University of Gdańsk

Subject card

Subject name and code	Biotechnology in industry and agriculture - Bio Technologies - Fundaments (M06_B1), PG_00196957		
Field of study	Biotechnology		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
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	4.0
Learning profile	academic	Assessment form	exam
Conducting unit	Intercollegiate Faculty of Biotechnology UG-MUG -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Dorota Krzyżanowska	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	68.0	0.0	0.0	0.0	0.0	68

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	68	5.0	27.0	100

Subject objectives

The aim of the course is to familiarize students with the practical aspects of microbiology, synthetic biology, agricultural and industrial biotechnology, as well as biotechnology in environmental protection. During the course, students will learn about biotechnological processes and modern analytical techniques used in accredited laboratories and in the pharmaceutical, petrochemical, and cosmetic industries.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[BIOTECHL3_W07] The graduate has advanced knowledge of the rules of operation and the possibilities of using research techniques and tools used in biotechnology.	Students can explain biotechnological processes and understand modern analytical techniques used in accredited laboratories and in the pharmaceutical, petrochemical, and cosmetic industries.	[SW4] test/exam - oral or written
[BIOTECHL3_W03] The graduate possesses structured and advanced knowledge of organism-environment relationships and their importance for understanding biological processes and biotechnological applications.	Students can explain and relate: the molecular basis of gene expression regulation and metabolism regulation (metabolic engineering); the molecular basis for searching for genes/gene clusters important in the synthesis of potential antibiotics and therapeutic substances; the molecular basis of techniques based on nucleic acid analyses. They can explain and relate: the possibilities of obtaining microorganisms from the environment for industrial processes, the adaptation of microorganisms to a given environment – important from an application point of view. Students provide examples of the properties of microorganisms and enzymes produced by various organisms depending on their habitat used in industrial production.	[SW4] test/exam - oral or written [SW5] implementation of a problem task

Subject contents

F1. Microorganisms in Practice (29 hours)

Instructors: Sylwia Jafra, Małgorzata Waleron, Andrea Lipińska

- Bioremediation of water and soils contaminated with heavy metals and petroleum compounds
- Bio-processes (photosynthesis, photoreduction, fermentation) used for obtaining "green energy": biomass, biogas, and hydrogen
- Bio-processes used for the extraction or recovery of metals
- Biological water purification
- Analysis of microbiological water purity
- Acquisition and use of microorganisms for the pharmaceutical, food, and agricultural industries
- Fermentation processes in industrial production (e.g., lactic, alcoholic, propionic fermentation, etc.)
- Use of microorganisms in the production of selected food products; food preservation and spoilage
- Improvement of microorganisms and their selection for industrial processes - modification of enzyme properties used in industry "Direct evolution"
- Biological plant protection (selected plant pathogens, viral infections and plant response, mechanisms used in biological control of plant pathogens)

F2. Bioprocess Engineering (36 hours)

Instructors: Bogdan Banecki, Wojciech Śledź, Małgorzata Waleron

- Construction and design of bioreactors; cultivation of various organisms and tissues in bioreactors
- Processes around bioreactors; application and construction of biosensors
- Processing of by-products from the agro-food industry
- Characterization of biologically neutral surfaces and their active applications
- Biomaterials in medicine and biotechnology
- Biofuels - types of biofuels as ecological energy sources, biotechnological and chemical methods of obtaining biofuels
- Synthesis and degradation of biopolymers
- Biodeterioration
- Methods of extraction, purification, and concentration of extracts
- Validation of equipment and analytical methods
- Quality standards (ISO 17025, ISO 9001, GMP, GLP), laboratory classifications

F3. Biosimilar drugs (3h)

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
Comprehensive integrating exam	50.0%	40.0%
F1-F3	51.0%	60.0%

Recommended reading	Basic literature	Mikrobiologia - wybrane rozdziały -Jadwiga Baj (red. nauk), Wydawnictwo Naukowe PWN SA, Warszawa 2018 Mikrobiologia techniczna. T. 1 Mikroorganizmy i środowiska ich występowania (wybrane rozdziały) Z. Libudzisz (red.), K. Kowal (red.), Z. Żakowska (red.), 2007, Wydawnictwo Naukowe PWN Mikrobiologia techniczna. T. 2 Mikroorganizmy w biotechnologii, ochronie środowiska i produkcji żywności (wybrane rozdziały) Z. Libudzisz (red.), K. Kowal (red.), Z. Żakowska (red.), 2008, Wydawnictwo Naukowe PWN Inżynieria procesowa i aparatura przemysłu spożywczego red. P. Lewicki, 2005, WNT, Warszawa Materiały dostarczone przez prowadzących zajęcia
	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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