

Design of Concrete Structures

- Initial requirements: None
- Name, surname, title of teacher: **Michał Musiał, Ph.D.**
- Aims of course and educational outcomes:

Familiarizing students with the rules of structure idealization and static calculations of reinforced concrete structures. Introduction with the rules of designing of reinforced concrete cross-sections and elements subjected to bending, shear, axial and eccentric compression. Presentation of main principles in reinforcing structural elements like concrete beams and columns.

Students will be able to identify and analyse simple and complex strength cases occurring in simple structures. They will be prepared for defining calculation models of structures and their elements for analytic and numeric structural analysis and conducting load-bearing capacity analysis of simple bar structures.

- Lecture – content:

Form of classes - lecture		Number of hours
Lec1	Principles of design according to EN-1990. Eurocode – Basis of structural design	1
Lec2	Principles of design according to EN-1992-1-1. Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings	2
Lec3	Properties of concrete and steel	1
Lec4	Flexural design (rectangular and T-shape beams, slabs)	2
Lec5	Shear design (beams)	2
Lec6	Serviceability limit states of reinforced concrete structures subjected to bending (deflection and cracking)	2
Lec7	Design and detailing of columns subjected to axial and eccentric compression and tension	2
Lec8	Second order effects in reinforced columns	1
Lec9	Design and detailing of slabs subjected to pure bending	1
Lec10	Selected topics of design and detailing of complex reinforced structures	1
Total hours		15

- Project - content:

Form of classes - project		Number of hours
Proj1	Design and detailing of reinforced concrete beam subjected to bending and shearing	7
Proj2	Design and detailing of reinforced concrete column subjected to axial and eccentric compression	4
Proj3	Design and detailing of reinforced concrete slab subjected to pure bending	4
Total hours		15

The whole course package consists of 90 hours:

- Design of Concrete Structures (30 hours);
- Design of Steel Structures (30 hours);
- Lecture of Selected Topics in Structural Mechanics with **Mr. Adrian RÓŻAŃSKI, PhD** (10 hours);

- Tutorial of Selected Topics in Structural Mechanics with **Mr. Adrian RÓŻAŃSKI, PhD** (10 hours);
- Laboratory of Advanced Computer Aided Engineering with **Mr. Jerzy SZOŁOMICKI, PhD** (10 hours).

Completion of all subjects is obligatory to finish the course.

- Basic literature:
 - 1 Beeby A.W., Narayanan R.S., Designers's guide Eurocode 2: Design of concrete structures. ICE Publishing, London 2005.
 - 2 Bond A.J., Brooker O., Harris A.J., Harrison T., Moss R.M., Narayanan R. S., Webster R., How to Design Concrete Structures using Eurocode 2. The Concrete Centre, Camberley 2006.
 - 3 Mosley B., Bungey J., Hulse R., Reinforced Concrete Design to Eurocode 2. Palgrave Macmilan, New York 2007.
 - 4 EN-1990. Eurocode – Basis of structural design
 - 5 EN-1992-1-1. Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings
- Additional literature:
 - 1 Brzev S., Pao J., Reinforced Concrete Design: A Practical Approach. Prentice Hall, Toronto, Ontario 2006.
 - 2 Narayanan R.S., Precast Eurocode 2: Design Manual. British Precast, Leicester 2007.
 - 3 Nawy E.G., Concrete Construction Engineering. Handbook. CRC Press, New York 2008.
 - 4 Limbrunner G. F., Agdhayere A. O., Reinforced Concrete Design. Prentice Hall, New Jersey 2010.
 - 5 Taranath B., Reinforced concrete design of tall buildings. CRC Press, Boca Raton 2009.
- Completion rules: **exam, realization of individual designs**