GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Hydropower , PG_00055978		
Field of study	Power Engineering, Power Engineering, Power Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	Optional subject group 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	6	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 -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Witold Sterpejkowicz-Wersocki	
	Teachers	dr inż. Witold Sterpejkowicz-Wersocki	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	15.0	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	49.0	100

Subject objectives	The aim of the course is to present the principles and methods of using the hydropower resources of rivers.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W11] has knowledge of known technologies and non-technical aspects to solve simple engineering tasks in the field of energy systems and devices	The student understands the principles of selecting water turbines based on head and flow, as well as the basic electrical and mechanical equipment for a hydroelectric power plant. The student explains the role and importance of hydropower in power system power regulation.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_W16] has an elementary knowledge about energy and environmental construction including building materials, their strength, construction mechanics and building physics, moisture migration in buildings, heat transfer through building partitions, has a basic knowledge of marine and inland hydrotechnical structures; has knowledge of the hydraulic and hydrological conditions of designing facilities and building structures, photogrammetry, remote sensing, hydrography, and spatial analysis.	The student has knowledge of basic hydrotechnical structures necessary for hydropower generation.	[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 and is able to apply regulations related to the technical conditions that should be met by hydrotechnical structures and their location.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
[K6_U12] can correctly choose tools (analytical or numerical) to solve engineering problems filtration processes, and data analysis; is able to use photogrammetric and remote sensing tools in engineering tasks in the field of geodetic techniques and metrology	The student is able to determine how to measure the speed and flow rate of water in a riverbed/ channel.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Course content – lecture

Water damming structures (weirs, earth dams, concrete dams). Types of water reservoirs. Sources and resources of primary energy worldwide. Potential and usable water and energy resources worldwide and in Poland. The share of hydropower in electricity production worldwide and in Poland. A historical overview of hydropower utilization. Development of hydroturbines. Types of hydropower plants (run-of-river, reservoir-storage, and pumped-storage). Selection of hydropower plant capacity. Principles of turbine selection, speed characteristics, and similarities between hydropower turbines. Ignition and reaction turbines (Pelton, Francis, Kaplan, Deriaz, propeller). Characteristics of hydropower turbines. Hydropower plant equipment: generators, speed gears, power regulators, flywheels, transformers. Situational solutions for hydropower plants. Power channels, tunnels, and pressure pipelines. Hydraulic losses at the power plant's intake, at the grates, and at the water turbine feed. Small hydropower plants. Functions of hydroelectric power plants in the power system..

Course content – project

Design of a run-of-river hydroelectric power plant with a weir. Selection of power output, turbine type, and power plant equipment.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Design	60.0%	60.0%
Written test	60.0%	40.0%

Recommended reading	Basic literature	• Balcerski i inni Budownictwo Betonowe tom XVII, Budowle Wodne Śródlądowe, Arkady, Warszawa, 1969 • Fanti i inni Budowle piętrzące, Wydawnictwo Arkady, Warszawa, 1972 • Bednarczyk, Bolt, Mackiewicz Stateczność oraz bezpieczeństwo jazów i zapór, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2009 • Depczyński, Szamowski Budowle i zbiorniki wodne, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 1999 • Steller i inni Jak zbudować elektrownię wodną? Poradnik inwestora, Instytut PAN, Bruksela/Gdańsk, 2010 • Jackowski K.: Elektrownie wodne. WNT Warszawa, 1971. • Łaski A.: Elektrownie wodne. Rozwiązania i dobór parametrów, Wydawnictwo N-T, Warszawa 1971
	Supplementary literature	Michałowski S., Plutecki J.: Energetyka wodna, Wydawnictwo Naukowo-Techniczne, Warszawa 1975
	eResources addresses	
Example issues/ example questions/ tasks being completed	Protection against excessive seepage in earth dams. What is the derivative power plant solution? Principles for selecting water turbines.	
Practical activites within the subject	Not applicable	

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