

Subject card

Subject name and code	Fundamentals of molecular diagnostics, PG_00180138						
Field of study	Chemistry, Environmental Protection						
Date of commencement of studies	October 2026		Academic year of realisation of subject			2027/2028	
Education level	Master's studies		Subject group			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	4		ECTS credits			4.0	
Learning profile	academic		Assessment form			credit	
Conducting unit	Laboratory of Bionanotechnology -> Department of Molecular Biotechnology -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Agnieszka Żylicz-Stachula				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	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		10.0		60.0	100
Subject objectives	familiarizing students with all the topics listed in the lecture syllabus familiarizing students with modern methods used in molecular diagnostics familiarizing students with current capabilities, limitations, and the anticipated directions of development of contemporary diagnostic methods						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[OŚMU2_U01] On the basis of the acquired knowledge, proposes to solve environmental problems.	Is able to apply molecular diagnostic techniques in practical environmental research.	[SU1] oral statement/conversation/discussion
	[OŚMU2_K10] Has a need for continuous professional development.	Is aware of the need to continuously update knowledge and develop skills in new molecular techniques and bioinformatics.	[SK1] oral statement/conversation/discussion
	[OŚMU2_U05] Searches, selects and analyses the literature achievements of environmental sciences, including scientific journals and databases, reading and understanding scientific texts in her/his native language and in English.	Is able to search for, select, and analyze source literature in the field of environmental sciences, including scientific journals and databases.	[SU2] presentation/project/paper/report
	[OŚMU2_W05] Describes development directions and the latest discoveries in the field of scientific disciplines related to environmental protection.	Understands the principles of high-throughput techniques, including next-generation sequencing (NGS), and their applications in metagenomics and microbiome analysis. Identifies and describes the directions of development of molecular diagnostics in environmental protection.	[SW2] presentation/project/paper/report
	[OŚMU2_W04] Chooses methods, techniques and research tools used in environmental protection.	Knows the definition, scope, and significance of molecular diagnostics in the context of environmental protection and its applications in monitoring biological contaminants. Describes the basic molecular biology techniques used in the analysis of biological and environmental samples. Knows the methods of isolation, purification, and analysis of nucleic acids (DNA, RNA) from environmental samples. Has knowledge of the fundamentals of immunological and hybridization techniques and their application in detecting environmental pathogens.	[SW1] oral statement/conversation/discussion [SW2] presentation/project/paper/report
Subject contents	[OŚMU2_K05] Critically assesses her/his own knowledge and the knowledge of the teams in which s/he works, can critically assess the content received.	Understands the importance of ethical responsibility in conducting molecular analyses, especially in the context of genetic and environmental data.	[SK1] oral statement/conversation/discussion [SK2] presentation/project/paper/report
	Definition and significance of molecular diagnostics in environmental protection Overview of basic molecular biology techniques Sampling and preparation of biological and environmental material Analysis of DNA and RNA in environmental studies; nucleic acid isolation Techniques for separation and sequencing of nucleic acids High-throughput methods; next-generation sequencing (NGS) in environmental analysis Metagenomics and environmental microbiome analysis Screening methods for detection of point mutations Immunological and hybridization techniques Diagnostics of environmental pathogens (bacteria, viruses, fungi) Ethical, legal, and social aspects of molecular diagnostics		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	presentation	50.0%	50.0%
	activity during scientific discussion	70.0%	50.0%
Recommended reading	Basic literature	Buckingham, M.L. Molecular diagnostics: Fundamentals, Methods and Clinical Applications. F.A. Davis Company, 2019.	

	Supplementary literature	Selected scientific publications and review papers in English (updated annually, available online), provided by the course instructor during the semester in which the course is conducted.
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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