COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mechanics of Materials I [S1MiBP1>WM1]

Course

Field of study
Mechanical and Automotive Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

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 in the field of mathematics, including algebra, analysis, theory of differential equations, probability, analytical geometry necessary to: describe the operation of discrete mechanical systems, understand computer graphics methods, describe the operation of electrical and mechatronic systems.

2. Has basic, ordered knowledge of metal materials used in mechanical engineering, such as iron, aluminum, copper, etc. alloys used in machine building, and in particular about their structure, properties, methods of production, heat and thermo-chemical treatment, and the influence of plastic working on their endurance.
3. Has basic knowledge of the strength of materials, including the basics of the theory of elasticity and plasticity, stress hypotheses, calculation methods for beams, membranes, shafts, joints and other simple structural elements, as well as methods of testing the strength of materials and the state of deformation and stress in mechanical structures.

Skills:
1. Can assess material, environmental and labor costs for making a simple machine.
2. Can perform basic functional and strength calculations of machine elements such as traction, gear, friction, bearings, rolling and sliding gears, clutches, brakes.
3. Can perform strength calculations of simple frames and load-bearing structures of machines using elementary strength theories.

Social competences:
1. Is ready to critically assess his knowledge and received content.
2. Is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on his own.
3. Is willing to think and act in an entrepreneurial manner.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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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

Course topics

none

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	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00