



Subject card

Subject name and code	MOLECULAR DIAGNOSTIC IN MEDICINE AND FOOD INDUSTRY, PG_00065564						
Field of study	Biotechnology						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
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 -> Faculties of Gdańsk University of Technology						
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/view.php?id=5762						
	Additional information: On-site lecture, educational materials available and contact with the lecturer via the e-learning website.						
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		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; works in accordance with the rules applicable in molecular diagnostics laboratories.		[SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work		
	[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		has the necessary knowledge to interpret the results of their research and draw conclusions		[SW3] Assessment of knowledge contained in written work and projects		
	[K7_U05] proposes solutions to technological and scientific problems in biotechnology and related fields using experimental methods and bioinformatics, statistics and specialized databases		is able to choose a diagnostic method depending on the diagnostic purpose.		[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		

Subject contents	Course content – lecture		
	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 laboratories. 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 <i>in situ</i> (FISH techniques), DNA microarrays, elements of transcriptomics. • 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. Immunodiagnosics, nucleic acid detection, of HCV, HBV, HIV, CMV. Application of Real-time PCR in the microbiological analysis (food and biopharmaceuticals).		
	Course content – laboratory		
	Laboratory: Simplex PCR. Identification of the species <i>E. faecalis</i> and <i>E. faecium</i> by PCR; Application of multiplex PCR for identification of <i>Staphylococcus aureus</i> , 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
	laboratory - 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 Bał; PWN W-wa 2008. Genetyka medyczna. L.B. Jorde, J.C. Carey, M.J. Bamshad, R.L. White. Redakcja naukowa wydania polskiego Jacek Wojciorowski. 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.Patrinis, W. Ansorge "Molecular diagnostics"	
		artykuły ze strony http://www.ncbi.nlm.nih.gov/pubmed/	
	eResources addresses	Supplementary https://enauczanie.pg.edu.pl/2025/course/view.php?id=5762 - After logging in to the e-learning platform, students can access videos and supplementary materials for each topic.	
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 activities within the subject	Not applicable		

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