GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fluid Mechanics and Hydraulics II, PG_00042729						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2021		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	Part-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	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	0.0	20.0	10.0	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		4.0		68.0	102
Subject objectives	Acquiring knowledge of the basic problems of hydrostatics, flow in pips and open channel flow.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W15] 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 students measure and estimate the hydraulic parameters in open channels and pipes for steady flow conditions.	[SW1] Assessment of factual knowledge
[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 knows the role of hydraulic structures and is capable to carry out basic calculation dealing with their designing The students knows the methods of calculating the flow of capacity in open irregulars channels	[SU4] Assessment of ability to use methods and tools
[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 students solve and analyze the problems of hydrostatics and hydrodynamics. The students calculate the basic hydraulic parameters and learns design methodology for: pipes, open channels and weirs. The students solve the problems for filtration in porous medium.	[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 performs the group tasks in the assumed period	[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 performs the group tasks in the assumed period. The student analyzes the information and makes decisions related to the selected engineering problems.	[SK1] Assessment of group work skills

Subject contents

AUDITORIUM EXERCISES Determination of pressure distribution and the calculation of pressure forces on the flat and curved surfaces. Application of Bernoulli"s equation to the streamline of real fluids. Calculation of the head losses for flow in pipes. Calculation of the uniform flow in open channels. Computation and applications for critical flow in open channels. Determination of the parameters of hydraulic jump. Calculation of the discharge for weirs for the various hydraulic schemes. Determination of the drawdown curve for the dyke filtration. Calculation of the inflow to a ditch and to a well.

LABORATORY EXERCISES Measurement of viscosity by means of the Höppler viscometer. Determination of the critical Reynolds number. Determination of the friction factors for flow in pipe. Calibration of the Venturi flume. Analysis of the flow for the broad-crest weir. Determination of the parameters of hydraulic jump.

Prerequisites and co-requisites

Acquiring knowledge of the basic problems of hydrostatics, flow in pips and open channel flow.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
exam	60.0%	100.0%

Recommended reading	Basic literature	Jaworska B., Szuster A., Utrysko B.: *Hydraulika i hydrologia*, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2008. 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. Sawicki M.J.: *Mechanika Przepływów,* Wydawnictwo PG, Gdańsk 2009. Szuster A.: *Zbiór zadań z hydrauliki*, WSiP, Warszawa 1978; Weinerowska K.: *Laboratorium z mechaniki płynów i hydrauliki*, skrypt PG, Gdańsk 2004.
	Supplementary literature	Czetwertyński E., Utrysko B.: *Hydraulika i hydromechanika*, PWN, Warszawa 1968; Gryboś P.: *Podstawy mechaniki płynów*, PWN, Warszawa 1989; Puzyrewski R., Sawicki J.: *Podstawy mechaniki płynów i hydrauliki*, PWN, Warszawa 1999;
	eResources addresses	Adresy na platformie eNauczanie:
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). Under what flow conditions (turbulent or laminar) we perform design calculations.7) Colebrook-White formula - nomogram or equation?8) How to design the channel shape which is hydraulically most favorable?9) how to counteract the unfavorable phenomena occurring during rushing flows in the channels.10) Overflow and orifice as a measuring device.12) How to properly design the excavation drainage?	
Work placement	Not applicable	