GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	CAE in design calculations, PG_00064862		
Field of study	Mechanical Engineering		
Date of commencement of studies	February 2027	Academic year of realisation of subject	2027/2028
Education level	second-cycle studies	Subject group	Specialty 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	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Machine Design and Medical Engineering -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Grzegorz Rotta	
	Teachers		

Lesson types

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	4.0	26.0	75

Subject objectives

A course covering the fundamentals of ANSYS Workbench, a software package belonging to the FEA (Finite Element Analysis) family. The training will cover methods for creating 3D geometry of the objects under analysis, preparing the computational analysis, performing calculations, and analyzing, interpreting, and presenting the results.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U12] dvelops her/his own potential and independently plans own, lifelong learning, while also being able to guide others in this regard	He knows what he wants in the field of mechanical engineering sciences and is a lifelong learner.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W01] explains and describes, on the basis of general knowledge of the scientific disciplines forming the theoretical basis of Mechanics and Mechanical Engineering, the structure and principles of operation of mechanical systems and processes	Based on a photograph or technical drawing (or both), the person is able to identify the device, describe its operating principle, and list the names and functions of its basic components.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation
[K7_U02] formulates and solves technical problems specific to Mechanics and Mechanical Engineering using appropriate tools including CAD and MES systems, and prepares technical documentation	Using CAD and FEM software, the individual is capable of designing new solutions or modifying existing ones typical of the field of Mechanics and Machine Design. They can present the resulting design through appropriate technical drawings and documentation.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment

<table>
<tr><td>Subject contents</td><td>Course content – lecture

1. Static FE analysis in CAD software
2. Transfer of a 3D model created in CAD software to ANSYS (FEA software) and analysis; comparison of results from CAD and FEA software
3. Creating 3D geometry in ANSYS – DesignModeler module
4. 3D shell model – DesignModeler module
5. Modal analysis
6. Transient analysis
7. Analysis of contact problems
8. Concepts: geometric model symmetry and cyclicity, "stress singularity"
9. Presentation and discussion of common issues encountered during FEA analyses

Course content – project

The project entails completing six distinct, relatively simple design projects covering fundamental concepts presented in the lectures, as well as a final project of greater complexity (involving a mechanism, a ready-made 3D model from a manufacturer's catalog of simple mechanical components; involving contact phenomena, and potential stress singularities) and a student presentation of the results of final project</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of the fundamentals of mechanics and the strength of metallic materials
Proficiency in using a popular CAD program (Autodesk Inventor is preferred due to its availability on university computers, though other software is acceptable)</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Lecture - final project</td><td>55.0%</td><td>40.0%</td></tr>
<tr><td>Project classes - 6 projects with specific themes</td><td>55.0%</td><td>60.0%</td></tr>
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<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>Lecture held at the university</td></tr>
<tr><td>Supplementary literature</td><td>Any book or online sources regarding the topics presented in the lecture.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Static strength analysis of a cantilever beam with various cross-sections – solid and shell models
2. Modal analysis of a cantilever beam with various cross-sections – solid and shell models
3. Analysis of pressure exerted by a plastic component on a flat surface – contact problems
4. Analysis of a shaft-hub press fit – contact problems
5. Simple pressin/clamping/locking mechanisms – contact problems</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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