



Subject card

Subject name and code	Flows in no gravity environment, PG_00050051						
Field of study	Space and Satellite Technologies						
Date of commencement of studies	February 2024		Academic year of realisation of subject			2024/2025	
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_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.			[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools	
	[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_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.			[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools	
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						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
		Exam	50.0%
Recommended reading	Basic literature	1. Fletcher C.A.J. Computational Techniques for Fluid Dynamics  2. Ferziger J.H, Peric M. Computational Methods for Fluid Dynamics	
	Supplementary literature	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	
	eResources addresses	Adresy na platformie eNauczenie:	
Example issues/ example questions/ tasks being completed	Turbulence modelling		
Work placement	Not applicable		