TED UNIVERSITY

CE 341
SOIL MECHANICS

SYLLABUS – FALL 2016-2017

Course Information

Required or Elective	☑Required ☐Elective	**Date**	September 2016
Semester	Fall 2016	**Class/Laboratory Hours and Class-rooms**	Lectures Tue. 13:00 – 15:00, Rm. D228 Wed. 11:00 – 12:00, Rm. D228 Laboratory Thu. 12:00 – 14:00, Soil Mech. Lab. (basement of Block H)
Course/ECTS Credit Hours	(3+0+2) 4 / 6	**Pre-requisite/ Co-requisite**	CE 214
Level of Course	Junior	**Language of Inst-ruction**	☑ English ☐ Turkish
Instructor and Office Hours	Dr. Cem Akgüner (cem.akguner@tedu.edu.tr) (Rm. D312) Office hours: Tue. 15:00 – 16:00; Thu. 16:00 – 17:00 Please make an appointment through e-mail for other times		
Teaching Assis-tant	Anıl Ekici (anil.ekici@tedu.edu.tr) (Rm. GB20)		
Textbook (available through TEDU Bookstore)	1) ***An Introduction to Geotechnical Engineering*** – 2nd Ed. (2011) by R.D. Holtz; W.D. Kovacs; T.C. Sheehan – Pearson International 2) ***Soil Mechanics Lab Manual*** – 2nd Ed. (2011) by M.E. Kalinski – Wiley Both of the books available through TEDU Bookstore and/or Library. 3) Additional hand-outs will be given in class as deemed necessary.		
Recommended Readings	1) Core Principles of Soil Mechanics (2014) by S.K. Shukla – ICE Publishing 2) Principles of Geotechnical Engineering – 8th Ed. (2013) by B.M. Das; K. Sobhan – Cengage Learning 3) Essentials of Soil Mechanics and Foundations: Basic Geotechnics – 7th Ed. (2006) by D.F. McCarthy – Prentice Hall 4) Soil Mechanics – 8th Ed. (2012) by J.A. Knappett; R.F. Craig – CRC Press 5) Introduction to Soil Mechanics Laboratory Testing by D. Fratta; J. Aguettant; L. Roussel-Smith – CRC Press 6) Soil Mechanics Fundamentals (2015) by M. Budhu – Wiley-Blackwell 7) Soils Magic (2011) and Grounded (2015) by D. Elton – ASCE Press You may find these and other books of interest through TEDU or other nearby libraries.		

Course Web Pages and Communication	I have already enrolled all of you to the Moodle course information system for this class (**2016F_CE341** on moodle.tedu.edu.tr). Please make a habit of regularly following these pages to have access to course materials and contribute to class discussions. I would also like to establish a quick and easy communication with you through a safe and popular tool called Remind using SMS for announcements, reminders, and last minute changes. Sign-up using the following QR code: ⟶ or the following link: https://www.remind.com/join/ce341-tedu. I would recommend using the Remind mobile app for real-time updates (Android and iOS).

Course Description

Introduction to soil mechanics. Formation of soils and basic geology. Engineering problems involving geo-materials and their variability. Basic physical characteristics of soils. Index and classification properties of soils. Water in soils – capillarity, shrinkage/expansion, frost. Flow of water through soil – permeability (hydraulic conductivity), heads, seepage, flow nets. Total and effective stresses in soil mass. Stress distribution. Compressibility of soils – consolidation theory, calculating settlements (amount and rate). Stress-strain behavior (shear strength) of soils. Properties of improved soils – compaction, add-mixtures, geotextiles, other in-situ techniques. Effects of dynamic loading and local soil conditions leading to earthquake damage.

Course Objective

Main aim of this course is to provide the knowledge and understanding of the engineering properties and behavior of soils by introducing the students to the fundamental principles of engineering mechanics and civil engineering technology applied to natural and engineered/improved soils with their inherent and/or induced variability under multitude of conditions (time, loading, water flow) in order to build with the soil (e.g. embankments, road base layers, levees), upon the soil (e.g. bridges, buildings, roads) or within the soil (e.g. tunnels, basements, pipelines). Conducting laboratory experiments to determine and critically evaluate soil properties is also an essential component of this course allowing for a hands-on experience.

Course Learning Outcomes

On successful completion of this course students will be able to:

1. Identify, set-up and perform appropriate laboratory experiments on soils under varying conditions in accordance with established standard procedures to determine their basic properties [B3]
2. Collect appropriate laboratory and in-situ soil data for civil engineering purposes, infer and appreciate their variability [B5]

3. Categorize soils according to standard methods, differentiate between their typical properties and effects of water [B4]
4. Evaluate one- and two-dimensional water flow through/below soils and constructed facilities [B3]
5. Differentiate between total and effective stresses under changing loading and hydraulic/drainage conditions [B4]
6. Estimate the stress distribution and calculate short- and long-term settlements beneath loaded soil layers and their rate [B2]
7. Apply the fundamental principles mechanics of soils affecting soil properties and behavior leading to proper estimation of shear strength [B3]
8. Understand soil improvement techniques and evaluate its effects on various properties of soils [B2]
9. Distinguish the effects of dynamic loads and local soil conditions causing damages during earthquakes [B2]
10. Improve written and oral communication skills through synthesis and presentation of technical data [B4]

