GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Basic Genetic Engineering, PG_00054716		
Field of study	Biotechnology		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study
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	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Microbiology -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marta Wanarska	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	0.0	30.0	0.0	0.0	60

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	60	8.0	57.0	125

Subject objectives

Preparing students for work in the laboratory of genetic engineering, including documentation of activities and results, application of the basic techniques and tools with particular emphasis on methods of isolation, modification, selection and analysis of organisms, cells and molecules.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U06	Student is able to perform agarose gel electrophoresis of genomic and plasmid DNA, and PCR products. Student is able to analyze the results of electrophoresis.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
K6_W08	Student acquires the knowledge about the basic tools used for the construction of genetically modified microorganisms, and about the development of new biotechnological processes using GMM.	[SW1] Assessment of factual knowledge
K6_U07	Student is able to isolate genomic and plasmid DNA from bacteria. Student is able to amplify the selected gene using the PCR technique. Student knows how to clone the PCR product into a plasmid vector. Student is able to perform a restriction analysis of the recombinant plasmid. Student is able to analyze the results of DNA sequencing.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
K6_U04	Student is able to prepare bacteriological media. Student is able to grow bacteria, including genetically modified ones. Student is able to transform Escherichia coli cells with plasmid DNA.	[SU4] Assessment of ability to use methods and tools

Subject contents	Definition and scope of genetic engineering. Basic glossary. Isolation and preparation of nucleic acids. Electrophoresis of nucleic acids. Enzymes used in genetic engineering: restriction endonucleases, DNA ligases, DNA polymerases, nucleases, enzymes modifying of DNA fragments termini (kinases, phosphatases). Plasmids, classification and encoded features. Plasmid vector systems: classification and characterization. Characterization of bacteriophage lambda: phage vector systems. Characterization of bacteriophage M13 and derived vectors. Hosts for cloning vectors. Recombinant clones selection. Construction of genomic, metagenomic and cDNA libraries. Methods of transformation: chemical transformation, transformation by electroporation, transduction. DNA sequencing methods. Polymerase chain reaction description, PCR variants, application of PCR. Site-specific mutagenesis. Expression of heterologous genes in bacteria (Escherichia coli) and yeast (Pichia pastoris). Practical application of genetic engineering: production of recombinant drugs, vaccines and industrial enzymes or production of biofuels.
Prerequisites and co-requisites	The exams passed: General microbiology, Industial microbiology, Molecular biology.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	60.0%	50.0%
Laboratory	60.0%	50.0%

Recommended reading	Basic literature	1. Węgleński P. (Ed.): Molecular genetics. PWN, Warsaw, 1995 (1996, 1998, 2000, 2002, 2012). 2. Brown T.A.: Genomes, PWN, Warsaw, 2001 (2009). 3. Buchowicz J.: Molecular biotechnology, PWN, Warsaw, 2006 (2012). 4. Brillowska-Dąbrowska A., Wanarska M., Zalewska-Piątek B., Piątek R., Kur J.: Principles of genetic engineering, PG, 2014.
	Supplementary literature	1. Kur J.: Principles of genetic engineering, PG, 1994. 2. Stryer L.: Biochemistry, PWN Press, Warsaw, 1997 (1999, 2000, 2003). 3. Glick B.R., Pasternak J.J.: Molecular biotechnology: principles and applications of recombinant DNA, ASM Press, Washington, D.C., 1998 (2010). 4. Hill W.E.: Genetic engineering, Taylor and Francis, London, 2002.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Isolation of genomic and plasmid DNA from bacteria. Agarose gel electrophoresis of genomic and plasmid DNA. Gene amplification by PCR. Cloning of PCR product into pUC19 plasmid. Chemical transformation of Escherichia coli cells with plasmid DNA. Analysis of recombinant plasmids by digestion with restriction enzymes. Analysis of gene sequence - comparison with NCBI database.	
Work placement	Not applicable	