GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Computer Modeling of Materials I, PG_00039818		
Field of study	Materials Engineering, Materials Engineering, Materials Engineering, Materials Engineering		
Date of commencement of studies	October 2020	Academic year of realisation of subject	2022/2023
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	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Solid State Physics -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Marek Augustyniak	
	Teachers	dr inż. Marek Augustyniak	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	0.0	30.0	0.0	0.0	30
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	30	3.0	17.0	50

Subject objectives

The aim of the course is to provide the Student with the ability to perform engineering analyzes using Finite Element Methods. All branches of the manufacturing industry use these methods, including production of vehicles and machinery, civil engineering, household, medicine, military ...). FEA is one of the "fast paths" leading from basic knowledge to applications, enabling the acquisition of analysts' job, and motivating the Student/Engineer to a deeper understanding of the physical basis of a given issue - whether it its nature is mechanical, thermal, electromagnetic, or flow-related.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_W05	- training of the market-related, or "engineering-related" system of co-working in small teams, with emphasis on the mutual reponsibility as to the work's deadlines and quality	[SW3] Assessment of knowledge contained in written work and projects
K6_U04	- independence in recognizing the applications of FEA and jobs for the analyst based on reports from the Internet - strengthening the critical approach with respect to the data acquired from the network - both in terms of the market news and technical/physical parameters	[SU3] Assessment of ability to use knowledge gained from the subject
K6_W06	- better assimilation of physical laws (especially mechanical and thermal constitutive models) by checking their operation in the practice of a "virtual laboratory"	[SW3] Assessment of knowledge contained in written work and projects
K6_K01	The lecturer, thanks to his own extensive experience in employing the CAE methods in industry, motivates students to improve their own competences, indicating the adequate information sources and persons who can help in further development in the field of virtual prototyping.	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	Task examples: 1. THE BOW (mechanics: composite, chord modelling, calculating the strength of the shot, correlation with the experiment) 2. THE TOWING HOOK (mechanics: weight optimization without loss of load capacity) 3. THE O-RING (non-linear mechanics: constitutive equation of a hyperelastic material, contact issues) 4. THE TUNING FORK (modal vibrations + design in CAD) 5. THE YACHT (modal vibrations, harmonic oscillations, model amendments) 6. THE EGG (unsteady heat exchange - boiling of an egg) 7. THE WELD (coupling of mechanics and heat exchange, analysis in time - testing of post-weld distortions) 8. LATTICE MATERIAL (examination of typical LM structures, then own design, with focus on mechanical and thermal properties) 9. NDT (magnetic yoke on steel plate - a question of the distribution of magnetic, static and variable fields) 10. ELECTRICAL CIRCUITS (tuning the RLC resonant circuit and optimising the heating coil)
Prerequisites and co-requisites	Willingness to obtain a job closely associated with the curriculum.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Practical and/or theoretical tests	60.0%	50.0%
Student's activity and ability during courses	60.0%	50.0%

Recommended reading

Basic literature	Scientific/technical articles associated with the engineering problems (Springer, Elsevier)Web pages of software vendors and case studies presented there.
Supplementary literature	User manuals of the applied software.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. THE BOW (mechanics: composite, chord modelling, calculating the strength of the shot, correlation with the experiment) 2. THE TOWING HOOK (mechanics: weight optimization without loss of load capacity) 3. THE O-RING (non-linear mechanics: constitutive equation of a hyperelastic material, contact issues) 4. THE TUNING FORK (modal vibrations + design in CAD) 5. THE YACHT (modal vibrations, harmonic oscillations, model amendments) 6. THE EGG (unsteady heat exchange - boiling of an egg) 7. THE WELD (coupling of mechanics and heat exchange, analysis in time - testing of post-weld distortions) 8. LATTICE MATERIAL (examination of typical LM structures, then own design, with focus on mechanical and thermal properties) 9. NDT (magnetic yoke on steel plate - a question of the distribution of magnetic, static and variable fields) 10. ELECTRICAL CIRCUITS (tuning the RLC resonant circuit and optimising the heating coil)
Work placement	Best Students are recommended to interships in the engineering offices known to the lecturer.