GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00064671		
Field of study	Recycling and Energy Recovery		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Chemistry, Technology and Biochemistry of Food -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Filipkowski	
	Teachers	dr inż. Paweł Filipkowski dr inż. Karolina Kucharska	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	10.0	20.0	0.0	0.0	40

E-learning hours included: 0.0

Additional information:

Lecture, conversational lecture, reverse lecture. Presentations. Essays and reports, taking into account the results obtained from bioinformatics programs and real results.Assessment:Laboratories - attendance, final papers, min. 60% thresholdPractices - 60% thresholdLectures - attendance, exam, min. 60% threshold

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	40	0.0	0.0	40

Subject objectives

The aim of the subject will be to present the basics of waste processing and/or sewage treatment processes from the perspective of dominant groups of microorganisms and ecological interactions/dependencies between them. An important aspect of the subject will be to familiarize students with methods of analysis of microorganism consortia, with particular emphasis on modern molecular biology tools and methods of biomass manipulation in order to optimize the course of processes (genetic engineering - GMO). As part of the exercises, students will carry out bioinformatic analysis of microbiological data. For the purposes of the exercises, bioinformatic tools generally available on the WWW will be used, which will allow students to identify dominant groups of microorganisms in the analyzed samples and/or compare them with reference samples. The aim of the subject may also be to familiarize students with the use of microorganisms and/or enzymes for the biosynthesis of desired substances. In addition, the student will learn the principles of safe work with microorganisms in industry and will be briefly acquainted with methods of improving desired production features.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] demonstrates knowledge and understanding of mathematics and other exact sciences and engineering disciplines at the level necessary to solve theoretical, engineering and technological problems and issues.	demonstrates knowledge and understanding of mathematics and other science and engineering disciplines at a level necessary to solve theoretical, engineering and technological problems and issues, being able to choose the most beneficial path for waste utilization	[SW1] Assessment of factual knowledge
[K6_W04] demonstrates knowledge and understanding of research methods (information acquisition, simulations, experimental methods) in the field of technologies related to the recovery of raw materials and energy.	demonstrates knowledge and understanding of research methods in the field of technologies related to the recovery of raw materials, e.g. by selecting appropriate methods for the identification or cultivation of organisms	[SW2] Assessment of knowledge contained in presentation
[K6_U04] formulates research problems and selects appropriate research methods (information acquisition, simulations, experimental methods) in the field of technologies related to the recovery of raw materials and energy in order to solve specific tasks and to report research results.	formulates research problems and selects appropriate research methods in the field of technologies related to the recovery of raw materials in order to solve specific tasks and report research results.	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_U01] applies knowledge of mathematics and other exact sciences and engineering disciplines to solve theoretical, engineering and technological problems and issues.	applications are made with other sciences and engineering disciplines that involve theoretical, engineering and technological issues, such as the application of waste processing	[SU1] Assessment of task fulfilment

Subject contents

Isolation of industrially important microorganisms from environmental samples. Examples of methods for improving the production characteristics of microorganisms. Controlled cultivation using microorganisms and/or enzymes for the biosynthesis of desired substances. Conditions for culturing industrial microorganisms and their effect on the efficiency of bioproduct production.Methods for storing pure cultures of industrial microorganisms.Presentation of selected biotechnologies (e.g. citric acid as an example). Production of recombinant enzymes. Use of bioaccumulation in industrial copper production.Study of ecological interactions/dependencies between organisms.Methods of analysis of microorganism consortia, with particular emphasis on modern molecular biology tools and methods of biomass manipulation in order to optimize the course of processes (genetic engineering-GMO). Bioinformatic analysis of microbiological data. Bioinformatic tools used to identify dominant groups of microorganisms in the analyzed samples and/or comparison with reference samples.

Prerequisites and co-requisites

Fundamentals of environmental microbiology

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
obecność, wykonanie, prace zaliczeniowe	60.0%	40.0%
prace zaliczeniowe, obliczenia, raport	60.0%	20.0%
obecność, egzaminy cząstkowe, kolokwium zaliczeniowe	60.0%	40.0%

Recommended reading	Basic literature	Wykład Zdzisława Libudzisz, Krystyna Kowal, Zofia Żakowska Mikrobiologia techniczna tom 1, Mikroorganizmy i środowiska ich występowania PWN, Warszawa, 2007. Zdzisława Libudzisz, Krystyna Kowal, Zofia Żakowska Mikrobiologia techniczna tom 2, Mikroorganizmy w biotechnologii, ochronie środowiska i produkcji żywności PWN, Warszawa, 2008. Hubert Cieśliński, Paweł Filipkowski, Józef Kur, Anna Lass, Marta Wanarska Podstawy Mikrobiologii Przemysłowej" Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2007. Metting Jr. F.B., Biodiversity and application of microalgae, Journal of Industrial Microbiology 1996, 17, 477-489. Frąc M., Jezierska-Tys S., Tys J., Algi energia jutra (biomasa, biodiesel), Acta Agrophysica 2009, 13(3), 627-638.
	Supplementary literature	Wykład Praca zbiorowa Redakcja naukowa: Włodzimierz Bednarski, Arnold Reps Biotechnologia Żywności, WNT, Warszawa, (2015). Wstęp do biokorozji, Malinowska-Pańczyk E. (red.), Sommer A., Filipkowski P.,Gdańsk : Wydawnictwo Politechniki Gdańskiej (2021) Heimann K., Huerlimann R., Chapter 3 Microalgal Classification: Major Classes and Genera of Commercial Microalgac Species, Handbook of Marine Microalgae 2015, 25-41.Muszyńska B., Jękot B., Topolska-Pasek M., Rzewińska A., Właściwości prozdrowotne węglowodanów występujących w algach, Farmacja Polska 2016, 72(7), 2-13.Szweykowska A., Szweykowski J., Botanika Systematyka, Tom 2, Wyd. 10, Wydawnictwo Naukowe PWN, Warszawa 2012.
	eResources addresses	Adresy na platformie eNauczanie: '24/'25 Podstawy mikrobiologi przemysłowej - Moodle ID: 42108 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=42108
Example issues/ example questions/ tasks being completed	1. Propose screening of microorganisms with biotechnological potential from environmental samples. 2. Is it worth improving the production properties of microorganisms of industrial importance? 3. Compare the use of continuous and stationary culture in industry. 4. What methods do you know of identifying organisms in consortia? 5. The importance of biofilm.	
Work placement	Not applicable	

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