

COURSE OUTLINE

(1) GENERAL

SCHOOL	UNIVERSITY OF THESSALY		
ACADEMIC UNIT	DEPARTMENT OF CIVIL ENGINEERING		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΔO0500	SEMESTER	8 th
COURSE TITLE	Assessment and Strengthening of Reinforced Concrete Structures		
INDEPENDENT TEACHING ACTIVITIES <i>if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>		WEEKLY TEACHING HOURS	CREDITS
		4	5
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
COURSE TYPE <i>general background, special background, specialized general knowledge, skills development</i>	Specialized general knowledge		
PREREQUISITE COURSES:	Design of Reinforced Concrete I, Statics I, Statics II, Strength of Materials II, Construction Materials		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK (or English to Erasmus+ students)		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes		
COURSE WEBSITE (URL)	https://eclass.uth.gr/courses/CULT_U_154/		

(2) LEARNING OUTCOMES

Learning outcomes <i>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.</i> <i>Consult Appendix A</i> • Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area • Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B • Guidelines for writing Learning Outcomes
The scope of this course is to understand specific topics in reinforced concrete design, primarily focusing on the assessment of the bearing capacity of existing substandard reinforced concrete structures, as well as on the strategies and methodologies for their structural strengthening or retrofitting. Emphasis is given on understanding and applying the most modern strengthening methods (e.g., composite materials). <i>Knowledge acquired</i> After completing the course, the student will have advanced knowledge, which entails a critical understanding of design principles and theories: • In the assessment of reinforced concrete structures for pre-determined performance levels. • In the behavior of reinforced concrete members under cyclic/seismic loading. • In strategies for structural strengthening/retrofitting old R/C structures. • In the use of composite materials for strengthening reinforced concrete beams and columns. <i>Skills developed</i>

Students will develop advanced skills in processing, analyzing, and solving complex problems related to the assessment and/or retrofitting of old substandard reinforced concrete structures.

Competencies

After completing the course, students will be able to:

- Evaluate and judge the load-bearing capacity of old substandard reinforced concrete structures.
- Propose optimal redesign solutions based on their previous evaluation.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

<i>Search for, analysis and synthesis of data and information, with the use of the necessary technology</i>	<i>Project planning and management</i>
<i>Adapting to new situations</i>	<i>Respect for difference and multiculturalism</i>
<i>Decision-making</i>	<i>Respect for the natural environment</i>
<i>Working independently</i>	<i>Showing social, professional and ethical responsibility and sensitivity to gender issues</i>
<i>Team work</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>.....</i>
<i>Production of new research ideas</i>	<i>Others...</i>
	<i>.....</i>

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Adapting to new situations
- Decision-making
- Teamwork
- Production of free, creative and inductive thinking
- Critical thinking
- Presentation skills

(3) SYLLABUS

1	Part A: Assessment of existing structures - Introduction
2	Performance levels, data reliability levels, analysis methods
3	Non-linear behaviour of RC elements – I
4	Non-linear behaviour of RC elements – II
5	Non-linear behaviour of RC elements – III
6	Term-project, Individual meetings with the teams
7	Part B: Retrofitting/strengthening of existing structures - Strategies
8	Strengthening with RC jackets. Infilling of RC frames
9	Strengthening with composite materials - Introduction
10	Strengthening with composite materials – Confinement for ductility increase
11	Strengthening with composite materials – Flexure
12	Strengthening with composite materials –
13	New trends on strengthening techniques with composite materials

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY <i>Face-to-face, Distance learning, etc.</i>	Face-to-face lectures	
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY <i>Use of ICT in teaching, laboratory education, communication with students</i>	PowerPoint slides, communication via email, use of an online classroom system (eclass).	
TEACHING METHODS <i>The manner and methods of teaching are</i>	<i>Activity</i>	<i>Semester workload</i>
	Lectures	52 hours

<i>described in detail.</i> <i>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i> <i>The student's study hours for each learning activity are given as well as the hours of non- directed study according to the principles of the ECTS</i>	Study of course material	30 hours
	Term project	60 hours
	Project presentation & Oral exam	3 hours
	Final exam	2 hours
	Course total	147 hours
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure <i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open- ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i> <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	Language of Evaluation: Greek (or English for Erasmus+ students) The performance evaluation is conducted through: (a) Semester term project (b) Final written examination at the end of the semester (theory and exercises, simple problem-solving) Evaluation Breakdown: - Semester term project (70% of the final grade) - Written exams (30% of the final grade) Evaluation Criteria (applicable to both the semester project and written exams): The evaluator assesses the candidate's ability to: - Think critically and respond to problems related to R/C structures and their mechanical behaviour. The evaluation criteria are explained in class at the beginning of the semester.	

(5) SUGGESTED BIBLIOGRAPHY

-Suggested bibliography:

1. P. Bhatt, T.J. MacGinley, B.S. Choo, " Reinforced Concrete Design to Eurocodes: Design Theory and Examples" , CRC Press
2. M.N. Fardis, "Seismic Design, Assessment and Retrofitting of Concrete Buildings based on EN-Eurocode8" , Springer.
3. C. Pellegrino, "Sustainability Improvements in the Concrete Industry - Use of Recycled Materials for Structural Concrete Production" , Springer.