



Subject card

Subject name and code	Molecular Diagnostics in Medicine and Food Industry, PG_00058418						
Field of study	Biotechnology						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Microbiology -> 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_K02] is aware of the limitations and the necessity of continuous development of knowledge and technology; understands the need for education and constant training	Understand how molecular techniques are organised and what their strengths and weaknesses are. Understand why new developments in molecular diagnostics are needed.			[SK2] Assessment of progress of work [SK3] Assessment of ability to organize work		
	[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	Knows the principles of designing new diagnostic tests. Has knowledge of methods that can be implemented for molecular diagnostics. Is able to discuss the problem and propose an appropriate solution.			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_U03] can propose applications of model organisms, microorganisms, viruses and biomolecules derived from them to perform bioprocesses and obtain desired substances	The student has knowledge about available solutions on the molecular diagnostics market.			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		
	[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 is able to assess the sensitivity and specificity of the test; The student is able to recognize false positive and negative results.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		

Subject contents	<p>Lectures:</p> <ul style="list-style-type: none"> 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). Next-generation sequencing - comparison of efficiency and effectiveness What is the epidemiology? Molecular methods in epidemiology. Detection of infection, identification of species and typing of bacterial strains using the classical and molecular techniques (phage typing, typing bacteriocins, plasmid profile analysis, 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). Biosensors in diagnostic OMICS technics - applications <p>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.</p>											
Prerequisites and co-requisites	<p>Pass exams: Microbiology, Molecular biology,</p> <p>additionally: General immunology</p>											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 1050 794 1077">Subject passing criteria</th> <th data-bbox="799 1050 1137 1077">Passing threshold</th> <th data-bbox="1142 1050 1481 1077">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1084 794 1111">report, written test</td> <td data-bbox="799 1084 1137 1111">60.0%</td> <td data-bbox="1142 1084 1481 1111">50.0%</td> </tr> <tr> <td data-bbox="456 1117 794 1144">lecture- exam- written test</td> <td data-bbox="799 1117 1137 1144">60.0%</td> <td data-bbox="1142 1117 1481 1144">50.0%</td> </tr> </tbody> </table>			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%
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Recommended reading	<p>Basic literature</p>	<p>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.</p>										
	<p>Supplementary literature</p>	<p>Analiza DNA teoria i praktyka pod red. Ryszarda Słomskiego Wydawnictwo Uniwersytetu Przyrodniczego w Poznaniu. 2008. Edited by G.Patrinis, W. Ansorge " Molecular diagnostics"</p> <p>artykuły ze strony http://www.ncbi.nlm.nih.gov/pubmed/</p>										
	<p>eResources addresses</p>	<p>Adresy na platformie eNauczanie:</p>										
Example issues/ example questions/ tasks being completed	<p>Molecular diagnostic methods for the detection of HIV</p> <p>Molecular epidemiology - studies of short-term epidemics and pandemics</p>											
Work placement	<p>Not applicable</p>											