COURSE DESCRIPTION CARD - SYLLABUS

Course name
Technical mechanics [N1Energ2>MT]

Course

Field of study
Power Engineering

Year/Semester
1/2

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
20

Laboratory classes
0

Other (e.g. online)
0

Tutorials
20

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

The student has basic knowledge of mathematics, including vector, differential and integral 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 mechanics, in the field of statics, kinematics and dynamics, which will enable him to study further subjects. Developing students' skills: analytical thinking, associating and conscious use of computational methods, modeling of physical phenomena occurring in technology.

Course-related learning outcomes

Knowledge:
1. 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
2. has ordered knowledge of materials that meet the construction and operational requirements of machines and devices, modeling of mechanical systems; strength analysis of basic mechanical

constructions; has the knowledge needed to understand the principles of operation of basic machine parts, the selection of typical machine parts; knows and understands the essence of technically and technologically proper construction of machines and devices, as well as knows the economic aspects of their construction
3. has basic knowledge of the main areas of technical mechanics: kinematics and material point dynamics, as well as the rigid body

Skills:
1. has the ability to self-study using modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books
2. 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
3. can create a system diagram, select elements and perform basic calculations of the mechanical system, machine components or aviation devices

Social competences:
1. is able to properly set priorities for implementation of the task specified by himself or others based on available knowledge
2. understands the need for critical assessment of knowledge and continuous education
3. 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 the decisions taken

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: written egzam verifying proper understanding of the concepts of technical mechanics. Issues of theory will be delivered to the students
Exercises: tests and assessment activities in the classroom

Programme content

Elements of vector calculus.
Statics, the study of the balance of various systems of forces
Reduction theorem
Balance of trusses, beams, frames
Static friction
Point kinematics
Kinematics of a rigid body

Course topics

- Introduction to the subject of mechanics, elements of vector calculus
- Postulates of statics, convergent plane and spatial systems, resultant, equilibrium equations, constraints
- Couple of forces, theorem on reduction, main vector, main moment, wrench, theorem about the main moment, reduction invariants, equilibrium conditions, plane system of forces, resultant of a system of parallel forces
- continuous load and its resultant, balance of systems of connected solids, determining the reaction of beams and frames
- Flat trusses, determining forces in rods by balancing nodes and Ritter's method; balance of spatial systems
- Static and kinetic friction, cable friction, Euler's formula, rolling resistance
- Geometry of masses, static moment, geometric center, moment of inertia for flat areas, Steiner's theorem, rotation of the coordinate system, main central moments of inertia
- Introduction to the issues of strength of materials, internal forces, stress, strain, Hooke's law, Young's modulus, axial load, static determination, strength condition, fatigue, creep, relaxation
- Shear stress, Kirchoff modulus, shaft torsion, strength and stiffness condition
- Distribution of shear forces and bending moments in beams and frames, beam bending, bending strength index
- Kinematics, including: point kinematics, velocity, acceleration, point motion in Cartesian and polar

coordinates, tangential and normal acceleration
- Solid kinematics, translational, rotational, flat, spherical, general motion
- Complex motion, the Coriolis effect and its importance in nature and technology
- Dynamics of a material point, including: principles of dynamics, d'Alembert's principle, momentum, moment of momentum, dynamic equations of motion, free, forced and damped vibrations, work, energy, power, force field
- Dynamics of systems of material points, theorem on the motion of the center of mass, geometry of masses; centers of gravity, mass moments of inertia, elements of rigid body dynamics

Teaching methods

Lectures: multimedia presentation, ilustrated by the examples on the blackboard
Tutorials: solving exemplar problems on blackboard

Bibliography

Basic:
1. J.Leyko, Mechanika ogólna, tom I i II, PWN, Warszawa, 2008
2. J.Misiak, Mechanika techniczna, tom I i II, WNT, Warszawa, 1996
3. M.Łunc, A.Szaniawski, Zarys mechaniki ogólnej, PWN, Warszawa, 1959
4. J.Misiak, Zadania z mechaniki ogólnej, Część I, II i III, Warszawa, WNT 2009
5. J.Nizioł, Metodyka rozwiązywania zadań z mechaniki, Warszawa, WNT 2007

Additional:
1. A.Bedford, W.Fowler, Engineering mechanics, Prentice Hall, New Jersey, 2002
2. D.J.McGill, Engineering Mechanics, PWS Publishers, Boston, 1985
3. J.Awrejcewicz, Mechanika techniczna, Warszawa WNT 2009
4. M.T.Niezgodzińscy, Zbiór zadań z mechaniki ogólnej, Wydawnictwo Naukowe PWN, Warszawa, 2009

Breakdown of average student's workload

	Hours	ECTS
Total workload	110	4,00
Classes requiring direct contact with the teacher	40	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	70	2,50