



Subject card

Subject name and code	, PG_00065427						
Field of study	Mechanical Engineering						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Systemów i Urządzeń Energetyki Ciepłej -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Paweł Ziółkowski				
	Teachers		dr inż. Paweł Ziółkowski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	15.0	0.0	0.0	25
	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	25		10.0		40.0	75
Subject objectives	The aim of the course is for the student to become familiar with experimental methods for the conversion of electromagnetic energy into heat with particular reference to the application to solar collectors, germicidal chambers and dedicated material cuvettes.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_W09] possesses profound knowledge on the directions of development of construction of machines, devices, calculating methods and systems aiding the design, materials and their properties, manufacturing methods and diagnostics, control-measurement equipment	The student has in-depth knowledge of the directions of development of the design of machines and devices, especially in terms of devices emitting electromagnetic waves. The student has in-depth knowledge of diagnostic methods and of control and measurement apparatus including laser power meters, thermal imaging camera and thermocouples.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
	[K7_U71] is able to apply knowledge from humanistic, social, economic or legal sciences in order to solve problems	The student is able to apply knowledge from the social sciences by cooperating in a multicultural team with employees of a non-Polish nationality. The student is able to apply knowledge of economic sciences by quantifying the ratio of effects obtained to the cost of nanoparticles.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
	[K7_W08] possesses widened knowledge within the range of design methods of hydraulic systems, heating and fluid-flow machines and transport devices	The student has an extended knowledge of design methods for hydraulic systems, thermal-fluid devices in particular germicidal chambers and thermal energy transfer and storage systems.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K7_K03] understands the importance of the necessity of solving dilemmas connected with practicing a profession and providing safe working conditions in manufacturing processes and in operation of machines and devices	The student understands the importance of the need for safe working conditions in the manufacturing processes and operation of machinery and equipment, especially in the laboratory where Class IV lasers are located.	[SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work [SK1] Assessment of group work skills	
Subject contents	The design and measurement of thermal-fluid devices, in particular germicidal chambers and thermal energy transfer and storage systems, are discussed. In addition, dedicated energy conversion measurements using a thermal imaging camera, thermocouples and a laser power meter are conducted.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Participation in classes	90.0%	50.0%
	Presentation of results	60.0%	50.0%
Recommended reading	Basic literature	CRAIG F. BOHREN and DONALD R. HUFFMAN, Absorption and Scattering of Light by Small Particles. Wiley Professional Paperback Edition Published 1998. Published simultaneously in Canada.  SHARON E. BLACK: LASER ABLATION: EFFECTS AND APPLICATIONS. Nova Science Publishers, Inc. New York 2011	
	Supplementary literature	H.C. van de Hulst: Light Scattering by Small Particles. Dover Publications, 1981	
	eResources addresses	Adresy na platformie eNauzanie:	
Example issues/ example questions/ tasks being completed	<p>Presentation of measurement methods using a thermal imaging camera, thermocouples, laser power meter.</p> <p>Discussion of measurement results and phenomena influencing the values obtained.</p> <p>Carrying out measurements and elaboration of results.</p>		

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