COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of mechanics [S1Bud1>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
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
30

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

Knowledge: Basic knowledge of the vector calculus and the mathematical analysis. Skills: Capability to apply the vector calculus and calculate derivatives and integrals of simple functions. Social competencies: Understanding the necessity of constant actualization and complementation of knowledge and skills.

Course objective

The aim of this subject is to prepare the student to be able to solve two- and three-dimensional static tasks, especially the statics of bar systems.

Course-related learning outcomes

Knowledge:
1. Student knows the equilibrium conditions for two- and three-dimensional forces sets.
2. Student knows methods of calculation of internal forces in statically determined plane bar systems.
3. Student knows the principle of virtual work.

Skills:
1. Student can determine reactions in two- and three-dimensional bar systems.

2. Student can determine internal forces in two- dimensional statically determined bar systems.
3. Student can apply the principle of virtual work to determine reactions and internal forces.

Social competences:
1. Student can work independently on specific task.
2. Student is responsible for the accuracy of obtained results of his work and their interpretation.
3. Student can formulate conclusions and describe results of his own work.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
The subject ends with a written exam. The exam consists of 3-5 tasks. Each task is assessed on a scale of 2.0-5.0. The final grade of the exam is a weighted average of grades from individual tasks. Task weights depend on their level of difficulty.
The grade from the class of the tutorial exercises is the average of the grades of the four written tests covering all the material of the exercise.
The grade from the project exercises is the arithmetic average of the grades from the four project tasks. The grade for a design assignment is influenced by the defense of the assignment and the deadline for submitting the work. For a task to be accepted, it must be performed correctly.

Programme content

The module program covers the following topics:
1) repetition and completion of vector calculation,
2) Reduction of the system of forces and equilibrium conditions,
3) geometric and static analysis of flat rigid body systems
4) determining internal forces in flat bar systems,
5) equilibrium of spatial systems of forces,
6) formulation and application of the principle of virtual work,
7) friction and rolling resistance,
8) basics of kinematics and dynamics of a material point and a rigid body.

Course topics

The lecture program covers the following topics:
1) elements of vector calculus, vector moment about a point and about an axis,
2) principles of statics, Newton's laws,
3) force couple and its properties,
4) reduction of the system of forces, resultant, equilibrium conditions of any system of forces,
5) degrees of freedom of the material system, constraints and reactions of constraints,
6) geometric invariance of the system.
7) statically determinate systems,
8) internal forces in beams and frames, differential bending relationships,
9) flat trusses - methods for determining forces in bars,
10) friction and friction laws, rolling resistance,
11) the principle of virtual work and its applications.

The program of auditorium exercises includes solving tasks in the following areas:
1) geometric and static analysis of flat rigid body systems,
2) calculating reactions and determining internal force functions in statically determinate beams,
3) calculating reactions and determining internal force functions within statically determinate frameworks,
3) calculation of reactions and forces in truss bars statically determined by the node balancing method and the Ritter method.

The design exercise program includes the student's independent development of individual design tasks regarding the following issues:
1) geometric and static analysis of flat rigid body systems,
2) calculating reactions and determining internal force functions in statically determinate beams,
3) calculating reactions and determining internal force functions within statically determinate frameworks,

3) calculation of reactions and forces in truss bars statically determined by the node balancing method and the Ritter method.

Teaching methods

Lecture - informative, monographic.
Tutorials - exercise method.
Projects - project method.

Bibliography

Basic
1. J. Misiak, Mechanika ogólna. T. 1, Statyka i kinematyka, WNT Warszawa 1998,
2. Z. Cywiński, Mechanika budowli w zadaniach. Układy statycznie wyznaczalne, PWN Warszawa 1999,
3. J. Dębiński, J. Grzymisławska, Podstawy mechaniki płaskich układów prętowych. Cz. 1-3, Wydawnictwo PP, Poznań 2019
Additional

Breakdown of average student's workload

	Hours	ECTS
Total workload	160	6,00
Classes requiring direct contact with the teacher	92	3,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	68	2,50