COURSE DESCRIPTION CARD - SYLLABUS

Course name
Mechanics of engineering structures [N2Bud1-BDMiK>MKI]

Course

Field of study
Civil Engineering

Year/Semester
1/2

Area of study (specialization)
Road, Bridge and Railway Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
10

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

KNOWLEDGE: Student knows the analytical methods of calculating forces and displacements in statically determinate and indeterminate bar systems. Student has knowledge of the state of stresses and deformations in the sections of bars and in the ground. SKILLS: Student can calculate forces and displacements in bar systems, statically determinate and indeterminate. He can calculate stresses and strains in the cross-sections of bars and in the ground and can perform numerical calculations using a spreadsheet. Ability to adapt of the type of any civil engineering structure to the communication requirements and social expectations, respect for the Polish language, understand the need for lifelong learning and group collaboration. SOCIAL COMPETENCE: Student is a responssible person willing to broaden her/his knowledge and to communicate and work in a team environment with her/his colleagues.

Course objective

To teach the student the principles and understanding of the static analysis of rod and tension systems in terms of the finite element method using computer programs.

Course-related learning outcomes

Knowledge:

The student knows the analytical and computer methods of calculating internal forces and displacements in beams on elastic ground.
The student knows the analytical and computer methods of calculating internal forces and displacements in bar structures, also taking into account the influence of large axial forces.
The student knows the specificity of the non-linear behavior of tension structures and the methods of their static analysis.

Skills:
The student is able to calculate analytically and using the finite element method internal forces and displacements in beams on elastic ground.
The student is able to calculate analytically and using the finite element method internal forces and displacements in bar structures.
The student is able to use the Newton"s method to calculate geometrically nonlinear tension systems.

Social competences:
The student can work individually and in a team.
The student is aware of the responsibility resulting from the accuracy of the results obtained and is able to interpret.
The student is aware of the need for continuous training and expanding knowledge.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Written test of the student"s knowledge in the field of material presented during the lectures.
Preparation of some project and oral test of knowledge of the range of this project.

Programme content

Static analysis of beams on elastic foundations.
Calculation of frames using the displacement method - using computer version of the method.

Course topics

Static analysis of beams on elastic foundation. Problem formulation and analysis by the finite element method. Static analysis of bar structures (frames) - using computer method. Problem formulation and analysis by the finite element method. Static analysis of tension systems. Problem formulation, analysis with the analytical method and the finite element method.

Teaching methods

Lectures: problem lecture/lecture with presentations/ case study
Project: project method

Bibliography

Basic
1. W.K. Kaczurin: Teoria konstrukcji wiszących. Arkady, Warszawa 1965.
2. P. Litewka, R. Sygulski: Wybrane zagadnienia zaawansowanej mechaniki budowli. Wydawnictwo PP, Poznań 2012.
3. T. Łodygowski, W.Kąkol: Metoda elementów skończonych w wybranych zagadnieniach mechaniki konstrukcji inżynierskich, dostępne na stronie internetowej Zakładu Komputerowego Wspomagania Projektowania PP
4. G. Rakowski, Z. Kacprzyk: Metoda elementów skończonych w mechanice konstrukcji. Oficyna Wydawnicza PW, Warszawa 2016.
Additional
1. J. Hajduk, J. Osiecki: Ustroje cięgnowe. Teoria i obliczanie. WNT, Warszawa 1970.
2. J.W. Leonard: Tension Structures - Behavior and Analysis. McGraw-Hill, 1987.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	20	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50