



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Mechanics and strength of materials [N1Log2>MiWM]

Course

Field of study

Logistics

Year/Semester

1/1

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

Number of hours

Lecture

18

Laboratory classes

8

Other

0

Tutorials

18

Projects/seminars

0

Number of credit points

6,00

Coordinators

dr Marcin Rodak

marcin.rodak@put.poznan.pl

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 the basic issues of mechanics, construction and operation of machines related to logistics [P6S_WG_02]
2. Student knows the basic issues in the field of chemical changes, materials science, commodity science

and the strength of materials and their importance for industrial and logistic processes [P6S_WG_03]

Skills:

1. Student is able to use appropriate experimental and measurement techniques, including computer simulation, to solve a problem within the mechanics and strength of materials [P6S_UW_03]
2. Student is able to evaluate and critically analyze in economic terms a selected problem within the scope of mechanics and strength of materials [P6S_UW_06]

Social competences:

1. Student is aware of initiating activities related to the formulation and transfer of information and cooperation in society in the field of mechanics, construction and operation of machines [P6S_KO_02]

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.

Laboratory: 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 content of the course includes a discussion of the basics of rigid body statics and the concepts of mechanics of deformable solids (stresses, strains, Hook's law for isotropic materials), which are the basis for the strength of materials.

Theoretical calculations of the strength and stiffness of typical structural elements such as rods, shafts, and beams, as well as simple trusses.

Basic of kinematics and dynamics.

Experimental research.

Course topics

Lecture: The fundamental rights of mechanics. Definition of force and its types. Systems of forces. Moment of forces relative to the pole. Principles of statics. Friction: nature and effects, coefficient of friction (rolling resistance). Strength of materials. Normal stresses and strain. Elasticity, plasticity. Linear elasticity and Hook's Law. Analysis of Stress. Analysis of Strain. Centroids and moments of inertia of plain areas. Shear stress and strain. Deflections of Beams. Buckling. Basic of kinematics of particle and rigid body. Basic of dynamics of particle and rigid body. Vibration of particle body.

Tutorial: Static equilibrium conditions. Axial tension / compression of bars, normal forces, normal stresses, total bar deformation. Bar structures statically determinate and indeterminate. Assembly stresses, thermal stresses. Centroids and moment of inertia of plane areas. Torsion of circular bars or shaft, shear stresses, angle of twist. Deflections of beams, bending moment, shear forces, angle of rotation, deflection curve.

Laboratory: Static tensile test. Hardness measurements using the following methods: Brinell, Vickers and Poldi. Rockwell hardness measurement. Microhardness measurement by the Vickers method. Material fatigue. Locati trial. Bend test. Spring characteristics. Static strain gauges in thin-walled tank.

Teaching methods

Lecture: mediated lecture.

Tutorial: giving method: discussion on the application of analytical methods.

Laboratory: ractical method: lab exercises.

Bibliography

Basic:

1. Zielnica J., Wytrzymałość materiałów, WPP, Poznań, 1996.
2. Ostwald M., Podstawy wytrzymałości materiałów, WPP, Poznań, 2007.
3. Ostwald M., Wytrzymałość materiałów. Zbiór zadań, WPP, Poznań, 2008.
4. Joniak S. (red.), Badania eksperymentalne w wytrzymałości materiałów, WPP, Poznań, 2006.
5. Misiak J., Mechanika techniczna, t.1, WNT, Warszawa, 1998, 2012.

Additional:

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

Breakdown of average student's workload

| | Hours | ECTS |
|---|-------|------|
| Total workload | 150 | 6,00 |
| Classes requiring direct contact with the teacher | 44 | 2,00 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 106 | 4,00 |