GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Strength of Materials II, PG_00040052		
Field of study	Mechanical Engineering		
Date of commencement of studies	October 2021	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	Part-time studies	Mode of delivery	blended-learning
Year of study	2	Language of instruction	Polish
Semester of study	4	ECTS credits	6.0
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 hab. inż. Mirosław Gerigk	
	Teachers	mgr inż. Grzegorz Banaszek dr hab. inż. Mirosław Gerigk	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	8.0	0.0	0.0	38
	E-learning hours included: 15.0						

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	38	5.0	107.0	150

Subject objectives	The aim of the lectures is to deliver to the students the knowledge and abilities to solve the complex problems concerning the bars, shells, 3D structures, mechanics of cracking and fatique strength, vibrations of bars and selected problems of finite element method.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U01] is able to acquire information from specialized literary sources, databases and other resources, essential for solving engineering tasks; is able to compile the obtained information pieces and to interpret them, additionally is able to form conclusions and present justified opinion	A student may consider the complex problems concerning the strength of materials as the complex tension, compresion, torsion and bending problems. A student is able to consider the complex problems of strength of materials associated with the thin-walled and thick shells.	
[K6_U06] is able to use mathematical and physical models for analysing the processes and phenomena occurring in mechanical devices within the range of material strength, thermodynamics and fluid mechanics	A student is able to solve hiper-static and non hiper-static problems of strength of the bars, beams and structures of a elsto-plastic character. A student is able to investigate the mechanical characteristics of the structures. A student is able to solve the 2-D and 3-D finite element strength of materials problems. A student is able to solve the strength of materials problems in different fields of technology.	[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
[K6_W05] possesses an organized and theoretically grounded knowledge within the range of strength analysis of basic mechanical constructions including stress and relaxation conditions, energetic methods, strength hypotheses	A student is able to consider the phenomena of the loads impact on the elsto-plastic fixed body for the complex state of strength of structure. A student is able to assess the complex state of loads and stress. A student is able to assess the complex states of loads, stress and deformation using the strength hypotheses and enery-based methods.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents

Selected problems of combined stress including the oblique bar bending, bar torsion together with bending and tension (compression), bending and tension (compression) of curved bar. Stress of thin-walled bars of the opened and closed cross section. Analysis of hiper-static and non hiper-static structures using the force method and three-momentum method. Plates and shells: bending of thin-walled plates, thin-walled shells, membrane theory of shells, bending theory of of thin-walled cylindrical shells. Cylindrical and sphere tanks. Stress of tanks under the pressure. Thick-walled cylindrical shells. Stress in shells uder the pressure. Thick-walled pipes. Stress in interference joints. Cracking and fatique stress. Vibrations of elasto-plastic structures. Finite elemnt method FEM.

Prerequisites and co-requisites

A student is able to solve the ordinary and partial differencial eguations. A student has the selected knowledge in maths: linear algebra, analitical geometry, trygonometry, differencial and integral calculus. A student has the selected knowledge in general mechanics: statics, kinetics, dynamics. A student has the knowledge in strength of materials I (3rd semester).

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
half term and final egzam	56.0%	100.0%

Recommended reading

Basic literature

1. Kaliński K.: Materiały do wykładów z przedmiotu "Wytrzymałość materiałów" sem IV. https://sites.google.com/a/mech.pg.gda.pl/krzysztof-kalinski/wytrzymalosc-materialow/semestr-iv.
2. Bąk R., Burczyński T.: Wytrzymałość materiałów z elementami ujęcia komputerowego. Warszawa: WNT 2001.
3. Dyląg Z., Jakubowicz A., Orłoś Z.: Wytrzymałość materiałów. Warszawa: WNT 1996 (t. I), 1997 (t. II).
4. Niezgodziński M.E., Niezgodziński T.: Wzory, wykresy i tablice wytrzymałościowe. Warszawa: WNT 1996.
5. Kaliński K. J.: Nadzorowanie procesów dynamicznych w układach mechanicznych. Gdańsk: Wydaw. Polit. Gdańskiej 2012.
6. Gallagher R. H.: Finite element analysisfundamentals. New Jersey: Prentice Hall 1975.
7. Banasiak M.: Ćwiczenia laboratoryjne z wytrzymałści materiałów. PWN, Warszawa 2000.

Supplementary literature

1. Misiak J.: Mechanika techniczna. Statyka i wytrzymałość materiałów. WNT, Warszawa 1996.
2. Walczyk Z.: Wytrzymałość materiałów. Gdańsk: Wydaw. Polit. Gdańskiej 2000 (Vol. I), 2001 (Vol. II).

eResources addresses

Adresy na platformie eNauczanie:

Wytrzymałość materiałów II, PG_00040052, 2022-2023 - Moodle ID: 28795
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=28795

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Example issues/ example questions/ tasks being completed	Analysis of combined stress of a bar under bending and tension (compression). Analysis of stress of a bar under oblique bending. Analysis of stres of hiper-static structures by the force method. Analysis of stress and deformations of plates under bending. Application of FEM method to solve the 2-D and 3-D structures stress problems.
Work placement	Not applicable