



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Engineering mechanics

### Course

Field of study

Aerospace engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

1/1

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

### Number of hours

Lecture

30

Laboratory classes

0

Other (e.g. online)

Tutorials

15

Projects/seminars

0

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

dr hab. inż. Maciej Tabaszewski

Responsible for the course/lecturer:

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Faculty of Mechanical Engineering

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### Prerequisites

Basic knowledge of mathematics in the field of vector, differential and integral calculus and physics in the field of mechanics

The ability to think logically and creatively, to use internet and library resources

The student understands the need for continuous learning and gaining new knowledge

### Course objective

Presentation of the basics of statics, kinematics and dynamics, enabling further study of issues in the field of the basics of machine construction, vibration and dynamics of machines, theory of machines and mechanisms and mechanics of materials.



## Course-related learning outcomes

### Knowledge

The student has a basic knowledge of the main divisions of technical mechanics: statics, kinematics and dynamics of a material point and a rigid body.

### Skills

The student is able to obtain information from literature, internet, databases and other sources. The student can integrate the obtained information, interpret and draw conclusions from it. The student is able to use learned mathematical theories to create and analyze simple mathematical models of machines and their elements as well as simple technical systems.

### Social competences

The student recognizes the importance of knowledge in solving cognitive and practical problems

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Passing the lecture on the basis of a test

Passing exercises on the basis of systematic tests

## Programme content

Selected problems from vector algebra. Axioms of statics. Supports and their reactions. The rigid fixing. Friction and the laws of friction, sliding friction, rolling friction, friction of elastic belts. Convergent system of forces: reduction of the system, equilibrium conditions, theorem of three forces. A couple of forces. A system of forces: reduction of the system, equilibrium conditions. Distributed force systems. Special cases of a system of forces. Statically determinate and statically indeterminate systems. Static moments. Centers of gravity of solids, surfaces and lines. Kinematics of point, equations of motion, velocity and acceleration. Movement of a point in the Cartesian, natural and polar coordinate systems. Velocity and acceleration of a body. Special cases of general body motion: translational, parallel to a fixed plane, motion with a fixed point, and rotation of a rigid body about a fixed axis. Relative point motion. Two basic problems of dynamics. D'Alembert's principle. Moments of inertia. Vibrations of a material point. Work, power, kinetic and potential energy. Theorems of conservation. Theorem of kinetic energy and work. Dynamics of relative point motion. The momentum of a point, system of points and a rigid body. Angular momentum of material point and rigid body. The principle of momentum, the principle of conservation of momentum. Koenig's theorem for kinetic energy. Center of mass motion. Variable mass system movement - rocket movement

## Teaching methods

Lectures: multimedia presentation with theory and examples, discussion and problem analysis

Classes: problem solving

## Bibliography



Basic

Sałata W., Mechanika ogólna w zarysie, Poznań, Wyd. PP 1998.

Leyko J., Mechanika ogólna. T. 1, Warszawa, PWN 2008.

Leyko J., Mechanika ogólna. T. II, Warszawa, PWN 2008.

Misiak J. Zadania z mechaniki ogólnej. Część I, II i III, Warszawa, WNT 1994

Nizioł J. Metodyka rozwiązywania zadań z mechaniki. Warszawa, WNT 2002.

Additional

Awrajcewicz J. Mechanika techniczna, Warszawa WNT 2009

Arczewski K. Drgania układów fizycznych, Warszawa, Wyd. PW. 2008

Szcześniak W. Dynamika teoretyczna w zadaniach dla dociekliwych, Warszawa, Wyd. PW. 2010

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	50	2,0
Student's own work (literature studies, preparation for classes, preparation for tests) <sup>1</sup>	50	2,0

<sup>1</sup> delete or add other activities as appropriate