



Subject card

Subject name and code	Strength of Materials I, PG_00040046						
Field of study	Mechanical Engineering, Mechanical Engineering						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2021/2022		
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		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Mechanics and Mechatronics -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Mirosław Gerigk				
	Teachers		dr hab. inż. Mirosław Gerigk mgr inż. Grzegorz Banaszek				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie: Wytrzymałość materiałów I / MiBM st. niestacjonarne / Wydział Inżynierii Mechanicznej i Okrętownictwa / studia I stopnia / inżynierskie / rok II, sem. 03, zimowy 2021/2022 (PG_00040046) - Moodle ID: 19981 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19981						
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		5.0		90.0	125
Subject objectives	The aim of the course is to familiarize students with the basic issues related to the strength of materials, from the basis of material strength, simple strength cases, complex strength to energy methods in strength and the basics of the FEM method.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[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	The student has the ability to analyze basic issues related to the strength of materials in the field of theory and solving simple tasks and practical problems. This applies to the topics mentioned in the purpose of the subject and later.	[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
	[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	The student has the ability to analyze the basics of material strength, the compressive / tensile strength of a straight bar, strength analysis for statically indeterminate bar systems, torsional strength of bars, beam strength - bending, deformation of a bent beam, bar shear (shear bar), stress states, stress state and deformations, methods of determining stresses (shear forces, bending moments) and deformations for statically indeterminate bar systems, determination of elastic energy, stresses and deformations of bars and bar systems - energy methods, determination of elastic energy, stresses and deformations of beams and frames using the Maxwell method -Mohra, bar buckling, basics of the finite element method FEM. The student has the ability to model issues related to the strength of materials in the field of rigid bodies, biomechanics, mechanical systems, vibrations and basic mechanical structures. Student has an ability to do the modelling using the CFD and FEM methods.	[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[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	The student has the ability to solve basic problems related to the strength of materials, including the performance of simple engineering tasks.	
Subject contents	The lectures concern, in turn: the basis of material strength, the compressive / tensile strength of a straight bar, strength analysis for statically indeterminate bar systems, torsional strength of bars, beam strength - bending, deformation of a bent beam, bar shear (shear bar), stress states, state of stress and deformations, methods of determining stresses (shear forces, bending moments) and deformations for statically indeterminate bar systems, determination of elastic energy, stresses and deformations of bars and bar systems - energy methods, determination of elastic energy, stresses and deformations of beams and frames using the Maxwell method -Mohra, bar buckling, basics of the finite element method FEM.		
Prerequisites and co-requisites	The student should have basic information in the field of applied physics and mathematics, mathematical analysis, numerical methods, solid state mechanics, including kinetics and dynamics, technical drawing and the basics of programming.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Zaliczenie kolokwium i egzaminu	56.0%	100.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Bąk R., Burczyński T.: Wytrzymałość materiałów z elementami ujęcia komputerowego. WNT, Warszawa 2001. 2. Dyląg Z., Jakubowicz A., Orłowski Z.: Wytrzymałość materiałów. WNT, Warszawa, t. I 1996, t. II 1997. 3. Misiak J.: Mechanika techniczna. Statyka i wytrzymałość materiałów. WNT, Warszawa 1996. 4. Kaliński K. J.: Nadzorowanie procesów dynamicznych w układach mechanicznych. Gdańsk: Wydaw. PG 2012. 5. Gallagher R. H.: Finite element analysis fundamentals. New Jersey: Prentice Hall 1975. 6. Niezgodziński M.E., Niezgodziński T.: Wzory, wykresy i tablice wytrzymałościowe. Warszawa: WNT 1996. 7. Walczyk Z.: Wytrzymałość materiałów. Wyd. PG, Gdańsk t. I 2000, t. II 2001. 8. Żmuda J.: Projektowanie konstrukcji stalowych. Wydawnictwo Naukowe PWN, 2016. 	

	Supplementary literature	<p>1. Ship Construction by D. J. Eyres, Butterworth-Heinemann, 2001.</p> <p>2. Elements of Modern Ship Construction by David J. House, 2010.</p> <p>3. Ship Construction 7th Edition, by George J Bruce, Butterworth-Heinemann, May 2012.</p> <p>4. Ship Construction and Welding by Mandal, Nisith Ranjan, Springer Series on Naval Architecture, Marine Engineering, Shipbuilding and Shipping.</p>
	eResources addresses	<p>Wytrzymałość materiałów I / MiBM st. niestacjonarne / Wydział Inżynierii Mechanicznej i Okrętownictwa / studia I stopnia / inżynierskie / rok II, sem. 03, zimowy 2021/2022 (PG_00040046) - Moodle ID: 19981 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19981</p>
Example issues/ example questions/ tasks being completed	<p>1. Assembly stresses - arise as a result of correcting dimensional differences of the connected elements of the structure. Example. To install a bar of length l between two vertical walls, increase its length by D. A tensile force N appears in the cross-section of the bar, which causes assembly stresses.</p> <p>2. Example. A beam with a length of $2l$ and stiffness EI, pinned at its ends, is loaded with a uniformly distributed load q acting on length l. Formulate the equation of deflection angles and deflection axis and determine the deflection angle and deflection at point B.</p>	
Work placement	Not applicable	