COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P+L Hour*	*Credits*	*ECTS*
SOIL IMPROVEMENT	CE 553	1	3+0+0	3	10

Prerequisites	

Language of Instruction	English
Course Level	Master's Degree (Second Cycle Programs)
Course Type	Departmental Elective
Course Coordinator	-
Instructors	Associate Prof. M. Murat Monkul
Assistants	-
Goals	The goal of this course is to teach various ground improvement techniques to students
Content	Introduction and importance of soil improvement; sufficiency of the foundation soils; soil improvement methods; ground improvement by compaction: compaction equipment, shallow compaction, dynamic compaction; consolidation by preloading and vertical drains; sand and stone columns; ground freezing methods; ground improvement techniques by injection; deep ground mixing; biological improvement.

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Ability to identify the soil conditions where soil improvement is needed.	1, 2	1,2	A,C
2) Ability to detect problematic soils.	1	1,2	A,C
3) Ability to select the optimal soil improvement method.	1, 2, 9	1,2	A,C
4) Ability to identify the solution for soil improvement and to make the related design.	1, 2, 4, 9	1,2	D

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Laboratory, 4: Case-study
Assessment Methods:	A: Exams, B: Experiment, C: Homework, D: Project

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Introduction and importance of soil improvement	Lecture Notes and Textbook
2	In-situ testing	Lecture Notes and Textbook
3	Sufficiency of the foundation soils	Lecture Notes and Textbook
4	Soil improvement method categories	Lecture Notes and Textbook
5	Ground improvement by compaction, compaction equipment.	Lecture Notes and Textbook
6	Shallow compaction	Lecture Notes and Textbook
7	Dynamic compaction	Lecture Notes and Textbook
8	Consolidation by preloading and vertical drains	Lecture Notes and Textbook
9	Sand and stone columns: vibrofloation	Lecture Notes and Textbook
10	Midterm Exam	Lecture Notes and Textbook
11	Ground freezing	Lecture Notes and Textbook
12	Ground improvement techniques by injection, grouting	Lecture Notes and Textbook
13	Deep ground mixing	Lecture Notes and Textbook
14	Biological improvement	Lecture Notes and Textbook
15	Review	Lecture Notes and Textbook

RECOMMENDED SOURCES	
Lecture Notes	Notes prepared by the instructor
Textbook	1) "Ground Improvement: Case Histories", Chu, Rujikiatkamjorn , Indraratna, 1st Ed., Elsevier Science

MATERIAL SHARING	
Documents	slides that are given to the photocopy room
Assignments	homeworks are returned to students after they are graded
Exams	exams questions are solved if demanded

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Mid-terms	1	40
Quizzes	-	-
Assignment	6	30
Lab Work	-	-
Term Project	1	30
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

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	3
Homework	6	15	95
Project	1	60	60
Final examination	1	3	3
Total Work Load			245
Total Work Load / 25 (h)			10
ECTS Credit of the Course			10