



Subject card

Subject name and code	CAE in design calculations, PG_00057406						
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	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			English		
Semester of study	2	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Konstrukcji Maszyn i Inżynierii Medycznej -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Grzegorz Rotta					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	30.0	0.0	45
	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	45	8.0		47.0	100	
Subject objectives	To familiarize students with the topic of data exchange between CAD programs and FEM calculation programs. Extending information on strength of the materials, including contact analysis. Introduction to software and internet part generators and catalogs.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W07] possesses profound knowledge on the diagnostics and monitoring of the condition of devices, assemblies and technical systems, as well as measurement methods of process and operation control	Student has wide knowledge of diagnostics and monitoring of the condition of equipment, facilities and technical systems as well as measurement methods for process and operation control			[SW3] Assessment of knowledge contained in written work and projects		
	[K7_W05] possesses profound knowledge on the operation of complex systems and mechanical devices, including process equipment	Student has wide knowledge of the operation of complex mechanical systems and devices, including process apparatus			[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	When solving engineering tasks in the field of design, technology and machine operation, Student is able to evaluate and classify typical methods and tools, determine system and non-technical aspects using modern calculation methods and design tools or modifying the existing ones			[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		

Subject contents	<p>LECTURE1. Transfer of 3D geometry from CAD software to MES software. Overview of the basics of FEM. Introduction to ANSYS Workbench on examples of strength issues. Division of a geometric model into finite elements. Comparison of different types of element meshes. 2. Introduction to the Design Modeler ANSYS Workbench module on examples of simple strength issues. 3. Shell modeling. 4. Modal analysis, multistep calculations, analysis of transient states. 5. Contact issues - basics. 6. Contact issues - extension. 7. The use of online generators of machine parts in CAD programs. PROJECT CLASSES: Preparation of 7 projects corresponding to the main topics of the lecture. Numerical calculations performed on 3D models made in CAD programs.</p>		
Prerequisites and co-requisites	Basic knowledge of the use of any CAD program		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Active participation in the lecture and implementation of the practice examples presented during the lecture together with the lecturer	50.0%	20.0%
	Evaluation of completed projects, (time to complete the project - 1 week, being late reduces the grade)	60.0%	80.0%
Recommended reading	Basic literature		ANSYS Users Manual. Swanson Analysis Systems, Inc., Houston USA. Zagrajek T., Krzesiński G., Marek P.: Metoda elementów skończonych w mechanice konstrukcji. Ćwiczenia z zastosowaniem systemu ANSYS. Oficyna Wydawnicza Politechniki Warszawskiej 2005. Any books, materials, websites and scientific articles on MES and CAD
	Supplementary literature		None
	eResources addresses		Adresy na platformie eNauczenie:
Example issues/ example questions/ tasks being completed	<p>1. Strength analysis of the cantilever beam. Comparison of FEM results made in CAD programs (Inventor, Solid Works, NX or other) with FEM results obtained in ANSYS. 2. Strength analysis of the cantilever beam - comparison of solid and shell modeling. 3. Cantilever beam modal analysis. 4. Analysis of transient states of the cantilever beam loaded with impulse force. 5. Contact issues in the shaft-hub connection. 6. Strength analysis of a catalog element acquired (3D geometry) from the Internet</p>		
Work placement	Not applicable		