



## Subject card

Subject name and code	Biomimetics in Fluid Mechanics with practical application using CFD, PG_00060130						
Field of study	Power Engineering, Power Engineering, Power Engineering						
Date of commencement of studies	February 2022	Academic year of realisation of subject				2022/2023	
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery				at the university	
Year of study	2	Language of instruction				English	
Semester of study	3	ECTS credits				2.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Zakład Ekoinżynierii i Silników Spalinowych -> Institute of Energy -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Jacek Kropiwnicki				
	Teachers		dr hab. inż. Jacek Kropiwnicki				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
Biomimetics in Fluid Mechanics with practical application using CFD, S-30, WIMiO, Energetyka, II st., sem. 03, stacjonarne, (PG_00060130), semestr letni 2022/2023 - Moodle ID: 30331 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30331">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=30331</a>							
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	0.0		0.0		30
Subject objectives	This lecture introduces to the biomimetic process, a systematic procedure to find solutions from nature. Aspecial focus lays on applications to fluid mechanics						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_U05] is able to integrate technical and economic analysis of the use of various energy technologies, including technologies using renewable energy sources and conventional and nuclear energy	Students are able to analyze the functional, economic and social consequences of technical solutions taken from nature, student understands the need for self-education and improvement, including in the area of new technologies and interdisciplinary applications of technology			[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
[K7_W07] knows the environmental effects of energy technologies used; is familiar with the issues of effective energy management and use of renewable energy sources, has a broad and well-established knowledge of the processes of energy production and use	Student explains the functional, economic and social limitations and conditions of the use in technology of solutions taken from nature			[SW2] Assessment of knowledge contained in presentation			
Subject contents	Nature offers a variety of solutions for technical applications. Famous examples are winglets for airplanes,riblets and the lotus effect. These are studied and explained. In parallel the students work on an own projectin a group of two using computational fluid dynamics (CFD). An introduction to finite volumes and the CFDsoftware OpenFOAM is given						

Prerequisites and co-requisites	Basic knowledge in fluid mechanics is necessary		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Conversation with the teacher	60.0%	50.0%
	Presentation	60.0%	50.0%
Recommended reading	Basic literature	<a href="https://openfoam.org/download/windows/">https://openfoam.org/download/windows/</a>  <a href="https://mech.pg.edu.pl/zaklad-mechaniki-plynow-turbin-wodnych-ipomp/materialy-dydaktyczne">https://mech.pg.edu.pl/zaklad-mechaniki-plynow-turbin-wodnych-ipomp/materialy-dydaktyczne</a>	
	Supplementary literature	<a href="https://www.sciencedirect.com/">https://www.sciencedirect.com/</a>  <a href="https://link.springer.com/">https://link.springer.com/</a>	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Explain the selected decision steps in the design process using OpenFOAM software</li> <li>2. Discuss an example of application in technology of solutions inspired by solutions used by living organisms</li> </ol>		
Work placement	Not applicable		