Relationship to Program Outcomes

This course contributes to fulfillment of the following program outcomes (4 count / 7 weights):
PO2: Apply knowledge of mathematics, science, and engineering to design and implement original, innovative and sustainable civil engineering systems or processes to meet desired needs within a greater societal context
PO5: Design and conduct experiments; analyze and interpret data
PO6: Identify, formulate, and solve engineering problems
PO7: Demonstrate effective oral and written professional skills in English

Course Assignments

A. ***Homework and In-Class Activities (10%):*** There will be multiple homework and in-class activies which will be graded. These activities may include quizzes, demonstrations, problem solving, question-and-answer sessions.
B. ***Laboratory Work (22.5%):*** You will conduct experiments, collect data and write a professional-looking reports in accordance with the formatting that will be provided.
C. ***Exam I & II (37.5%):*** There will be two exams during the semester which I will try to give within class hours. Date of the exam will be announced later.
D. ***Final (30%):*** There will be a comprehensive final during the final exam weeks starting on December 21, 2015 running through December 31st, 2015. Exact date of the final will be announced by the university towards the end of the semester.

Course Assessments & Learning Outcomes Matrix

Assessment Methods	Course Learning Outcomes
Weekly Homework	#2, #3, #4, #5, #6, #7, #8
In-class Activities	#2, #3, #4, #5, #6, #7, #8
Midterm Exams	#2, #3, #4, #5, #6, #7, #8, #9
Laboratory Work	#1, #2, #3, #7, #10
Final Exam	#2, #3, #4, #5, #6, #7, #8, #9

Teaching Methods & Learning Activities

☑ Telling/Explaining
☐ Discussions/Debates
☑ Questioning
☑ Reading
☐ Peer Teaching
☐ Scaffolding/Coaching
☐ Demonstrating
☑ Problem Solving
☑ Inquiry
☐ Collaborating
☐ Think-Pair-Share
☐ Predict-Observe-Explain
☐ Microteaching
☐ Case Study/Scenario Analysis
☑ Simulations & Games
☑ Video Presentations
☑ Oral Presentations/Reports
☐ Concept Mapping
☐ Brainstorming
☐ Drama/Role Playing
☐ Seminars
☐ Field Trips
☐ Guest Speakers
☑ Hands-on Activities
☐ Service Learning
☐ Web Searching
☑ Experiments
☐ Other(s):

Student Workload

☑ Lectures .....**40**.. hrs
☑ Course Readings .....**25**... hrs
☐ Workshop .... hrs
☐ Online Discussion .... hrs
☐ Debate .... hrs
☐ Work Placement..... ..... hrs
☐ Field Trips/Visits..... ..... hrs
☐ Observation..... ..... hrs
☑ Lab Applications.....**28** .. hrs
☐ Hands-on Work..... ..... hrs
☑ Exams/Quizzes .....**42** .. hrs
☐ Resource Review..... ..... hrs
☐ Research Review .... hrs
☑ Report on a Topic ..... **20**... hrs
☐ Case Study Analysis .... hrs
☐ Oral Presentation .... hrs
☐ Poster Presentation .... hrs
☐ Demonstration .... hrs
☐ Web Designs .... hrs
☐ Mock Designs .... hrs
☐ Team Meetings..... ..... hrs
☑ Other: Homework ..... **25**... hrs
TOTAL.....**180**... hrs

Assessment Methods

☑ Test/Exam
☑ Quiz
☐ Oral Questioning
☑ Performance Project
☑ Written ☐Oral
☐ Observation
☐ Self-evaluation
☐ Peer Evaluation
☐ Portfolio
☐ Presentation (Oral, Poster)
☑ Other(s): Homework

Tentative Course Outline

A tentative course outline for the lectures is given below. Any changes and updates will be announced on the Moodle web page for the course.

