

COURSE INFORMATION					
Course Title	Code	Semester	L+P+L Hour	Credits	ECTS
REPAIR AND STRENGTHENING OF DAMAGED STRUCTURES	CE 528	1	3+0+0	3	10

Prerequisites	
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Language of Instruction	English
Course Level	Master's Degree (Second Cycle Programmes)
Course Type	Departmental Elective
Course Coordinator	-
Instructors	Assist. Prof. Dr. Özden Saygılı
Assistants	-
Goals	The goals of this course are to learn various distress and damages to concrete, masonry and steel structures and to learn repair techniques of damaged structures and strengthening techniques of undamaged structures.
Content	Introduction; structural systems; earthquake safety of existing buildings; damage inspection; temporary post-earthquake measures; general principles of repair of reinforced concrete structures; repair of bearing system for reinforced concrete structures; materials and their application techniques for repair of reinforced concrete structures; corrosion as a damage and its rehabilitation; general strengthening principles; strengthening of reinforced concrete structures; repair and strengthening of masonry structures; repair and strengthening of steel structures

Course Learning Outcomes	Program Learning Outcomes	Teaching Methods	Assessment Methods
Define the concepts of repair and strengthening. Define damage detection processes, methods for determining material quality and strength.	1, 2, 4, 9	1,2	A,C
Define the basic concepts for the evaluation of buildings under the earthquake effect given in the 2018 Turkish Building Seismic Code.	1, 2, 4, 9	1,2	A,C

Teaching Methods:	1: Lecture, 2: Project
Assessment Methods:	A: Written exam, B: Project Evaluation

COURSE CONTENT		
Week	Topics	Study Materials
1	Introduction	Lecture Notes
2	Structural systems	Lecture Notes
3	Earthquake safety of existing buildings	Lecture Notes
4	Damage inspection	Lecture Notes
5	Temporary post-earthquake measures	Lecture Notes
6	General principles of repair of reinforced concrete structures	Lecture Notes
7	Repair of bearing system for reinforced concrete structures	Lecture Notes
8	Materials and their application techniques for repair of reinforced concrete structures	Lecture Notes
9	Corrosion as a damage and its rehabilitation	Lecture Notes
10	General strengthening principles	Lecture Notes
11	Strengthening of reinforced concrete structures	Lecture Notes
12	Repair of masonry structures	Lecture Notes
13	Strengthening of masonry structures	Lecture Notes
14	Repair of steel structures	Lecture Notes
15	Strengthening of steel structures	Lecture Notes

RECOMMENDED SOURCES	
Lecture Notes	Notes prepared by the instructor
Textbook	<ol style="list-style-type: none"> 1. V. M. Malhotra, Nicholas J. Carino 2004 "Handbook on Nondestructive Testing of Concrete" 2. Bangash, M. Y. "Earthquake Resistant Buildings: Dynamic Analyses, Numerical Computations, Codified Methods, Case Studies and Examples", Springer, 2011 3. TEC 2007, FEMA 273, 356, 440, 445 etc., ATC40,41 etc.

MATERIAL SHARING	
Documents	-
Assignments	Assignments are returned to students after they are graded
Exams	Solution of exam questions are handed out

ASSESSMENT		
IN-TERM STUDIES	NUMBER	PERCENTAGE
Mid-terms	1	50
Quizzes	-	-
Assignment	4	10
Lab Work	-	-
Term Project	1	40
Total		100
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60
Total		100

COURSE CATEGORY	Expertise/Field Courses
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COURSE'S CONTRIBUTION TO PROGRAM						
No	Program Learning Outcomes	Contribution				
		1	2	3	4	5
1	Attains knowledge through wide and in-depth investigations his/her field and surveys, evaluates, interprets, and applies the knowledge thus acquired.			√		
2	Has a critical and comprehensive knowledge of contemporary engineering techniques and methods of application.			√		
3	By using unfamiliar, ambiguous, or incompletely defined data, completes and utilizes the required knowledge by scientific methods; is able to fuse and make use of knowledge from different disciplines.					
4	Has the awareness of new and emerging technologies in his/her branch of engineering profession, studies and learns these when needed.			√		
5	Defines and formulates problems in his/her branch of engineering, develops methods of solution, and applies innovative methods of solution.					
6	Devises new and/or original ideas and methods; designs complex systems and processes and proposes innovative/alternative solutions for their design.					
7	Has the ability to design and conduct theoretical, experimental, and model-based investigations; is able to use judgment to solve complex problems that may be faced in this process.					
8	Functions effectively as a member or as a leader in teams that may be interdisciplinary, devises approaches of solving complex situations, can work independently and can assume responsibility.					
9	Has the oral and written communication skills in one foreign language at the B2 general level of European Language Portfolio.			√		

10	Can present the progress and the results of his investigations clearly and systematically in national or international contexts both orally and in writing.				
11	Knows social, environmental, health, safety, and legal dimensions of engineering applications as well as project management and business practices; and is aware of the limitations and the responsibilities these impose on engineering practices.				
12	Commits to social, scientific, and professional ethics during data acquisition, interpretation, and publication as well as in all professional activities				

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Excluding the exam weeks: 14x Total course hours)	14	3	42
Hours for off-the-classroom study (Pre-study, practice)	14	3	42
Midterm examination	1	3	10
Homework	4	25	100
Project	1	30	30
Final examination	1	2	20
Total Work Load			244
Total Work Load / 25 (h)			10
ECTS Credit of the Course			10