



Subject card

Subject name and code	Numerical Design of Thermo-fluid Systems, PG_00039896						
Field of study	Mechanical Engineering, Mechanical Engineering						
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		dr hab. inż. Jacek Barański				
	Teachers		dr hab. inż. Jacek Barański prof. dr hab. inż. Krzysztof Tesch dr inż. Paweł Ziółkowski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	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	45		6.0		24.0	75
Subject objectives	Introducing students to the use of CFD computer software as tools for designing heat-flow devices.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U03] is able to identify, formulate and develop the documentation of a simple design or technological task, including the description of the results of this task in Polish or in a foreign language and to present the results using computer software or other aiding tools		The student is able to identify, formulate and develop documentation of a simple project task, including the description of the results of this task in Polish, and to present the results using computer programs or other supporting tools.		[SU4] Assessment of ability to use methods and tools		
	[K6_W09] possesses basic knowledge within the range of thermodynamics and fluid mechanics, construction and operation of heat generating devices, process equipment, including renewable energy sources, cooling and air conditioning		The student has a basic knowledge of thermodynamics and fluid mechanics, construction and operation of thermal energy devices.		[SW1] Assessment of factual knowledge		
	[K6_W11] possesses knowledge on design, technology and manufacturing of machine parts, metrology, and quality control; knows and understands methods of measuring and calculating basic values describing the operation of mechanical systems, knows basic calculating methods applied to analyse the results of experiments		The student knows the basic computational methods used to analyze the results of the experiment.		[SW1] Assessment of factual knowledge		

Subject contents	<p>Lecture</p> <p>To acquaint students with modern software for solving problems of heat transfer and conservation of momentum in simple thermal-flow systems. Characteristics of the computational code of numerical fluid dynamics ANSYS FLUENT. Preparing the participants of the classes to use the ANSYS FLUENT software when solving tasks. The scope of the course concerns the correct setting of boundary conditions and the basics of turbulence and heat transfer modeling. Laboratory</p> <ol style="list-style-type: none"> 1. Optimization of the shape of the "tee" type pipe connection - minimization of flow losses 2. Selection and analysis of the nozzle shape for given boundary conditions 3. Analysis of heat transfer in the fluid flow through the elbow 4. Analysis of heat exchanger operation for given boundary conditions 		
Prerequisites and co-requisites	physics, thermodynamics, fluid mechanics, heat transfer		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test	56.0%	100.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Puzyrewski R., Sawicki J.: "Podstawy mechaniki płynów i hydrauliki". 2. Fletcher C.A.: "Computational techniques for fluid dynamics". 	
	Supplementary literature	1. Bilicki Z., Cieśliński J., Kwidziński R., Mikielwicz D.: "Komputerowe metody w technice ciepłej" .	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Numerical calculations of the flow and heat transfer of the shape of the pipe connection "tee" type 2. Selection and analysis of the nozzle shape for given boundary conditions 3. Analysis of heat transfer in the fluid flow through the elbow 4. Analysis of heat exchanger operation for given boundary conditions 		
Work placement	Not applicable		