COURSE DESCRIPTION CARD - SYLLABUS

Course name
Strength of Materials

Course

Field of study	Year/Semester
Sustainable Building Engineering First-cycle studies	1/2
Area of study (specialization)	Profile of study
-	general academic
Level of study	Course offered in
First-cycle studies	English
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	0	0
Tutorials	Projects/seminars	
30	15	

Number of credit points
6

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Knowledge: Mathematics: algebra (including matrix calculus), mathematical analysis (including differential and integral calculus), geometry, planimetry, trigonometry. Theoretical mechanics: knowledge of the equilibrium equations and internal forces in rod elements of a structure.

Skills: Mathematics: skills of calculation of derivatives and integrals of functions, the ability to use matrix calculus. Physics: ability to apply the principles of Newton. Theoretical mechanics: the ability to use the balance equations to determine the reactions and internal forces in statically determined bar systems.

Social competences: Students can work in groups. The student follows the rules of ethics.

Course objective

Acquiring knowledge, skills and competences in solving problems of stress, deformations and displacements in structural member elements and in the field of material strength.

Course-related learning outcomes

Knowledge

The student has detailed knowledge in the field of mechanics, strength of materials and principles of general structural design, and knows the theories explaining the complex relationships between them (obtained during the lecture). The student knows at an advanced level the principles of structure theory and analysis of rod systems in the field of statics and stability (obtained during the lecture).

Skills

The student is able to make a list of loads acting on buildings and perform static analysis of statically determinate rod structures (obtained during exercises and projects).

Social competences

The student is responsible for the reliability of the results of their work and their interpretation. The student is ready to critically assess their knowledge and received content, as well as critically evaluate the results of their own work.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Evaluation of lectures

Written test (duration: 60-90 minutes) on the date specified at the beginning of the semester. The basis for passing is to obtain a sufficient minimum score (3.0).

Rating scale: very good (5.0), good plus (4.5), good (4.0), satisfactory plus (3.5), satisfactory (3.0), insufficient (2.0).

Evaluation of exercises

The classes are passed on the basis of positive grades (at least 3.0) from tests, dates given at the beginning of the semester.

Rating scale: very good (5.0), good plus (4.5), good (4.0), satisfactory plus (3.5), satisfactory (3.0), insufficient (2.0).

Project evaluation

Project classes are passed on the basis of positive grades (at least 3.0) from project tasks. Project tasks are subjected to individual defense (oral or written form).

Rating scale: very good (5.0), good plus (4.5), good (4.0), satisfactory plus (3.5), satisfactory (3.0), insufficient (2.0)

Programme content

Lectures

1. Geometrical parameters of figures
2. Normal force
3. Bending moment (bending straight)
4. Shear force
5. Principal stresses
6. Simultaneous action of normal force and bending moment

7. Skew bending
8. Eccentric action of normal force
9. Normal stresses under the foundation
10. Torsion of circular and thin-walled closed sections
11. Torsion of rods with a thin-walled open section
12. Determination of beams displacements
13. Theory of experimental research methods
14. Examination of the lectures

Exercises
1. Determination of internal forces in systems subjected to non-uniform loading
2. Determination of geometric parameters of figures
3. Analysis of axially loaded bars
4. Bending moment action.
5. Designing of cross-sections in bending, stresses in a rectangular cross-section
6. Colloquium
7. Stresses in the I-section
8. Stresses in the box section
9. Principal stresses, stress cubes
10. Equivalent stress
11. Skew bending
12. Eccentric action of normal force
13. Colloquium
14. Correction test

Projects
1. Explanation of organizational principles, discussion of subject matter, project commissioning
2. Project No. 1 - determination of internal forces
3. Projects No. 2 and 2 - determination of geometrical parameters of cross-sections. Defense of project No. 1.
4. Defense of projects no. 2 and 3
5. Project No. 4 - determination of stresses in beams
6. Project No. 4 - determination of stresses in beams - tensors and stress cubes
7. Defense of project No. 4

Teaching methods

Information lecture

Practice method

Project method

Bibliography

Basic

1. S. Timoshenko, Strength of materials, P. 1, Elementary theory and problems, Van Nostrand Reinhold Company 1970.

2. R.D. Snyder, E.F. Byars, Engineering mechanics: statics and strength of materials, McGraw Hill Book Company, cop. 1973.

Additional

1. G.M. Seed, Strength of materials: an undergraduate text, Saxe-Coburg Publications, 2000

2. B. Skalmierski, Mechanics and strength of materials, PWN-Polish Scientific Publishers ; Elsevier Scientific Publishing Company, 1979.

3. B. Turoń, G. Piątkowski, Strength of materials: internal forces in statically determinate structures - examples for beams, Politechnika Rzeszowska im. Ignacego Łukasiewicza. Oficyna Wydawnicza, 2015.

Breakdown of average student's workload

	Hours	ECTS
Total workload	160	6,0
Classes requiring direct contact with the teacher	80	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	80	3

[1] delete or add other activities as appropriate