University of Gdańsk

Subject card

Subject name and code	Basis of genetic engineering, PG_00048689		
Field of study	Podstawy inżynierii genetycznej (Ćw. laboratoryjne)		
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	0.0	0.0	15.0	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	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 products.

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	[SW1] wypowiedź ustna/rozmowa/ dyskusja [SW2] prezentacja/projekt/referat/ raport
[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/ dyskusja [SW2] prezentacja/projekt/referat/ raport
[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 research trends in the fields of molecular genetics, molecular biology, medical biology and biotechnology and indicates their relationship with other natural sciences	[SW1] wypowiedź ustna/rozmowa/ dyskusja [SW2] prezentacja/projekt/referat/ raport
[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/ dyskusja
[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/ dyskusja [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 multimedia presentation on a given topic	[SU1] wypowiedź ustna/rozmowa/ dyskusja [SU2] prezentacja/projekt/referat/ raport
[BIOLL3_U06] the graduate can read with understanding simple scientific biological texts in Polish and simple texts in English	read with understanding simple scientific biological texts in Polish and simple texts in English read 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	[SU1] wypowiedź ustna/rozmowa/ dyskusja [SU2] prezentacja/projekt/referat/ raport
[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/ dyskusja [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/ dyskusja [SK8] obserwacja samodzielnej lub zespołowej pracy studenta

Subject contents

Practical applications of genetic engineering. Achievements and problems of genetic engineering (including ethical assessment of genetic engineering applications). Eukaryotic vectors, artificial chromosomes (BAC, YAC). Use of plants for the production of biopharmaceuticals. Gene therapy, i.e. gene correction. RNA interference. Transgenic organisms. Basics of molecular diagnostics. Site-specific mutagenesis. Real-time PCR technique and its application in medicine. RNAseq technique as a versatile method of transcriptome recognition; GFP as a basic tool of molecular biology. Molecular guardians - the new face of the RNA world. Overproduction of heterologous proteins in E. coli bacteria. Methods of purifying recombinant proteins from bacterial cells.

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
participation in the discussion	5.0%	10.0%
70 / 5 000 preparing and delivering a multimedia presentation on a given topic	51.0%	90.0%

Recommended reading	Basic literature	Literature studied independently by the student: Original experimental and review papers provided by the lecturer and source materials selected by the student. Lecture materials 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	Supplementary 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	Examples of presentation topics:1. Genetic engineering - opportunities and threats;2. GFP protein as a basic method in molecular biology;3. Theoretical and practical aspects of the RNA interference phenomenon;4. Overproduction and purification of recombinant, heterologous proteins in E. coli bacterial cells;5. RNA sequencing - a versatile method of learning the transcriptome;6. CRISPR-Cass system - from bacterial resistance to genome engineering.	
Work placement	Not applicable	

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