COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mechanics and strength of materials [S1IBiJ1>MiWM]

Course

Field of study
Safety and Quality 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
15

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge in mathematics (in the field of algebra, geometry, trigonometry) and physics (vector calculus, Newtonian physics). In addition, the ability to think logically and can visualize simple mechanical constructions in space. Ability to obtain information from specified sources. Is aware of the interdependence between mathematical, physical and technical sciences.

Course objective

Providing students with basic knowledge in the field of applied mechanics, especially in the field of statics. In addition, visualization of theoretical and practical problems related to the strength analysis of simple structures based on the mechanical properties of materials as the basis for the proper design of machinery and equipment.

Course-related learning outcomes

Knowledge:
1. Student knows advanced engineering issues (materials science, manufacturing technologies, material strength, mechanics) [K1_W01].
2. Student knows at an advanced level issues in the field of mathematics and statistics in the field of

solving practical engineering and quality problems [K1_W04],
3. Student has advanced knowledge of the life cycle of products, devices, facilities, systems and technical systems [K1_W06].

Skills:
1. Student can properly select sources and information derived from them, perform the evaluation, critical analysis and synthesis of this information [K1_U01].
2. Student can use analytical, simulation and experimental methods to formulate and solve engineering tasks, also with the use of information and communication methods and tools [K1_U04].
3. Student is able to critically analyze and optimize existing technical solutions to increase the quality and safety of machines, devices, facilities, systems, processes and services [K1_U06].

Social competences:
1. Student can see the cause-and-effect relationships in the implementation of set goals and use ranks in relation to the importance of alternative or competitive tasks [K1_K01].
2. Student is aware of responsibility for their own work and readiness to submit to the principles of teamwork and responsibility for jointly performed tasks [K1_K07].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: formative assessment - written tests, summary assessment - arithmetic average of the grades obtained as part of the formative assessment.
Exercises: formative assessment - written tests, summary assessment - arithmetic average of the grades obtained as part of the formative assessment
Laboratories: forming assessment - oral and written answer, written reports from each laboratory exercise, summary assessment - arithmetic average of the marks obtained as part of the forming assessment.
The exam includes 3 tests during the semester, which are graded on points. The student receives a positive assessment of the credit if he / she obtains at least 50% of the points available for each colloquium. The final grade for the credit is determined according to the following rules:
Very good (A) - if the total number of points obtained from all colloquia is above 90% of the total number of points possible to get, Good plus (B) - 80.1 - 90.0% of points, Good (C) -70.1 - 80.0%, Sufficient plus (D) - 60, 1 - 70.0%, Sufficient (E) - 50.0 - 60.0%.
A student who has received an unsatisfactory grade has the option of joining one retake exam.
Laboratory exercises: credit on the basis of: oral or written answer for each exercise and reports on each exercise. The condition of passing laboratory exercises is passing all the exercises included in the program and acceptance by the teacher of all reports.

Programme content

The program includes:
- Basic concepts of mechanics.
- Introduction to the strength of materials.
- Geometric characteristics of plane figures.
- Torsion of bars with circular cross-sections.
- Simple bending of beams.
- Selected experimental tests in the strength of materials.

Course topics

1. The fundamental rights of mechanics. Definition of force and its types. Systems of forces. Moment of forces relative to the pole.
2. Principles of statics.
3. Friction: nature and effects, coefficient of friction (rolling resistance).
4. Strength of materials. Normal stresses and strain.
5. Elasticity, plastisity. Linear elasticity and Hook's Law.
6. Analysis of Stress.
7. Analysis of Strain.
8. Centroids and moments of inercia of plain areas.

9. Shear stress and strain
10. Deflections of Beams.
11. Basic of kinematics of particle and rigid body.
12. Basic of dynamics of particle and rigid body.
Laboratory exercises:
1. Static tensile test.
2. Hardness measurements using the following methods: Brinell, Vickers and Poldi.
3. Rockwell hardness measurement. Microhardness measurement by the Vickers method.
4. Material fatigue. Locati trial.
5. Bend test. Spring characteristics.
6. Static strain gauges in thin-walled tank.

Teaching methods

Lecture - mediated lecture,
Classes/tutorial - giving method: discussion on the application of analytical methods
Practical method: lab exercises

Bibliography

Basic:
Zielnica J., Wytrzymałość materiałów. Wydawnictwo PP, Poznań, 1996.
Ostwald M., Podstawy wytrzymałości materiałów, Wydawnictwo PP, Poznań, 2007.
Ostwald M., Wytrzymałość materiałów. Zbiór zadań. Wydawnictwo PP, Poznań, 2008.
Badania eksperymentalne w wytrzymałości materiałów. Pod redakcją S. Joniaka, WPP. 2006.
Misiak J., Mechanika techniczna t.1, WNT, Warszawa, 1998, 2012.

Additional:
Magnucki K., Szyc W., Wytrzymałość materiałów w zadaniach: pręty, płyty i powłoki obrotowe, Wydawnictwo Naukowe PWN, 2000.
Dyląg Z., Jakubowicz A., Orłoś Z., Wytrzymałość materiałów t.1 i 2, WNT, Warszawa, 2000.

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