GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00060046					
Field of study	Environmental Engineering					
Date of commencement of studies	February 2024		Academic year of realisation of subject		2023/2024	
Education level	second-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	1		Language of instruction		Polish	
Semester of study	1		ECTS credits		2.0	
Learning profile	general academic profile		Assessment form		assessment	
Conducting unit	Department Of Geotechnical And Hydraulic Engineering -> Faculty Of Civil And Environmental Engineering -> Wydziały Politechniki Gdańskiej					
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Piotr Zima			
	Teachers					

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	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	20.0	55

Subject objectives	Mastering the basics of mathematical modeling and basic numerical techniques used in sanitary engineering. Practical aspects of modeling in sanitary engineering		

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_U06	Student is able to formulate a problem in the field of mathematical description of the phenomenon and select the appropriate numerical or analytical methods to solve it on a practical level	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
	[K7_U05] can rely on scientific sources for modern methods and technologies, and propose trends in the development of methods and rules for acquiring, filtering, processing and analyzing data	The student is able to obtain information on the development of numerical methods used in sanitary engineering. He knows the practical aspect of their use.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
	K7_W01	The student formulates the problem of solving differential equations with ordinary and partial derivatives describing selected problems in the field of sanitary engineering. It describes the solution of an engineering problem using a structural algorithm. Uses basic numerical methods to solve problems. He knows how to take into account practical aspects at this stage of modeling.	[SW1] Assessment of factual knowledge
	[K7_W12] has knowledge of contemporary and useful principles on data acquisition, filtration, processing and analysis	The student is able to obtain information on the development of numerical methods used in sanitary engineering and is able to apply them in practice.	[SW1] Assessment of factual knowledge

Subject contents	LECTURESolving ordinary differential equations: initial and boundary problems. Methods of numerical solution of the initial problem: one-step methods, explicit and implicit multiple-step methods. Solving systems of ordinary differential equations. Pollutant transport equation - mathematical and practical aspects. Ways of simplification in practice. Source members - description of cleaning and self-cleaning processes. Analytical solutions in special cases. Solving differential equations with partial derivatives. Classification of equations.Formulating the problem to solve. Finite difference method, approximation of first and second order derivatives.Solving the equations of unsteady pollutant transport in one- and two-dimensional cases.Applying equations in practice.LABORATORY EXERCISESSolving ordinary differential equations describing selected issues in the field of sanitary engineering. Practical aspect of modeling - simulation of rainwater runoff in the SWMM 5 program.
Prerequisites and co-requisites	Knowledge of basic computer operation and operating system. Knowledge of subjects: Mathematics, Fundamentals of computer science and Hydraulics.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	test	60.0%	100.0%

Recommended reading	Basic literature	1. Szymkiewicz R.: Matematyczne modelowanie przepływów w rzekach i kanałach, Wyd. Naukowe PWN Warszawa 2000. 2. Szymkiewicz R.: Metody numeryczne w inżynierii wodnej. Wyd. Politechniki Gdańskiej, 2007.
	Supplementary literature	1. FortunaZ., Macukow B., Wąsowski J,: Metody numeryczne. WNT Warszawa 1982.
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Describe the Runge-Kutta methodDiscuss the basics of the finite difference methodDescribe the solution of the transport equation using the finite difference method in an implicit schemeDescribe the preparation of input data for SWMM 5
Work placement	Not applicable

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