Course Unit Descriptor

**Study Programme:** Civil Engineering

**Course Unit Title:** Concrete Structures 1

**Course Unit Code:** 043

**Name of Lecturer(s):** Associate Professor Danica Goleš

**Type and Level of Studies:** Undergraduate Academic Studies

**Course Status (compulsory/elective):** Compulsory

**Semester (winter/summer):** Winter

**Language of instruction:** English

**Mode of course unit delivery (face-to-face/distance learning):** Face-to-face and/or distance learning

**Number of ECTS Allocated:** 5

**Prerequisites:** Fundamentals of Concrete Structures

**Course Aims:**

Extending knowledge about ultimate limit state analysis of slender RC elements and of linear RC elements subjected to biaxial bending. The acquisition of basic knowledge about the control of stresses in cross-section of RC members. The acquisition of basic knowledge of the time-dependent deformation. Getting to know the calculation procedures of serviceability limit states of RC elements. Acquiring knowledge about the calculation, design, reinforcing and execution of linear RC elements.

**Learning Outcomes:**

Qualification for independent calculation and adoption of materials, shapes, dimensions and reinforcement of linear RC elements and structures, and their graphical representation for the project of structure.

**Syllabus:**

*Theory*

Design of cross section of RC elements subjected to biaxial bending. Ultimate limit state of slender RC elements. Calculation of stresses in concrete and reinforcement - General; Axially loaded non-slender and slender elements in pressure; Axially tensioned elements; Small eccentricity - pressure and tension force. Calculation of stresses in concrete and reinforcement of RC elements in bending. Serviceability limit states of RC elements - The limit state of cracks; The limit state of deformations. Reliability. Design models. Expansion joints. Design and construction of elements. Effective span and supports. Local load distribution. Beams and T-beams - Selecting the shape and size of cross-section; Reinforcement; Effective flange width; Distribution of longitudinal reinforcement using the envelope of the tensile force. Columns and walls - Selecting the shape and size of cross-section; Reinforcement. Partially loaded areas. Hinges in RC structures. Corbels. Design of RC frame structures. Detailing of reinforcement in joints of RC frame structures. RC lattice girders. RC two-flanged girders.

*Practice*

Week by week practice is following theoretical lectures, presenting the numerical examples. Student's work on the individual assignments under the teacher’s guidance.

**Required Reading:**

1.EN 1992-1-1:2004 Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings

2. Subramanian, N.: Design of Reinforced Concrete Structures, Oxford University Press, 2013.

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

4. Bhatt, P., MacGinley, T. J., Choo, B. S.: Reinforced Concrete Design to Eurocodes, CRC Press, Boca Raton, FL, 2014.
5. Calavera, J.: Manual for Detailing Reinforced Concrete Structures to EC2, Spon Press, New York, 2012.

| **Weekly Contact Hours:** 6 | **Lectures:** 3 | **Practical work:** 3 |
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**Teaching Methods:**

Lectures, exercises, consultations and individual assignments under the teacher's guidance

**Knowledge Assessment (maximum of 100 points): 100**

| **Pre-exam obligations** | points | **Final exam** | points |
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| Active class participation | 5 | written exam | 30 |
| Practical work | 5 | oral exam | 30 |
| Preliminary exam(s) | | ……. | |
| Colloquia and seminar paper | 30 | | |

The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.