University of Gdańsk

Subject card

Subject name and code	Biotechnology in industry and agriculture - Bio Technologies Methodology (M06_B1), PG_00197692		
Field of study	Biotechnology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	Bachelor'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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	6.0
Learning profile	academic	Assessment form	credit
Conducting unit	Intercollegiate Faculty of Biotechnology UG-MUG -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Leszek Kadziński	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	66.0	0.0	14.0	80

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	80	10.0	60.0	150

Subject objectives

The purpose of the classes is to acquaint students with the practical aspects of microbiology, synthetic biology, agricultural and industrial biotechnology, and biotechnology in environmental protection. During the classes, students will become familiar with biotechnological processes and modern analytical techniques used in accredited laboratories as well as in the pharmaceutical, petrochemical, and cosmetic industries. The classes will provide students with knowledge regarding the acquisition and practical use of microorganisms for the pharmaceutical, food, and agricultural industries. Additionally, students will acquire essential laboratory skills, and learn basic research techniques and tools necessary for biotechnology and biofuel production, as well as the validation of methods and laboratory equipment, exemplified by the UV/VIS spectrophotometer, with a focus on methods for isolation and purification of preparations using a chromatographic system. The classes will also enable individual planning of experiments and provide exposure to equipment and methods that students will encounter in their future careers. Special emphasis is placed on issues related to the validation techniques of methods and measuring equipment, quality standards 17025 and ISO9001, GLP, and GMP. The module allows students to learn about and discuss the latest trends and challenges in biotechnology.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOTECHL3_W03] The graduate knows and understands selected issues of organism-environment interdependence	The student is able to develop a research question in writing.	[SW3] text preparation/written work
[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	The student is able to solve a scientific problem in a group using the acquired knowledge and with the help of English-language scientific information.	[SU5] implementation of a problem task
[BIOTECHL3_K02] The graduate is willing to work in a team, in particular to carry out joint laboratory work.	The student is able to distribute the various tasks to be solved among the other members of the team so as to achieve the final result.	[SK8] observation of student's independent or team work
[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.	The student is able to document activities and results; in laboratory work under the supervision of an instructor, they use basic research techniques and tools necessary in biotechnology.	[SU8] observation of student's independent or team work
[BIOTECHL3_W07] The graduate knows and understands basic techniques and research tools used in biotechnology.	The student is able to relate the acquired knowledge in a logical sequence of events leading to the solution of a problem.	[SW3] text preparation/written work
[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.	The student listens to the instructor's instructions and performs the assigned work with full awareness of his and other students' safety.	[SK8] observation of student's independent or team work
[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	The student is able to prepare and discuss a topic related to the use of microbiology, synthetic biology, agricultural and industrial biotechnology, and biotechnology.	[SU2] presentation/project/paper/ report
[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	The student knows the rules of laboratory work, understands the danger of working in the laboratory, realizes the potential danger of working with infectious material (bacteria) and GMOs and GMMs.	[SW1] oral statement/ conversation/discussion

Subject contents	Methodology - Laboratory exercises **M1. Practical use of microorganisms (36 h)** Microbiology of water and soil: solation of microorganisms from environmental samples. Analysis of microorganisms to produce biologically active substances (enzymes, growth inhibitors, signalling particles). Storage of microorganisms. Biological plant protection - rhizosphere microbiology, biological plant protection factors - antagonism against bacterial and fungal plant pathogens, volatile substances with antifungal activity **M2. Bio-processes (33 h)** Techniques of obtaining oil for biofuels on a micro and semi-industrial scale, techniques for producing biofuels from vegetable oils, procedures for determining parameters and biofuel production; practices for determining the FAME content in biofuels Cleaning techniques and quality control according to ISO standards Purification of preparations with a chromatographic system Techniques for concentrating protein preparations, techniques for testing protein concentrations of food and feed products Validation of the UV / VIS spectrophotometer, Fitness and operational qualification (PQ, IQ), Validation of methods for the determination of active substances using UV-VIS spectroscopy, **Methodology - Proseminar (14 h)** M3. New trends in biotechnology The course content includes innovative techniques and research strategies used in biotechnology e.g.: modern methods used in the analysis of environmental microorganisms; extraction and practical use of extremophilic microorganisms, the use of bacteriophages, the potential and the use of synthetic biology; the use of invertebrate viruses in plant protection; the use of viruses in medicine; construction and application of affimers; use of micro- and nano-flow systems (microfluidics, nanofluidics)
Prerequisites and co-requisites	Knowledge and skills from modules 01-05.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
M1. Practical use of microorganisms	51.0%	44.0%
M2. Bio-processes	51.0%	35.0%
M3. New trends in biotechnology	51.0%	21.0%

Recommended reading	Basic literature	Skrypt Materiały do ćwiczeń Mikrobiologia przemysłowa S.Jafra, D. Krzyżanowska, A. Ossowicki, A. Królicka, M. Rajewska Prescotts Microbiology (wybrane rozdziały: :27,28,29, part of 30, 40, 41,42) J. M. Willey, L. M. Sherwood, C. J. Woolverton, 8th edition, McGraw-Hill, 2011. Biotechnologia w ochronie środowiska. Ewa Klimiuk, Maria Łebkowska, Wydawnictwo: PWN, 2003. Biotechnologia roślin. Wydawnictwo: PWN, Marzec 2004. Mikroorganizmy w ochronie środowiska. Mieczysław Błaszczyk. Wydawnictwo: PWN, 2007. Environmental biotechnology. HJ Jordening J. Winter. Wiley-VVH. 2006. Biotechnologia żywności red: W. Bednarski, A. Reps PWN, Warszawa 2019 Procesy i reaktory biochemiczne - B. Tabiś, R. Grzywacz, Politechnika Krakowska im. T. Kościuszki (1993)
	Supplementary literature	Biotechnologia roślin. red. S. Malepszy, Wydawnictwo Naukowe PWN 2009, rozdział 11: Bakterie wykorzystywane w produkcji roślinnej P. Sobiczewski str. 172-213. Wybrane publikacje (przeglądowe i doświadczalne)
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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