

# STRENGTH OF MATERIALS

Subject code: **06.4-WILŚ- BUD- WM1- IB06**

Subject type: Obligatory

Language of instruction: English

Responsible for the subject: Person currently conducting lectures

Providing education: Department of Building Mechanics

Type of class	Number of classes per semester	Number of classes per week	Semester	Type of credit	ECTS points	
<b>Full time studies</b>						
Lecture	30	2	II	exam	6	
Class	15	1		credit with a grade		
Project	15	1		credit with a grade		
<b>Part time studies</b>						
Lecture	18	2	II	exam		
Class	9	1		credit with a grade		
Project	9	1		credit with a grade		

## SUBJECT OBJECTIVE:

The objective of the course is to teach about the principles of description and analysis of the behaviour of construction materials under load, determination of internal forces and the basics of dimensioning structural elements in the elastic range.

## INITIAL REQUIREMENTS:

General Mechanics (theoretical). Mathematics.

## SUBJECT SCOPE:

### *Lecture*

Tasks in the subject "strength of materials". Internal forces in bars. Calculation and graphs of internal forces in statically determinate bar structures: single-span beams, multi-span joints, statically determinate frames and arcs. Differential equations of the rod balance. Dimensioning principles such as stretching. Internal forces in normal cross-sections and ones inclined towards the bar axis. Normal and tangent stresses. Displacement. Linear and angular distortions. Stress-strain relation in the case of soft steel, Hooke's law. Preliminary information about the design of the structure. Construction safety. Strength conditions related to the point, section, element and entire structure. Terms of use of the structure. Stress vector and strain tensor. Balance conditions on the surface. Differential equilibrium equations. The boundary problem of the linear theory of elasticity. Basics of the shield theory. Flat state of stress. Internal forces in the shield. Boundary conditions. Flat stress state - transformation of components of the stress state during the rotation of a coordinate system, stresses and main directions. Displacement vector and deformation



66% - 75%	satisfactory plus
76% - 85%	good
86% - 93%	good plus
94% - 100%	very good

Project The condition for a credit is a positive grade for all projects (2 projects)) and for written tests with points proving the student's knowledge and individual work on tasks.

Credit for the subject:

The final grade is the average of the grades:  $G = (L+C+P)/3$

### STUDENT WORK:

Interaction with the teacher	30L+30P+6C, total	66 h
Preparation for the exam		24 h
Preparation for the classes		30 h
Projects – individual work	2proj x 20h	40 h
Total	66+24+30+40	160 h
ECTS for the subject	160/30=5,33	5 ECTS.

### BASIC LITERATURE:

1. Bąk R., Burczyński T.: *Wytrzymałość materiałów z elementami ujęcia komputerowego*. WNT, Warsaw 2001  
<http://www.mes.polsl.gliwice.pl>
2. Gawęcki A.: *Mechanika materiałów i konstrukcji*. t. I-II, Wyd. PP, Poznań 1998  
[http://www.uz.zgora.pl/~mkuczma/spis\\_tresci.pdf](http://www.uz.zgora.pl/~mkuczma/spis_tresci.pdf)
3. Banasiak M., Grossman K., Trombski M.: *Zbiór zadań z wytrzymałości materiałów*. PWN, Warsaw 1998.
4. Cieślak B.: *Metodyczny zbiór zadań z wytrzymałości materiałów*. Wyd. PŚI, Gliwice 1984.
5. Jastrzębski P., Mutermilch J., Orłowski W.: *Wytrzymałość materiałów*. t. I – II. Arkady, Warsaw 1985 (wyd. 2).
6. Jakubowicz A., Orłós Z.: *Wytrzymałość materiałów*. WNT, Warszawa 1984.
7. Piechnik S.: *Wytrzymałość materiałów dla wydziałów budowlanych*. PWN, Warszawa-Kraków 1980.

### COMPLEMENTARY LITERATURE:

1. Magnucki K., Szyc W.: *Wytrzymałość materiałów w zadaniach. Pręty, płyty i powłoki obrotowe*. PWN, Warszawa 1999.
2. Walczak J.: *Wytrzymałość materiałów oraz podstawy teorii sprężystości i plastyczności*. t. I – II. PWN, Warszawa –Kraków 1977.
3. Gross D., Hauger W., Schröder J., Wall W.A.: *Technische Mechanik*, Band 1: *Statik*, Band 2: *Elastostatik*. Springer, Berlin Heidelberg New York 2006, 2007.
4. Ragab A.R., Bayoumi S.E.: *Engineering Solid Mechanics: Fundamentals and Applications*. CRC Press, Boca Raton, FL, 1998.

### SYLLABUS PREPARED BY:

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