COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mechanics of Materials I

Course

Field of study
Construction and Exploitation of Means of Transport

Year/Semester
2/3

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
18

Laboratory classes

Other (e.g. online)

Tutorials
9

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
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Faculty of Mechanical Engineegin
ul. Jana Pawła II 24, 61-131 Poznań

Responsible for the course/lecturer:

Prerequisites

Student starting the course should have fundamental knowledge in the field of mechanics, especially statics, mathematics (geometry, trigonometry, calculus) and material science (mechanical properties, structure of materials)

Course objective

Presenting the rules and methods of modelling of structural elements and the rules of structural analysis. Explaining the basic terms allowing to understand the way the structure works, undergoes failure and the way of correct design of structures. Presenting the methods of solving of problems related to the strength and stiffness of the structure.

Course-related learning outcomes

Knowledge

1. Has knowledge how to use the mathematical modelling tools for modelling of structures.
2. Has knowledge in strength and stiffness analysis of basic structural elements like bars, shafts and beams.
3. Has basic knowledge allowing to understand how the material and the structure behave under different types of load.
4. Knows and understands the basic terms in the subject like stress, strains, deformation.

Skills

1. Is able to apply the mathematical tools to describe the behaviour of the material and structure.
2. Is able to conduct a simple strength calculations base on which the geometrical parameters can be determined.
3. Is able to access the usefulness of available structural materials in designing different types of structures.
4. Is able to find a proper standard and catalog necessary to design a structure.

Social competences

1. Understands non-technical aspects of design engineer's work.
2. Is aware of the influence of the design engineer's work on shaping the public space and the environment.
3. Is aware of the importance of multidisciplinary education of the design engineer.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

- two colloquiums during the semester, about 40 min. each, containing about 20 questions answering which requires understanding of basic notions, making simple calculations and completing the drawings; students receive a list of issues covering the whole material in advance; the condition to get credit are positive grades from both colloquiums (at least 60 % of points).

Tutorials:

- two colloquiums during the semester, 90 min. each, containing 1 or 2 problems; the problems cover the knowledge presented during the tutorials; the condition to get credit are positive grades from both colloquiums (at least 60 % of points).

Programme content

Lecture:

1. Introduction
- basic notions: stress, strains, deformation

2. Behaviour of material under load
- stress-strain curve
- mechanical properties of materials

3. The rules of structural design
- the strength, stiffness and stability condition
- allowable stress

4. Tension and compression of bars and trusses
- determining of internal forces
- solving of statically determinate and indeterminate problems
- Hooke's law
- energy of elastic deformation

5. Simple shear
- definition of shear stress; mean shear stress
- exemplary calculations

6. Torsion - design of shafts
- determining of internal forces
- solving of statically determinate and indeterminate problems

7. Bending
- determining of internal forces
- solving of statically determinate problems

Tutorials:

- solving of statically determinate and indeterminate problems related to determining internal forces, displacements and stress in bars, trusses and shafts; determining internal forces in statically determinate problems

Teaching methods

Lecture:

- lecture with multimedia presentation containing figures and pictures supported with examples presented on the blackboard
- application of theoretical knowledge presented on the lecture to solve simple engineering problems
- during the lecture the discussion with students is initiated

Tutorials:

- examples of engineering problems solving on the blackboard
- discussion with students concerning the solutions and the obtained results

Bibliography

Basic

1. Ostwald M. Podstawy wytrzymałości materiałów i konstrukcji, WPP, Poznań, 2017
2. Ostwald M. Wytrzymałość materiałów i konstrukcji - zbiór zadań, WPP, Poznań, 2018
3. Dyląg Z., Jakubowicz A., Orłoś Z. Wytrzymałość materiałów Tom I, WNT, Warszawa, 1997
4. Goodno BJ, Gere JM. Mechanics of materials, Cengage Learning, Boston, MA, 2018

Additional

1. Steif PS. Mechanics of materials, Pearson, Boston, 2012
2. Banasiak M., Grossman K, Trombski M. Zbiór zadań z wytrzymałości materiałów, PWN, Warszawa, 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	110	4,0
Classes requiring direct contact with the teacher	45	1,5
Student's own work (literature studies, preparation for laboratory classes, preparation for tests) [1]	65	2,5

[1] delete or add other activities as appropriate