GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Microplastics – Formation, Detection and Environmental Impact, PG_00069719		
Field of study	Nanotechnology		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2027/2028
Education level	first-cycle studies	Subject group	Optional subject group 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	4	Language of instruction	Polish
Semester of study	7	ECTS credits	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of New Functional Materials For Energy Conversion -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Beata Bochentyn	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	10.0	0.0	0.0	5.0	0.0	15

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	15	1.0	9.0	25

Subject objectives

The course aims to familiarize students with the processes of microplastic formation and emission sources, as well as their dispersal in the environment. The course presents methods for identifying and labeling these particles using modern analytical techniques. Participants also learn how to assess the impact of microplastics on ecosystems and human health, and how to reduce this pollution.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] has knowledge of materials science and understands its key role in the progress of civilization	Knowledge of the properties and degradation of plastics and the mechanisms of microplastic formation allows for an understanding of the role of polymeric materials in the environment and their impact on civilizational development. They can connect issues related to the design, use, and recycling of materials with the need to reduce pollution and implement sustainable technologies. This allows them to understand how knowledge about materials supports innovation and shapes pro-ecological initiatives.	[SW1] Assessment of factual knowledge
[K6_U06] can accurately present technological and scientific problems, related to the production and application of nanostructures, to specialists in related fields, and initiate and coordinate interdisciplinary cooperation.	He has the ability to clearly and substantively present issues related to the formation, identification, and impact of microplastics to specialists in related fields, such as environmental chemistry, materials science, and toxicology. He can initiate discussions on the technological and research aspects of reducing microplastic emissions and coordinate interdisciplinary collaboration to develop effective methods for monitoring and reducing this pollution.	[SU3] Assessment of ability to use knowledge gained from the subject

<table>
<tr><td>Subject contents</td><td>LECTURE

• Characterization of microplastics definitions, primary and secondary sources, and plastic degradation processes.
• Environmental distribution transport in water, soil, and the atmosphere, as well as accumulation mechanisms.
• Research and analysis methods sampling, identification and quantification techniques (microscopy, spectroscopy, thermal analysis).
• Impact on ecosystems and human health bioaccumulation, toxicity, and incorporation into the food chain.
• Emission reduction and regulation circular economy strategies, material innovations, legal actions, and monitoring.

PROJECT

Group work - collecting material and presenting the results of the study on microplastics from food packaging</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>None</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project presentation</td><td>100.0%</td><td>50.0%</td></tr>
<tr><td>Final exam</td><td>50.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>M.S Bank, Microplastic in the Environment: Pattern and Process, 2021, Springer, https://library.oapen.org/bitstream/handle/20.500.12657/50951/978-3-030-78627-4.pdf?sequence=1</td></tr>
<tr><td>Supplementary literature</td><td>1. M. Ramkumar, Microplastics, Footprints On The Earth and Their Environmental Management, 2022, Springer
2. Handbook of Microplastics in the Environment, 2021, Springer
3. Mikroplastik w środowisku : jego pochodzenie, klasyfikacja, drogi migracji i wpływ na organizmy / Marek Klimasz (Politechnika Częstochowska. Wydział Infrastruktury i Środowiska), Anna Grobelak (Politechnika Częstochowska. Wydział Infrastruktury i Środowiska). Klimasz Marek, Grobelak Anna, 2022, Inżynieria środowiska i biotechnologia : wyzwania i nowe technologie : monografia. S. 151-164 | W: Inżynieria środowiska i biotechnologia : wyzwania i nowe technologie : monografia. S. 151-164
4. MIKROPLASTIK GLOBALNE ZAGROŻENIE W MIKROSKALI: MICROPLASTICS A GLOBAL THREAT ON A MICROSCALE, Zahorska, Aleksandra ; Topolewska, Anna ; Kumirska, Jolanta, Wiadomości Chemiczne, 2025-05, Vol.79 (3), p.259-271</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td></td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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