GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	CAE in design calculations, PG_00064862		
Field of study	CAE in design calculations		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Grzegorz Rotta	
	Teachers	dr inż. Grzegorz Rotta	

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

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=1839

Moodle ID: 1839 CAE in design calculations (2025-2026)
https://enauczanie.pg.edu.pl/2025/course/view.php?id=1839

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

To familiarize students with the topic of data exchange between CAD programs and FEM calculationprograms. Extending information on strength of the materials, including contact analysis. Introduction tosoftware and internet part generators and catalogs.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[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	The student knows how mechanical devices work, how individual elements/components interact with each other, how external loads work, how internal forces are distributed	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[K7_U12] dvelops her/his own potential and independently plans own, lifelong learning, while also being able to guide others in this regard	An example of combining CAD and CAE functionality shows students the possibilities of combining different knowledge groups in the field of mechanical engineering to improve their qualifications.	[SU4] Ocena umiejętności korzystania z metod i narzędzi
[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	Is able to use CAD and CAE programs at a level enabling the performance of computational analyses and final technical documentation for the purposes of a previously formulated technical problem.	[SU1] Ocena realizacji zadania [SU4] Ocena umiejętności korzystania z metod i narzędzi [SU5] Ocena umiejętności zaprezentowania wyników realizacji zadania

Subject contents

Course content – lecture
LECTURE

1. 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 graphic 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 - expanding the knowledge

7. Theuse of online generators of machine parts in CAD programs.

Course content – project
PROJECT CLASSES:

Preparation of 7 projects corresponding to the main topics of the lecture. Numerical calculations performed on 3D models made in CAD programs.

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
Evaluation of completed projects, (time to complete the project - 1 week, being late reduces the grade)	60.0%	80.0%
Active participation in the lecture and implementation of the practice examples presented during the lecture together with the lecturer	50.0%	20.0%

Recommended reading

Basic literature	ANSYS Users Manual. Swanson Analysis Systems, Inc., HoustonUSA. Zagrajek T., Krzesiński G., Marek P.: Metoda elementów skończonychw mechanice konstrukcji. Ćwiczenia z zastosowaniemsystemuANSYS. Oficyna Wydawnicza Politechniki Warszawskiej 2005 Any books, materials, websites and scientific articles on FEM and CAD
Supplementary literature	None
eResources addresses	

Example issues/ example questions/ tasks being completed	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 thecantilever 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
Practical activites within the subject	Not applicable

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