COURSE DESCRIPTION CARD - SYLLABUS

Course name
Concrete structures [N2Bud1-IPB>KB]

Course

Field of study
Civil Engineering

Year/Semester
1/1

Area of study (specialization)
Construction Engineering and Management

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
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
18

Number of credit points

3,00

Coordinators

dr inż. Adam Uryzaj
adam.uryzaj@put.poznan.pl

Lecturers

Prerequisites

KNOWLEDGE: The student has knowledge of mathematics, physics and chemistry, knows the rules of analysis, construction and dimensioning of reinforced concrete elements of any building objects and knows the standards and guidelines for designing building objects and their elements. SKILLS: The student is able to evaluate and compile loads acting on building objects, can classify building objects, can design elements in complex reinforced concrete structures, and can choose tools (analytical or numerical) to solve engineering problems. SOCIAL COMPETENCE: Student is a responssible person willing to broaden her/ his knowledge and to communicate and work in a team environment with her/his colleagues.

Course objective

Understanding the principles of analysis and design of shell reinforced concrete structures.

Course-related learning outcomes

Knowledge:
The student knows the rules for determining the combination of permanent and variable loads.
The student knows the rules of dimensioning reinforced concrete sections in a complex load condition.
The student knows the rules of constructing complex reinforced concrete structures.

The student have extended and detailed knowledge of material strength, modelling and constructing; have knowledge of theoretical principles of the finite element method as well as general rules of non-linear calculations of engineering structures

Skills:
The student is able to determine the loads acting on structural systems and determine their most unfavorable cases in combination.
The student is able to design shell structures in the membrane and bending states.
The student is able to construct the reinforcement of selected elements and thin-walled structures.
The student can dimension complex construction details in selected building units.

Social competences:
Student is aware of the need for acting in the public interest and with regard to the purposes of sustainable building engineering and of her/his respossiblity for the results of performed calculations and design of structural elements.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture ─ Final exam
Projects ─ Completion of a project of a reinforced concrete silo or tank and defence of it in the form of test (1 h) at the last meeting.

Programme content

Analysis of reinforced concrete structures according to Eurocode 2. Types of silos and tanks. Loads acting on silos and tanks and their calculation in combination. Differential equilibrium equations of shells. Surface structures as spherical and conical shells. Cylindrical shells. Liquid tanks. Silos for loose materials. Application of the finite element method and computer programs in the calculation of shell structures.

Course topics

1 . Calculation and construction of unidirectionally and multidirectionally reinforced rectangular slabs, based on two, three and four edges, single and multi-span.
2. Calculation and construction of round and triangular cross-reinforced slabs.
3. Determination of fluid and soil pressure loads and their standard combinations.
4. Calculation and construction of direct foundations. Strip foundations for continuous and concentrated loads, footings and foundation slabs.
5. Calculation and construction of retaining walls.
6. Calculation and construction of tanks for liquids with a rectangular cross-section, aboveground, aboveground and underground.
7. Calculation and construction of cylindrical tanks for liquids, aboveground, aboveground and underground.
8. Calculation of spherical shells and thin-walled coverings.
9. Calculation and construction of silos for bulk materials depending on the cross-sectional dimensions and their height.

Teaching methods

Lecture ─ Traditional lectures ("chalk-and-talk"), with computer-assisted presentations at times.
Projects ─ Project of a reinforced concrete silo or tank.

Bibliography

Basic
1. K. Grabiec, Żelbetowe konstrukcje cienkościenne. PWN, Warszawa-Poznań 1999.
2. A. Halicka, D. Franczak, Projektowanie zbiorników żelbetowych. Tom 1: Zbiorniki na materiały sypkie. PWN, Warszawa 2011.
3. A. Halicka, D. Franczak, Projektowanie zbiorników żelbetowych. Tom 2: Zbiorniki na ciecze. Wyd. 2.

PWN, Warszawa 2014.
4. M. Knauff i in., Podstawy projektowania konstrukcji żelbetowych i sprężonych według Eurokodu 2. Dolnośląskie Wydawnictwo Edukacyjne, 2006.
5. J. Kobiak, W. Stachurski, Konstrukcje żelbetowe. Arkady, Tom 2 i Tom 4, Warszawa 1987 i 1991.
6. A. Seruga, Sprężone betonowe zbiorniki na ciecze o ścianie z prefabrykowanych elementów. Wyd. Politechniki Krakowskiej, Kraków 2015.
Additional
1. P. Lewiński, Zasady projektowania zbiorników żelbetowych na ciecze z uwzględnieniem wymagań Eurokodu 2: przykłady obliczeń. Wyd. ITB, Warszawa 2011.

Breakdown of average student's workload

	Hours	ECTS
Total workload	80	3,00
Classes requiring direct contact with the teacher	36	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	44	1,50