UNIVERSITY OF ENGINEERING AND TECHNOLOGY TAXILA

Department of Civil Engineering

Course Learning Outcomes for Soil Mechanics-I (CE-208)

Subject: Soil Mechanics (CE-208, 2+1)
Instructor: Dr. Naveed Ahmad/Engr. Usman Arshid
Semester: 4th (Spring 2016)

CLO 1: To understand the soil formation (i.e. Science) and determination of its physical and engineering properties using mathematical and engineering knowledge.

CLO 2: To identify problems involving complex soil behavior and understanding the complex phenomenon using basic principles of mathematics, natural sciences and engineering sciences.

CLO 3: Figure out solution of soil related problems faced by the engineering society using both theoretical knowledge and soil testing.

CLO 4: Use existing knowledge/experimental setup for understanding the complex mechanisms within the soil.

CLO 5: Develop an understanding regarding responsibilities of professional engineers at the site and dealing with expected legal and cultural issues at the site.

CLO 6: Developing abilities to work individually and as a team leader in different environments.

CLO 7: To develop technical report writing skills and presenting own work to the large audience by supporting the data using engineering principles.

Countersigned_____ **Signed by**_____
(Chairman of the Department) (Course Instructor)

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Soil and its constituents:

Introduction to Geotechnical Engineering and Soil Mechanics, Weathering of rock and types of soil, Physical properties, e.g., water content, void-ratio, porosity, degree of saturation, specific gravity, unit weight and their determination, Mass~Volume relationships.

Soil Classification:

Importance of soil classification, Fundamental tests required, e,g, Atterberg limits, grain size distribution, sieve analysis, hydrometric analysis, Unified and AASHTO classification systems and description of their subgroups.

Compaction:

Definition, Compaction fundamentals, Moisture density relationship, Compaction standard, Factors affecting compaction, Field control and measurements of in-situ density, Effect of compaction on properties of soil.

Consolidation:

Mechanics of consolidation, Primary and secondary consolidation, Theory of one dimensional consolidation, assumptions and validity, Oedometer test and graphical presentation of data, Compression index, Coefficient of compressibility, Time factor, Co-efficient of volume change and degree of consolidation.

Shear Strength:

Concept, Shear strength parameters, Coulomb's law, shear strength of cohesive and non-cohesive soils, Simple laboratory and field tests for determination of shear strength

Soil Exploration:

Purpose of soil exploration, soil exploration methods, trenches and pits, Auger boring, Wash boring, Rotary drilling, Soil samples, Distributed and undistributed samples.

Permeability and capillarity:

Definition, Darcy's law, Factors affecting permeability, Laboratories and field determination of permeability, Capillarity and effects, Capillarity related issues and their prevention, i.e. bulking of sand, slaking of clay, frost heave, Theory of flow nets.

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(Chairman of the Department)

Signed by_____
(Course Instructor)

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Mapping of CLOs with Course Content for Laboratory work

of Soil Mechanics-I (CE-208)

Subject: Soil Mechanics (CE-208, 2+1)
Instructor: Dr. Naveed Ahmad/Engr. Usman Arshid
Semester: 4th (Spring 2016)

Course Title: Soil Mechanics-I (Laboratory work)

Course Code:CE- 208 (2+1)

Pre-requisite(s): Engineering Geology

Credit Hours:3 (2+1)

Contact Hours:5 (2+3)

Course Learning Outcomes:

At the end of this course, the students will:

CLO:1 Learn fundamentals of soil mechanics and will be able to classify any given soil sample.

CLO:2 Learn fundamentals about therole of soil moisture on its degree of compaction.

CLO:3 Learn basic methods to measure the in-situ soil density and specific gravity.

CLO:4 Learn factors effecting flow of water through soil.

Practical work:

EXPERIMENTS	DESCRIPTION
Experiment No. 1	Determination of Liquid Limit of soil
Experiment No. 2	Determining the Plastic Limit and Plasticity Index of Soil
Experiment No. 3	Determination of Field Density of Soil by Drive Cylinder (Core Cutter) Method
Experiment No. 4	Particle Size Analysis (Sieve Analysis) of Soil
Experiment No. 5	Determination of Field Density by Sand Replacement Method
Experiment No. 6	The Moisture-Density Relations of Soil [AASHTO Compaction Test]
Experiment No. 7	The Moisture-Density Relations of Soil [Modified AASHTO Compaction Test]
Experiment No. 8	Determination of Specific Gravity of Soil
Experiment No. 9	Determination of Permeability of Granular Soil (Constant Head Method)
Experiment No. 10	Determination of Permeability of Fine-grained Soil (Variable Head Method)

Mapping of CLOs to Lab Practical of Soil Mechanics				
Lab Practical	**CLOs**			
	CLO-1 (Soil Classification)	**CLO-2** (Moisture~Density Relationship)	**CLO-3** (Density of soil solids and soil matrix)	**CLO-4** (Water flow through soil)
Determination of Liquid Limit of soil	✓			
Determining the Plastic Limit and Plasticity Index of Soil	✓			
Particle Size Analysis (Sieve Analysis) of Soil	✓			
Determination of Field Density of Soil by Drive Cylinder (Core Cutter) Method			✓	
Determination of Field Density by Sand Replacement Method			✓	
Determination of Specific Gravity of Soil			✓	
The Moisture-Density Relations of Soil [AASHTO Compaction Test]		✓		
The Moisture-Density Relations of Soil [Modified AASHTO Compaction Test]		✓		
Determination of Permeability of Granular Soil (Constant Head Method)				✓
Determination of Permeability of Fine-grained Soil (Variable Head Method)				✓

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Mapping of CLOs with PLOs for Soil Mechanics-I (CE-208)

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Instructor: Dr. Naveed Ahmad/Engr. Usman Arshid
Semester: 4th (Spring 2016)

	PLO # 01	PLO # 02	PLO # 03	PLO # 04	PLO # 05	PLO # 06	PLO # 07	PLO # 08	PLO # 09	PLO # 10	PLO # 11	PLO # 12
CLO # 01	✓											
CLO # 02		✓										
CLO # 03			✓									
CLO # 04				✓								
CLO # 05						✓						
CLO # 06									✓			
CLO # 07										✓	✓	

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Weekly Lesson Plan for Soil Mechanics-I (CE-208)

Subject: Soil Mechanics (CE-208, 2+1)
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Semester: 4th (Spring 2016)

WEEKS	DATE	TOPICS
1st Week	00/00/16	**Introduction to the subject**
2nd Week	00/00/16	**Physical Properties**
3rd Week	00/00/16	**Physical Properties**
4th Week	00/00/16	**Soil Classification**
5th Week	00/00/16	**Soil Classification** **QUIZ-I**
6th Week	00/00/16	**Shear Strength**
7th Week	00/00/16	**Shear Strength**
8th Week	00/00/16	**Permeability and capillarity**
9th Week	00/00/16	**Permeability and capillarity** **QUIZ-II**
10th Week	00/00/16	**Soil Exploration**
11th Week	00/00/16	**Soil Exploration**
12th Week	00/00/16	**Compaction**
13th Week	00/00/16	**Compaction**
14th Week	00/00/16	**Consolidation**
15th Week	00/00/16	**Consolidation** **QUIZ-III**
16th Week	00/00/16	**Presentations by Students**

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