

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modelling in machine design, PG_00064917							
Field of study	Mechanical Engineering							
Date of commencement of studies	February 2026		Academic year of realisation of subject			2025/2026		
Education level	second-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	Part-time studies		Mode of delivery			at the university		
Year of study	1		Language of instruction			Polish		
Semester of study	1		ECTS credits			4.0		
Learning profile	general academic profile		Assessment form			exam		
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	Subject supervisor		dr inż. Leszek Dąbrowski					
of lecturer (lecturers)	Teachers	ers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM
	Number of study hours	18.0	0.0	0.0	18.0		0.0	36
	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	36		6.0		58.0		100
Subject objectives	The aim of the classes is to introduce students to work in a modern, advanced FEM calculation system (i.e. in Ansys). The learning is practical in nature: it consists of independent (but based on provided, carefully described examples) calculation of several calculation tasks, starting from simple strength tasks in the linear range, up to highly nonlinear problems in terms of material and geometry. In addition to familiarizing students with the technique of operating the calculation system, great emphasis was placed on the requirement to gather detailed knowledge about the design, technology and working conditions of the calculated machine assembly and the need to include these aspects in the calculation model (using the example of a geometric notch, a helical spring, a pre-tensioned screw connection, a thin-walled support at risk of losing stability or a polyurethane seal operating under high pressure). The subject consists of a remote, asynchronous lecture and calculation projects carried out in stationary mode, in a computer room. As part of the lecture, students must watch approximately two-hour instructional videos and repeat the computational examples presented in the videos on their home computers. In the computer lab, they receive individually formulated tasks, similar to the example in the video, which they must solve during the class to earn another credit point.							

Learning outcomes Course outcome		Subject outcome	Method of verification			
	[K7_W02] demonstrates a structured and theoretically grounded knowledge of the key topics in Mechanical Engineering enabling the analysis and modelling of mechanical systems, processes and devices	The student is able to explain the basic concepts and methods of FEM, the influence of computational decisions on their course and calculation results.	[SW1] Assessment of factual knowledge			
	[K7_W11] interprets social, economic, legal (including industrial and intellectual property laws), and other non-technical aspects of engineering activities, and includes them into engineering practice	The student knows the possibilities of using commercial and open source software in professional work.	[SW1] Assessment of factual knowledge			
	[K7_U15] evaluates the feasibility of advanced methods and tools for solving complex engineering tasks of a practical nature, characteristic of the field of study, and selects and applies appropriate methods and tools for this purpose	Analysis of the engineering task and selection of the data set, construction of a geometric and FEM model of the analyzed object, determination of the behavior of this object and selection of appropriate boundary conditions and calculation procedure.	[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment			
	[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	Skills in solving technical problems using modern tools, as exemplified by the ANSYS computational modeling and analysis environment.	[SU1] Assessment of task fulfilment			
Subject contents						
	LK1 - stress concentration calculations and evaluation of the influence of the finite element density on the calculation results					
	LK2 - geometric model of the helical spring LK3 - FEM calculations of the helical springLK4 - geometric model of the cantilever with a bolted connection LK5 - FEM calculations of the cantilever with a bolted connection LK6 - FEM calculations of the cantilever stability loss LK7 - FEM calculations of the polyurethane gasket					
	LK8 - strength calculations in free software					
Prerequisites and co-requisites						
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade			
and criteria	LK1 project	56.0%	14.0%			
	LK3 project	56.0%	14.0%			
	LK4 project	56.0%	14.0%			
	LK5 project	56.0%	14.0%			
	LK6 project	56.0%	15.0%			
	LK7 project	56.0%	15.0%			
	LK8 project	0.0%	0.0%			
	LK2 project	56.0%	14.0%			
Recommended reading	Basic literature Krzesiński G., Zagrajek T., N skończonych w mechanice r wybranych zagadnień za po Wydawnicza Politechniki Wa		., Borkowski P.: Metoda elementów ów i konstrukcji. Rozwiązywanie /stemu ANSYS. Oficyna kiej 2015, ISBN: 978-83-7814-445-8			

	Supplementary literature	Rusiński E., Czmochowski J., Smolnicki T.: Zaawansowana metoda elementów skończonych w konstrukcjach nośnych. Oficyna Wydawnicza Politechniki Wrocławskiej 2014. ISBN: 9788370854584		
	eResources addresses			
Example issues/ example questions/ tasks being completed	Stress concentration calculations and evaluation of the influence of the finite element density on the calculation results, FEM calculations of a helical spring, FEM calculations of a bracket with a bolted connection, FEM calculations of the stability loss of the bracket, FEM calculations of a polyurethane gasket, strength calculations in free software.			
Work placement	Not applicable			

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