



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Design of structures [S2Bud1E-ZBZ>PK]

Course

Field of study

Civil Engineering

Year/Semester

1/1

Area of study (specialization)

Sustainable construction and management

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

45

Laboratory classes

30

Other

0

Tutorials

0

Projects/seminars

30

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

Student knows the basic methods of mathematical analysis, has a basic knowledge of structural mechanics and strength of materials. Knows the basic materials used in building constructions.

Course objective

Acquire and develop skills related to modeling and dimensioning of different types of building structures based on the PN-EN European Standards.

Course-related learning outcomes

Knowledge:

Student knows the principles of modeling and analysis of selected structural elements of buildings.

Student knows the principles of analysing the issues of statics, stability and dynamics.

Student knows the software and calculation procedures used in the design process.

The student knows the basic provisions of construction law, standards, and guidelines concerning the design of building structures and their elements.

Skills:

Student is able to use building standards regarding structural loads.
Student can design the main building components using the principles of European PN-EN standards.
Student is able to perform basic static and strength calculations of building structural elements.
Student can design selected foundations.

Social competences:

Student is responsible for the reliability of the results obtained.

Student is aware of the need for sustainable development of his personal competence.

Student is aware of the importance of design work and its impact on the safety of people and property.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

1. A written test covering the lecture content;
2. Assessment of individual design tasks, including the correctness of the computational model, load determination, static and strength calculations, and the design of structural members;
3. Assessment of individual laboratory reports;
4. Assessment of independence, punctuality, reliability of the completed work, and correctness of the interpretation of results.

The passing threshold for the written test, design tasks and reports is 50% of points. Grading scale and assignment of grades to percentage ranges of results in accordance with the Study Regulations.

A positive grade in each required component is necessary to pass the course.

Programme content

Fundamentals of structural design.

Construction law and design standards.

Computational models, static schemes, and loads.

Static analysis and verification of limit states.

Design of timber, steel, and reinforced concrete structures.

Design of selected building elements.

Fundamentals of industrial hall and frame structure design.

Dynamic analysis and structural stability.

Computer-aided structural design.

Course topics

Principles of structural design and the professional responsibility of civil engineers.

Construction law, design standards, and the basic requirements imposed on building structures.

Development of computational models and selection of static schemes for structural members and systems.

Determination of loads acting on a structure and their application in static analysis.

Static analysis of structural members and verification of ultimate and serviceability limit states.

Principles for the design of timber, steel, and reinforced concrete structural members.

Design of selected building structural elements, such as girders, columns, floors, and foundations.

Principles of designing industrial hall structures, frame systems, and bracing elements.

Stability analysis of members and frame systems, including the determination of critical load.

Dynamic analysis of structures and the use of computer tools in structural design.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples on the board. Some of the lectures (15 h) delivered remotely using online learning methods and techniques.
2. Laboratory exercises: performing the tasks given by the teacher - practical exercises.
3. Design exercises: solution of design tasks given by the teacher - practical exercises.

Bibliography

Basic:

1. Trahair, N.S., Bradford, M.A., Nethercot, D.A., Gardner, L. (2008). The Behaviour and Design of Steel Structures to EC3. 4th ed. CRC Press.

2. Bond, A.J. et al. (2018). How to Design Concrete Structures using Eurocode 2. 2nd ed. The Concrete Centre.
3. Porteous, J., Kermani, A. (2013). Structural Timber Design to Eurocode 5. 2nd ed. Wiley-Blackwell.
4. EN 1990: Eurocode - Basis of structural design.
5. EN 1991: Eurocode 1: Actions on structures.
6. EN 1992: Eurocode 2: Design of concrete structures.
7. EN 1993: Eurocode 3: Design of steel structures.
8. EN 1995: Eurocode 5: Design of timber structures.

Additional:

1. Underwood, J.R., Chiuini, M. (2007). Structural Design: A Practical Guide for Architects. 2nd ed. John Wiley & Sons.
2. Al Nageim, H. (2017). Steel Structures: Practical Design Studies. 4th ed. CRC Press.
3. Chopra, A.K. (2023). Dynamics of Structures: Theory and Applications to Earthquake Engineering. 6th ed. Pearson.
4. Galambos, T.V., Surovek, A.E. (2008). Structural Stability of Steel: Concepts and Applications for Structural Engineers. Wiley.

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	105	4,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	1,50