COURSE DESCRIPTION CARD - SYLLABUS

Course name

Strength of mechanical structures

Course

Field of study

Construction and Exploitation of Means of Transport

Year/Semester

1/1

Area of study (specialization)

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

Number of hours

Lecture

9

Laboratory classes

Other (e.g. online)

Tutorials

9

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

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Wydział Inżynierii Mechanicznej

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of mathematics, mechanics, strength of materials, engineering graphics and other areas of education in the field of study.

Course objective

The aim of the course is to provide the tools necessary to construct machines, with particular emphasis on their strength and stability. Indication of the limitations of the applied mathematical models of structures. Presenting in an understandable form the principles of carrying out strength calculations in complex load states with the use of energy methods. Acquainting with the basics of strength analysis of thin-walled structures with particular emphasis on circular-symmetric plates and shells of revolution.

Course-related learning outcomes

Knowledge

Has basic knowledge of the mechanics of solids and discrete systems with many degrees of freedom, mathematical modeling of mechanical systems.

Has extended knowledge of the strength of materials in the field of calculations of statically indeterminate structures and stability of the structures.

Has knowledge of the methods of strength calculations and mathematical optimization of mechanical structures.

Skills

He can estimate the potential threats to the environment and people from the designed working machine and vehicle from a selected group.

He can develop a construction documentation for a complex machine from a selected group of machines.

Can use a popular numerical system to program a simple system simulation task with a small number of degrees of freedom.

Can perform a medium complex design of a working machine or its assembly with the use of finite element calculation tools.

Social competences

He is ready to critically assess his knowledge and received content.

Is ready to recognize the importance of knowledge in solving engineering problems and consult experts in case of difficulties in solving the problem on its own.

He is ready to develop his professional achievements.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written test and assessment of activity in the classroom:

3 50.1% -70.00%

4 70.1% -90.0%

5 from 90.1%

Programme content

The introduction emphasizes the need to generalize the mathematical models used in the strength of materials.

Stability of bars in compression: internal forces of a deformed structure, integral of the uniform and inhomogeneous equation of the beam deflection line, generalization of the Euler formula for various support methods, limiting slenderness, radius of inertia of the cross-section, compression of bars with the participation of transverse forces, the scope of the Euler's formula applicability.

Energy methods of strength of structures: linear elastic system, generalized force, generalized displacement, potential energy of elastic forces. Castigliano theorem, Menabre theorem, force method, integration by multiplying graphs.

Strength of circular-symmetric plates: the concept of a plate, internal forces in plates, plate equilibrium equations, boundary conditions, integral of the differential equation of plate deflection, assessment of plate strength.

Membrane theory of shells of revolution.

Teaching methods

Live lecture with multimedia illustrations, tutorials with problems solved on the board.

Bibliography

Basic

Dyląg Z., Jakubowicz A., Orłoś Z., Wytrzymałość Materiałów Tom 1–2, Wydawnictwa Naukowo-Techniczne, Warszawa 2010.

Zielnica J., Wytrzymałość materiałów, Wydawnictwo Politechniki Poznańskiej, Poznań 2001.

Niezgodziński M., Niezgodziński T., Wytrzymałość materiałów, Wydawnictwo Naukowe PWN, Warszawa 2009.

Additional

Magnucki K., Szyc W., Wytrzymałość materiałów w zadaniach. Pręty, płyty i powłoki obrotowe., Wydawnictwo Naukowe PWN, Warszawa 2012.

Banasiak M., Grossman K., Trombski M., Zbiór zadań z wytrzymałości materiałów, Wydawnictwo Naukowe PWN, Warszawa 2009.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for classes, preparation for tests) [1]	30	1,0

[1] delete or add other activities as appropriate