GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Molecular Diagnostics in Medicine and Food Industry, PG_00058418		
Field of study	Biotechnology		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study 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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Laboratorium Biotechnologii i Mikrobiologii -> Katedra Biotechnologii i Mikrobiologii -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Beata Krawczyk	
	Teachers	dr hab. Beata Krawczyk	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	5.0	40.0	75

Subject objectives	The aim of the course is to acquaint the student with molecular methods, applied for medical diagnosis and food industries, overview the achievements and tools of molecular biology in the diagnosis, overview news of the diagnostics market.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W01] has advanced knowledge of methods of genetic engineering and molecular genetics, functioning of the immune system and mechanisms of immune system response, diagnostic methods, and analytical methods in the area of specialty	The student can select the appropriate diagnostic method depending on the purpose of the study. The student knows the methods currently used in the detection and typing of microorganisms. The students can select a method according to its discriminatory power.	[SW1] Assessment of factual knowledge
[K7_U03] an propose applications of model organisms, microorganisms, viruses and biomolecules derived from them to perform bioprocesses and obtain desired substances	The student understands the importance of using control reactions in nucleic acid amplification techniques. The student understands what controls to apply in PCR.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
[K7_K02] is aware of the limitations and the necessity of continuous development of knowledge and technology; understands the need for education and constant training	Students understand that there are advances in diagnostics assay and the need to introduce personalised medicine and new diagnostic methods and solutions with higher sensitivity and specificity of tests to the diagnostics market.	[SK5] Assessment of ability to solve problems that arise in practice
[K7_U05] is able to apply instrumental methods of quantitative and qualitative analysis and studies on activity of biomolecules, select and apply diagnostic and analytical methods in the field of his/her specialty with particular emphasis on genetic, molecular and microbiological diagnostics and diagnostics based on antigen-antibody reaction	The student can carry out a research task with high accuracy. Understands what mistakes can be made in PCR.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools

Subject contents

Lectures:

- Personalized medicine - definition; Laboratory Diagnostics Act. Who can work in laboratory diagnostic? Range of molecular diagnostic applications in medicine and food industry. The most important discoveries that have been used in molecular diagnostics. Rules for the introduction of new diagnostic assays on the market. Guidelines for safe work practices in human and animal medical diagnostic laboratorie**s.**Diagnostic criteria for validation method. Collection, storage and transport of samples.
- Nucleic acid hybridization techniques and application in microbiology, in diagnosis of genetic diseases and cancer (hybridization in solution and on a solid, probe selection, hybridization formats, reverse hybridization, elements of cytogenetics and hybridization *in situ* (FISH techniques), DNA microarrays, elements of transcryptomics.
- Next-generation sequencing, mutation detection, microbiota analysis
- What is the epidemiology? Molecular methods in epidemiology. Typing of bacterial strains using the molecular techniques (pulse field gel electrophoresis REA-PFGE, DNA fingerprinting methods). The criteria for selecting methods and criteria for the interpretation of genetic patterns in epidemiological studies.
- Molecular diagnostics in virology detection of blood-borne viruses. Immunodiagnostics, nucleic acid detection, of HCV, HBV, HIV, CMV. Application of Real-time PCR in the microbiological analysis (food and biopharmaceuticals).
- Proteomics and metobolomic in the diagnosis of microbial and genetic diseases and cancer.

Laboratory: Simplex PCR. Identification of the species *E. faecalis* and *E. faecium* by PCR; Application of multiplex PCR for identification of *Staphylococcus aureus*, and the -lactam antibiotics resistance. 3. Amplification of the human CCR5 gene - the detection of deletions 32pz-resistance to HIV infection. Isolation of the human DNA and Sex determination by polymerase chain reaction (PCR) analysis of the X-Y homologous amelogenin gene. DNA genotyping of bacterial strains.

Prerequisites and co-requisites

Pass exams: Microbiology, Molecular biology,

additionally: General immunology

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
lecture- exam- written test	60.0%	50.0%
report, written test	60.0%	50.0%

Recommended reading	Basic literature	Diagnostyka molekularna w mikrobiologii. B.Krawczyk, J.Kur. Wydawnictwo PG.2008. Biologia molekularna w medycynie. Elementy genetyki medycznej. Pod red. Jerzy Bal; PWN W-wa 2008. Genetyka medyczna. L.B. Jorde, J.C. Carey, M.J. Bamshad, R.L. White. Redakcja naukowa wydania polskiego Jacek Wojcierowski. Lublin 2002. Genomy. T.A. Brown. Przekład P. Węgleński. PWN W-wa 2001. PCR Application Manual. 2006. Roche Diagnostics GmbH, Mannheim (www.roche-applied-science.com) Analiza DNA - teoria i praktyka pod red. Ryszarda Słomskiego Wydawnictwo Uniwersytetu Przyrodniczego w Poznaniu. 2008. Diagnostyka molekularna z zastosowaniem techniki PCR. Krawczyk B. i in. Wyd. PG-2012 Podstawy techniki PCR ćwiczenia laboratoryjne. Wyd. PG 2012.
	Supplementary literature	Analiza DNA teoria i praktyka pod red. Ryszarda Słomskiego Wydawnictwo Uniwersytetu Przyrodniczego w Poznaniu. 2008. Edited by G.Patrinos, W. Ansorge " Molecular diagnostics" artykuły ze strony http://www.ncbi.nlm.nih.gov/pubmed/
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Molecular diagnostic methods for the detection of HIV Molecular epidemiology - studies of short-term epidemics and pandemics	
Work placement	Not applicable	

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