COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mechanics of Materials II

Course

Field of study
Construction and Exploitation of Means of Transport

Year/Semester
2/4

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other (e.g. online)

Tutorials
15

Projects/seminars

Number of credit points

5

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), measurements techniques.

Course objective

Presenting the rules and methods of modelling of structural elements and the rules of structural analysis. Presenting the methods of solving of problems related to the strength and stiffness of the structure. Presenting the combined states of loads as well as the limit loads.

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. Has basic knowledge in behaviour of structures in an elastic-plastic range.

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 perform a simple laboratory test and elaborate the obtained results.

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:

- a 45 min. exam 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; at least 60 % of points are required to pass the exam

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).

Laboratory:

- oral verification of knowledge at the beginning of classes; preparation of the correct report from all 6 exercises

Programme content

Lecture:

1. Bending
- determining the normal and shear stress in beams
- design of beams
- determining the deflection of beams
- bending under inclined load
- composite beams

2. Analysis of stress and strains - plain state of stress

3. Combined load
- three dimensional trusses

4. Stability of bars
- basic knowledge in stability of structures
- Euler equation
- stability of bars in an elastic-plastic range

5. Introduction to the behaviour of structures in an elastic-plastic range

Tutorials:

- solving of statically determinate and indeterminate problems related to determining internal forces, displacements and stress in beams; determining the deflection of beams, solving the problems concerning the structures under combined load - three dimensional problems

Laboratory:
- static tensile test; hardness tests; toughness test; determining the stiffness of springs; determining the fatigue limit; static gauge measurements

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

Laboratory:

- presentation of theoretical knowledge concerning each exercise; getting acquainted with the equipment at the test stand; performing the exercise by students

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
5. Joniak S. Badania eksperymentalne w wytrzymałości materiałów, WPP, Poznań, 2006

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	140	5,0
Classes requiring direct contact with the teacher	60	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests) [1]	80	3,0

[1] delete or add other activities as appropriate