

Subject card

Subject name and code	Basis of genetic engineering, PG_00207443						
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 Subject group related to scientific research 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		1.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Laboratory of Microbial Biochemistry -> Department of General and Medical Biochemistry -> Faculty of Biology -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Sabina Kędzierska-Mieszkowska				
	Teachers						
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		1.0		9.0	25
Subject objectives	The main goal of this course is to familiarize students with the basic concepts and techniques of genetic engineering and its practical application in various areas of our lives. Class participants have the opportunity to acquire skills in: (1) designing experiments related to cloning genes, examining their expression and identifying their products						

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_U09] is able to learn independently and plan her/his own development in an organized and controlled manner		
	[BIOLL3_U05] is able to prepare written papers and oral presentations on biological issues, using specialized terminology		
	[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_K04] is ready to apply the principles of bioethics, scientific integrity and honesty, including the proper handling of biological material and respect for intellectual property		
	[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	Practical applications of genetic engineering. Achievements and problems of genetic engineering (including ethical assessment of genetic engineering applications). Eukaryotic vectors, artificial chromosomes (BAC, YAC). The use of plants to produce biopharmaceuticals. Gene therapy, i.e. improving genes. RNA interference. Transgenic organisms. Basics of molecular diagnostics. Site-specific mutagenesis. Real-time PCR technique and its application in medicine. RNAseq technique as a comprehensive method of understanding the transcriptome; GFP as a basic tool in molecular biology. Molecular guardians - a new face of the RNA world. Overproduction of heterologous proteins in bacteriaE. coli. 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 the 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%
	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 works 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, Warszawa. 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 <i>Escherichia coli</i> . Gene, 168: 1-8
	eResources addresses	
Example issues/ example questions/ tasks being completed	Sample 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 <i>E. coli</i> bacteria cells; 5. RNA sequencing - a comprehensive method of understanding the transcriptome; 6. CRISPR-Cass system - from bacterial resistance to genome engineering.	
Work placement	Not applicable	

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