

**(B) Course information in English**

**General course information:**

<b>Course title:</b>	<b>Reinforced Concrete Design I</b>	<b>Course code:</b>	<b>CE06_S05</b>
<b>Credits:</b>	5	<b>Work load (hours):</b>	160
<b>Course level:</b>	Undergraduate <input checked="" type="checkbox"/>	Graduate <input type="checkbox"/>	
<b>Course type:</b>	Mandatory <input checked="" type="checkbox"/>	Selective <input type="checkbox"/>	
<b>Course category:</b>	Basic <input checked="" type="checkbox"/>	Orientation <input type="checkbox"/>	
<b>Semester:</b>	6 <sup>th</sup>	<b>Hours per week:</b>	4
<b>Course objectives (capabilities pursued and learning results):</b>			
The course objective is the behavior and ultimate strength design of prismatic reinforced concrete members (beams and columns) under normal stresses (bending moment and axial force) and shear stresses (shear force and torsional moment). The course provides the tools for the ultimate strength design of R/C beams and columns under a possible seismic loading.			
<b>Prerequisites:</b>			
1. Mechanics I, II 2. Construction Materials 3. Structural Analysis I			

**Instructor's data:**

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<b>Level:</b>	Professor
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<b>Other tutors:</b>	-

**Specific course information:**

<b>Week No.</b>	<b>Course contents</b>	<b>Hours</b>	
		<b>Course attendance</b>	<b>Preparation</b>
1	Materials: concrete, steel	4	3
2	Behavior of a reinforced concrete member - constitutive laws for concrete and steel	4	3
3	Load combinations – maximum/minimum M, V. Ultimate strength design: concepts and code specifications.	4	3
4	Design under seismic loading – Factor of seismic response and ductility	4	4
5	Ultimate strength design for normal stresses due to uniaxial bending (M) and axial force (N). Equations of equilibrium/equivalence between internal forces and external actions	4	3
6	Under-reinforced, over-reinforced and balanced design of RC beams with rectangular cross-section. Design of rectangular RC beams with single (only tension reinforcement) or double steel (tension and compression reinforcement)	4	3
7	Ultimate strength design of T-beams (effective width, balanced steel reinforcement ratio). LAB: 4-point bending test of R/C beam failing in flexure	4	3
8	Ultimate strength design for reinforced concrete columns under uniaxial bending and axial force	4	3
9	Ultimate strength interaction diagrams M-N (uniaxial bending and axial force) – Lateral confinement	4	3
10	Ultimate strength design for rectangular columns under biaxial bending and axial force ( $M_x$ - $M_y$ -N) and interaction diagrams) - Columns with low shear-length ratio	4	4
11	Ultimate strength design for beams under shear (V) (mechanisms, cross-section, transverse reinforcement - stirrups)	4	3
12	Ultimate strength design for beams under shear (V) (critical regions, design for shear under seismic loading – X steel reinforcement)	4	3
13	Ultimate strength design for beams under pure torsion (T) (mechanism, cross-section, transverse and longitudinal steel reinforcement)	4	4
14	Ultimate strength design for beams under combined torsion (T), shear (V) and bending (M) (transverse and longitudinal steel reinforcement, construction details)	4	3

Additional hours for:			
Class project	Examinations	Preparation for examinations	Educational visit
25	4	30	

**Suggested literature:**

1. Greek Code for the Design of Reinforced Concrete Structures (2000)
2. Eurocode 2: Part 1-1 (EN1992-1-1)
3. Eurocode 8: Part 1 (EN1998-1)
4. Greek Code for Aseismic Design
5. Nilson, A., "Design of Reinforced Concrete Structures"
6. Class notes for RC I
7. Fardis M., «A course on Reinforced Concrete»
8. Penelis/Stylianidis/Kappos/Ignatakis, «Reinforced Concrete Structures»

**Teaching method** (*select and describe if necessary - weight*):

Teaching	<input checked="" type="checkbox"/>	75%
Seminars	<input type="checkbox"/>	-
Demonstrations	<input type="checkbox"/>	-
Laboratory	<input checked="" type="checkbox"/>	3%
Exercises	<input checked="" type="checkbox"/>	20%
Visits at facilities	<input checked="" type="checkbox"/>	2%
Other ( <i>describe</i> ): .....	<input type="checkbox"/>	-
Total		100%

**Evaluation method** (*select*)- **weight**:

	<u>written</u>	<u>%</u>	<u>Oral</u>	<u>%</u>
Homework	<input type="checkbox"/>		<input type="checkbox"/>	
Class project	<input checked="" type="checkbox"/>	25	<input checked="" type="checkbox"/>	5
Interim examination	<input type="checkbox"/>		<input type="checkbox"/>	
Final examinations	<input checked="" type="checkbox"/>	70	<input type="checkbox"/>	
Other ( <i>describe</i> ): .....	<input type="checkbox"/>		<input type="checkbox"/>	