



Subject card

Subject name and code	Strength of Materials II, PG_00050281						
Field of study	Mechanical Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2025/2026		
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	2	Language of instruction			English		
Semester of study	4	ECTS credits			5.0		
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. Wiktoria Wojnicz				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	15.0	0.0	0.0	60
	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	60		8.0		57.0	125
Subject objectives	The aim of the subject is to acquire knowledge to conduct engineering calculation of systems under the complex load						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_W05		A student can formulate an engineering problem for the given mechanical construction and solve this problem by applying energetic methods and failure criteria		[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	K6_U06		A student can formulate a mathematical model that considers mechanical loading and thermal influence, apply engineering tools to solve this engineering problem		[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 [SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information		
	K6_U01		A student can formulate the engineering problem for the given system subjected to the load, solve this problem and explain obtained results		[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		

## Subject contents

### **Lectures (30h, Wiktoria Wojnicz)**

Energy theorems: Clapeyrons theorem, Bettis theorem, Maxwells theorem (Maxwell-Mohrs method), Castigliano theorem, Menabreas theorem (Menabrea-Castiglianos method).

Complex loading problems.

Frames: Force method.

Unsymmetric beam bending.

Axial and flexural stresses.

Curved beams. Curved bars

Pressure vessels. Thin walled structure. Thick walled structure

Bending of circular plates loaded symmetrically with respect to the centre

### **Tutorials (15h, Grzegorz Banaszek)**

Beams and frames: Maxwells theorem (Maxwell-Mohrs method) and Castigliano theorem.

Frames: Menabrea-Castiglianos method.

Frames: Force method.

Unsymmetric beam bending.

Axial and flexural stresses.

Curved beams. Curved bars

Pressure vessels. Thin walled structure. Thick walled structure

Test 1

Test 2

Repeat Test

### **Laboratory (15h, Grzegorz Banaszek)**

Tensile static test. Compressive static test.

Impact test.

	<p>Torsion test.</p> <p>Fatigue test.</p> <p>Test</p> <p>Repeat Test</p>			
Prerequisites and co-requisites	Knowledge of the Mechanics (Theoretical Mechanics) and Strength of Materials I			
Assessment methods and criteria		Subject passing criteria	Passing threshold	Percentage of the final grade
		laboratory's test passing	56.0%	20.0%
		tutorials' tests passing	56.0%	30.0%
		lectures' test passing	56.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Hibbeler R.C. Mechanics of materials, 8th edition, Pearson Prentice Hall, USA, 2011</li> <li>2. Muvdi B.B., McNabb J.W.: Engineering Mechanics of Materials. Third edition. Springer-Verlag 1991.</li> <li>3. Da Silva, Vitor Dias: Mechanics and Strength of Materials. Springer 2006.</li> <li>4. Timoshenko S.: Strength of Materials. Part I. Elementary Theory and Problems. USA 1940.</li> <li>5. Timoshenko S.: Strength of Materials. Part II. Advanced Theory and Problems. USA 1940.</li> </ol>		
	Supplementary literature	Literature from the "Strength of Materials"		
	eResources addresses	Adresy na platformie eNauczanie:		
Example issues/ example questions/ tasks being completed	<p>1. Analysis a behaviour of the given mechanical system composed of simple beam and curved beam connected by one hinge joint.</p> <p>2. Determine equal stresses in the beam subjected to the influence of torque, bending moments, shear forces and normal forces.</p>			
Work placement	Not applicable			