COURSE DESCRIPTION CARD - SYLLABUS

Course name
Advanced Concrete Structures

Course

Field of study
Civil Engineering

Year/Semester
1/1

Area of study (specialization)
Structural Engineering

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
30

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
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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 work, erection, 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

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

Social competences

Student is aware of the responsibility arising from the accuracy of obtained results and is able to provide their interpretation

Student is aware of the need for acting in the public interest and with regard to the purposes of sustainable building engineering

Student is aware of the necessity of constant education and knowledge expansion

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture – final exam at the last lecture (2h).

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

Functions, specificity and principles of calculating and designing the structure of silos and tanks. Loads acting on silos and tanks and their design combinations according to Eurocode 2. 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.

Teaching methods

Lecture – traditional lectures ("chalk-and-talk"), with computer-assisted presentations at times.

Projects – project of a reinforced concrete silo or tank, using traditional and computerized approaches.

Bibliography

Basic

1. Mosley B., Bungey J., Hulse R.: Reinforced concrete design to Eurocode 2. 7th Ed., Palgrave Macmillan 2012

2. Toniolo G., di Prisco M.: Reinforced Concrete Design to Eurocode 2. Springer 2017

3. Nilson A.H., Darwin D., Dolan Ch.W.: Design of Concrete Structures. 15th Ed., McGraw-Hill 2016

4. Safarian S.S., Harris E.C.: Design and Construction of Silos and Bunkers. VNR Company 1985

5. Chapelle D., Bathe K-J.: The Finite Element Analysis of Shells – Fundamentals. Springer-Verlag, Berlin 2011

Additional

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.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	1,5

[1] delete or add other activities as appropriate