GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Unconventional Devices and Energy Conversion Systems, PG_00042215		
Field of study	Power Engineering, Power Engineering, Power Engineering, Power Engineering, Power Engineering		
Date of commencement of studies	October 2020	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	4	Language of instruction	Polish
Semester of study	7	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Energy and Industrial Apparatus -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Bartosz Dawidowicz	
	Teachers	dr inż. Bartosz Dawidowicz	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	8.0	0.0	0.0	23

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	23	3.0	24.0	50

Subject objectives

Presentation of the physical background of the procesess occuring in the selected thermal power appliances and devices as well as technical problems arising during operation of the energy conversion systems. Analysis of the efficiency/effectiveness of the selected polygeneration systems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W10	The student has theoretical knowledge of the construction and operation of unconventional energy conversion devices and energy installations. Is aware of the impact of the above-mentioned installation on the environment.	[SW1] Assessment of factual knowledge
K6_U08	The student has the ability to use tools supporting engineering design. Is able to independently carry out a project and make correct calculations and interpret the obtained results.	[SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Lecture Modern energetic appliances. Thermionic generator. Thermoelectric generator. MHD generator. Stirling engine. Heat pumps. Fuel cells. ORC systems. Micro-ORC systems. Co-generation. CHP systems with gas engines. CHP systems with Stirling engines. CHP systems with fuel cells. CHP systems with gas turbines. Trigeneration. CHP systems with gas engines and heat pumps. Laboratory 1. Characteristics of system of the thermo-couple set 2. Characteristics of Peltier elment 3. Energy balance of high-efficient electrolyser 4. Characteristics of the micro-power system: photovoltaic cell-electrolyser-fuel cell 5. Steady-state characteristics of the power supply system based on fuel cells

Prerequisites and co-requisites

fundamentals of physics, chemistry, thermodynamics and fluid mechanics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Test	56.0%	50.0%
Laboratory	56.0%	50.0%

Recommended reading	Basic literature	1. Cieśliński J.T.: Niekonwencjonalne urządzenia i układy energetyczne. Przykłady obliczeń. Wydawn. PG, 1997. 2. Mikielewicz J., Cieśliński J.T.: Niekonwencjonalne urządzenia i systemy konwersji energii. Maszyny Przepływowe pod red. E.S. Burki. Tom 24. IMP PAN, Ossolineum Wrocław 1999. 3. Nowe kierunki wytwarzania i wykorzystania energii. Praca pod red. W. Wójcika. Lubelskie Towarzystwo Naukowe, Lublin 20054. Chmielniak T.: Technologie energetyczne. WNT Warszawa, 2008
	Supplementary literature	No requirements
	eResources addresses	Adresy na platformie eNauczanie: Niekonwencjonalne Urządzenia i Systemy Konwersji Energii, W/L, En, I st., sem. 7, zimowy 23/24 (PG_00042215) - Moodle ID: 33994 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=33994
Example issues/ example questions/ tasks being completed	1. Principle of operation of the thermionic generator 2. Peltier and Seebeck effects 3. Principle of operation of the MHD generator 4. Principle of operation of the PEMFC 5. Scheme of the selected polygeneration system	
Work placement	Not applicable	