COURSE DESCRIPTION CARD - SYLLABUS

Course name
Advanced structural mechanics [S2Bud1E-KB>ZMK]

Course

Field of study
Civil Engineering

Year/Semester
1/1

Area of study (specialization)
Structural Engineering

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
15

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

1. Student knows analytical methods of computation of internal forces and displacements in statically determinate and indeterminate structures 2. Student has basic knowledge related to buckling of compressed elements and stability of bar structures 3. Student has fundamental knowledge on stress and strain state in cross-sections of beams 4. Student can compute forces and displacements in statically determinate and indeterminate structures 5. Student can compute stresses and strains in cross-sections of beams 6. Student can describe the carried out computations

Course objective

1. Extension of knowledge on classical methods of analysis of bar structures 2. Getting familiar with matrix methods of analysis of statics and stability of bar structures 3. Presentation of fundations of analysis of space girders - plates and shells

Course-related learning outcomes

Knowledge:
1. Student knows the analytical and numerical methods to calculate internal forces and displacements in bar structures, also with the influence of large axial forces

2. Student knows the methods of analysis of initial stability
3. Student knows the foundations of forming and non-linear behaviour of cable structures
4. Student knows the foundations of the finite strip method
5. Student knows the foundations of the engineering method of shell analysis

Skills:
1. Student can compute internal forces and displacements of bar structures using various methods, also with the influence of large axial forces
2. Student can compute the critical load and the mode of stability loss for bar structures
3. Student can apply the Newton method to analyze geometrically non-linear cable structures
4. Student can critically assess the obtained results of statics and stability of bar structures
5. Student can describe the carried out computations and draw conclusions

Social competences:
1. Student is responsible for the obtained results of computations
2. Student can co-operate in small teams

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
- 3 written tests checking the knowledge and skills
- 3 individual exercises (projects) to be solved together with written verification of related knowledge

Programme content

Lectures and tutorials
Computation of internal forces and displacements in curved beams of various geometry, statically determinate and indeterminate (6h)
Computation of internal forces and displacements in 3D frames, statically determinate and indeterminate (4h)
Engineering method of analysis of shell structures (6h)
Matrix version of stiffness method for frames (10h)
Matrix formulation of statics of plane frames with large axial forces influence (4h)
Matrix formulation of stability loss of frames (4h)
Computation of displacements and internal forces in cable structures (2h)
Foundatuions of the finite strip method for plates (2h)
Exercises (projects)
1. Statically indeterminate curved beam - numerical integration
2. Matrix version of the stiffness method
3. Stability and statics with large axial forces

Course topics

Lectures and tutorials
Computation of internal forces and displacements in curved beams of various geometry, statically determinate and indeterminate (6h)
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Engineering method of analysis of shell structures (6h)
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Matrix formulation of stability loss of frames (4h)
Computation of displacements and internal forces in cable structures (2h)
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Exercises (projects)
1. Statically indeterminate curved beam - numerical integration
2. Matrix version of the stiffness method
3. Stability and statics with large axial forces

Teaching methods

lecture - monographic lecture method, tutorials and projects - exercise and project method

Bibliography

Basic
1. Wybrane zagadnienia zaawansowanej mechaniki budowli, P. Litewka, R. Sygulski, Wydawnictwo Politechniki Poznańskiej, Poznań, 2012
2. Electronic textbook: http://www.ikb.poznan.pl/przemyslaw.litewka/str-ana.html
Additional
1. Mechanika budowli - ujęcie komputerowe, t. 1, 2 i 3, Z. Waszczyszyn i in., Arkady, Warszawa, 1995
2. Computer Analysis of Structural Systems, J. F. Fleming, Mc Graw - Hill, 1989

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50