University of Gdańsk

Subject card

Subject name and code	Unicellular organisms - Genetics Methodology (M03_B2), PG_00153674						
Field of study	Biotechnology						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2025/2026			
Education level	undergraduate studies		Subject group				
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	Polish Classes are conducted in Polish, selected group(s) may have classes in English.			
Semester of study	3		ECTS credits	6.0			
Learning profile	academic		Assessment form				
Conducting unit	Intercollegiate Faculty of Biotechnology UG-MUG						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Sylwia Jafra				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	12.0	74.0	0.0	0.0	86
	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	86		40.0	60.0	186	
Subject objectives	The course aims to familiarize students with the genetics of unicellular organisms and the practical use of the molecular biology of microorganisms. The practical classes is to use the acquired knowledge and develop skills and competencies for proper planning and conducting experiments in genetics of unicellular organisms. The student will gain awareness of the risks and benefits of using genetically modified microorganisms. The student will gain awareness of the safety rules in working with microorganisms and care for their own and others' safety..						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[BIOTECHL3_U04] The graduate is able to use scientific information, including English-language information, on biotechnology in the fields of exact and natural sciences, as well as medical sciences and health sciences; use electronic sources; use appropriate databases	Students will develop the ability to use scientific information, including English-language information, related to biotechnology in the fields of exact and natural sciences; they will acquire basic skills in using relevant databases and electronic sources.	[SU1] oral statement/conversation/ discussion
	[BIOTECHL3_K03] The graduate is willing to understand risks and dilemmas, including ethical dilemmas related to conducting scientific research and introducing advanced technologies using the achievements of biotechnology; understand and appreciate the importance of intellectual property; behave ethically.	Students will acquire awareness and understanding of the risks and dilemmas, including ethical dilemmas, associated with conducting scientific research and introducing advanced technologies utilizing biotechnological achievements. They will understand and appreciate the importance of intellectual property and will act ethically.	[SK8] observation of student's independent or team work
	[BIOTECHL3_W08] The graduate knows and understands occupational health and safety regulations; the dangers of working in a laboratory; the dangers of working with infectious material, GMOs and GMMs	Students will learn the principles of safety and hygiene at work; they will understand the hazards associated with working in a laboratory; they will be aware of the risks involved in working with infectious materials, GMOs, and GMMs	[SW4] test/exam - oral or written
	[BIOTECHL3_U07] The graduate is able to prepare and present a short oral presentation in Polish and/or English, covering detailed issues in the field of biotechnology, using scientific language, including specialist terminology and conceptual apparatus appropriate for biotechnology; conduct discussions	Students will develop the ability to properly plan experiments in the field of genetics of unicellular organisms.	[SU3] text preparation/written work [SU5] implementation of a problem task
	[BIOTECHL3_U01] The graduate is able to do basic laboratory work; document activities and results; use basic techniques under the supervision of the supervisor in laboratory work and research tools necessary in biotechnology, with particular emphasis on the analysis of methods of isolation, modification, selection and analysis of organisms, tissues, cells and molecules; handle basic laboratory equipment.	Studentswill develop the basic skills necessary for laboratory work; they will be able to document activities and results. In laboratory work, they will use basic research techniques and tools and acquire the ability to operate basic laboratory equipment.	[SU3] text preparation/written work [SU4] test/exam - oral or written [SU6] demonstration of practical skills
	[BIOTECHL3_K04] The graduate is willing to understand the importance of work safety rules, in particular laboratory work; apply the principles of work safety; be responsible for his/her own safety and that of others; be able to act in emergency situations.	Students will gain an awareness of the safety principles for working with microorganisms and the importance of ensuring their own safety and the safety of others.	[SK8] observation of student's independent or team work
	[BIOTECHL3_W07] The graduate knows and understands basic techniques and research tools used in biotechnology.	Students will acquire knowledge of the basic techniques and research tools used in working with unicellular organisms.	[SW4] test/exam - oral or written
	[BIOTECHL3_W01] The graduate knows and understands basic biological phenomena at the molecular level, he/she is familiar with their significance for biotechnology.	Students will understand the basic biological phenomena at the molecular level occurring in the cells of unicellular organisms and will learn the practical applications of molecular biology of microorganisms in biotechnology	[SW4] test/exam - oral or written

Subject contents

Methodology - Laboratory exercises (group selection - Polish or English)

M1. Bacterial genetics (42 h) (IFB MUG 36 h, IFB UG 6h)

- Antibiotic resistance genes - plasmids as carriers of genetic information
- Titration of bacteriophages
- Transposon mutagenesis + Transduction with SPP1 phage
- One-step experience - lysis or lysogeny decision
- Spores - resistance of spores to drying, temperature, UV, spore germination
- Induction and measurement of the overall stress response

M2.Yeast genetics (14h) (IFB UG)

- Conjugation + Transformation + Plasmid Loss Two-hybrid test + plasmid loss CD Two-hybrid test + plasmid loss

Methodology - Auditorium exercises

M3. - Fundamentals of Genetic Engineering (30h) (IFB MUG, IFB UG)

- Gene and genomic libraries
- Cloning (restriction and other enzymes, vectors, Gibson assembly)
- Mutagenesis Recombination
- Phage transdcution
- Designing in silico
- Cloning project

Prerequisites and co-requisites

Knowledge and skills acquired during the implementation of modules M01-M02

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
M2 - number of points from the completion of the program content described in points M2	13.0%	25.0%
M1 - number of points from the completion of the program content described in points M1;	18.0%	35.0%
M3 - number of points from the completion of the program content described in points M3;	21.0%	40.0%

Recommended reading

Basic literature

A.1. Literature used during classes

- Biologia molekularna bakterii Redakcja naukowa: Jadwiga Baj, Zdzisław Markiewicz, PWN 2006 i nowsze
- Molecular Cell Biology, wydanie IX, 2021, W.H. Freeman and Co.
- Molecular Biology of the Gene, wydanie 7, 2014, Pearson
- Genomes 4 T.A. Brown, 2018, Garland Science
- Skrypt Pracownia inżynierii genetycznej materiały do ćwiczeń Katarzyna Węgrzyn
- Materiały przygotowane przez prowadzącego zajęcia

A.2.Literature for self-study

- Mikrobiologia - Jadwiga Baj (red. nauk.), Wydawnictwo Naukowe PWN SA, Warszawa 2018.
- Biologia molekularna bakterii PWN 2006
- Molecular cloning - A laboratory manual. 4thedition, (2012) Green, Sambrook

	Supplementary literature	Chapters dedicated to the genetics of microorganisms: • Microbiology: an introduction. Gerard J. Tortora, Berdell R. Funke, Christine L. Case, 2016, Pearson • Prescotts MicrobiologyJoanne Willey[10th ed.] 2016. McGraw-Hill Education, • Mikrobiologia Murray Rosenthal Wydanie 2018 EDRA URBAN & PARTNER • Brock biology of microorganisms, global edition, 15/e M. T. Madigan, K. S. Bender, D. H. Buckley, W. M. Sattley,D. A. Stahl, 2018. Pearson. • Principles of Biochemistry, Lehninger, wydanie VII, 2017, Freeman • Concepts of Genetics, wydanie 10, 2012, Pearson • Sherman F., (2002) Getting started with yeast. Methods Enzymol. 350: 3-41. • The Yeasts: Yeast Technology (2012)Anthony H. Rose, J. Stewart Harrison • Guide to Yeast Genetics and Molecular Biology. (2004) Christine Guthrie, Gerald R. Fink
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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