



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Fundamentals of mechanics [N1Bud1>PM]

### Course

Field of study

Civil Engineering

Year/Semester

1/1

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

20

### Number of credit points

6,00

### Coordinators

dr hab. inż. Anna Knitter-Piątkowska  
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### Lecturers

### Prerequisites

Basic knowledge of mathematics and physics. The student has the ability to self-learning, can acquire information from literature, databases and other sources. The student understands the need for learning throughout life, is able to interact and work in a group.

### Course objective

Acquire the knowledge, skills and competence in solving problems concerning statics and kinematics of the material point and rigid body, which is necessary for further study of the strength of materials, structural mechanics and theory of elasticity and plasticity.

### Course-related learning outcomes

Knowledge:

1. Student knows conditions of geometrical invariability of a system of rigid bodies.
2. Student knows the equilibrium conditions for two-dimensional set of forces.
3. Student knows the methods of determining of internal forces in statically determined plane structures.
4. Student knows the equilibrium equations for beams.

### Skills:

1. Student can identify statically determined and geometrically invariable structural systems.
2. Student can determine reaction forces in plane structures.
3. Student can determine internal forces in plane trusses, beams and frames.
4. Student can draw the diagrams of internal forces in beams and frames.

### Social competences:

1. Students can work independently or cooperate in group on specific task.
2. Student is responsible for the accuracy of obtained results of his/her work and their interpretation.
3. Student is responsible for safety of the own work and work of the team.
4. Student understands the need of raising of the professional and personal competences.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

- classes are passed in the case of positive mark (at least E) in two written tests (duration of one test is 90 minutes), dates are given at the beginning of the semester,
- project classes are passed in the case of positive marks (at least E) in 4 project tasks; evaluation depends on the result of the discussion on issues related to the project,
- the subject is finished by written exam (duration 3x45 minutes), dates are given at the beginning of the semester.

Scale of the evaluation:

- excellent (A)
- good (B)
- average (C)
- passing (D)
- near failed (E)
- failed (F)

### Programme content

Newton's laws of mechanics. Elements of vector calculus. Force. Constraints and reaction forces. Conditions of geometrical invariability of a system of rigid bodies. Statically determined systems. Internal forces. Differential equations of internal equilibrium in beams. Friction. Kinematics of point. Vibrations. Kinetic and potential energy.

### Course topics

Newton's laws of mechanics. Elements of vector calculus: force, moment of a force about a point and about an axis.  
Pair of forces and its properties. Reduction of a system of forces. Resultant force.  
Equilibrium of a system of forces. Degrees of freedom. Constraints and reaction forces.  
Conditions of geometrical invariability of a system of rigid bodies.  
Statically determined systems.  
Internal forces in statically determined plane structures: systems of rigid bodies, truss structures, beams and plates.  
Differential equations of internal equilibrium in beams.  
Friction and the laws of dry friction.  
Kinematics of point.  
Free vibrations, forced vibrations and damped vibrations.  
Kinetic and potential energy, the principle of conservation of mechanical energy.

### Teaching methods

informative and conversational lecture, tutorial, method of projects

### Bibliography

Basic

1. Przewłócki J., Górski J.: Podstawy mechaniki Budowli. Arkady, Warszawa, 2006
  2. Leyko J.: Mechanika ogólna. PWN, Warszawa, 2008
  3. Grabowski J., Iwanczewska A.: Zbiór zadań z wytrzymałości materiałów. Oficyna Wydawnicza Politechniki Warszawskiej, 2006
  4. Dębiński J.: Siły przekrojowe w układach statycznie wyznaczalnych. Wydawnictwo Politechniki Poznańskiej, 2011
  5. Beer F. P., Johnston E. R.: Vector Mechanics for Engineers, Statics, International Student Edition, McGraw-Hill Book Company Japan, Tokyo 1984.
  6. Shelley J. F.: Engineering Mechanics, Dynamics, McGraw-Hill Book Company 1980.
  7. Przewłócki J., Górski J.: Podstawy mechaniki Budowli. Arkady, Warszawa, 2006
  8. Leyko J.: Mechanika ogólna. PWN, Warszawa, 2008
  9. Grabowski J., Iwanczewska A.: Zbiór zadań z wytrzymałości materiałów. Oficyna Wydawnicza Politechniki Warszawskiej, 2006
  10. Dębiński J.: Siły przekrojowe w układach statycznie wyznaczalnych. Wydawnictwo Politechniki Poznańskiej, 2011
  11. Dębiński J., Grzymisławska J.: Podstawy mechaniki płaskich układów prętowych. Wydawnictwo Politechniki Poznańskiej, 2018
  12. Beer F. P., Johnston E. R.: Vector Mechanics for Engineers, Statics, International Student Edition, McGraw-Hill Book Company Japan, Tokyo 1984.
  13. Shelley J. F.: Engineering Mechanics, Dynamics, McGraw-Hill Book Company 1980.
- Additional
1. Praca zbiorowa: Wytrzymałość materiałów. Zarys teorii, przykłady, zadania. Część I. Wydawnictwo PP, 1992
  2. Cywiński Z.: Mechanika budowli w zadaniach. Układy statycznie wyznaczalne. PWN Warszawa, 2006.
  3. Praca zbiorowa: Wytrzymałość materiałów. Zarys teorii, przykłady, zadania. Część I. Wydawnictwo PP, 1992
  4. Cywiński Z.: Mechanika budowli w zadaniach. Układy statycznie wyznaczalne. PWN Warszawa, 2006.

### Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	64	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	86	4,00