GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Hydraulics in transmission networks and installations, PG_00055893		
Field of study	Power Engineering, Power Engineering, Power 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	4	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. Piotr Zima	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	0.0	15.0	0.0	60

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	60	4.0	36.0	100

Subject objectives

Acquiring knowledge of the basic problems of hydrostatics, flow in pips and open channels. Practical aspects of water flow in water supply and sewage systems and gas in gas networks.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U14] can use properly selected methods and devices for hydraulics and hydrology, enabling determination of basic parameters characterizing the flow of medium in channels, pipelines and flow objects and can design installations, networks in the field of sanitary engineering	The student has knowledge of hydraulics and hydrology to determine the flow rate, water level in the channel, pressure in the pipeline and other characteristic quantities in flow objects. He can design networks and installations in the field of sanitary engineering.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K6_W15] knows and understands the basic quantities characteristic methods for thermodynamics, fluid mechanics and hydraulics, hydrology; knows the calculation methods and IT tools necessary to analyse the results of laboratory and field work	The student knows the methods of measuring water flow parameters in open channels and in pipes under steady-state conditions.	[SW1] Assessment of factual knowledge
[K6_U09] knows and applies the basic provisions of construction law, water law and environmental law; can determine the impact of construction investments on the environment	The student knows the principles of construction law, water law and environmental law in relation to industrial networks and installations. He is able to determine the impact of investments on the environment.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K6_U13] can read architectural, construction and geodesy drawings, and can use the known computer software to prepare a drawing part of technical documentation for the sanitary, energy, hydropower industry and prepare a text or presentation including a discussion of the implemented results	The student knows the principles of creating technical drawings, can use design programs in the field of sanitary, energy and hydrotechnical industry. He can prepare a presentation containing the results of hydraulic analyses..	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task

Subject contents	Hydrostatics - the basic equations. Thrust on the flat and curved wall. Buoyancy. Archimedes" principle. Equilibrium of bodies submerged. Balance of floating bodies. Hydrodynamics. Hydrodynamic size. Continuity equation for liquid flow. Bernoulli"s equation. Basic laws of hydrodynamics. The equation of conservation of mass, conservation of quantity of motion, Bernoulli"s equation for the actual liquid flow. The hydrodynamic reaction and hydrodynamic thrust. Real liquid flow. Reynolds" experiment. Friction in the laminar uniform motion. Velocity distribution in laminar motion. Velocity distribution in turbulent motion. Liquid flow in pipes under pressure. Practical calculation of pipelines. Losses on the length and the local losses. Examples of local losses determination. Liquid flow in open channels. Uniform motion. Solving problems of flow in open channels. Hydraulically most advantageous shape of the channel. Natural and complex channels. Critical motion. Nonuniform steady motion in open channels. Gradually varied flow. Swelling and depression curve. Rapidly varied flow. Hydraulic jump. The flow of fluids through openings, weirs, and culverts. Steady outflow. Weirs and culverts. Unsteady flow. Water outflow from the tank. Water hammer phenomeno. Construction and basic components of water supply and sewage networks. Parameters of pressure and flow in transmission water supply networks. Practical use of the basics of hydraulics to design water supply and sewage systems. Gas transmission networks: parameters, metering, fittings. Basics of hydraulic calculations for internal gas installations. Construction, basic operating parameters and hydraulics of the central heating installation. Rainwater management systems: reliable rain intensity, reliable roof area, design flows.
Prerequisites and co-requisites	Knowledge of physics and fluid mechanics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
project completion	100.0%	30.0%
lecture test	60.0%	40.0%
passing tutorials	60.0%	30.0%

Recommended reading

Basic literature	Kubrak E., Kubrak J.: Hydraulika techniczna. Przykłady obliczeń, SGGW, Warszawa 2004; Mitosek M., Matlak M., Kodura A.: Zbiór zadań z hydrauliki dla inżynierii i ochrony środowiska, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2008; Grabarczyk C.: Przepływy cieczy w przewodach. Metody obliczeniowe, Envirotech, Poznań 1997; Hudzicki J., Sownowski S.: Instalacje wodociągowe. Projektowanie, Wykonanie, Eksploatacja PWN, Warszawa 2011; Hudzicki J., Sownowski S.: Instalacje kanalizacyjne. Projektowanie, Wykonanie, Eksploatacja PWN, Warszawa 2011; Bąkowski K,: Sieci i instalacje gazowe. Poradnik projektowania, budowy i eksploatacji. PWN, Warszawa 2020; Osuch-Pajdzińska E., Roman, E.: Sieci i obiekty wodociągowe. Oficyna Wydaw. Politechniki Warszawskiej, Warszawa 2008; Guzik J.:Instalacje centralnego ogrzewania. Wydawnictwo KaBe, Krosno 2015.
Supplementary literature	Czetwertyński E., Utrysko B.: Hydraulika i hydromechanika, PWN, Warszawa 1968; Puzyrewski R., Sawicki J.: Podstawy mechaniki płynów i hydrauliki, PWN, Warszawa 1999.
eResources addresses	

Example issues/ example questions/ tasks being completed	1). What is the property of fluids manifested in the formation of resistance during the flow of liquids in open pipes and under pressure? 2). Discuss the problems that the designer may encounter when designing sewage and water pipes. 3). Make a design calculation of the wall of the tank filled with water. 4). Discuss the problem of hydrostatic pressure and hydrodynamic pressure. 5). Using the Bernoulli equation for a real liquid as a tool for designing open and pressurized pipes. 6). Colebrook-White formula - nomogram or equation? 7). Estimation of the demand for water and the amount of sewage discharged for municipal facilities. 8). Selection of measuring fittings, pipe diameters and determination of total pressure losses for a sample installation/water transmission network. 9). Determination of losses and pressure increases in the internal gas installation. 10). Practical use of nomograms for the selection of water and sewage and gas pipes. 11). Hydraulic calculations of central heating installations.
Work placement	Not applicable