University of Gdańsk

Subject card

Subject name and code	Marine OMICS - laboratory classes, PG_00195182						
Field of study	Marine Biotechnology						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Master's 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		English		
Semester of study	3		ECTS credits		2.0		
Learning profile	academic		Assessment form		credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Paulina Czaplewska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	32.0	0.0	0.0	32
	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	32		2.0		16.0	50
Subject objectives	The aim of the laboratory classes is to familiarize the student with the latest techniques used in broadly understood Omics and their application in analysis related to the sea and marine organisms. The latest protocols in proteomic and genomic analysis, software for the analysis of proteins, genomes, transcriptomes and metabolites will be introduced. Additionally, students will learn next-generation sequencing (NGS) techniques and the analysis of microbiomes in marine environments.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MBMU2-KU01] Can plan and conduct research in the laboratory and at sea, and to document procedures and results. Independently or under the supervision of an authorized staff member, carries out work using specialized equipment. Complies with occupational health and safety regulations.	Has the skills necessary for laboratory work; is able to plan and carry out an experiment, is able to document his own operations and results; in laboratory work, under the supervision of the instructor, uses complex research techniques and tools, can use laboratory equipment (KU_01). Collects and interprets empirical data, uses statistical methods and IT tools to analyze data, draws conclusions based on empirical data (K_U05).	[SU8] observation of student's independent or team work
[MBMU2-KK03] Is ready to apply the principles of occupational health and safety, especially in the laboratory and at sea; is responsible for their own and others' safety; can recognize hazards and take appropriate action	Understands complex biological phenomena at the molecular level, knows their importance for biotechnology and their connections with other fields and disciplines of science (KW_01). Knows the basic principles of occupational safety, understands the risks associated with laboratory work, knows the risks associated with conducting laboratory tests, knows the risks associated with working with pathogenic organisms and GMOs (K_W04).	[SK1] oral statement/conversation/ discussion

Subject contents

Laboratory exercises. Genomic DNA isolation - strategies and techniques. Genomic sequencing - strategies and techniques. Gene splicing and identification of protein and RNA-coding genes, including splice sequences from Sanger sequencing. Identification of orthologous genes in newly sequenced genomes. Mapping short sequence reads to the reference genome. Annotation of gene functions in the genome. Genetic modifications in prokaryotic and eukaryotic genomes - techniques and methods. Identification of genes associated with genetic diseases.

Next generation sequencing (NGS) techniques: Collecting environmental samples from the seas, securing samples, isolating genetic material, preparing a library for high-throughput sequencing, conducting the sequencing process.Metagenomic data analysis: Manipulation and analysis of collected metagenomic data, interpretation of results regarding microbiomes of marine environments.Protein digestion, recording of MS/ MS spectra, data analysis, protein identification. The influence of various factors on changes in the metabolite profile

Prerequisites and co-requisites

Formal requirements: no formal requirements. Entry requirements It is required to obtain knowledge, skills and competences for specific subjects: Biochemistry (lecture), Organic chemistry (lecture), Biodiversity and basics of taxonomy, Bioinformatic sequence analysis, Molecular biology and genetics After passing the compulsory subjects in the first three semesters, the student has the knowledge and skills that qualify him to participate and pass the course

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
S3 - Transcriptomics	51.0%	25.0%
S1 - Metabolomics	51.0%	25.0%
S4 - Proteomics	51.0%	25.0%
S2 - Genomics	51.0%	25.0%

Recommended reading	Basic literature	Scientific publications and studies prepared by the teacher and made available to students during classes. • Genomes 3 T.A. Brown, 2007, Garland Science • Brown T.A. "Genomes", ed. II, translation edited by P. Węgleński, Wydawnictwo Naukowe PWN, Warszawa 2009. • Molecular Biology of the Gene, 7th edition, 2014, Pearson • Johnstone Robert A.W. I Malcolm E.Rose, Mass spectrometry, PWN 2001 • De Hoffmann, Edmond, Charette, Jean Joseph, Stroobant, Vincent, Mass Spectrometry, Wydawnictwa Naukowo-Techniczne 1998 Materials provided by the teacher
	Supplementary literature	Primers for Proteomics https://doi.org/10.1142/13595 | May 2024 Pages: 250 Edited by: Paulina Czaplewska (*University of Gdańsk, Poland & Medical University of Gdańsk, Poland*), Katarzyna Macur (*University of Gdańsk, Poland & Medical University of Gdańsk, Poland*), and Paweł Ciborowski (*University of Nebraska Medical Center, USA*) Metagenomics: Techniques, Applications, Challenges and Opportunities; Reena Singh Chopra, Chirag Chopra, Neeta Raj Sharma; 2020, Springer https://doi.org/10.1007/978-981-15-6529-8
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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