

Subject card

Subject name and code	Molecular Diagnostics of Microorganisms, PG_00154757						
Field of study	Biology						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2026/2027		
Education level	Master's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		English		
Semester of study	3		ECTS credits		2.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Laboratory of Microbial Biochemistry -> Department of General and Medical Biochemistry -> Faculty of Biology -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Karolina Stojowska-Swędryńska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		2.0		33.0	50
Subject objectives	The aim of the lecture is to present the possibilities and limitations of using molecular phenotypic and genotypic diagnostics in various aspects of microbiological research.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[BIOLMU2_U03] the graduate can critically analyse and select biological information, especially from electronic sources		The student is able to make a critical analysis and selection of information in the field of molecular diagnostics of microorganisms, especially from electronic sources.		[SU1] oral statement/conversation/discussion [SU4] test/exam - oral or written		
	[BIOLMU2_U01] the graduate is able to select and apply research techniques and tools appropriate to the problems of the biological sciences specialisation studied		The student is able to select and use techniques and research tools adequate to the problems related to molecular diagnostics of microorganisms.		[SU1] oral statement/conversation/discussion [SU4] test/exam - oral or written [SU5] implementation of a problem task		
	[BIOLMU2_W08] the graduate has an in-depth knowledge and understanding of the wealth of contemporary experimental approaches and techniques in the biological sciences and their use to solve the tasks at hand		The graduate has an in-depth knowledge and understanding of the wealth of modern experimental approaches and techniques used in the molecular diagnostics of microorganisms and their use to solve the assigned tasks.		[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion [SW5] implementation of a problem task		
	[BIOLMU2_W03] the graduate has an in-depth knowledge and understanding of research problems at the frontiers of biological sciences that require the use of advanced tools		The graduate has an in-depth knowledge and understanding of research problems related to molecular diagnostics of microorganisms that require the use of advanced tools.		[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion		

Subject contents	• Application of molecular diagnostics in medicine, microbiology and biotechnology. • Standardization of diagnostic methods and verification of molecular tests. • Conducting diagnostic tests, controls, the problem of contamination, false positive and false negative results • Genetic material for diagnostic tests (source, isolation methods) • Genetic polymorphism and regions conserved evolutionarily. • Detection and species specific identification of microorganisms • Detection of virulence and antibiotic resistance genes • Genetic typing methods of microorganisms (DNA fingerprinting, e.g. Restriction Enzyme Analysis Pulsed-field Gel Electrophoresis, Ligation Mediated PCR, Restriction Fragment Length Polymorphism, Variable Number Tandem Repeat, Ribotyping) • Application of molecular typing methods in epidemiology.		
Prerequisites and co-requisites	Knowledge of basic issues in the field of molecular biology, biochemistry, genetic engineering and microbiology. Knowledge of the structure, properties and functions of basic biological macromolecules (including DNA, RNA, restriction enzymes, DNA polymerases), knowledge of basic techniques of molecular biology and genetic engineering (including PCR, electrophoresis), basic knowledge of the structure and biochemistry of microorganisms.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	written or oral colloquium	50.1%	80.0%
	problem task	50.0%	20.0%
Recommended reading	Basic literature	• scientific publications and multimedia presentations provided to students during the course	
	Supplementary literature	• Persing, Tenover, Hayden, <i>Molecular Microbiology</i>, American Society for Microbiology, 2016 • Elizabeth van Pelt-Verkuil, <i>Molecular Diagnostics</i>, Springer-Verlag GmbH, 2019 • Vira, Bhat, Chavan, <i>Diagnostic molecular microbiology and its applications: Current and future perspectives</i>, Clin Microbiol Infect Dis, 2016, doi: 10.15761/CMID.1000105 • Karolina Stojowska, Beata Krawczyk - A new double digestion ligation mediated suppression PCR method for simultaneous bacteria DNA-typing and confirmation of species: an <i>Acinetobacter</i> sp. Model. PLoS One. 2014 Dec 18;9(12):e115181. doi: 10.1371/journal.pone.0115181. • Karolina Stojowska-Swędryńska, Beata Krawczyk. A new assay for the simultaneous identification and differentiation of <i>Klebsiella oxytoca</i> strains. Appl Microbiol Biotechnol. 2016 Dec;100(23): 10115-10123. doi: 10.1007/s00253-016-7881-1.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Topics and sample tasks required for the exam are provided throughout the course.		
Work placement	Not applicable		

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