1. Course number and name

RB-S1-17-W10-14, **Concrete Structures V**

2. Credits and contact hours*

3 ECTS, lectures: 15 hours**, classes: 5 hours**, laboratory: 25 hours**

3. Instructor's or course coordinator's name

Radosław Kupczyk PhD

4. Text book, title, author, and year

- M. Nadim Hassoun, Akthem Al-Manaseer: *Structural Concrete: Theory and Design*, 7th Edition, 2020
- Mehdi Setareh, Robert Darvas: *Concrete Structures*, 2016
- Neville A. M.: *Properties of Concrete*, 5-th edition, 2012
- Neville A. M.: *Właściwości betonu*. Polski Cement

a. other supplemental materials

- Standards: EN 1992-1-1 Eurocode 2. Part 1-1, EN 1992-1-2 Eurocode 2. Part 1-2.

5. Specific course information

a. brief description of the content of the course (catalog description)

Lectures:

(1) Anchor of reinforcement bars in concrete, (2) Fire and explosions on structures, (3) Designing simple and complex structures with computer calculators and advanced MES methods, (4) Creating the drawing documentation – 2D and 3D, (5) Projekt and execution of the real construction on the example of a single-family house.

Classes:

Discussing two projects. Project No 1 – Create a N_{ED} - M_{ED} interaction graph for non - typical shapes of cross section concreto element, Project No 2 – Calculation of the length of anchoring of steel reinforcing bars in concrete.

Laboratory:

There are five tests:

- determination of the properties of reinforcing bars by the tensile test in the hydraulic press,
- determination of the bond stress between the reinforcing bar and concrete in the pull-out method, including the test of compressive strength of concrete
- experimental presentation of the destruction mechanism of reinforced concrete, wooden and cellular concrete beam due to shear/bending.

b. prerequisites or co-requisites

Knowledge of *Building Materials* (s. 2), *Mechanics of Materials* (s. 2) and *Concrete Structures* (s. 3, 4 and 5).

c. indicate whether a required, elective, or selected elective (as per Table 5-1) course in the program

Required.

6. Specific goals for the course

a. specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic

The student can:

- calculate the anchorage of the reinforcement
- correctly define computinal models and perform a static analysis of simply and advanced structures
- design reinforced concrete elements according to fire load
- calculate the bearing capacity of a reinforced concrete element with interaction graph
- carry out simple experimental studies

b. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.

K1A_W05, K1A_W06, K1A_U02, K1A_U04

7. Brief list of topics to be covered

1. Factors influencing on anchoring of reinforcement bars in concrete - standard requirements and experimental results.
2. Influence of fire on the properties of building materials and design of constraction elements. Examples of objects in which a fire occurred - causes and effects.
3. Explosions in / around buildings - examples, effects, conclusions.
4. Designing simple and complex structures using computer calculators and advanced MES computational methods, including buckling analysis.
5. Todays methods creating the drawing documentation - 2D and 3D modeling and introduction to BIM
6. Construction of a simple, real object - assumptions, design, implementation

*- Consultations were not included in the contact hours

**-per semester