



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Advanced structural mechanics

Course

Field of study

Year/Semester

Civil Engineering

1 / 1

Area of study (specialization)

Profile of study

Structural Engineering

general academic

Level of study

Course offered in

Second-cycle studies

Polish

Form of study

Requirements

full-time

compulsory

Number of hours

Lecture

Laboratory classes

Other (e.g. online)

15

Tutorials

Projects/seminars

15

15

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

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Prerequisites

1. Student knows analytical methods of calculation of internal forces and displacements in statically determinate and indeterminate bar structures
2. Student has basic knowledge concerning buckling and stability loss of plane bar structures
3. Student has knowledge concerning stress and strain states in beam cross-sections
4. Student can calculate internal forces and displacements in statically determinate and indeterminate bar structures
5. Student can calculate stress and strain states in beam cross-sections



6. Student is responsible for the results of carried out computations

Course objective

1. Presentation of matrix methods of static and stability analysis of bar structures
2. Introduction of foundations of plane girders analysis by analytical methods, finite strip method and boundary element method.

Course-related learning outcomes

Knowledge

1. Student knows analytical and numerical methods of calculation of internal forces and displacements in bar structures, also with the influence of large axial forces
2. Student knows methods of analysis of initial stability of bar structures.
3. Student knows the foundations of forming and non-linear behaviour of cable structures
4. Student knows the foundations foundations of forming and bahaviour of shells in membrane and bending state

Skills

1. Student can use analytical and numerical methods of calculation of internal forces and displacements in bar structures, also with the influence of large axial forces
2. Student can compute the critical load and mode of the stability loss for bar structures
3. Student can apply the Newton method to analyze geometrically non-linear cable structures
4. Student can compute internal forces in axially symmetric shells using the engineering approach
5. Student can critically assess the results of carried out calculations and draw appropriate conclusions
6. Student can describe the carried out analyses and draw the general conclusions from the results

Social competences

Student is responsible for the obtained results of computations

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

-Lecture - written examination with 5 questions checking the study outcomes. Satisfactory mark - for 3 correct answers, good mark - for 4 correct answers, very good mark - for 5 correct answers

- Example classes - the final mark is the mean value from three marks for three tests checking the knowledge from three individual exercises

1. Matrix version of stiffness method - 33%
2. Matrix method of analysis of frame stability and statics with large axial forces - 33%



3. Internal forces in axisymmetric shells - 33%

The tests take place on the deadline of particular exercises

- Exercise classes - the final mark is the mean value from three marks for each individual exercise. The particular mark for the exercise results from the mark for the particular test which may be:

- a) decreased if the exercise deadline is not met (by 1 for each week of delay),
- b) increased in the case of special activity of the student during classes

Programme content

Matrix version of stiffness method.

Matrix analysis of bending of plane frames with large axial forces.

Matrix approach to the initial stability analysis of frames.

Internal forces and displacements in cable structures.

Engineering approach to computation of internal forces in axially-symmetric shells.

Foundations of finite strip method and boundary element method.

Teaching methods

lecture - informative, monographic, exercises - exercise and project methods

Bibliography

Basic

1. Wybrane zagadnienia zaawansowanej mechaniki budowli, P. Litewka, R. Sygulski, Wydawnictwo Politechniki Poznańskiej, Poznań, 2012

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
3. Metoda przemieszczeń i podstawy MES, T. Chmielewski, H. Nowak, L. Sadecka, PWN, Warszawa, 2016



Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	45	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	30	1,0

¹ delete or add other activities as appropriate