GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Heat Exchange and Heat Exchangers, PG_00033008		
Field of study	Nanotechnology		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
Education level	first-cycle studies	Subject group	Optional subject group 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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Energy and Industrial Apparatus -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Janusz Cieśliński	
	Teachers	prof. dr hab. inż. Janusz Cieśliński dr hab. inż. Jan Wajs mgr inż. Piotr Jasiukiewicz dr inż. Marcin Jewartowski dr hab. inż. Michał Klugmann dr hab. inż. Zbigniew Kneba	

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	8.0	37.0	75

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

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W06	The student is able to perform the analysis for the case of heat conduction in solids and in the boundary layer. It has a basis for assessing the influence of the type of substance and its structure on thermal and thermal-flow properties that directly affect heat transport. In particular, he can connect the internal structure of a solid and a fluid with the tendency to conduct thermal energy and electricity.	[SW3] Assessment of knowledge contained in written work and projects
K6_U04	The student can plan simple experiments in the field of heat transfer.	[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 [SU5] Assessment of ability to present the results of task
K6_U01	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
K6_W02	The student can perform calculations: - for cases of heat conduction in solids - radiative heat exchange and forced and natural convection for simple geometric cases. The participant should be able to perform hydraulic calculations (especially pressure resistance) and balance calculations for simple heat exchanger structures.	[SW3] Assessment of knowledge contained in written work and projects

Subject contents

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
LAboratory reports	60.0%	20.0%
Written exam	60.0%	80.0%

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 i wymienniki ciepła - Moodle ID: 25216 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25216

Example issues/ example questions/ tasks being completed	What is conduction? How does the vacuum between the two walls reduce conduction? How does the vacuum between the two walls reduce convection? What is radiation? What is convection?
Work placement	Not applicable