COURSE DESCRIPTION CARD - SYLLABUS

Course name
Structural mechanics [S1BZ1E>MB1]

Course

Field of study
Sustainable Building Engineering

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
15

Number of credit points

3,00

Coordinators

prof. dr hab. inż. Przemysław Litewka
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Lecturers

Prerequisites

Student has the basic knowledge in: mathematics, foundations of mechanics, strength of materials in the scope from the current course Student can use the possessed knowledge and gain new abilities from accessible literature. Student can apply the known theory to solve practical problems Student is aware of necessity to expand knowledge so that he can find the justification for its application to practical problems. Student undestands the necessity of constant education.

Course objective

Knowledge of theoretical foundations and models in mechanics of plane bar structures. Ability to compute internal forces and displacements in statically determinate and indeterminate systems. Ability to compute influence lines of static and kinematic quantities in bar structures.

Course-related learning outcomes

Knowledge:
1. Student knows basic theorems and principles of linear structural mechanics
2. Student knows the relations between displacements and loading in statics of straight beams
3. Student knows the methods to build the computational models of plane bar structures.

Skills:
1. Student can find the distributions of internal forces and compute displacements due to external loading, temperature change and imposed displacements in plane bar structures.
2. Student can find the functions of static and kinematic quantities due to movable load.
3. Student can choose correct methods to solve plane bar structures

Social competences:
1. Student can work individually and in a team
2. Student has the responsibility for the correctness of the obtained solutions and can give their interpretation
3. Student has the consciousness fo necessity of continuous expansion of 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) lecture
final mark based on the mark from tutorial
2) tutorial - 2 test during the semester
3) projects - 2 individual projects for each student - individual consultations, the marks based on the current verification of knowledge at the submission date

Programme content

Lecture
Mechanical models of civil engineering structures (1h)
Work of internal and external forces. Principle of virtual work (1h)
Calculation of displacements in statically determinate bar structures due to loading, temperature change and imposed displacements (2h)
Statically indeterminate structures. Flexibility method. Loading, temperature change, imposed displacements (2h)
Reciprocity theorems (2h)
Reduction theorems - computation of displacements in statically indeterminate structures (2h)
Influence lines of static and kinematic quantities in statically determinate and indeterminate structures (4h)
Tutorials
Calculation of displacements in statically determinate bar structures due to loading, temperature change and imposed displacements (4h)
Statically indeterminate structures. Flexibility method. Loading, temperature change, imposed displacements (6h)
Reduction theorems - computation of displacements in statically indeterminate structures (2h)
Exercises (projects)
1.Calculation of displacements in statically determinate bar structures due to loading, temperature change and imposed displacements (4h)
2. Statically indeterminate structures. Flexibility method. Loading, temperature change, imposed displacements. Computation of displacements in statically indeterminat structures

Course topics

Lecture and classes
Derivation of the principle of virtual work
Application of PVW in computation of displacements (translations and rotations) i plane frames and trusses - under the action of loading, temperature change and support displacements
Plane frames statically indeterminate - flexibility method. Determination of DR, computation of plane frames under the action of loading, temperature change and support displacements
Influence lines of forces and displacements in statically determinat beams
Influence lines of forces in statically indeterminate beams
Projects
Application of PVW in computation of displacements (translations and rotations) i plane frames and trusses

- under the action of loading, temperature change and support displacements
Plane frames statically indeterminate - flexibility method. Determination of DR, computation of plane frames under the action of loading, temperature change and support displacements

Teaching methods

Lecture - monographic lecture, tutorials, exercices - exercise and project method

Bibliography

Basic
1. Electronic textbook http://www.ikb.poznan.pl/przemyslaw.litewka/str-me-w.html
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
4. Z. Cywiński, Mechanika budowli w zadaniach (t.I+II), PWN, Warszawa 1976
5. J. Rakowski, Mechanika budowli, Zadania cz.1, Wydawnictwo PP, Poznań 2007
Additional
1. Internet textbook, Mechanika budowli, www.ikb.put.poznan.pl/node/49
2. W. Nowacki, Mechanika budowli, PWN, Warszawa 1974
3. Z. Dyląg i in., Mechanika budowli (t.I+II), PWN, Warszawa 1989

Breakdown of average student's workload

	Hours	ECTS
Total workload	80	3,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00