



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 2024	Academic year of realisation of subject			2024/2025		
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 inż. Paweł Ziółkowski					
	Teachers						
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 interpret the results obtained using commercial numerical codes.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[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	student is able to transform technical problem into mathematical model, applies appropriate mathematical simulation methods			[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		
	renewable energy sources, air conditioning and cooling						
	[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_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 mathematical 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			[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information			
Subject contents	Presentation of capabilities of CFD ANSYS Fluent and NSYS CFX/ANSYS thermal/ANSYS structural commercial packages And codes for calculating thermodynamic cycles.						

Prerequisites and co-requisites	mathematics I, II, III, physics, fluid mechanics, solid mechanics		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	56.0%	60.0%
	Project	56.0%	40.0%
Recommended reading	Basic literature	<p>P. Ziółkowski, Learning materials.</p> <p>Also available in electronic form at the e-mail address: pawel.ziolkowski1@pg.edu.pl</p> <p>J. Badur: Pięć wykładów ze współczesnej termomechaniki płynów. Gdańsk 2005 <a href="https://www.imp.gda.pl/fileadmin/doc/o2/z3/publications/2005_piecwykladow.pdf">https://www.imp.gda.pl/fileadmin/doc/o2/z3/publications/2005_piecwykladow.pdf</a></p>	
	Supplementary literature	<p>1.Patankar S.V. Numerical Heat Transfer and Fluid Flow, Taylor and Francis, 1980.</p> <p>2.Minkowycz W. J., Sparrow E. M., Schneider G. E., Pletcher R. H., Handbook of Numerical Heat Transfer, Wiley, 1988</p>	
	eResources addresses	Adresy na platformie eNauczenie:	
Example issues/ example questions/ tasks being completed	<p>Analysis of the physical phenomenon and the possibility of analysis in the numerical code.Solving engineering problems using advanced commercial tools.</p> <p>Creating a numerical model in ANSYS preprocessor-main stages</p> <p>Discretization of numeric model in ANSYS preprocessor-types of mesh and their main characteristics</p> <p>Ways of defining of thermal and flow conditions in ANSYS solver</p> <p>Analysis of received the results of numerical simulations and their interpretation</p>		
Work placement	Not applicable		