COURSE DESCRIPTION CARD - SYLLABUS

Course name
Strength of materials

Course

Field of study
Security engineering
Area of study (specialization)
-
Level of study
First-cycle studies
Form of study
full-time

Year/Semester
2 / 4
Profile of study
practical
Course offered in
polish
Requirements
compulsory

Number of hours

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

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
dr inż. Maciej OBST

Responsible for the course/lecturer:
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Prerequisites

The student starting the course Strength of Materials should have knowledge of mechanics, mathematics and physics. He should also have the ability to think creatively, obtain information from indicated sources and show readiness to cooperate within a team.

Course objective

The study of Strength of Materials aims to indicate the theoretical fundamentals of particular strength problems with an orientation of their analytical application. The student becomes aware with the basic

load cases, recognizes the relationship between load models, material models and shape models, and understands the concept of material and structure destruction in a mechanical sense. Strength of Materials lectures aims to shape abstract analytical thinking with a focus on solving technical problems, also in the aspect of broadly understood security engineering. Students also develop teamwork skills.

Course-related learning outcomes

Knowledge

The student gains knowledge about the methods used in the science of Strength of Materials, also knows the theoretical foundations of the issues discussed. The student understands the difference between simple load cases and knows the difference in the effects of their actions. The student knows the basics of complex strength loads, understands the concept of strength hypotheses, especially understands the Huber-Mises hypothesis. The student knows how to solve strength problems for tension, compression, torsion and bending, as well as combinations of simple loads the same time acting on mechanical structures. The student knows how to determine the geometrical characteristics of the fields of flat figures and knows how to interpret individual characteristics including their practical application. The student knows how to interpret the definition of allowable stress and safety factor for mechanical structures. The issue of stability and the definition of critical force are known on the example of a slender rods.

Skills

The student has the skills to calculate stresses, deformations and displacements for selected structural elements (bars, beams). The student is able to make and interpret diagrams of internal forces, deformations and stresses. The student is able to carry out a strength analysis of the rod and beam to determine the geometric dimensions or to check the strength and stiffness of the existing structure. The student has the skill of creative thinking and independent learning.

Social competences

Understanding the need for lifelong learning.

Understanding the social effects of engineering activities.

Understanding the need for team cooperation.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Analytical problems exam. Theoretical exam of the lecture is also possible.

Programme content

The science of strength of materials, models used in the science of strength of materials, mechanical properties of construction materials, static tensile test, definition of stress and deformation, material model - Hooke's law, Simple axial tensile or compression - theory and strength calculations, Static moments and moments of inertia of flat figures - theory and determination, Torsion of rods - strength theory and calculations, Bending of straight rods - strength theory and calculations, The concept of

elastic deformation energy, the concept of volumetic deformation energy, strength hypotheses, Huber-Mises hypothesis, complex strength, Slender rod stability - theory, determination of Euler's critical force.

Strength calculation of tension and compression bars, examples of calculations of statically determinate and statically indeterminate bars structures, calculation of thermal and assembly stresses in rod constructions. Calculation of static moments and moments of inertia of flat figure areas. Strength calculation of torsion bars with circularly symmetrical cross-sections - statically determinate and statically indeterminate issues. Strength calculation of bending bars – beams. Application of the analytical method for calculating deformations of bending beams.

Teaching methods

Lecture, analytical exercises, laboratories

Bibliography

Basic

1.Ostwald M. "Podstawy wytrzymałości materiałów". Wydawnictwo Politechniki Poznańskiej, 2012

2.Ostwald M. "Wytrzymałość materiałów i konstrukcji - zbiór zadań" Wydawnictwo Politechniki Poznańskiej, 2017

3. Niezgodziński T., Niezgodziński M., "Wytrzymałość materiałów". Warszawa, Wyd. Naukowe PWN, 2009

Additional

1. Bąk R., Burczyński T., "Wytrzymałość materiałów z elementami ujęcia komputerowego" WNT, 2013

2. FeoDosyew V., "Strength of Materials" Moscow, 1968

3. Timoshenko. S.P., "Strength of Materials" Dover Publications Inc., 2003

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5
Classes requiring direct contact with the teacher	60	2
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam) [1]	65	3

[1] delete or add other activities as appropriate