GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00056106		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	6	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Andrzejczyk	
	Teachers		

Lesson types and methods of instruction							
	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	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	0.0	0.0	45

Subject objectives	Presentation of the main mechanisms and laws of heat transfer. The course introduces the methods of solving the problems of heat conduction convection, as well as radiative heat transfer. The course particular emphasis consideration of practical examples applicable in therapeutic technology and medical diagnostics.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U05] he/she is able to use analytic and modelling methods to formulate and solve engineering tasks related to the mechanical-medical area	The student knows the basic methods of solving problems related to heat flow. Including, in particular, analytical methods based on the use of correlations based on the results of experimental research. Analytical and numerical methods taking into account the corrections obtained in the course of experimental tests in the CFD calculations. The student has a basic knowledge of numerical modelling.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	[K6_W09] he/she has basic knowledge related to numerical methods and engineering software used to analyze, model and design a given mechanical system	The student can independently perform basic simplifications concerning the differential equation of the temperature field and the Navier-Stokes equation. Knows formulating boundary conditions and initial conditions for solving a given form of differential equation applicable in the analysis of heat flow	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	[K6_U08] he/she is able to assess whether proposed methods and tools can be used in practice to solve simple engineering task related to machine design, manufacturing and utilization	The student can perform calculations: - for cases of heat conduction in solids - radiative heat exchange and forced and natural convection for simple geometric cases. Thestudent should be able to perform hydraulic calculations (especially pressure resistance) and balance calculations for simple heat exchanger structures.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
	[K6_U03] he/she is able to use information-communication skills to solve typical engineering tasks related to design, production and utilization	The student can use the literature on the subject and other literature sources, in particular from e-sources available through the GUT library.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
Subject contents	Lecture: Presentation of the main mechanisms and laws of heat transfer. Methods of solving problems related to conduction, heat transfer and radiation heat transfer, with particular emphasis on practical examples found in medical therapy and diagnostics. Laboratory: Understanding the experimental and computational methods of determining heat transfer problems: determination of the heat transfer and conduction coefficient, determination of the radiative heat transfer coefficient, flow visualization using liquid crystal techniques.		
Prerequisites and co-requisites	mathematics, physics, fluid mechanics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	60.0%	70.0%
	Laboratory reports	60.0%	30.0%

Recommended reading	Basic literature	1.Mikielewicz J., Grochal B., Gumkowski S., Polesek-Karczewska S., Mikielewicz D., Wymiana ciepła, Wydawnictwo IMP PAN, 1996 2.F. Incropera, D. deWitt, Fundamentals of heat and mass transfer, 5th edition, CRC Press, 2007. 3.Wiśniewski S., Wiśniewski T., Wymiana ciepła, WNT, 2007. 4.Pudlik W., Wymiana i wymienniki ciepła, Wydawnictwo PG, Gdańsk 1996 4. R.C. Eberhart (Editor), A. Shitzer (Editor), Heat Transfer in Medicine and Biology: Analysis and Applications, ISBN-13: 978-1468482874
	Supplementary literature	1. Sid Becker (Editor), Andrey Kuznetsov (Editor), Heat Transfer and Fluid Flow in Biological Processes, ISBN-13: 978-0124080775
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Define the concept of heat conduction. Explain the influence of the vacuum barrier on the reduction of heat conduction losses. Define the concept of radiative heat transfer. Define the concept of convective heat exchange. Give non-invasive methods of determining the temperature field of a solid bodies.	
Work placement	Not applicable	