# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Advanced Concrete Structures

## Course

Field of study
Civil Engineering

Year/Semester
1/2

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
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
15

## Number of credit points

2

## Lecturers

Responsible for the course/lecturer:
prof. dr hab. inż. Mieczysław Kuczma

email: mieczyslaw.kuczma@put.poznan.pl

Phone: 61 665-2155

Faculty of Civil Engineering and Transport

ul. Piotrowo 5, 60-965 Poznań

Responsible for the course/lecturer:
mgr inż. Michał Demby

email: michal.demby@put.poznan.pl

tel: +48 061 665 2085

Faculty of Civil and Transport Engineering

ul. Piotrowo 5, 60-965 Poznań

## Prerequisites

KNOWLEDGE: The student has knowledge of mathematics, physics and chemistry, knows the rules of analysis, construction and dimensioning of reinforced concrete elements and the standards and guidelines for designing building objects and their elements. He/She knows the issues discussed in the first part of the course on "Advanced Concrete Structures".

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, manufacturing, analysis and design of prestressed concrete members and structures made thereof.

## Course-related learning outcomes

### Knowledge

The student knows the rules for determining the combination of permanent and variable loads

The student knows the specifics and rules of dimensioning prestressed concrete elements, taking into account the limit states of serviceability and load-bearing capacity

The student knows the rules of constructing inter-element connections and prestressed 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 prestressed concrete elements under complex loading conditions

The student is able to design structures made of prestressed concrete members

### 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 written test at the last lecture (1.5h).

Tutorials – final written test at the last meeting (1.5h).

Projects – completion of the project of prestressed concrete member (beam or slab) and defence of it in the form of test (1 h) at the last meeting.

## Programme content

Materials used for prestressed concrete. Determination of operating states of prestressed concrete elements. Calculation of stresses in prestressed sections. Determination of compression losses. Calculation of crack width and minimum reinforcement due to cracking. Calculation of deflections of

prestressed concrete elements. Limit load-bearing capacity of prestressed cross-sections. Shear and anchorage zones in prestressed concrete elements. Connections of prestressed elements.

## Teaching methods

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

Tutorials – discussing and solving problems on the blackboard with plenty of student participation.

Projects – project of a prestressed concrete beam or slab, using traditional and computerized approaches.

## Bibliography

Basic

1. Dolan C. W., Hamilton H. R. (Trey): Prestressed Concrete. Building, Design, and Construction. Springer 2019.

2. Gilbert R. I., Mickleborough N. C., Ranzi G.: Design of Prestressed Concrete to Eurocode 2. Second Edition. CRC Press, Boca Raton 2017.

3. Naaman A. E.: Prestressed Concrete. Analysis and Design. Fundamentals. Techno Press, Ann Arbor 2004.

Additional

1. Ajdukiewicz A., Mames J.: Konstrukcje z betonu sprężonego. Polski Cement, 2004.

2. Knauff M.: Obliczanie konstrukcji żelbetowych według Eurokodu 2. Wyd. III poszerzone. PWN, Warszawa 2019.

3. OBrien E., Dixon A,: Reinforced and Prestressed Concrete Design to EC2. Spon Press, London 1999.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 60 | 2,0 |
| Classes requiring direct contact with the teacher | 45 | 1,5 |
| Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1] | 15 | 0,5 |

[1] delete or add other activities as appropriate