GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00056096		
Field of study	Mechanical and Medical Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	
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	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Leszek Dąbrowski	
	Teachers	dr inż. Leszek Dąbrowski	

Lesson types and methods of instruction							
	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	0.0	0.0	45

Subject objectives	The ability of structural analysis of machine parts in terms with Finite Elements Method (FEM). Getting to know the steps and elementar methods applied in professional calculation systems and classic mechanical problems.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W09] he/she has basic knowledge related to numerical methods and engineering software used to analyze, model and design a given mechanical system	Student themself builds a geometrical model of construction in ANSYS computing system. He takes into account model parameters. They split the geometrical model of construction to finite elements: shell and solid. They define the support and the required nodal, line and surface loads. They implement selection procedures to define support and load. They analize the safety and rates the linear stiffness with usage of surface and volume elements. They use large deformation technique to estimate the load limit connected with loss of the stability of the structure. They locate and eliminate errors in program written in APDL language. They build flat and axially-symetric models themself. They apply the model of plasticity of the material. They build models of interactions of parts taking into account contact finite elements.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_U03] he/she is able to use information-communication skills to solve typical engineering tasks related to design, production and utilization	The student understands the problem presented in the drawing, compares his solution with fellow students solving a simmilar problem	[SU1] Assessment of task fulfilment
	[K6_U08] he/she is able to assess whether proposed methods and tools can be used in practice to solve simple engineering task related to machine design, manufacturing and utilization	Student uses material and construction node models	[SU1] Assessment of task fulfilment
	[K6_U05] he/she is able to use analytic and modelling methods to formulate and solve engineering tasks related to the mechanical-medical area	Student draws conclusions from the results of FEM calculations, evaluates the risk of various forms of machine part destruction based on FEM.	[SU1] Assessment of task fulfilment

Subject contents

LECTURE

Methods of describing the shape in FEM programs. Methods for the automatic distribution of a geometric model construction for shell and solid elements. The possibilities and advantages of the parametric description of a geometric model, and load support in a FEM model. The course analyzes the state of stress and linear stiffness assessment, differences in the use of linear, surface and volume elements. Models of plasticity of material and its description in FEM program. The method of load limit disclosure. The method of taking into account the impact of strain on the stiffness (taking into account large deformations). Goals and possibilities of co-modeling many of parts of the machine. Discussion of the elements of contact and procedures for the detection range of the contact. Possibility to include friction in the model of numerous parts of the machine and methods of friction results observation in the calculations. Distributed load and mass forces modeling capabilities.

LABORATORY EXERCISES

Running sample programs in ANSYS APDL computing system, describing FEM models illustrating the thesis of the lecture. Self-building of six individual computing tasks related with: solid modeling, parametric modeling, modeling study of shell stability loss, modeling with the model of a plasticity, contact model of two parts, improving the design based on the results of the calculation results in a graphical environment.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
six projects	33.0%	100.0%

Recommended reading

Basic literature	http://www.kkiem.mech.pg.gda.pl/oacm/kwpi/ - Course Website
Supplementary literature	Zagrajek T., Krzesiński G., Marek P.: Metoda elementów skończonych w mechanice konstrukcji. Ćwiczenia z zastosowaniem systemu ANSYS. Oficyna Wydawnicza Politechniki Warszawskiej 2005
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Self-building of six individual computing tasks related with: 1. solid modeling, 2. parametric modeling, 3. modeling study of shell stability loss, 4. modeling with the model of a plasticity, 5. contact model of two parts, 6. improving the design based on the results of the calculation results in a graphical environment.
Work placement	Not applicable

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