



## Subject card

Subject name and code	, PG_00065428						
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 Due to the implementation of the internship and the presentation at the conference, part of the course is in English		
Semester of study	2	ECTS credits			6.0		
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	15.0	0.0	30.0	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	20.0		85.0		150
Subject objectives	The aim of the course is an introduction to the analysis of biological materials using lasers. An equivalent aim of the course is to analyse the interaction of nanoparticles with biological material and lasers, as well as an internship in a foreign laboratory producing nanoparticles						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U02] is able to communicate in English in professional matters within the area of technical science and, particularly, of construction and operation of machines	The student is able to communicate in English in professional matters in the field of technical sciences with particular emphasis on the construction and operation of machines including lasers, exchangers - chambers/ research cuvettes. He/she is able to refer to the construction of a laser bench using gold nanoparticles and irradiation of biological materials.	[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task
	[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 of economic sciences to plan the implementation of a budget for an overseas conference and research internship.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
	[K7_W71] has general knowledge in humanistic, social, economic or legal sciences, including their fundamentals and applications	The student has general knowledge in the humanities or social sciences especially in terms of the working culture in other CINT-type units in Los Alamos. He/she knows the law and can also apply it to other countries, e.g. USA.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_U04] is able to prepare and present a presentation of a solution of a construction or technological task and results of performed experiments including the analysis of the results and possible changes in Polish or in a foreign language, is able to organize and manage the work of a team, directing the tasks	The student is able to prepare and present, in Polish or foreign language, a presentation of the results of his research with an analysis of the findings and possible alternatives, especially as regards biological materials. The student is able to organise work in a team, directing the tasks in view of a scientific placement in a foreign unit.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task	
Subject contents	Analysis of physical and biological properties of biological materials. Analysis of environmental effects using lasers or lasers and gold nanoparticles on human skin material. The course content also includes an internship in a foreign laboratory producing nanoparticles.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lab class	60.0%	50.0%
	Implementation of the internship	100.0%	50.0%
Recommended reading	Basic literature	SHARON E. BLACK: LASER ABLATION: EFFECTS AND APPLICATIONS. Nova Science Publishers, Inc. New York 2011  H.C. van de Hulst: Light Scattering by Small Particles. Dover Publications, 1981	
	Supplementary 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.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	What are the properties of biological materials? How do they interact with lasers of different wavelengths? What effect do nanoparticles have on biological materials and what concentrations should be introduced into biological materials?		
Work placement	Not applicable		

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