COURSE DESCRIPTION CARD - SYLLABUS

Course name
Strength of materials I [S2MwT1-MT>WM1]

Course

Field of study
Mathematics in Technology

Year/Semester
1/2

Area of study (specialization)
Modelling in Technology

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

- knowledge of mathematics (mathematical analysis: differential and integral calculus, differential equations, complex numbers, vector calculus; algebra; geometry: right triangle, trigonometry; elements of differential geometry, calculus of variation) and mechanics (especially statics), - the ability to solve algebraic systems of linear equations, - ability to solve second order linear differential equations with constant coefficients, - the ability to integrate, - the ability to learn with understanding, - ability to independently search for information in literature.

Course objective

Theoretical knowledge of problems related to the basic methods of structural strength analysis. Ability to determine stresses and displacements in tension / compression, torsion and bending as well as critical loads in buckling.

Course-related learning outcomes

Knowledge:
- expanded and in-depth knowledge of mathematical modelling,
- advanced general knowledge of mathematical terminology as well as strength of materials and

stability,
- advanced knowledge of engineering graphics and computer-aided design,
- knowledge of the influence of mathematics on the progress of science,
- expanded knowledge of the latest development trends in scientific disciplines, in particular in mechanics,
- advanced knowledge of occupational health and safety rules.

Skills:
- use of knowledge from higher mathematics,
- construction and analysis of mathematical models, including derivation and solving of equilibrium equations in the problem of bending and buckling,
- using mathematical tools and methods, including numerical ones, to solve engineering tasks,
- application of health and safety at work,
- use of the acquired knowledge and appropriate methods to solve problems of strength and stability,
- modeling of structural elements and selection of appropriate materials,
- self-learning.

Social competences:
- understanding the need to learn,
- awareness of the importance of knowledge in solving cognitive and practical problems,
- awareness of making mistakes by oneself and others,
- criticism of the results obtained.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture:
- Assessment of knowledge and skills on the written exam,
- Assessment of knowledge and skills during the oral exam.

Tutorials:
- Assessment of knowledge and skills on the basis of tests (at the beginning of the class),
- Assessment of the student"s preparation for exercises (questions from previously indicated issues / tasks discussed during the lecture).

Laboratory classes:
- Assessment of knowledge and skills on the basis of reports.

Programme content

Statics equations. Force classification. Hooke"s Law. Stresses, strains. Elastic range. Bars and bar systems statically determinate and statically indeterminate. Stretching and compression. Stresses and displacements in bar systems. Torsion of bars with circular cross-sections. Rotation angle. Torsion angle. Bending of beams. Static moments and moments of inertia of cross-sections of beams. Normal and shear stresses in beams. Steiner theorem. Derivation of the beam equilibrium equation. Statically determinate and statically indeterminate beams. Stability of a compressed bar. Global buckling. Variational methods. Numerical modeling of beams using the finite element method in the SolidWorks system.

Teaching methods

Lecture:
- in traditional form - blackboard and chalk (supplemented with examples),
- interactive - with formulating questions for students,
- theoretical with practical application,
- referring to issues already known from other subjects.

Tutorials:
- in traditional form - blackboard and chalk,
- interactive - with formulating questions for students,
- devoted to the issues discussed during the lecture - solving tasks and analyzing the obtained results.

Laboratory classes:
- detailed reviewing of reports,
- demonstrations,
- work in teams.

Bibliography

Basic
1. Wytrzymałość materiałów, wyd. II, J. Zielnica, Wydawnictwo Politechniki Poznańskiej, Poznań, 1998
2. Wytrzymałość materiałów, A. Jakubowicz, Z. Orłoś, WNT, Warszawa, 1996
3. Mechanics of materials, J.M. Gere, S. Timoshenko, PWS-Kent Publishing Company, Boston, 1994
Additional
1. Wytrzymałość materiałów w zadaniach, K. Magnucki, W. Szyc, Wyd. Naukowe PWN, Warszawa-Poznań, 2000

Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4,00
Classes requiring direct contact with the teacher	70	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	50	2,00