GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Steam, Gas and Hydraulic Turbines, PG_00039900		
Field of study	Mechanical Engineering, Mechanical Engineering		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
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	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Energy and Industrial Apparatus -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Krzysztof Kosowski	
	Teachers	dr inż. Wojciech Włodarski prof. dr hab. inż. Krzysztof Kosowski	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	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	24.0	75

Subject objectives

Present the principles of turbomachinery theory and design.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U07] is able to design a typical construction of a mechanical device, component or a testing station using appropriate methods and tools, adhering to the set usage criteria	Student can perform the preliminary design of the steam, gas and water turbine.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K6_W09] possesses basic knowledge within the range of thermodynamics and fluid mechanics, construction and operation of heat generating devices, process equipment, including renewable energy sources, cooling and air conditioning	Students has the basic backgrounds of thermodynamics and fluid flow mechanics.	[SW1] Assessment of factual knowledge

Subject contents

LECTURE: HYDRAULIC TURBINES: Hydropower economy in Poland and the world. Types of hydropower plants and their key parameters. Principles of operation and types of hydraulic turbines. Power profile of a turbine. Geometric parameters of turbines. Model and full-scale characteristics. Basic equation of hydraulic turbines. Assumptions of simplified turbine theory. Characteristic equation of hydraulic turbines and their application. Speed quotient. Design and design calculation of hydraulic turbines. STEAM AND GAS TURBINES: Actualizing power cycles. The Carnot cycle: cycle and heat flow diagrams. Comparison of steam, gas, and combined cycle efficiencies. The Brayton cycle. The Rankine cycle. Methods for carnotization of cycles. The steam-gas cycle. Effect of process irreversibilities on cycle efficiency. Efficiency of the power plant. Purpose of main components of steam and gas turbines. Principle of operation of a turbine stage. Course of the thermodynamic process in a turbine stage. Characteristics of turbine stages. LABORATORY: Measurements of model hydraulic turbine operating parameters. Preparation of the I propeller water turbine characteristics. Preparation of the universal characteristic of Kaplan turbine.

Prerequisites and co-requisites

Fluid Mechanics, Thermodynamics

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory experiment reports	100.0%	30.0%
	Lecture written test	60.0%	70.0%
Recommended reading	Basic literature	1. Krzyżanowski W.: Turbiny wodne. Konstrukcja i zasady regulacji. WNT. Warszawa, 1971. 2. Perycz S.: Turbiny parowe i gazowe. Maszyny przepływowe tom 10. Zakład Narodowy im. Ossolińskich Wydawnictwo Polskiej Akademii Nauk. Wrocław 1992. 3. Kosowski K. at al, Steam and Gas turbines, Alstom	
	Supplementary literature	No requirements	
	eResources addresses	Adresy na platformie eNauczanie: Turbiny parowe, gazowe i wodne, L, Mechanika i budowa maszyn, sem. 6, letni 22/23 - Moodle ID: 29729 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29729	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		