GDAŃSK UNIVERSITY OF TECHNOLOGY

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

<table>
<tr><td>Subject contents</td><td>Lecture
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
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</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>physics, thermodynamics, fluid mechanics, heat transfer</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Test</td><td>56.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>1. Puzyrewski R., Sawicki J.: "Podstawy mechaniki płynów i hydrauliki".

2. Fletcher C.A.: "Computational techniques for fluid dynamics".</td></tr><tr><td>Supplementary literature</td><td>1. Bilicki Z., Cieśliński J., Kwidziński R., Mikielewicz D.: "Komputerowe metody w technice cieplnej" .</td></tr><tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>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</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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