GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Pollutant Transfer Phenomenon, PG_00042395						
Field of study	Green Technologies						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2024/2025			
Education level	second-cycle studies		Subject group	Obligatory subject group in the field of study			
Mode of study	Full-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	3.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Mariusz Marć				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	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	30		5.0	40.0	75	
Subject objectives	The aim of the course is to familiarize students with the issues of environmental management and to prepare for work related to modeling the transport of pollutants in various elements of the environment. Introduction of issues related to the transport of pollutants, where the standard is tensor notation. To acquaint students with the rules of behavior for homogeneous fluids and methods of transport description.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U03] capable of formulating and solving design tasks in the field of environmental technology to recognize their non-technical aspects, including environmental, economic and legal. Applies the principles of occupational health and safety	The student is able to solve simple problems related to fluid mechanics.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
	[K7_W04] is aware of the importance of environmental protection and has a detailed knowledge of chemical and biological threats to the environment, with particular emphasis on anthropogenic factors	The student is able to solve simple environmental problems and indicate solutions.	[SW1] Assessment of factual knowledge
	[K7_U04] can be used to formulate and solve engineering tasks analytical methods, simulation and experimental, can make a critical analysis of the methods of operation and evaluate the existing technical solutions, in particular equipment, facilities, systems, processes, services in the field of environmental technology and make a preliminary economic analysis of engineering activities undertaken	Has a general knowledge of mathematical modeling of mass transport in environmental problems. Student is able to describe and visualize the phenomena of fluid flow and pollutant transport.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
	[K7_W01] a broader and deeper knowledge of certain branches of mathematics, including elements of applied mathematics and optimization methods including mathematical methods, useful to formulate and solve complex tasks in the field of environmental technologies and modern analytical methods	The student knows the basics of vector and tensor analysis, differential equations and numerical methods.	[SW1] Assessment of factual knowledge

Subject contents	Vector analysis Tensor values. Basic operations on tensors Differential operators. The state of the fluid. Principles of conservation of mass, energy and momentum. Heterogeneous systems. Methods of describing fluid movement. The phenomenological method. Phenomenological Method: Practical Versions of Equations. Phenomenological method: simplification of the underlying system of equations. Laminar and turbulent movement of fluids. An introduction to numerical calculations in the Mathematica environment Algorithms for numerical calculations: solving nonlinear equations Algorithms for numerical calculations: solving ordinary and partial differential equations.
Prerequisites and co-requisites	Basic knowledge of the atmosphere, hydrosphere and lithosphere. Typical pollutants present in the environment and their behavior in the environment. Basics of vector calculus.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>lecture: class attendance, positive assessment of the final test</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>seminar / project: completion of all exercises</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Migracja zanieczyszczeń, Jerzy M. Sawicki, Wydawnictwo PG, Gdańsk 2003

Przenoszenie masy i energii, Jerzy M. Sawicki, Wydawnictwo PG, Gdańsk 1993</td></tr>
<tr><td>Supplementary literature</td><td>Mechanics of pollutants transfer, Jerzy M. Sawicki, Wydawnictwo PG, Gdańsk 1997</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">How to solve the diffusion equation

List the methods of describing the state of the fluid, and describe one chosen one.

List numerical methods, describe one chosen one.

List the basic physical laws used in the phenomenological method.

List the methods of describing the mixture movement and describe one chosen one.

The phenomenon of diffusion - theory and practice

Solve content tasks related to the transport of pollutants in a selected environmental medium</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
</table>