COURSE DESCRIPTION CARD - SYLLABUS

Course name
Structural mechanics [N1Bud1>MB1]

Course

Field of study
Civil Engineering

Year/Semester
2/4

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
10

Laboratory classes
10

Other (e.g. online)
0

Tutorials
10

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr inż. Olga Kawa
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Lecturers

Prerequisites

Knowledge. The student has basic knowledge of the following subjects: mathematics, theoretical mechanics, strength of materials in the field of construction or related studies. Skills. The student is able to skillfully use his knowledge and at the same time obtain it from available bibliographic sources. Student has the ability to apply the learned theory to solve practical tasks. Social competence. The student is aware of the need to expand his theoretical knowledge in order to be able to find a justification for its application while practicing the profession. He understands the necessity of continuous education.

Course objective

Calculation of displacements in flat rod systems using the principle of the virtual work. Solving beams and frames using the flexibility-force method.

Course-related learning outcomes

Knowledge:
The student knows the relationship between displacements and loads in terms of statics for straight bars.
The student knows the methods of creating computational models of flat bar structures, has detailed

knowledge of theoretical mechanics, strength of materials and general principles of shaping the structure.

Skills:
The student is able to determine the distribution of internal forces and calculate generalized displacements in systems under any load, thermal and kinematic influences in plane bar systems.
The student is able to formulate equilibrium equations for beams, trusses and frames according to the first order theory.
The student is able to use the force method to solve flat statically indeterminate structures and to determine the distribution of internal forces.

Social competences:
The student is able to work independently and cooperate in a team.
The student knows the responsibility resulting from the reliability of the obtained results of their work and is able to interpret them.
The student is aware of the need to systematically supplement and expand his 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:
1) Lectures ending with an exam.
Duration of each examination: 2 hours. Each student receives an individual set of exam topics.
The grade consists of the sum of the points obtained from the answers; a positive grade on a scale of 2 = insufficient to 5 = very good is obtained after obtaining a minimum of 50% of the maximum number of points. 1 written test at the end of the semester.
2) Auditorium exercises: one knowledge test at the end of the semester.
3) Design exercises: each student receives individual tasks for independent solution and development (projects). Number of projects: 2.
The form of checking: individual consultations during design exercises.
Assessment: defense of the project at the time of its submission by the deadline set at the beginning of the semester.
The scale for the evaluation of results for the test and exam:
> = 90% - 5.0 (very good)
> = 85% - 4.5 (good plus)
> = 75% - 4.0 (good)
> = 65% - 3.5 (sufficient plus)
> = 55% - 3.0 (satisfactory)

Programme content

An application of the principle of the virtual work to calculation displacements in statically determined flat bar systems. An application the flexibility-force method to solving statically undetermined flat bar systems.

Course topics

1. Introduction.
2. Work of internal and external forces. Principle of virtual work.
3. An application of the principle of the virtual work to calculation displacements in statically determined flat bar systems.
4. Reciprocity theorems. Statically indeterminate structures.
5. Flexibility method. An application the flexibility-force method to solving statically undetermined flat bar systems.

Teaching methods

Application of the virtual work equation to calculate displacements in selected sections of a structure. Solving statically indeterminate frames using the force method. Informative and monographic lecture.
Monographic lectures covering theoretical foundations and simple numerical examples.
Auditorium exercises including numerical examples. The examples are solved by the teacher using the

"chalk and blackboard" method.
Exercises for self-solution covering two design tasks. The tutor consults the tasks given to students and, as needed, solves similar tasks on the blackboard

Bibliography

Basic
1. J. Rakowski Mechanika budowli. Zadania część 1 Wydawnictwo PP Poznań 2007.
2. M. Guminiak, J. Rakowski Zbiór zadań z mechaniki budowli Wydawnictwo PWSZ Piła 2008.
3. M. Guminiak, J. Rakowski Mechanika Budowli. Zbiór zadań z elementami ujęcia komputerowego Wydawnictwo PWSZ Piła 2011.
Additional
1. W. Nowacki Mechanika budowli PWN Warszawa 1974.
2. Z. Dyląg i in Mechanika budowli (t.I+II) PWN Warszawa 1989.
3. Z. Cywiński Mechanika budowli w zadaniach (t.I+II) PWN Warszawa 1976.

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,00
Classes requiring direct contact with the teacher	32	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	58	2,00