gene cloning, studying their expression and identifying their protein products; (2) using publicly available databases of sequences and structures; (3) preparing a multimedia presentation.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BIOLL3_W16] the graduate knows and understands the relationship between the achievements of the selected field of science and discipline of natural sciences and the possibilities of their use in socio-economic life, taking into account the sustainable use of biodiversity	explains the connections between the achievements of genetic engineering and the possibilities of their use in socio-economic life, taking into account the sustainable use of biodiversity	[SW2] prezentacja/projekt/referat/raport [SW5] realizacja zadania problemowego
	[BIOLL3_W14] the graduate knows the theoretical basis of experimental methods and the most important techniques of biological sciences	explains the theoretical basis of experimental methods and lists the most important methods and techniques used in genetic engineering, biotechnology and molecular biology	[SW1] wypowiedź ustna/rozmowa/diskusja [SW2] prezentacja/projekt/referat/raport [SW5] realizacja zadania problemowego
	[BIOLL3_W10] the graduate knows and understands to an advanced degree the development and current state of knowledge and the latest trends in biology, as well as their relationship with other natural disciplines	is familiar with the development and current state of knowledge and the latest biology, as well as their relationship with other natural sciences	[SW2] prezentacja/projekt/referat/raport [SW5] realizacja zadania problemowego
	[BIOLL3_U10] the graduate is able to prepare oral speeches in Polish and foreign language concerning specific issues in biology	has the ability to deliver oral presentations in Polish on specific issues in the field of genetic engineering	[SU1] wypowiedź ustna/rozmowa/diskusja
	[BIOLL3_U08] the graduate is able to learn independently, in a focused manner	learns independently, in a directed manner, striving to expand existing knowledge in the field of genetic engineering	[SU1] wypowiedź ustna/rozmowa/diskusja [SU2] prezentacja/projekt/referat/raport
	[BIOLL3_U07] the graduate is able to independently search and use available sources of biological information, including electronic sources	independently searches for and uses available sources of biological information, including electronic sources, especially when preparing a cloning project for a selected gene	[SU2] prezentacja/projekt/referat/raport [SU5] realizacja zadania problemowego
	[BIOLL3_U06] the graduate can read with understanding simple scientific biological texts in Polish and simple texts in English	reads with understanding simple scientific biological texts in the field of molecular genetics, molecular biology, biotechnology and medical biology in Polish and simple texts in English	[SU2] prezentacja/projekt/referat/raport [SU5] realizacja zadania problemowego
	[BIOLL3_K08] the graduate is ready to be honest, reliable, apply the principles of savoir-vivre in scientific and professional work	understands the need for honesty and integrity in scientific and professional work	[SK1] wypowiedź ustna/rozmowa/diskusja [SK8] obserwacja samodzielnej lub zespołowej pracy studenta
[BIOLL3_K01] the graduate is ready to evaluate his own knowledge and understands the need for continuous learning and development and is open to new ideas	knows the limitations of his/her own knowledge and understands the need for continuous learning and development and is open to new ideas	[SK1] wypowiedź ustna/rozmowa/diskusja [SK8] obserwacja samodzielnej lub zespołowej pracy studenta	
Subject contents	The main topic of the lecture is the process of cloning genes of both prokaryotic and eukaryotic origin in various expression systems. During the classes, the following are discussed: selected prokaryotic (plasmid, phage, cosmid) and eukaryotic vectors; enzymology of genetic engineering; stages of the gene cloning process (including mRNA purification, cDNA synthesis, identification of the cloned gene); basic methods used in genetic engineering (DNA sequencing, PCR, RT-PCR, nucleic acid hybridization techniques: Southern blot, Northern blot); popular expression systems such as the bacterial expression system with the participation of phage T7 RNA polymerase; identification of protein products of cloned genes (immunodetection and protein microsequencing). The lecture topics are selected so as to encompass a coherent thematic and experimental sequence from the gene cloning process to obtaining purified protein, i.e. the product of the cloned gene.		
Prerequisites and co-requisites	Completed courses: Biochemistry, Molecular biology with biotechnology. Knowledge of the structure and properties of basic types of biological macromolecules, molecular mechanisms of the flow of genetic information and regulation of its expression.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	completion of a final assignment - preparation of a cloning project for a selected gene or a written assignment with test questions and open tasks	51.0%	100.0%

Recommended reading	Basic literature	The course is an original study based on many years of study of source materials and own research work. A.2. studied independently by the student. Original experimental and review papers provided by the lecturer and source materials selected by the student. Materials from lectures provided by the lecturer. Buchnowicz J. (ed.). 2012. Molecular biotechnology. Genetic modifications, progress, problems. PWN, Warsaw. Brown T. A. 2009. Genomes. PWN, Warsaw.
	Supplementary literature	Additional literature: Ledakowicz S (ed.) 2014. Biochemical engineering. WNT, Warsaw. Berg J. M., Tymoczko J. L., Stryer L. 2009. Biochemistry. PWN, Warsaw. Watson J. D. et al. 2006. Recombinant DNA: Genes and Genomes- A Short Course. Baskerville Beucher. Węgleński P. (ed.). 2007. Molecular genetics. PWN, Warsaw. Hanych, B. Kędzierska, S., Walderich B., Uznański, B. and Taylor A (1993) Expression of the Rz gene and the overlapping Rz1 reading frame present at the right end of the bacteriophage lambda genome. Gene, 129: 1-8. Kędzierska, S., Wawrzynów, A. and Taylor A. (1996) The Rz1 gene product of bacteriophage lambda is a lipoprotein localized in the outer membrane of Escherichia coli. Gene, 168: 1-8
	eResources addresses	
Example issues/ example questions/ tasks being completed	1) Propose a bacterial expression system that could be used for efficient overproduction of a protein that is well tolerated by host cells (full sequence of experiments from cloning to obtaining purified protein). 2) Propose a bacterial expression system that could be used for efficient overproduction of a protein that is poorly tolerated by host cells (full sequence of experiments from cloning to obtaining purified protein). 3) Propose experiments that would allow for testing the activity of a potential promoter of a selected gene.	
Work placement	Not applicable	

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