



Subject card

Subject name and code	Thermography application in medical measurements, PG_00057879						
Field of study	Mechanical and Medical Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
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			2.0		
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 hab. inż. Michał Klugmann				
	Teachers		dr hab. inż. Michał Klugmann				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	0.0	30
	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	30	0.0		0.0		30
Subject objectives	The aim of the lecture is to acquaint students with liquid crystal thermography - one of the techniques of recording and analyzing temperature distributions, useful in medical diagnostics. Discussion of the physical foundations of this measuring technique as well as the method itself and practical aspects of its use. During laboratory exercises - familiarization with the specificity of the currently used apparatus and the method of liquid crystal calibration.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W08] He/she broad knowledge related to understand social, economic, legal, ecological and other outer techniques conditions of engineering activities in mechanical-medical engineering	Knowledge of a safe, non-invasive diagnostic technique.			[SW1] Assessment of factual knowledge		
	[K7_U05] He/she can use measurement technique and methods to assess errors of measurement. He/she can plan and conduct research (also numerical ones) and interprets obtained results and draw conclusions	Personal implementation of the task, bringing these issues closer.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		
	[K7_U09] He/she has skills to work in industrial environment and is aware of work safety rules	Knowledge of the specifics of the measurement technique and the conditions that must be ensured for obtaining reliable results in conditions comfortable for the patient.			[SU4] Assessment of ability to use methods and tools		
	[K7_W03] He/she knows methods, techniques and tools applied to solve engineering problems in the scope of the field of study of mechanical-medical engineering	Knowledge of imaging techniques in medical diagnostics, in particular: liquid crystal thermography and thermography.			[SW1] Assessment of factual knowledge		
	[K7_U04] He/she can use programming-communicative techniques concerning to the scope of engineering tasks	Ability to calibrate the tool and interpretation of the results with the use of computer software.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>Non-contact temperature measurements.</p> <p>Radiative heat exchange.</p> <p>Thermal processes in the human body.</p> <p>Basics of thermovision.</p> <p>Basics of liquid crystal thermography.</p> <p>Diagnostic methods used in the case of the most common diseases.</p> <p>Preparation of the patient and conditions required for conducting diagnostics.</p> <p>Standardization and archiving of research results.</p>											
Prerequisites and co-requisites	Knowledge of the basic mechanisms of heat transfer (1st degree study material).											
Assessment methods and criteria	<table border="1" data-bbox="448 781 1487 884"> <thead> <tr> <th data-bbox="448 781 794 815">Subject passing criteria</th> <th data-bbox="794 781 1141 815">Passing threshold</th> <th data-bbox="1141 781 1487 815">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 815 794 848">Laboratory report</td> <td data-bbox="794 815 1141 848">56.0%</td> <td data-bbox="1141 815 1487 848">20.0%</td> </tr> <tr> <td data-bbox="448 848 794 884">Written exam</td> <td data-bbox="794 848 1141 884">56.0%</td> <td data-bbox="1141 848 1487 884">80.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratory report	56.0%	20.0%	Written exam	56.0%	80.0%
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Laboratory report	56.0%	20.0%										
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Recommended reading	<table border="1" data-bbox="448 891 1487 994"> <tbody> <tr> <td data-bbox="448 891 794 925">Basic literature</td> <td colspan="2" data-bbox="794 891 1487 925">-</td> </tr> <tr> <td data-bbox="448 925 794 958">Supplementary literature</td> <td colspan="2" data-bbox="794 925 1487 958">-</td> </tr> <tr> <td data-bbox="448 958 794 994">eResources addresses</td> <td colspan="2" data-bbox="794 958 1487 994">Adresy na platformie eNauczanie:</td> </tr> </tbody> </table>			Basic literature	-		Supplementary literature	-		eResources addresses	Adresy na platformie eNauczanie:	
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Supplementary literature	-											
eResources addresses	Adresy na platformie eNauczanie:											
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Physical properties of liquid crystals. 2. Measurement methods. 3. Self-measurement. 											
Work placement	Not applicable											