GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Passive methods in heat transport, PG_00053658						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2026/2027			
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	English			
Semester of study	5		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 -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Szymański					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	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 main objectives of the course:** • To teach students the issues of passive methods of heat transfer; • To explain passive methods of heat transfer, such as heat conduction in fins and heat sinks, as well as passive heat dissipation methods in electronic devices. Additionally, will be explained the state-of-the-art methods of heat dissipation, such as heat pipes, thermosiphons, loop heat pipes, steam chambers, thermoelectric coolers, phase change materials and the operation of graphene to intensification a heat transfer.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W09	The student will acquire basic knowledge of heat transfer, in particular of passive methods of heat transfer.	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation
K6_U06	Upon completion of the course, the student will be able to select, estimate and calculate a passive heat exchanger such as a fin, heat sink, heat pipe, loop heat pipe etc.	[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
[K6_W12] possesses basic knowledge necessary to understand the ex-technical conditions of engineering activity, possesses basic knowledge on management, including quality management and running commercial enterprise, within the range of protection of intellectual property and patent law; knows general principles of creating and developing forms of individual entrepreneurship and basic HSE rules applicable to machine industry	The student has a basic knowledge necessary to understand the phenomena associated with heat transfer, in particular with its passive methods. He knows the general principles of selection and calculation of passive heat exchangers.	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
K6_U01	The student is able to acquire information from literature, databases, and other resources necessary to solve engineering tasks; can integrate information obtained and make their interpretation, and draw conclusions and present reasoned opinions	[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information

Subject contents

Course content – lecture
- Introduction importance of passive methods of heat transfer;
- Principles of HeatTransfer;
- HeatTransfer Mechanisms;
- Fins and Heat Sinks;
- Thermal Resistance Network;
- Thermal Specification of Microelectronic Packages;
- Fundamentals of Convection Heat Transfer;
- Natural Convection HeatTransfer;
- Radiation HeatTransfer;
- Advanced CoolingTechnologies (Heat Pipes, Thermosyphons, Loop Heat Pipes, Vapor Chambers, Thermoelectric Coolers, Phase-change materials, graphene);

Prerequisites and co-requisites

Basic knowledge of mathematics, thermodynamics, physics and strength of materials

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project - correct completion of the project	56.0%	50.0%
Lecture - exam	56.0%	50.0%

Recommended reading

Basic literature	• "Heat Transfer: Thermal Management of Electronics" by Younes Shabany
Supplementary literature	• "Heat Pipes, Theory, Design and Applications" by David.Reay, Peter Kew
eResources addresses	

Example issues/ example questions/ tasks being completed

The multiple case studies, exaples and solved design problems from the field of heat transfer and the passive heat exchangers

Practical activites within the subject

Not applicable

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