COURSE DESCRIPTION CARD - SYLLABUS

Course name
Technical mechanics [S1ETI1>MT2]

Course

Field of study
Education in Technology and Informatics

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
30

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of physics and mathematics, vector calculus, calculus. Can think logically, learn with understanding, and use textbooks. Is aware of the need to expand their competences and understands the need to learn and acquire new knowledge.

Course objective

Providing students with basic knowledge of engineering mechanics, in the field of statics, kinematics and dynamics, which will enable them to study further subjects

Course-related learning outcomes

Knowledge:
student has knowledge in physics, covering the basics of classical mechanics, necessary to understand issues in the field of materials science, theory of machines and mechanisms, theory of drives and mechatronic systems,
has basic knowledge of the main areas of technical mechanics: statics, kinematics and dynamics of the material point and rigid body.

Skills:
student has the ability to self-study using modern teaching tools, such as remote lectures, websites, databases, e-books, etc.
is able to obtain information from literature, the internet, databases and other sources, is able to integrate obtained information, interpret and draw conclusions from it
can create a free-body diagram, select elements and perform basic calculations of the mechanical system.

Social competences:
student is able to properly set priorities for implementation of the task specified by himself or others based on available knowledge,
understands the need for critical assessment of knowledge and continuous education
is aware of the importance and understands the non-technical aspects and effects of engineering activities, including its impact on the environment, and the associated responsibility for decisions made.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture: written egzam verifying proper understanding of the concepts of engineering mechanics (9 theoretical questions and 4 problems to solve)
Tutorials: tests and assessment of classroom activity

Programme content

- Kinematics of complex motion; absolute motion, relative motion
- Dynamics of a material point; direct and inverse problems, equation of motion, momentum, moment of momentum, work, power, energy, force field
- Vibrations of a system with one degree of freedom; free, damped and forced vibrations
- Geometry of masses; static moments and moments of inertia of the solid
- Dynamics of a rigid body; equations of motion, momentum, torque, kinetic and potential energy

Course topics

Lecture:
- Reminder of point and solid kinematics information from the previous semester. Kinematics of complex motion; derivation of formulas for velocities and accelerations in complex motion, in-depth analysis of the Coriolis effect, yoke mechanisms.
- Dynamics of a material point. In this section, the following topics will be discussed: equation of motion, simple and inverse dynamics, momentum, momentum law and conservation of momentum, moment of momentum, work, power, kinetic energy, force field, potential energy, principle conservation of energy, d'Alembert's principle
- Vibrations of a system with one degree of freedom, including free, damped and forced vibrations. Introduction of concepts related to vibrations, e.g. amplitude, period, frequency. Resonance phenomenon, beating phenomenon.
- Dynamics of the system of material points. This topic will expand upon the issues discussed for a single point. The derived formulas provide an introduction to the dynamics of a rigid body.
- Geometry of masses, including static moments and moments of inertia of material bodies; radius of inertia, Steiner's theorem with derivation, inertia tensor, main and central moments of inertia
- Dynamics of a material rigid body, including equations of motion, momentum, moment of momentum, kinetic and potential energy, principle of work-energy equivalence
All discussed issues are illustrated with carefully selected examples of tasks.

Tutorials: solving problems in mechanics regarding the issues presented during the lecture

Laboratory: Solving problems in mechanics using a computer program for analytical and numerical calculations. Tasks of high computational complexity are solved.

Teaching methods

Lecture: multimedia presentation illustrated by the examples given on the blackboard

Tutorial: solving of the mechanical problems on the blackboard, discussion.

Computer laboratory: solving computationally complex mechanics problems

Bibliography

Basic
1. J. Leyko, Mechanika ogólna, t. 1 i 2, PWN, Warszawa, 2000
2. M. Lunc, A. Szaniawski, Zarys mechaniki ogólnej, PNW, Warszawa, 1959
3. M.E.Niezgodziński, T.Niezgodziński, Zbiór zadań z mechaniki ogólnej, PWN, Warszawa, 1998
5. J. Misiak, Zadania z mechaniki ogólnej, t. 1, 2 i 3, WNT, Warszawa, 1992
6. J. Nizioł; Metodyka rozwiązywania zadań z mechaniki, WNT, Warszawa, 2002
Additional
1.A.Bedford, W.Fowler, Engineering Mechanics – Dynamics,Prentice Hall, 2002
2.R.C.Hibbeler, Engineering mechanics – Dynamics, PEARSON, 2013

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	65	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,00