

SYLLABUS

Name: Selected Engineering Problems - Mechanics of Materials (BudAB>SI2SEPMOM19)

Name in Polish:

Name in English: Selected Engineering Problems - Mechanics of Materials

Information on course:

Course offered by department: Faculty of Civil Engineering
Course for department: Silesian University of Technology
Term: Summer semester 2025/2026
Cordinator of course edition: Dr hab. inż. Tomasz Krykowski

Default type of course examination report:

EGZ

Language:

English

Course homepage:

<https://platforma2.polsl.pl/rb/course/view.php?id=307>

Short description:

The aim of the course is to acquire the ability to determine stress and strain states in simple and complex cases of material strength.

Description:

LECTURE: 30 hours

- 1) The principles of creating static schemes (calculation models) of building structures - review and classification of structures, construction of calculation schemes, basic assumptions and simplifications used in the mechanics of beam structures.
- 2) Basics of tensor calculus.
- 3) Basic physical models of deformable body mechanics, physical equations of models.
- 4) Stress and strain state in simple strength cases: axial tensile or compression, straight and combined bending, pure shear, torsion (circular and non-circular members), stability problems.
- 5) State of stress and strain in complex strength cases: eccentric compression or tensile - neutral line position, cross-sectional core; bending with shear.
- 6) Influence of temperature changes on stress and strain in simple problems.
- 7) Analysis of stress and strain state in multi-material (complex) members.
- 8) Analysis of the complex state of stress and strain - concepts and components of the state of stress and strain, plane state of stress and strain, main stresses, basic stress hypotheses.

EXERCISE: 3 hours

- 1) Methods and principles of rapid plotting of internal forces in simple member systems.

PROJECT : 35 hours

- 1) Cross-section design or calculation of the load capacity of members in basic strength cases: a) statically indeterminate e axial tensile or compression, b) straight bending, c) oblique bending, d) eccentric tensile or compression, e) torsion, f) stress and deformation state.

Bibliography:

- [1] Wyrwał J.: "Mechanics of materials for construction students", PWN 2022,
- [2] Bijak-Żochowski M., Jaworski A. et al.: "Mechanics of materials and structures". Volumes 1 and 2. Warsaw University of Technology Publishing House 2013,
- [3] Gawęcki A.: "Mechanics of materials and member structures", Wydawnictwo Politechniki Poznańskiej 2003,
- [4] Dylağ Z., Jakubowicz A., Orłoś Z.: "Strength of materials", Volume 1, WNT 1996,
- [5] Bodnar A.: "Strength of materials", Wydawnictwo Politechniki Krakowskiej 2004,
- [6] Pyrak S., Szulborski K.: "Mechanics of construction. Examples of calculations", Arkady 2004,
- [7] Matheja M., Piłśniak J., Bartoszek M., Szczepaniak P.: "Zbiór zadań z strength materials", Wydawnictwo Pol. Śl. 2015,
- [8] Cieślak B.: "Methodical collection of tasks from the strength of materials", Wydawnictwo Pol. Śl. 1997.

Learning outcomes:

KNOWLEDGE:

- (1) The student knows and understands the concepts of stress and deformation state of the structure - [directional effect K1A_W04].
- (2) The student understands the concept of a physical model of a material and the specifics of the linear-elastic model - [directional effect K1A_W04].
- (3) The student knows simple and complex endurance cases - [directional effect K1A_W04].

ABILITIES:

- (4) The student is able to make diagrams of internal forces for simple member systems and interpret them from the point of view of the strength of materials - [directional effect K1A_U03].
- (5) The student is able to design a bent, compressed or stretched cross-section axially or eccentrically, twisted (with axisymmetric cross-section) for the given conditions (in the range of linear-elastic work of the material and structure) - [directional effect K1A_U12].
- (6) Student can determine stress and strain tensors in an element.

Assessment methods and assessment criteria:

Prerequisites: Passing the subject Selected Engineering Problems - Mechanics

In order to transfer partial grades, the student should contact the instructor within the first month of the semester.

The syllabus is valid from the summer semester of the 2025/2026 academic year, and its content is not subject to change during the semester.

Independent completion of project classes (6 projects) and exam (6 parts) is required.

The final grade consists of: passing 30-60 points from individual parts of the exam (0-10 points task, passing from 5 points), from project

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assignments 6-24 (0-4 points project, passing from 1 point). Final classification according to the points obtained:

84 – 77 points – 5

76 – 68 points – 4.5

67 – 61 points – 4

60 – 53 points – 3.5

52 – 36 points – 3

Practical placement:

No

Information on course edition:

Default type of course examination report:

EGZ

Bibliography:

missing bibliography in English

Details of classes and study groups

lecture (30 hours)

Study groups details

missing study groups details

classes (3 hours)

Study groups details

missing study groups details

project (35 hours)

Study groups details

missing study groups details

Element of course groups in various terms:

Course group description	First term	Last term
<i>missing group description in English (BudAB-S1-2019-sem2)</i>	2020/2021-L	

Course credits in various terms:

<without a specific program>			
Type of credits	Number	First term	Last term
European Credit Transfer System (ECTS)	5	2020/2021-Z	

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Signature