GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	MOLECULAR DIAGNOSTIC IN MEDICINE AND FOOD INDUSTRY, PG_00065564		
Field of study	DIAGNOSTYKA MOLEKULARNA W MEDYCYNIE I PRZEMYŚLE SPOŻYWCZYM		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
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	2.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Biotechnology and Microbiology -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Beata Krawczyk	
	Teachers	dr hab. Beata Krawczyk	

Lesson types

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

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/edit.php?id=1542

Moodle ID: 1542 DIAGNOSTYKA MOLEKULARNA W MEDYCYNIE I PRZEMYŚLE SPOŻYWCZYM https://enauczanie.pg.edu.pl/2025/course/view.php?id=1542

Additional information:

wykład zdalny (on-line) na platformie MS Teams

Program kursu i materiały pomocnicze (PDF wykładów, filmy i artykuły) na platformie eNauczanie (Nowa Platforma)

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	25.0	60

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_K02] is aware of the potential risks and opportunities associated with the development of science and technology for the natural environment and society	The student understands the need to use modern molecular biology tools as an alternative in medical diagnostics and the food industry, alongside classical reference methods, and is also able to assess possible threats resulting from environmental contamination and high test sensitivity. The student works in accordance with the rules applicable in molecular diagnostics laboratories.	[SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce [SK3] Ocena umiejętności organizacji pracy
[K7_U05] proposes solutions to technological and scientific problems in biotechnology and related fields using experimental methods and bioinformatics, statistics and specialized databases	The student is able to choose a diagnostic method depending on the diagnostic purpose.	[SU2] Ocena umiejętności analizy informacji [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU4] Ocena umiejętności korzystania z metod i narzędzi
[K7_W04] selects methods of data analysis, including bioinformatics, statistical and molecular modeling, useful for solving technological and scientific problems in biotechnology and related fields	The student is able to interpret the results of his/her research and draw conclusions	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym

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.
- Nucleic acid amplification techniques (PCR, real-time PCR, non-PCR - NASBA, MDA)
- 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).

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.MDA method with Phi29 polymerase.

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
report, written test	60.0%	50.0%
lecture- exam- 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	Basic https://enauczanie.pg.edu.pl/2025/course/edit.php?id=1542 - PDF Lectures; publications and additional materials Supplementary https://enauczanie.pg.edu.pl/2025/course/edit.php?id=1542 - provided on the e-learning website
Example issues/ example questions/ tasks being completed	Molecular diagnostic methods for the detection of HIV Molecular epidemiology - studies of short-term epidemics and pandemics	
Practical activites within the subject	Not applicable	

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