Week	Date	Topic	Sections from Holtz et al. (2011)
1	Sept. 27	No class	1.1, 1.2, 1.4
2	Oct. 04, 05	Introduction to soil mechanics. Formation of soils and basic geology. Engineering problems involving geo-materials and their variability. (3)	3.1, 3.2, 3.3 Handouts
3	Oct. 11, 12	Basic physical characteristics of soils. (1)	2.4, 2.6, 4.8, 4.9
4	Oct. 18, 19	Index and classification properties of soils – weight-volume relationships, grain size distributions, Atterberg limits, soil classification systems (USCS, AASHTO) Water in soils – capillarity, shrinkage/expansion, frost. (3)	2.2, 2.3, 2.5, 2.7, 2.8, 2.9, 2.10 6.2, 6.3, 6.4, 6.5, 6.6, 6.8
5	Oct. 25, 26	Flow of water through soil – permeability (hydraulic conductivity), heads, seepage, flow nets. (3)	7.2, 7.3, 7.4, 7.5
6	Nov. 01, 02	Flow of water through soil – permeability (hydraulic conductivity), heads, seepage, flow nets. (3)	7.7, 7.8, 7.9, 7.10
		Exam I	
7	Nov. 08, 09	Total and effective stresses in soil mass. Stress distribution. (3)	6.9, 6.10, 6.11, 7.6, ~~10.2,~~ 10.3, ~~10.4~~
8	Nov. 15, 16	Compressibility of soils – consolidation theory, calculating settlements (amount and rate). (1)	8.2, 8.3
9	Nov. 22, 23	Compressibility of soils – consolidation theory, calculating settlements (amount and rate). (3)	8.4, 8.5, 8.6, 8.7, 8.9, 8.10, 8.12
10	Nov. 29, 30	Stress-strain behavior (shear strength) of soils. (3)	11.2, 11.3, 11.4, 11.5
11	Dec. 06, 07	Stress-strain behavior (shear strength) of soils. (3)	12.1, 12.3, 12.4, 12.5, 12.7, 12.8,
12	Dec. 13, 14	Stress-strain behavior (shear strength) of soils. (3)	12.9, 12.10, 12.11, 12.12, 12.13
		Exam II	
13	Dec. 20, 21	Properties of improved soils – compaction. (3)	5.2, 5.3, 5.4, 5.5, ~~5.6~~, ~~5.7~~, 5.8, ~~12.14~~
14	Dec. 27, 28	Properties of improved soils – add-mixtures, geotextiles, other in-situ techniques. (3)	Handouts
		Effects of dynamic loading and local soil conditions leading to earthquake damage. (3)	Handouts

Tentative Laboratory Schedule

The laboratory schedule is prepared assuming that the construction at across the street will be completed within the next two weeks. The laboratory on the third week will be conducted in the classroom. Any changes due to some unexpected circumstance and/or necessary updates will be announced on the Moodle web page for the course.

Week	Date	Topic	Chapters from Kalinski (2011)
1	Sept. 29	No laboratory	
2	Oct. 06	No laboratory	-
3	Oct. 13	No laboratory	
4	Oct. 20	Introduction to soil mechanics laboratory Code of conduct Data collection and report writing Units and significant figures used in soil mechanics Water content Specific gravity	Handouts Appendix A (Holtz et al., 2011) ASTM D-6026 Handouts 1, 2, 3
5	Oct. 27	Grain size analysis Atterberg limits Visual-manual classification of soils	4, 5, 6, 7 ASTM D-2488
6	Nov. 03	Constant head permeability testing Falling head permeability testing	10
7	Nov. 10	Consolidation (set-up including machine deflection and loading)	11
8	Nov. 17	Consolidation (loading/unloading)	11
9	Nov. 24	Consolidation (dismantling, data reduction)	11, Chapter 9 from HK&S
10	Dec. 01	Direct shear testing	12
11	Dec. 08	Unconfined compression testing Pocket penetrometer	13
12	Dec. 15	Unconsolidated undrained triaxial testing	14
13	Dec. 22	Standard and modified compaction testing	8
14	Dec. 29	No laboratory	-

Course Policies and Some Remarks

Instructor Absence

I will have to miss some classes and/or laboratories during the semester for professional activities such as conferences or seminars. We will have to make-up the missed classes and/or laboratories during the semester through additional sessions as needed.

Attendance

I encourage you to be a part of the lectures but I will not be collecting any attendance. I expect you to behave in a responsible and appropriate manner while you are in class. However, you are required to be present in all of the laboratory sessions without any exception. You will not be allowed to make-up any laboratory sessions unless you can provide an acceptable proof of your absence within a couple of days which should be approved by me. Anyone who fails to meet the attendance requirement for the laboratories will not be allowed to take the final exam and will be assigned a failing grade.

Classes and laboratories start on time. Please be respectful of your classmates by being on time.

Cell phones should be in quite mode/turned off and kept out of sight. Please do not undertake any unrelated activities (homework for some class, use of your computers etc.) during class time.

Calculator Policy

You may use a regular calculator during exams.

Plagiarism

Collaboration on non-collected homework and in studying is strongly encouraged; however, the work you hand in must be solely your own. Sharing written work before it is turned in to be graded is academic dishonesty. For more information on TEDU policy on intellectual integrity, see the link: http://student.tedu.edu.tr/sites/default/files/content_files/2015-2016ogrencielkitabi.pdf

Disability Support

If you have a disabling condition which may interfere with your ability to successfully complete this module, please contact the TEDU Disabled Students Committee (email: info@tedu.edu.tr). For further information, please see the Handbook for Registered Students above.

Make Up Exams

In general, make-up exams for the first two exams during the semester will NOT be offered. If you have a legitimate reason for missing an exam, then you must arrange to make up the exam BEFORE the scheduled time of the exam. The only exceptions are illness or emergency (e.g., death in family, a traffic accident, etc.). In case of an illness or emergency you need to supply a documentation that supports your claim.

Also please read the document given in the link below for the TEDU Academic Rules and Regulations for Undergraduate Study:
http://www.tedu.edu.tr/sites/default/files/content_files/docs/Yonetmelikler/TEDU_Academic_Rules_Regulations_Undergraduate_Study.pdf