University of Gdańsk

Subject card

Subject name and code	Application of genetic engineering in diagnostics, PG_00154563		
Field of study	Medical Biology		
Date of commencement of studies	October 2025	Academic year of realisation of subject	2027/2028
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	6	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit	Faculty of Biology -> Rector		
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	20.0	0.0	0.0	0.0	0.0	20

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	20	3.0	27.0	50

Subject objectives

Introduction of basic concepts in the field of genetic engineering, molecular and cellular cloning (hybridoma), DNA amplification, gene expression 2. Principles of using DNA restriction and modification enzymes, plasmid vectors, creation of genetic fusions 3. Methods of diagnostics of genetic, microbiological and epidemiological diseases based on DNA 4. Basics of DNA analysis (sequencing, genotyping, genetic fingerprinting) 5. DNA editing (CRISPR-Cas)

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOLMEDL3_U03] performs simple tasks or research expertise typical of medical biology under the guidance of a supervisor	under the supervision of a scientific supervisor, performs simple tasks and research expert opinions in the field of genetic engineering BM_U03	[SU1] oral statement/conversation/ discussion [SU5] implementation of a problem task
[BIOLMEDL3_W16] explains the theoretical basis of experimental methods and lists the most important techniques of biological sciences that can be applied to medical biology and diagnostics	The student explains the theoretical foundations of experimental methods and lists the most important genetic engineering techniques that can be used in medical biology and diagnostics BM_W16	[SW4] test/exam - oral or written [SW1] oral statement/ conversation/discussion

Subject contents

Genetic engineering in medical diagnostics. Basic tools of genetic engineering - DNA restriction and modification enzymes, DNA vectors (plasmids). DNA molecular and cellular cloning (hybridoma). Ensuring the quality of DNA/RNA in clinical materials. Genetic and microbiological diagnostics (genotyping methods: RFLP, PFGE, qPCR, RAPD, MLVA, AFLP, MLST, MP-PCR). DNA amplification (PCR). DNA sequencing using the Sanger and NGS methods. Chromosomal markers STR and VNTR - genetic fingerprint. Vaccine therapy (monoclonal antibodies and their modifications) Phage therapy. DNA editing - CRISPR-Cas

Prerequisites and co-requisites

knowledge of Microbiology, Biochemistry, Molecular Biology is required

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Written exam (test) graded on a percentage basis</td><td>51.0%</td><td>100.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Jerzy Bal. Biologia molekularna w medycynie. Elementy genetyki klinicznej. PWN. Warszawa 2001

Marian Sęktas. Zastosowanie inżynierii genetycznej w biotechnologii. Molekularne podstawy ekspresji genów. Wydawnictwo UG. Gdańsk. 2000</td></tr>
<tr><td>Supplementary literature</td><td>Publications available in the Pubmed database htpps:// pubmed.ncbi.nlm.nih.gov</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1. Detection of nucleic acids with SYBR-green dye is used for: 2. Indicate the incorrect statement regarding genotyping by sequences of several genes (MLST) 3. A specific PCR reaction product (target sequence) is obtained after only 1 PCR cycle when 4. Which of the DNA analysis techniques for bacterial diagnostics provides the most information distinguishing the compared strains</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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