



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Structural dynamics [N2Bud1-KB>DK]

### Course

Field of study

Civil Engineering

Year/Semester

2/3

Area of study (specialization)

Structural Engineering

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

part-time

Requirements

compulsory

### Number of hours

Lecture

18

Laboratory classes

10

Other (e.g. online)

0

Tutorials

10

Projects/seminars

0

### Number of credit points

4,00

### Coordinators

dr hab. inż. Zdzisław Pawlak prof. PP  
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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 with state variables.  
 Dynamic models of selected types of structures.  
 Models of damping and models of vibration dampers.  
 Analysis of free vibration, dynamic characteristics of structures with and without consideration of damping and dampers.  
 Analysis of steady-state, harmonically varying vibrations.  
 Rayleigh quotient.  
 Computer methods of solving eigenproblems.  
 Methods of numerical integration of equations of motion.  
 Dynamic analysis of block foundation.  
 Analysis of structures subjected to seismic and paraseismic loads.

### Teaching methods

Monographic lecture, blackboard exercises, correction of project exercises

### Bibliography

Basic

1. Lewandowski R.: Dynamika konstrukcji budowlanych. WPP, Poznań 2006
2. Gromysz K., Dynamika budowli, Obliczanie układów pretowych oraz o masach skupionych, PWN, Warszawa, 2019
3. Chmielewski T., Zembaty Z.: Podstawy dynamiki budowli, Arkady, Warszawa, 1999.

Additional

1. Lewandowski R., Redukcja drgań konstrukcji budowlanych, PWN, Warszawa, 2014;
2. Paz M.: Structural dynamics. Theory and computation. Chapman and Hall, New York, 1997;

### Breakdown of average student's workload

	Hours	ECTS
Total workload	120	4,00
Classes requiring direct contact with the teacher	40	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	80	2,50