University of Gdańsk

Subject card

Subject name and code	Fundamentals of molecular diagnostics, PG_00180138						
Field of study	Chemical Business, Chemistry, Environmental Protection						
Date of commencement of studies	February 2026		Academic year of realisation of subject	2026/2027			
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	3		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_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
[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_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_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_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

Subject contents

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
activity during scientific discussion	70.0%	50.0%
presentation	50.0%	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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