GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Technical application of nanofluids, PG_00025469		
Field of study	Nanotechnology		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
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	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	dr inż. Bartosz Dawidowicz prof. dr hab. inż. Janusz Cieśliński dr hab. inż. Tomasz Muszyński	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	7.0	8.0	0.0	15.0	45

E-learning hours included: 0.0

Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=22244

Additional information:
Power Point presentation. Discussion.

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	1.0	29.0	75

Subject objectives

Basic concepts of nanofluids. Methods of fabrication of nanofluids. Thermal and physical properties of nanofluids. Pecularities of heat transfer in single phase and two-phase convection.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U04	Student is able to measure basic thermal properties of nanofluids as well as convective heat transfer coefficient	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools
K6_W06	Student knows mechanisms of influence of nanoparticles on thermal, electro-magnetic and optical properties of nanofluids	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
K6_U02	Student is able to solve problems regarding application of nanofluids in cooling/heating system	[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information
K6_K05	Student knows fundamental definitions, equations and schemes that allow discussion about properties and potential applications of nanofluids	[SK4] Assessment of communication skills, including language correctness

Subject contents

Technological challenges. Heat transfer intensification. Nanofluids. Nanoscale. Nanoparticles. Nanoparticle concentration. Fabrication of nanofluids. Thermal conductivity mechanisms of improvement. Viscosity. Flow resistance. Coefficient of thermo-hydraulic enhancement. Zeta potential. Stability of nanofluids. Contact angle. Critical heat flux. Single phase convection heat transfer.

Prerequisites and co-requisites

Thermodynamics, heat transfer

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test	56.0%	30.0%
	Testy	56.0%	30.0%
	Seminar	56.0%	40.0%
Recommended reading	Basic literature	1. S.K. Das, S.U.S. Choi, W. Yu, T. Pradeep: Nanofluids. Science and technology, j. Wiley, 2008. 2. H.M. Ali: Hybrid nanofluids for convection heat transfer, Elsevier, 2020	
	Supplementary literature	1. Experimental Thermal and Fluid Science 2. Int. J. Heat Mass Transfer 3. Int. J. Heat and Fuid Flow 4Energies 5. Nanomaterials	
	eResources addresses	Adresy na platformie eNauczanie: Zastosowania techniczne nanocieczy - Moodle ID: 37729 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37729	
Example issues/ example questions/ tasks being completed	1. Methods of nanofluids fabrication - advantages and disadvantages 2. Explanation of thernal conductivity enhancement 3. Factors influencing stability of nanofluids 4. Influence of nanoparticles on boiling process		
Work placement	Not applicable		