



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Technical mechanics I [S1ETI2>MT1]

Course

Field of study

Education in Technology and Informatics

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

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

0

Other

0

Tutorials

15

Projects/seminars

0

Number of credit points

3,00

Coordinators

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Lecturers

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Prerequisites

Basic knowledge of physics and mathematics, vector calculus, calculus. Ability to use textbooks and manuals. Understands the need to expand their competences and understands the need to 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:

Lecture: written test verifying proper understanding of the concepts of engineering mechanics

Tutorials: tests and assessment of classroom activity

Programme content

1. Elements of vector calculus
2. Reduction of a system of forces
3. Constraints
4. Plane and spatial statics
5. Kinematics of a point
6. Kinematics of a rigid body

Course topics

Lecture:

Ad.1. Vector calculus; adding vectors, scalar product, vector product, notation of a vector using coordinates, unit vectors of the coordinate system, projection of a vector onto an axis, unit vector, vector modulus, moment of a vector with respect to a point, moment of a vector with respect to an axis, tasks illustrating the issues discussed

Ad.2. Theorem on the reduction of a system of forces; principal moment and principal vector, invariants of reduction, mechanically equivalent systems of forces, principal axis, torque, Varignon's theorem, special cases of reduction

Ad.3. The postulate of constraints; basic types of constraints occurring in flat and spatial systems, (movable or fixed articulated support, rigid mounting, rope, smooth or rough substrate, hinge, bearing, etc.) methods of releasing a mechanical system from constraints, forces and moments of reaction of constraints

Ad.4. Statics, including; postulates of statics, conditions of equilibrium of various systems of forces, release from constraints, study of the equilibrium of beams and plane frames, calculation of trusses using the method of balancing constraints and the Ritter method, systems of bound bodies, sliding friction, friction of belt, rolling resistance

Ad.5. Definition of trajectory, velocity and acceleration of a point, description of the motion of a point in the Cartesian and polar coordinate system, natural coordinate system, tangential and normal acceleration, radius of curvature of the trajectory, path, arrangement of kinematic equations of motion of points of mechanisms and calculation of other kinematic parameters based on them

Ad.6. Classification of rigid body motions, number of degrees of freedom, theorem on velocity projections, kinematic equations of motion of a body, vector relations between velocities and accelerations of points of a rigid body, discussion of special cases of motion with emphasis on translational, rotational and plane motion, instantaneous center of rotation

Teaching methods

Lecture: multimedia presentation illustrated by the examples given on the blackboard or using the graphical tablet

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

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.Nieźgodziński, T.Nieźgodziński, 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
7. W. Biały, Metodyczny zbiór zadań z mechaniki, WNT, Warszawa, 2004

Additional:

1. A.Bedford, W.Fowler, Engineering Mechanics, Prentice Hall, 2002
2. R.C.Hibbeler, Engineering mechanics, PEARSON, 20133.
3. J.Awrejcewicz, Mechanika techniczna, Warszawa WNT 200980

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00