



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Strength of materials and structures [S1MiBM2>WMiK1]

Course

Field of study

Mechanical 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

45

Laboratory classes

0

Other

0

Tutorials

30

Projects/seminars

0

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

A student has basic knowledge about mathematics, strength of materials, engineering graphics and other areas of studies. A student has theoretical knowledge of areas of studies. A student can solve basic problems of geometry and mathematical analysis. A student can solve basic problems of solid mechanics. A student can search for necessary information and facts in literature, scientific databases and catalogues. A student can use information and communication techniques for realizing engineering tasks. A student has the ability to self-study. A student understands a need for lifelong learning and acquiring knowledge. A student understands general social results of engineering activities. A student understands a need for teamwork. A student is aware of connections between mathematics, physics and technical sciences.

Course objective

Familiarizing students with strength of materials and strength tests, teaching students basic concepts of mechanics and strength of materials. Presenting theoretical and practical engineering methods of analysing the strength of structures that are based on material properties. Delivering in understandable form selected strength of materials issues, i.e. modelling indeterminate systems or solving complex strength problems. Showing the restrictions imposed on structures due to their strength, safety and regulations (standards, law). Discussing the methods of solving strength problems in an effective and proper way, highlighting the importance of building and testing prototypes, showing a system approach to solving engineering problems.

Course-related learning outcomes

Knowledge:

-

Skills:

-

Social competences:

-

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures and classes:

Basic concepts of statics. Definition of force, division of forces, systems of forces. Constrains and constrains reactions. Internal forces. One-dimensional stresses and deformations state. Stress-strain diagrams. Hooke's Law. Equilibrium conditions of plane force systems. Statically determinate and indeterminate bar systems and bar-beam systems. Shearing stresses, non-dilatational strain (deviatoric strain). Generalized Hooke's law. Allowable stress, factor of safety structural and strength condition. Mohr's circle of stress. Material failure theories. Moments of inertia of plane areas, centroids of cross section, main principal axes (principal moment of inertia). Steiner's theorem (parallel axis theorem). Twisting of shafts and rods with rectangular cross section, open and closed thin-walled cross section. Bending of beams with constant and variable stiffness. Shear-force and bending-moment diagrams in bending beam. Normal stresses and shear stresses in beams.

Programme content

none

Course topics

Basic concepts of statics. Definition of force, division of forces, systems of forces. Constrains and constrains reactions. Internal forces. One-dimensional stresses and deformations state. Stress-strain diagrams. Hooke's Law. Equilibrium conditions of plane force systems. Statically determinate and indeterminate bar systems and bar-beam systems. Shearing stresses, non-dilatational strain (deviatoric strain). Generalized Hooke's law. Allowable stress, factor of safety structural and strength condition. Mohr's circle of stress. Material failure theories. Moments of inertia of plane areas, centroids of cross section, main principal axes (principal moment of inertia). Steiner's theorem (parallel axis theorem). Twisting of shafts and rods with rectangular cross section, open and closed thin-walled cross section. Bending of beams with constant and variable stiffness. Shear-force and bending-moment diagrams in bending beam. Normal stresses and shear stresses in beams.

Teaching methods

1. Lecture: presentation illustrated with examples administered on the blackboard, solving tasks, didactic materials for E-Courses: films, presentations, etc.
2. Exercises: solving tasks on the board (problem solving), discussion, didactic materials for E-Courses: films, presentations.

Bibliography

Basic:

1. Zielnica J., Wytrzymałość Materiałów, WPP 1996.
2. Ostwald M., Podstawy wytrzymałości materiałów, Wydawnictwo PP, Poznań, 2007.
3. Magnucki K., Szczyg W., Wytrzymałość materiałów w zadaniach: pręty, płyty i powłoki obrotowe, Wydawnictwo Naukowe PWN, 2000.
4. Leyko J., Mechanika ogólna t.1, PWN, Warszawa, 1997.
5. Jakubowicz A., Orłoś Z., Wytrzymałość materiałów, WNT, Warszawa, 1984.
6. Badania eksperymentalne w wytrzymałości materiałów. Pod redakcją S. Joniaka, WPP. 2006.

Additional:

1. Banasik M., Grossman K., Trombski M., Zbiór zadań z wytrzymałości materiałów. PWN 1992.
2. Osiński Z., Mechanika ogólna, PWN, Warszawa, 1994.
3. Ostwald M., Wytrzymałość materiałów. Zbiór zadań. Wydawnictwo PP, Poznań, 2008.
4. Dyląg Z., Jakubowicz A., Orłoś Z., Wytrzymałość materiałów t.1 i 2, WNT, Warszawa, 2000.
5. Polskie Normy.
6. Niezgodziński M. E., Niezgodziński T., Wzory, wykresy i tablice wytrzymałościowe, Wydawnictwo Naukowo-Techniczne Warszawa 2004.
7. Willems N., Easley T. J., Rolfe S. T., Strength of Materials, Mc GrawHill Book Company, 1981.
8. Gere M., Timoshenko S., Mechanics of Materials, PWS-Kent Publishing Company, Boston, 1984.

Breakdown of average student's workload

	Hours	ECTS
Total workload	0	0,00
Classes requiring direct contact with the teacher	0	0,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	0	0,00