

COURSE SYLLABUS

Course code	1080-BU200-ISA-0302
Course name	Strength of Materials I
Course version	2026L
Level of education	first cycle programme
Form and mode of study	full-time study
Study profile	general academic profile
Field of study	Civil Engineering
Specialisation	-
Organizational unit	The Faculty of Civil Engineering
Implementing unit	The Faculty of Civil Engineering
Course unit	n/a
Course groups	-
Course status	Obligatory
Language of the course	English
Study stage code	BU000-S2-ISA-1080
Number of ECTS credits	5

Part I**01. Learning outcomes and the method of conducting classes**

Learning outcomes	see table "Learning outcomes"
Forms of classes and the number of hours in the semester	
lectures	30,00 h
tutorials	20,00 h
project	10,00 h

02. ECTS balance

Number of ECTS credits	5
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Course workload	Hours	ECTS
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Total number of hours and ECTS credits for the course:

Hours and ECTS credits for courses involving direct participation of academic teachers	68	2,72
Hours and ECTS credits involving student's independent work	57	2,28
Total	125	5,00

Number of hours involving direct participation of academic teachers:

Hours connected with class participation	60
Other synchronous hours	8
Total	68

Number of hours involving student's independent work:

Hours for student's independent work	57
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03. Course content

Part I

Course content	1. Introduction. Basic assumptions. Types of structures, loads and deformations. External and internal forces. 2. Internal forces in trusses. 3. Shear forces and bending moments in beams. 4. Internal forces in frames. 5. Cross-sectional properties. 6. Stress analysis in members under axial loading, torsion, shear and bending. 7. Welded and bolted connections, calculation of stresses. 8. Triaxial and plane stress, principal stresses and maximum shear stresses. 9. Deflection of beams. 10. Work and energy methods, Elastic strain energy. Clapeyron's theorem, Castigliano's theorem. Virtual work. 11. Maxwell-Mohr's formula. Calculation of displacements for beams and frames. Temperature loading, support movements, assembly errors.
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Table: Learning outcomes

Knowledge	
Outcomes code	W1
Description	Has knowledge of basic physical and strength properties of structural materials, knows basic methods for solving beams, trusses, frames and statically determinate arches, has knowledge of stress, strain and displacement states of deformable bodies.
Related field-of-study learning outcomes	K1_W01, K1_W04
Skills	
Outcomes code	U1
Description	Has the ability to determine stress, strain and displacement of a linear-elastic body, can calculate and analyze stresses and displacements in simple bar systems. Can determine internal forces in statically determinate planar bar systems, calculate stresses and strains in axially loaded, bent, sheared bars and in welded and riveted joints, compute beam deflections, and solve simple statically indeterminate bars.
Related field-of-study learning outcomes	K1_U05, K1_U07
Social competence	
Outcomes code	K1
Description	Is ready to independently interpret final calculation results in design exercises. Is ready to formulate conclusions and describe the results of own work.
Related field-of-study learning outcomes	K1_K02, K1_K07

Part II**04. Year and semester of studies**

Year	2026L
Semester	2

05. Course leader and course teachers

Course leader	Marcin Gajewski
lectures	Marcin Gajewski
project	Marcin Gajewski
tutorials	Marcin Gajewski

06. Course objective

Course objective	Acquiring knowledge and skills in: Assessing the basic mechanical and strength properties of materials; Understanding the concepts of stress, strain, and displacement and the relationships between them; Determining cross-sectional forces and the stress and displacement states in elements made of linear-elastic materials – axially loaded, torsionally loaded, and bent."
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07. Teaching methods and techniques

Part II	
lectures	Presentation on the board and using a computer and projector
tutorials	Presentation on the board by the lecturer of methods for solving problems related to the issues discussed during the lectures
project	Students solve computational tasks independently with the teacher's consultation

08. Methods of verifying learning outcomes

Knowledge	
Outcomes code	W1
Description	Has knowledge of basic physical and strength properties of structural materials, knows basic methods for solving beams, trusses, frames and statically determinate arches, has knowledge of stress, strain and displacement states of deformable bodies.
Verification methods	lectures: written examination lectures: oral examination tutorials: written test
Skills	
Outcomes code	U1
Description	Has the ability to determine stress, strain and displacement of a linear-elastic body, can calculate and analyze stresses and displacements in simple bar systems. Can determine internal forces in statically determinate planar bar systems, calculate stresses and strains in axially loaded, bent, sheared bars and in welded and riveted joints, compute beam deflections, and solve simple statically indeterminate bars.
Verification methods	lectures: written examination lectures: oral examination project : project
Social competence	
Outcomes code	K1
Description	Is ready to independently interpret final calculation results in design exercises. Is ready to formulate conclusions and describe the results of own work.
Verification methods	project : project

09. Required and recommended reading list

Required reading	Silva, V. D. (2006). Mechanics and strength of materials. Springer
Recommended reading	Nash, W. A., & Potter, M. C. (2019). Schaum's Outline of Strength of Materials (7th ed.). New York, NY: McGraw Hill. Ambrose, James. Simplified Mechanics and Strength of Materials. 6th ed. New York: John Wiley & Sons, 2002.

10. Other information

Other information	
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