



## Subject card

Subject name and code	Hydraulics I, PG_00058779						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2023/2024		
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	2	Language of instruction			Polish		
Semester of study	3	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Geotechnical and Hydraulic Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Katarzyna Weinerowska-Bords					
	Teachers	dr hab. inż. Katarzyna Weinerowska-Bords dr inż. Patrycja Mikos-Studnicka					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	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	45		6.0		50.0	101
Subject objectives	Familiarizing students with the theoretical foundations, calculation methods and practical applications of hydraulics in general terms and in relation to flows under pressure, as well as acquiring practical skills in selecting the methodology and conducting hydraulic calculations in the field of flow under pressure.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U08] can use properly selected methods and devices of hydraulics and hydrology, enabling determination of basic quantities characterizing the flow of water in open channels and rivers, pipelines and flow objects of environmental engineering	The student is able to select methods and calculate tasks related to steady flow in pressurized pipes and pipe networks, including flumes, siphons and dispensing pipes.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[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	The student understands the role of the subject in further studies of environmental engineering and in the professional work of an engineer; understands the need to constantly update his knowledge and the impact of the development of technology and calculation methods on the implementation of engineering tasks.	[SK5] Assessment of ability to solve problems that arise in practice
	[K6_U02] can work individually and in a team; knows how to estimate the time needed to complete the task ordered; is able to develop and implement a work schedule that ensures deadlines	The student is able to perform computational tasks related to the subject correctly and on time	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[K6_W14] knows and understands the methods of measuring basic quantities characteristic for fluid mechanics and hydraulics, hydrology; knows the calculation methods and IT tools necessary to analyze the results of laboratory and field work	The student knows and is able to explain the basic methods of measuring and calculating the flow pressure, discharge and velocity, and is also able to explain the impact of the simplifying assumptions made on the selection of the method of calculations.	[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)	The student knows the basic concepts of hydraulics, is able to classify flows, knows the basic equations of steady flow under pressure in a single pipe and in a network of pipes, knows the basic calculation schemes used in environmental engineering.	[SW1] Assessment of factual knowledge
Subject contents	Basic concepts and calculation schemes of hydraulics. Flow classifications and their consequences. Basic description of fluid flow - the role of balance equations, constitutive equations and equations of state; simplifications of general flow equations and their consequences. Continuity equation and Bernoulli equation. Equations of steady flow in pressurized pipes. Model of inviscid and viscous liquids. Flows through flumes, orifices, nozzles and injectors. Flows in a single pipe under pressure - calculating and drawing pressure lines and energy lines. Siphon pipelines. Pumps in the pipeline. Pipelines with lateral outflow. Pressurized pipe networks. Water hammer.		
Prerequisites and co-requisites	Basic knowledge of physics in the field of hydrostatics and fluid flow.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test - exercises (tutorials)	60.0%	50.0%
	Theory test (lectures)	60.0%	50.0%
Recommended reading	Basic literature	Weinerowska-Bords K. "Hydraulika do poćwiczenia", Wydawnictwo Politechniki Gdańskiej, Gdańsk 2023 Sawicki Jerzy M. "Mechanika przepływów", Wydawnictwo Politechniki Gdańskiej Materiały na e-kursie: Hydraulika dla IŚ sem.3 (stacj. IŚ 2023/24 ZIMA) (kurs na platformie eNauczanie PG)	
	Supplementary literature	Kubrak J., Kubrak E. "Podstawy obliczeń z mechaniki płynów w inżynierii i ochronie środowiska", Wydawnictwo SGGW Warszawa Amanowicz Ł., Schiller T. "Mechanika płynów w inżynierii środowiska", Wydawnictwo Politechniki Poznańskiej, Poznań 2022 Puzyrewski R., Sawicki J. "Podstawy mechaniki płynów i hydrauliki", Wydawnictwo Politechniki Gdańskiej	
	eResources addresses	Podstawowe <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32004">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32004</a> - course on e-learning platform: e-Nauczanie PG Adresy na platformie eNauczanie:	

<p>Example issues/ example questions/ tasks being completed</p>	<p>Exercise: for given conditions, calculate the flow rate of liquid in a pressurized pipe. Task: draw the pressure line and energy lines for the given pipe (flow under pressure). Task: determine the pressure at the highest point of the siphon. Sample theoretical questions:- explain the concept of steady flow- explain the concept of turbulent flow- provide the formula to determine the average velocity in the pipe cross-section- provide a formula showing the relationship between flow rate and average velocity in the pipeline cross-section- provide the basic assumptions used in the calculations of Venturi flume- provide methods for determining linear energy losses in a pipeline- explain the concept of hydraulically smooth pipelines- provide three methods for measuring the flow rate in a pressurized pipeline- provide applications of flumes- explain the specificity of flow through a siphon- draw the characteristics of the connection of several pumps- explain the concept of water hammer</p>
<p>Work placement</p>	<p>Not applicable</p>