GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Engineering computer simulations, PG_00061922		
Field of study	Materials Engineering, Materials Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
Education level	first-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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Division of Magnetic Properties of Materials -> Institute of Nanotechnology and Materials Engineering -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marek Augustyniak	
	Teachers	dr inż. Marek Augustyniak	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	30.0	15.0	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	5.0	25.0	75

Subject objectives

The course aims to equip students with practical skills related to engineering simulationsmechanical, thermal, and electromagneticwhich the instructor has been using in industry for over twenty years. The selection of tools is driven by the desire to maintain their broadest possible versatility within the limited time available.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K01] Understands the need to improve professional and personal competencies; is conscious of own limitations and knows when to turn to experts, properly establishes priorities helping to accomplish tasks defined by oneself or others.	He/she understands the need to improve professional and personal competences; is aware of his/her own limitations and knows when to turn to experts, is able to properly define priorities for the implementation of tasks defined by himself/herself or others	[SK1] Assessment of group work skills
[K6_W06] Knows selected methods, techniques, tools and materials used in solving simple engineering problems within the scope of materials engineering.	Student knows selected methods, techniques, tools and materials used to solve simple engineering tasks in the field of materials engineering	[SW2] Assessment of knowledge contained in presentation
[K6_U04] Can use information and communication techniques used for the execution of typical engineering tasks, can apply learnt methods and mathematical and physical models to describe and explain chemical phenomena and processes.	The student is able to use information and communication techniques appropriate for the implementation of typical engineering tasks, is able to use the learned mathematical and physical methods and models to describe and explain chemical phenomena and processes	[SU1] Assessment of task fulfilment
[K6_W05] Has the knowledge of mechanics, technology and electrical engineering, including engineering graphics and using computer aid, the use of databases in the design of technological processes.	The student has knowledge in the field of mechanics, technology and electrical engineering, including engineering graphics and the use of computer aids, the use of databases in the design of technological processes	[SW3] Assessment of knowledge contained in written work and projects

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

Four thematic areas are planned:
- calculations of static, stationary (natural vibrations) or slowly varying (mechanics, heat transfer) problems
- simulations of highly dynamic problems (crash tests)
- fluid modeling (CFD)
- electromagnetic (low-frequency) analyses
The primary focus is on understanding and implementing the Finite Element Method, with the creation of three-dimensional models or using ready-made starting geometries (main program: ANSYS APDL version, due to its educational value and wide industrial application).

Course content – project
As part of the project, the student is tasked with selecting one of the proposed simulation programs, planning and conducting their own analysis, and simultaneously creating a so-called tutorial that can be used by others.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></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>Completing design tasks</td><td>80.0%</td><td>50.0%</td></tr>
<tr><td>Student participation intensity</td><td>80.0%</td><td>50.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Software manuals (PDF, online training courses)

The Finite Element Method Fifth edition Volume 1: The Basis, O.C. Zienkiewicz</td></tr>
<tr><td>Supplementary literature</td><td>----</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>@ Bending a panel (with an experimental element)
@ Thermomechanical modeling of a pipeline section or of a Mars base
@ Determining the mechanical characteristics of a nanotube
@ Modeling the welding process
@ Modeling and calculating the vibrations of a tuning fork or a simple yacht model
@ Crash-test
@ Acoustic calculations of a partition
@ Thermal analysis of a furnace with a chimney
@ Modeling the NDT method using electromagnetic phenomena</td></tr>
<tr><td>Practical activites within the subject</td><td>The acquired skills are directly applicable in industry.</td></tr>
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