



Subject card

Subject name and code	Technical application of nanofluids, PG_00025469						
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				
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		prof. dr hab. inż. Janusz Cieśliński dr inż. Bartosz Dawidowicz dr inż. Blanka Jakubowska				
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. Peculiarities of heat transfer in single phase and two-phase convection.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	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		
	K6_U02		Student is able to solve problems regarding application of nanofluids in cooling/heating system		[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task		
	K6_W06		Student knows mechanisms of influence of nanoparticles on thermal, electro-magnetic and optical properties of nanofluids		[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation		
	K6_U04		Student is able to measure basic thermal properties of nanofluids as well as convective heat transfer coefficient		[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task		
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
	Seminar	56.0%	40.0%
	Testy	56.0%	30.0%
	Test	56.0%	30.0%
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 Fluid Flow 4Energies 5. Nanomaterials	
	eResources addresses	Adresy na platformie eNauczenie:	
Example issues/ example questions/ tasks being completed	1. Methods of nanofluids fabrication - advantages and disadvantages 2. Explanation of thermal conductivity enhancement 3. Factors influencing stability of nanofluids 4. Influence of nanoparticles on boiling process		
Work placement	Not applicable		