GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Hydraulics I, PG_00058779		
Field of study	Environmental Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
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 inż. Patrycja Mikos-Studnicka dr hab. inż. Katarzyna Weinerowska-Bords	

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_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
[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_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	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[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_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.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools

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
Theory test (lectures)	60.0%	50.0%
Test - exercises (tutorials)	60.0%	50.0%

Recommended reading

Basic literature	Weinerowska-Bords K. "Hydraulika do poćwiczenia", Wydawnictwo Politechniki Gdańskiej, Gdańsk 2023Sawicki Jerzy M. "Mechanika przepływów", Wydawnictwo Politechniki GdańskiejMateriały 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 WarszawaAmanowicz Ł., Schiller T. "Mechanika płynów w inżynierii środowiska", Wydawnictwo Politechniki Poznańskiej, Poznań 2022Puzyrewski R., Sawicki J. "Podstawy mechaniki płynów i hydrauliki", Wydawnictwo Politechniki Gdańskiej
eResources addresses	Podstawowe https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32004 - course on e-learning platform: e-Nauczanie PG Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	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
Work placement	Not applicable

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