GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Flows in no gravity enviroment, PG_00050051		
Field of study	Space and Satellite Technologies, Space and Satellite Technologies		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study 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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	2.0
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. Krzysztof Tesch	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	0.0	0.0	30

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	30	5.0	15.0	50

Subject objectives

Knowledge of methods of numerical modeling of flow problems in cosmic-satellite technology

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_U05	The student notices, when formulating and solving engineering tasks, their systemic and non-technical aspects, is able to plan and carry out experiments, including measurements and computer simulations, critically interprets the obtained results and draws conclusions. Can lead the team's work.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K7_K03] Can analyse and implement assigned tasks while maintaining high technical standards. Is able to work and interact in a group, taking on different roles. Adheres to the principles of professional ethics and respects the diversity of views and cultures.	The student is able to analyze and implement the assigned tasks while maintaining high technical standards. Can work and interact in a group, assuming different roles in it. Observes the principles of professional ethics and respects the diversity of views and cultures.	[SK2] Assessment of progress of work
K7_U08	The student identifies and describes technical problems within the scope of the specialization, and is able to solve them by choosing the right methods and tools.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Basics of finite difference method, finite volume method and finite element method. Problem of properly defined boundary conditions and basics of turbulence modeling. Basic features of computational fluid dynamics solvers, mesh generators, convergence criteria and results analysis Students run the simulations for 3D flows by means of available CFD code. Students generate the mesh for selected geometry, select model and solver settings, run the simulations for steady and unsteady case, analyse the convergence and visualize results.

Prerequisites and co-requisites

Basic knowledge of differential equations. Basics of thermodynamics and fluid mechanics. Basics of computational fluid dynamics

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Exam</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. Fletcher C.A.J. Computational Techniques for Fluid Dynamics

2. Ferziger J.H, Peric M. Computationa Methods for Fluid Dynamics</td></tr>
<tr><td>Supplementary literature</td><td>1. Gryboś R. Podstawy mechaniki płynów, PWN Warszawa 1998

2. Puzyrewski R. Sawicki J. Podstawy mechaniki płynów i hydrauliki, PWN Warszawa 1998

3. Tesch K. Mechanika Płynów, 2014</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Turbulence modelling</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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