COURSE DESCRIPTION CARD- SYLLABUS

Course name
Mechanics

Course

Field of study
Mathematics in Technology
Area of study (specialization)
—
Level of study
first-cycle studies
Form of study
full-time

Year/Semester
2/3
Profile of study
general academic
Course offered in
Polish
Requirements
compulsory

Number of hours

Lectures
30
Tutorials
30

Laboratory classes
—
Projects/seminars
—

Other (e.g. online)
—

Number of credit points

4

Lecturers

Responsible for the course/lecturer::

dr hab. inż. Małgorzata Jankowska

Responsible for the course/lecturer::

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Prerequisites

Student should have a basic knowledge from the fields of mathematics, physics and mechanics. Student should have the ability to solve basic problems of mechanics. Furthermore, student should have the ability to work alone, self-study and broaden the knowledge based on available literature.

Course objective

Gaining a basic knowledge of mechanics within the scope specified in the study program. The ability to solve basic problems from the field of mechanics.

Course-related learning outcomes

Knowledge

- in-depth knowledge of three branches of classical mechanics, i.e., statics, kinematics and dynamics.

Skills

- solving of the problems of mechanics with analytical methods;
- the use of acquired knowledge in modeling of mechanical problems;
- acquiring information from literature, databases and other available sources of knowledge;
- the ability to work individually and in a team. The ability to estimate the time needed for the implementation of the task ordered;
- the ability to self-study, including to improve professional and social competences.

Social competences

- awareness of the limits of one's own knowledge and understanding the need for further education;
- precise formulation of questions used to deepen one's own understanding of a given topic or finding missing elements of reasoning.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: written exam verifying a knowledge and a proper understanding of the concepts of mechanics.

Tutorials: written exams verifying proper solving of the mechanical problems with analytical methods.

Programme content

Update: 31.01.2020r.

Overview of the scope of classical mechanics. Introduction to kinematics and dynamics (statics and kinetics). Characteristics of basic concepts such as: models of real bodies (material point, perfectly rigid body), forces and types of forces depending on their nature and origin, a balance of forces. The principles of statics with examples.

Statics: a definition of a degree of freedom (numbers of degrees of freedom for a material point and a rigid body in a plane and a space), a concept of external and internal forces, constrains (classification and types) and supports. Introduction to systems of forces in a plane and in a space. Finding a resultant of forces. Varignon's theorem. The concept of a moment of a force about a point, a couple of forces and a moment of a couple. Equilibrium conditions and equations of a planar and a space force system.

Kinematics: particle kinematics. Kinematic equations of motion and trajectory (path) of motion. Motion, velocity and acceleration of a particle in Cartesian and natural coordinate systems. Ksinematics of a rigid body. Rotational motion. Planar motion. Velocity and acceleration of points of a rigid body. Composite motion of a material point. Relative and absolute velocity and acceleration. The Coriolis acceleration.

Dynamics: dynamics of a material point. Newton's second law. Equations of motion. Simple and reverse problems of dynamics. Work, power, potential of a force field. The work–energy principle. The principle of conservation of mechanical energy. The momentum conservation principle. The conservation of angular momentum.

Teaching methods

Lectures: multimedia presentation illustrated with examples solved on the board.

Tutorials: solving of the mechanical problems analytically on the board, performing the tasks proposed by the lecturer.

Bibliography

Basic

- J. Leyko. Mechanika ogólna. Część 1 i 2. Wydawnictwo naukowe PWN. Warszawa 2002.
- J. Misiak. Mechanika techniczna. Statyka i wytrzymałość materiałów. Tom 1. Wydawnictwa Naukowo-Techniczne. Warszawa 2006.
- J. Misiak. Mechanika techniczna. Kinematyka i dynamika. Tom 2. Wydawnictwa Naukowo-Techniczne. Warszawa 1999.
- W. Biały. Metodyczny zbiór zadań z mechaniki. Wydawnictwa Naukowo-Techniczne. Warszawa 2004.

Additional

- J. Misiak. Zadania z mechaniki ogólnej. Część 1, 2 i 3. Wydawnictwa Naukowo-Techniczne. Warszawa 1994.
- J. Nizioł. Metodyka rozwiązywania zadań z mechaniki, Wydawnictwa Naukowo-Techniczne. Warszawa 1978.
- M.E. Niezgodziński, T. Niezgodziński. Zbiór zadań z mechaniki ogólnej, Wydawnictwo naukowe PWN. Warszawa 1997.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation)	30	1,0