GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Numerical modelling of thermal-flow processes, PG_00059383		
Field of study	Mechanical Engineering		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	Optional subject group Subject group related to scientific research in the field of study
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	5.0
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	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	18.0	0.0	0.0	18.0	0.0	36

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	36	12.0	77.0	125

Subject objectives

Presentation of the basics of computer modelling of systems and applications from the area of heat technology so that the student could be able to understand and interprete the results obtained using commercial numerical codes.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U06] when solving engineering problems on design, technology and operation of machines is able to assess and classify typical methods and tools, define systemic and ex-technical aspects using modern calculating methods and design tools or modifying the current ones	student is able to theoretically and experimentally formulate mathematlical model of technical problem, is conscious of the role and apply mathematical model linearization, knows standard mathematical models, can adapt standard mathematical model to the technical problem	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K7_W09] possesses profound knowledge on the directions of development of construction of machines, devices, calculating methods and systems aiding the design, materials and their properties, manufacturing methods and diagnostics, control-measurement equipment	Students acquire knowledge about the possibilities of designing and optimizing the operation of heat-flow devices using numerical modeling.	[SW3] Assessment of knowledge contained in written work and projects
[K7_W03] possesses a profound knowledge on thermodynamic processes and their simulation, knows simulation methods and programs aiding the design and operation of power generating machines and process equipment, including renewable energy sources, air conditioning and cooling renewable energy sources, air conditioning and cooling	student is able to transform technical problem into mathematical model, applies apropriate mathematical simulation methods	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects

Subject contents

Presentation of capabilities of CFD ANSYS Fluent and NSYS CFX/ANSYS thermal/ANSYS structural commercial packages And codes for calculating thermodynamic cycles.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">mathematics I, II, III, physics, fluid mechanics, solid mechanics</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project</td><td>56.0%</td><td>40.0%</td></tr>
<tr><td>Exam</td><td>56.0%</td><td>60.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">P. Ziółkowski, Learning materials.

Also available in electronic form at the e-mail address: pawel.ziolkowski1@pg.edu.pl

J. Badur: Pięć wykładów ze współczesnej termomechaniki płynów. Gdańsk 2005 https://www.imp.gda.pl/fileadmin/doc/o2/z3/publications/2005_piecwykladow.pdf</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1.Patankar S.V. Numerical Heat Transfer and Fluid Flow, Taylor and Francis, 1980.
2.Minkowycz W. J., Sparrow E. M., Schneider G. E., Pletcher R. H., Handbook of Numerical Heat Transfer, Whiley, 1988</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">Analysis of the physical phenomenon and the possibility of analysis in the numerical code.Solving engineering problems using advanced commercial tools.

Creating a numerical model in ANSYS preprocesor-main stages

Discretization of numeric model in ANSYS preprocesor-types of mesh and their main characteristics

Ways of defining of thermal and flow conditions in ANSYS solver

Analysis of received the results of numerical simulations and their interpretation</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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