GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00037315		
Field of study	Technical Physics		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
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	1.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Zakład Maszyn Przepływowych -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marzena Banaszek	
	Teachers	dr inż. Marzena Banaszek	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	0.0	0.0	15

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	15	2.0	8.0	25

Subject objectives

The aim of the course is to familiarize students with the technological and economic aspects of water energy use, the principles of operation of hydraulic turbines and their applications in various working conditions.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W01	The student understands the civilizational importance of physics and its applications.	[SW1] Assessment of factual knowledge
K6_W02	The student has systematic knowledge of the basics of physics, including mechanics, thermodynamics, electricity and magnetism, optics, atomic and molecular physics, solid state physics, atomic nucleus and elementary particle physics.	[SW1] Assessment of factual knowledge
K6_U01	The student is able to learn independently, obtain information from literature, databases and other properly selected sources.	[SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>HYDROPOWER IN POLAND AND IN THE WORLD: Current status and prospects for the development of hydro energy. Impact of hydropower on the environment.
HYDROENERGY POTENTIAL: Poland's water resources and their use. Hydropower potential.
HYDROENERGY ASSESSMENT OF RIVER RESOURCES: Hydrological characteristics of the watercourse. Hydropower assessment of flowing water resources. Hydrograph, flow duration curve.
HYDROMETRY: Measurements and observations of hydrological phenomena. River stage measurement. Discharge measurement.
HYDRAULIC STRUCTURES -1: Hydropower weirs and dams.
HYDRAULIC STRUCTURES -2: water reservoirs, energy dissipation devices, fish ladders.
HISTORY OF THE DEVELOPMENT OF HYDROPOWER
HYDROPOWER PLANTS: energy properties, method of operating the power plant during the day, methods of concentrating the head in hydropower plants, installed power.
SMALL HYDRO POWER PLANTS: SHP, Radunia River cascade, Wierzyca River cascade.
HYDRAULIC TURBINES THEORETICAL INTRODUCTION: Energy and geometric parameters of a hydraulic turbine, Specific speed, Characteristics.
EULER'S EQUATION: Euler's equation, Construction of velocity triangles.
CONVENTIONAL HYDRAULIC TURBINES: Types and selection of hydraulic turbines, Nomogram for the selection of water turbines, Action turbines: Pelton, Turgo, cross-flow, Reaction turbines: Kaplan, Francis, Deriaz.
NON-CONVENTIONAL HYDRAULIC TURBINES: Gravity turbines: Archimedes screw, Vortex turbine, Hydrostatic turbines, Hydrokinetic turbines</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>test</td><td>50.0%</td><td>100.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1. Krzyżanowski W.: Turbiny wodne. Konstrukcja i zasady regulacji, WNT Warszawa 1971
2. Hoffman M.: Małe elektrownie wodne poradnik, Nabba Sp. z.o.o. Warszawa 1991
3. Jackowski K.: Elektrownie wodne turbozespoły i wyposażenie, WNT Warszawa 1971
4. Łaski A.: Elektrownie wodne rozwiązania i dobór parametrów, WNT Warszawa 1977
5. Michałowski S., Plutecki J.: Energetyka Wodna, WNT Warszawa 1975
6. Rup K., Taler D.: Podstawy obliczeń turbin wiatrowych i wodnych. PWN Warszawa 2021</td></tr>
<tr><td>Supplementary literature</td><td>1. Dick E.: Fundamentals of Turbomachines, Springer, New York 2015
2. Dixon S.L.: Fluid Mechanics and thermodynamics of turbomachinery, Elsevier, New York 2007
3. Laymans Guidebook: on how to develop a small hydro site
4. Lewandowski W.: Proekologiczne odnawialne źródła energii. WNT Warszawa 2012
5. Korpela S.A.: Principles of Turbomachinery, J.Wiley & Sons Inc., New York 2011
6. Marecki J.: Podstawy przemian energetycznych, WNT Warszawa 2008</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Energetyka wodna W, IOZE, sem.6, letni 23/24 (IOZE1007) - Moodle ID: 37717
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37717</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Positive and negative impact of hydropower on the environment.
2. Hydrograph and flow duration curve, as a way of assessing river water resources for the needs of hydropower.
3. Characteristics of hydroelectric power plants (energy properties of the power plant, method of operation during the day, method of concentration of damming).
4. Specific speed of water turbines and its influence on the shape of the reaction turbine rotor.
5. Euler's equation.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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