GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Heat transfer, PG_00055892		
Field of study	Power Engineering, Power Engineering, Power Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study 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	2	Language of instruction	Polish
Semester of study	4	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Energy and Industrial Apparatus -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Andrzejczyk	
	Teachers	dr hab. inż. Rafał Andrzejczyk dr inż. Stanisław Głuch dr hab. inż. Michał Klugmann dr inż. Paweł Szymański	

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	2.0	18.0	50

Subject objectives	Presentation of principal mechanisms and laws of heat transfer. Course familiarises with methods of solving problems in technical applications, conduction and heat transfer problems as well as rtadiative heat transfer. Presents foundations to sizing of heat exchangers.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W09] knows the dangers of electrical devices and the principles of protection against them, has basic knowledge of heat exchangers, has basic knowledge of power equipment such as pumps, compressors, turbines, combustion engines, boilers, pipelines and their accessories and methods of their selection depending on the needs	The student can design heat exchangers used in the energy sector (e.g. thermal power plants, internal combustion engines, systems compressor cooling and more rotating machines) or select individual elements of it devices . He can describe appropriate equations basic processes in them taking place. The student can use the thermal analogy electricity to solve practical issues in the field heat exchange.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_W15] knows and understands the basic quantities characteristic methods for thermodynamics, fluid mechanics and hydraulics, hydrology; knows the calculation methods and IT tools necessary to analyse the results of laboratory and field work	The student is able to independently carry out experimental methodology in the field of measurement of basic physical quantities necessary for the experimental determination of the heat conduction and heat transfer coefficient and heat fluxes transferred by convection, conduction and radiation. He can also use simple engineering software to support the calculation process in terms of basic parameters and measurement uncertainty analysis.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation
[K6_U04] is able to design a simple device structure and prepare the accompanying technical documentation, conduct a basic technical and economic analysis of energy systems, including technologies using renewable and pro-ecological energy sources as well as conventional and nuclear energy, design energy installations for them and their basic elements (including electric lighting)); select, operate and control the most commonly used electrical devices and drive systems.	The student can carry out technical and economic analysis for simple structures heat exchangers. Student can apply the appropriate calculation methods for solving simpe technical issues reletaed to heat transfer. The student can design heat exchangers used in the energy sector or choose individual ones components of this device. Can describe with appropriate equations basic processes in them taking place	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment

Subject contents

Lecture Presentation of major mechanisms and laws governing the flow of heat. Presentation of methods of solving of technical problems incorporating heat conduction, heat convection and radiative heat transfer. Methods of heat transfer intensification. Boiling and condensation. Basics of heat exchanger design. Laboratory classes Experimental methods and hand calculations for determination of heat flow problems: determination of coeffcient of thermal conductivity, heat transfer coefficient, surface cooling by means of jets of liquid, determination of the boiling curve, flow visualisation by means of liquid crystal techniques.

Prerequisites and co-requisites

maths I, II, III, physics, fluid mechanics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	60.0%	60.0%
Laboratory classes	60.0%	40.0%

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, Wydzwnictwo PG, Gdańsk 1996.
Supplementary literature	No requirements
eResources addresses	Adresy na platformie eNauczanie: Wymiana ciepła - Moodle ID: 44040 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=44040

Example issues/ example questions/ tasks being completed	Explain the concept of heat conduction mechanism? How does the vacuum maintained between the partitions affect the heat conduction mechanism? How does the vacuum maintained between the partitions affect the convection mechanism? Explain the concept of radiative heat transfer? Explain the concept of convection?
Work placement	Not applicable

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