



## Subject card

Subject name and code	Migration of Pollution, PG_00043366						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study 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	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Jerzy Sawicki				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
Additional information: films with the lecturer comments, manuscripts of lectures, lessons on-line							
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	60		5.0		45.0	110
Subject objectives	The goal of the subject is presentation the physical fundamentals and technical methods of description of ignoratio of pollutants in a human natural environment. After the presentation of the basic characteristics of the considered problem, the students get to know the methods of the suspension and dissolved matter migration description -general equations and technical procedures.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_K02] understands the need to formulate and communicate to the public information and opinions on the achievements of environmental engineering and other aspects of the sanitary industry engineer's activity; is aware of the importance and understands the non-technical aspects and effects of engineering activities; makes efforts to provide such information and opinions in a widely understandable way, presenting different points of view	Student is able to formulate the problems of pollutants migration from the social relations standpoint.	[SK5] Assessment of ability to solve problems that arise in practice
	[K6_W04] possesses elementary knowledge in the field of land mechanics, ground science, land reclamation and geotechnics; has basic knowledge about the composition of air, water and soil, environmental pollution and processes responsible for their formation and ways to reduce them, knows the principles and organization of sustainable water management	Student is able to classify the particular pollutants, according to categories applied during description of migration .	[SW1] Assessment of factual knowledge
	[K6_W06] has a structured and theoretically founded knowledge in the field of computer science, numerical methods and the possibilities of their applications for solving tasks, description of phenomena related to the flow of water in the environment, in open pipes and channels, filtration, migration of pollutants	Student is able to formulate complex (i.e. demanding computer methods) problems of pollutants migration - select equations, describe the system and its properties, formulate the initial and boundary conditions.	[SW1] Assessment of factual knowledge
	[K6_W05] knows the theoretical basis of hydromechanics and its practical models, necessary to solve technical problems in the field of environmental engineering (sanitary engineering, water melioration, water management and flood protection, pollution spread)	Student is able to solve simple (i.e. described by means of algebraic equations) problems of the pollutants migration - transfer of suspension and transfer of dissolved matter.	[SW1] Assessment of factual knowledge
[K6_K01] can think and act in a creative and enterprising way; can set priorities for the implementation of an individual or group task; understands the need for continuous training and professional responsibility for their activities and team	Student is able to work in a task-team. He understands the question of a professional responsibility.	[SK1] Assessment of group work skills [SK2] Assessment of progress of work	
Subject contents	Classification and properties of dispersed systems. Structural method. Basic equations of motion of a particle suspended in a fluid. Drag force. Practical models. Phenomenological method. Equation of dissolved matter mass conservation. Molecular and turbulent diffusion. Dispersion. Transfer of pollutants in groundwater. Equation of energy conservation. Practical models.		
Prerequisites and co-requisites	Politechnical courses of mathematics, chemistry, fluid mechanics and hydraulics.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm colloquium	60.0%	40.0%
	Written exam	60.0%	60.0%
Recommended reading	Basic literature	1) Sawicki J.M., "Migracja zanieczyszczeń", Wyd. PG. Gdańsk 2003. 2) Sawicki J.M., "Przenoszenie masy i energii", Wyd. PG, Gdańsk 1993.	
	Supplementary literature	1) James A., "Modelowanie matematyczne w oczyszczaniu ścieków i ochronie wód", Arkady, Warszawa 1986. 2) Adamski W., "Modelowanie systemów oczyszczania wód", A=PWN, Warszawa 2002.	
	eResources addresses	Adresy na platformie eNauczanie:	

Example issues/ example questions/ tasks being completed	Simplified equation of a suspended particle motion.  Equation of advection-dispersion with sources.  Migration of pollutants in groundwater.  Molecular diffusion, turbulent diffusion, dispersion - similarities and differences.
Work placement	Not applicable