SYLLABUS

Course title: Structural Mechanics

Course title (in Polish): Mechanika budowli

The syllabus is valid since the summer semester of the academic year 2025/26 and its content is not subject to changes during the semester.

Course details:

Unit offering the course: Faculty of Civil Engineering

Course designated for the unit: The Silesian University of Technology

Specialization: Structural Engineering

Didactic cycle: Winter semester 2025/2026 - the 5th semester of the first degree studies

Coordinator of the course: PhD Agnieszka Padewska-Jurczak

Delivery mode: in-person

Number of ECTS credits: 3

Language:
English
Course homepage:
Distance Education Platform
Prerequisites:
Prerequisite: completion of the course Strength of Materials and Structural Mechanics
Short description:
The Structural Dynamics course analyzes the behavior of building structures under the influence of dynamic loads, such as forces resulting from wind, earthquakes, machinery motion, and vibrations. It covers topics such as dynamic modeling (dynamic schemes), natural vibration analysis, the influence of damping, and methods for analyzing the impact of external dynamic forces on a structure in time and space.
Description:
LECTURES: 10 h **PRACTICAL CLASSES:** 2 h **PROJECT:** 13 h **LABORATORY:** 5 h The Structural Dynamics course analyzes the behavior of building structures under the influence of dynamic loads, such as forces resulting from wind, earthquakes, machinery motion, and vibrations. It covers topics such as dynamic modeling (dynamic schemes), natural vibration analysis, the influence of damping, and methods for analyzing the impact of external dynamic forces on a structure in time and space. The course discusses the creation of dynamic diagrams, which are an extension of static diagrams with elements relevant to dynamics. Includes analysis of mass distribution, resistance to motion, and modeling of external active forces as a function of time and location. Participants learn how to determine the natural frequencies and modes of vibration of a structure. The course include discussing computational methods for analyzing the effects of dynamic loads on a

structure. The influence of damping on the behavior of a structure under dynamic loads is discussed.

Bibliography:

1) Ghali et al.: ‘Structural Analysis: The Unified Classical and Matrix Approach’. Taylor & Francis
2) Karnovski and O. Lebed: ‘Advanced Methods of Structural Analysis’. Springer C.H.
3) Norris and J.B. Wilbur: ‘Elementary Structural Analysis". McGraw Hill
4) Chmielewski and Zembaty: ‘Podstawy dynamiki budowli’. Wydawnictwo Arkady

Learning outcomes:

KNOWLEDGE : The student knows: (1) princiles of dynamics of structures, K1A_W04;

SKILLS: defining computational models of computer analysis of structures, simulating various construction variants, performing static analysis and elements of dynamic analysis of statically determinate and indeterminate bar structures, as well as critically evaluating the results of these analyzes - [learning outcome K1A_U03]; presentin, assessing and discussing various opinions and positions concerning structural, material and technological solutions, taking into account the costeffectiveness and durability of the analysed solution - [learning outcome K1A_U12].

Assessment methods and assessment criteria:

Report of the dynamic analysis of a discrete system. 67% Final quiz. 33% Prerequisite: completion of the course Strength of Materials and Structural Mechanics.

In order to transfer partial grades, the student should contact the instructor within the first two weeks of the semester.

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