



Subject card

Subject name and code	POLLUTANT TRANSFER PHENOMENON, PG_00048952						
Field of study	Green Technologies						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2022/2023		
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			English		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Hydraulic Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Wojciech Artichowicz				
	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 subject is to introduce students to the flow and transport phenomena and their mathematical 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	Student has the ability to connect the mathematical and technical aspects of the subject with the environmental aspects.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[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	The student knows the basic methods (phenomenological, structural method) and tools (differential equations: Reynolds, diffusion) of the description of the transport process. In addition, he or she knows how to solve them (the basics of numerical methods).	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[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	Student has the knowledge on the Streeter-Phelps model.	[SW1] Assessment of factual knowledge
	[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 tensor calculus and numerical methods.	[SW1] Assessment of factual knowledge

Subject contents	1. Fluid mechanics as an engineering field 2. Scalar quantities and fields 3. Vector quantities and fields 4. Tensor quantities and fields 5. Vector analysis and basics of the tensor analysis 6. Differential operators (Grad, Div, Rot), material derivative 7. Description of the heterogenous systems 8. Movement (flow) description methods 9. Phenomenological method, conservation principles 10. Phenomenological method - practical remarks 11. Phenomenological method - averaging 12. Introduction to numerical methods 13. Numerical methods (derivatives and integrals, accuracy) 14. Numerical methods (solution of differential equations) 15. Test											
Prerequisites and co-requisites	Basic mathematical analysis, geometry and physics											
Assessment methods and criteria	<table border="1" data-bbox="448 1346 1487 1451"> <thead> <tr> <th data-bbox="448 1346 794 1377">Subject passing criteria</th> <th data-bbox="794 1346 1141 1377">Passing threshold</th> <th data-bbox="1141 1346 1487 1377">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 1377 794 1411">Test</td> <td data-bbox="794 1377 1141 1411">60.0%</td> <td data-bbox="1141 1377 1487 1411">50.0%</td> </tr> <tr> <td data-bbox="448 1411 794 1451">Projects</td> <td data-bbox="794 1411 1141 1451">100.0%</td> <td data-bbox="1141 1411 1487 1451">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Test	60.0%	50.0%	Projects	100.0%	50.0%
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Recommended reading	Basic literature	Heat and Mass Transfer, second ed., Baehr, H., D., Stephan, K., 2006. Springer-Verlag, Berlin.										
	Supplementary literature	Heat and Mass Transfer, second ed., Baehr, H., D., Stephan, K., 2006. Springer-Verlag, Berlin.										
	eResources addresses	Adresy na platformie eNauczanie:										
Example issues/ example questions/ tasks being completed	Solution of the diffusion equation  Using streeter-Phelps model for determination of solved oxygen in water.											
Work placement	Not applicable											