COURSE DESCRIPTION CARD - SYLLABUS

Course name
Structural dynamics [S2Bud1E-KB>DK]

Course

Field of study
Civil Engineering

Year/Semester
1/2

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
30

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Students have known the integral and differential calculus and the matrix analysis, methods of static analysis of structures and a basis of dynamic analysis. Students should also have a basic knowledge of computer programming.

Course objective

The aim of lectures is to acquaint students with modern methods of dynamic analysis of structures

Course-related learning outcomes

Knowledge:
- knows the basic ways of deriving equations of motion of building structures
- knows the basic methods of determining the dynamic characteristics of structures
- knows the basic methods of analysis of forced vibrations of building structures
- knows the method of analysis of vibrations caused by seismic loads
- knows the basic methods of dynamic analysis of structures with vibration dampers

Skills:

- can perform the classic dynamic analysis of bar (trusses, frames and tension members) and cubature objects (foundation block) structures
- can perform dynamic analysis of structures loaded seismically
- can perform an analysis of structure with vibration dampers

Social competences:
- is responsible for the reliability of the results of his work and the work of his team
- is ready to independently supplement and expand knowledge in the field of structure dynamics

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, project evaluation, written and oral exam.

Programme content

Dynamic models of selected types of structures.
Models of damping and models of vibration dampers.
Equations of motion of structures with discrete mass distribution.
Analysis of free vibration of structures.
Computer methods for solving eigenproblems.
Analysis of steady-state, harmonically varying vibrations.
Dynamic analysis of block foundation.
Analysis of structures subjected to seismic loads.
Methods of numerical integration of equations of motion.

Course topics

Equations of motion of structures treated as discrete systems.
Equations of motion written in terms of state variables.
Models of chosen types of structures.
Damping models.
Free vibration analysis, dynamic characteristics of structures with and without damping.
Sensitivities of natural frequencies and modes of vibration with respect to design parameters.
Analysis of steady state vibration.
Normal coordinates and theirs applications.
Rayleigh quotients.
Computer methods of solution of eigenvalue problems.
Time integration methods.
Dynamic analysis of block foundations.
Tuned mass damper.
Analysis of structures seismically and para-sejsmically excited.

Teaching methods

Monographic lecture, blackboard exercises, correction of project exercises

Bibliography

Basic
1. Hart G.C., Wong K.: Structural dynamics for structural engineers, Wiley,, New York, 2000.
2. Paz M.: Structural dynamics. Theory and computation, Chapman and Hall, New York, 1997.
3. Meirovitch L.: Computational methods in structural dynamics, Sjthoff and Noordhoff, Alpen aan dej Rein, 1980.
Additional
1. Clough R.W., Penzien J.: Dynamics of structures, McGraw-Hill,, New York, 1993.
2. HumarJ.L.: Dynamics of structures, Balkema,, Lisse, 2000.

Breakdown of average student's workload

	Hours	ECTS
Total workload	105	4,00
Classes requiring direct contact with the teacher	75	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00