



## Subject card

Subject name and code	Energy conversion laboratory II, PG_00037310						
Field of study	Technical Physics						
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	5	ECTS credits			1.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Instytut Fizyki i Informatyki Stosowanej -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Piotr Grygiel					
	Teachers	dr inż. Piotr Grygiel					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	15.0	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	1. Application of knowledge in the field of thermodynamics, quantum physics, gas physics, heat transport and the theory of electric circuits.  2. Ability to plan and measure physical quantities.  3. Ability to develop and present the results of research in writing.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W08	Possesses the knowledge of planning and conducting a physical experiment in the field of renewable energy sources and the critical analysis of its results.			[SW1] Assessment of factual knowledge		
	K6_U04	Can plan and conduct experiments in the field of research of various energy conversion systems, critically analyze their results, draw conclusions and formulate opinions. Has experience in laboratory work			[SU3] Assessment of ability to use knowledge gained from the subject		
	K6_W12	Knows the basic principles of occupational health and safety while testing various energy conversion systems			[SW1] Assessment of factual knowledge		
	K6_W07	Possesses the basic knowledge of the construction and operation of physical instruments, measurement and research equipment used for testing various energy conversion systems.			[SW1] Assessment of factual knowledge		

Subject contents	Set of experiments: 1. Investigation of a solar battery. 2. Investigation of the emission capacity of bodies with different surfaces as a function of temperature. 3. Investigation of a semiconductor thermogenerator. 4. Investigation of thermoelectric phenomena in metals. 5. Investigation of a solar collector. 6. Comparative studies of absorbers of solar collectors. 7. Heat pump test. 8. Investigation of the solar collector - heat pump assembly. 9. Investigation of fuel cell systems with proton membranes (2 exercises). 10. Examination of the Stirling engine. 11. Investigation of ideal gas transformations. 12. Investigation of a heat pump with Peltier elements. 13. Determination of the value of the thermal insulation coefficient of various materials.		
Prerequisites and co-requisites	1. Advanced knowledge of thermodynamics, quantum physics, gas physics, heat transport and electric circuit theory. 2. Advanced knowledge of methods of analysis of experimental data and calculus of uncertainties.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Acceptance of reports from each exercise according to the schedule	100.0%	50.0%
	Passing the theoretical admission to each exercise according to the schedule	50.0%	50.0%
Recommended reading	Basic literature		1. D. Halliday, R. Resnick, J. Walker, " Fundamentals of Physics", Extended, 10th Edition, Wiley, 2013.  2. J. Larminie i A.Dicks „Fuel cell systems explained"", John Wiley & Sons Ltd., Chichester, 2003.
	Supplementary literature		1. R. Eisberg, R. Resnick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles, John Wiley & Sons Inc, 1985.  2. A. Szlek, M. Wróbel, "Renewable Energy Sources: Engineering, Technology, Innovation", Springer Nature Switzerland AG, 2020
	eResources addresses		Adresy na platformie eNauczenie:
Example issues/ example questions/ tasks being completed	According to the exercise list.		
Work placement	Not applicable		