# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Strength of Materials [S1IZarz1E>WM]

## Course

Field of study
Engineering Management

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

## Number of credit points

4,00

## Coordinators

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## Lecturers

## Prerequisites

Solving basic tasks in geometry and mathematical analysis. Ability to search for necessary information in literature, databases, catalogues. The ability to self-study. Using information and communication techniques appropriate to carry out engineering tasks.

## Course objective

Introduction to the basic principles of mechanics of deformable bodies.

## Course-related learning outcomes

Knowledge:
The student describes the conditions for the equilibrium of a rigid body [P6S_WG_14].
The student defines the classification of loads acting on an elastically deformable body and understands stresses and internal forces [P6S_WG_15].
The student recalls and describes the study of mechanical properties of materials [P6S_WG_16].
The student characterizes the processes of stretching and compression within the limits of elasticity, including the generalized Hooke's law [P6S_WG_17].
The student explains the bending of beams and the normal stresses in bent beams [P6S_WG_17].

Skills:
The student prepares and conducts laboratory tests, such as tensile tests, hardness measurements, fatigue tests, impact bending tests, and analyzes their results [P6S_UW_14].
The student applies typical methods for solving simple problems in the field of machine construction and operation, including the design of beams and solving differential equations of beam deflection lines [P6S_UW_15].
The student plans and carries out the design of structures and technologies for simple parts and subassemblies of machines, and organizes first-degree complexity production units [P6S_UW_16].

Social competences:
The student is aware of the importance of a systemic approach in creating products, considering technical, economic, marketing, legal, organizational, and financial issues [P6S_KO_02].

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture, tutorials - written test and assessment of activity in the classroom:
3 50.1% -70.00%
4 70.1% -90.0%
5 from 90.1%
Laboratory classes - ongoing control of theoretical preparation for classes, discussion of results, substantive assessment of test reports.

## Programme content

Equations of static equilibrium
Classification of loads acting on an elastically deformable body, stresses and internal forces. Internal forces in the bar.
Tests of mechanical properties of materials.
Tension and compression. Strength conditions, generalized Hooke's law.
Tension and compression within the limits of elasticity, the statically determinate and indeterminate bar systems.
Moments of inertia of flat figures.
Torsion of round bars.
Graphs of bending moments and shear forces. Bending of beams.
Normal stresses in beams.
Beam Design. Differential equation for beam deflection lines and beam deflection lines.
Strength theories.
Bars and beams subject to combined loadings. Simultaneous stretching or compression with bending, core cross-section. Bending with torsion.
Program content of laboratory classes: tensile test, hardness measurements using Brinell, Vickers, Poldi, Rockwell methods, fatigue tests, impact bending test, spring characteristics, strain gauges tests.

## Course topics

Equations of static equilibrium
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core cross-section. Bending with torsion.
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## Teaching methods

Live lecture with multimedia illustrations, tutorials with problems solved on the board, laboratories - measurements performed by students under the supervision of a teacher.

## Bibliography

Basic:
1. M. Ostwald, Podstawy wytrzymałości materiałów i konstrukcji, WPP, Poznań 2017
2. J. Zielnica, Wytrzymałość materiałów, str. 554, WPP, wyd. III, Poznań 2000

Additional:
1. N. Willems, T. J. Easley, S. T. Rolfe, Strength of Materials, Mc Graw-Hill Book Company, 1981
2. M. Gere, S. Timoshenko, Mechanics of Materials, PWS-Kent Publishing Company, Bos-ton, 1984

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 100 | 4,00 |
| Classes requiring direct contact with the teacher | 60 | 2,50 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 40 | 1,50 |