University of Toledo
Construction Engineering Technology
Master Syllabus

Course Title: Soil Mechanics **Course Code & Number:** CET-2220

Credit Hour Total: 3 **Weekly Contact Hours Lecture:** 2 **Lab Hours:** 2

Prerequisite(s): CET-1200, ENGL-1110, and (ENGL-1130 or ENGL 2950)

Text: Soils and Foundations, 8th Ed.
Liu & Evett ISBN: 978-0135113905
(Special Custom Edition Chapters 1-8)

Soil Mechanics Laboratory Manual, 8th Ed.
Das, ISBN: 978-0199846375

Software: None

Course Coordinator: Open

A. **Course Description** (Approved catalog description.)

This course covers the characteristics and behavior of soil as it relates to the design and construction of civil engineering projects. The course will focus on identifying types of soils, the methods by which soils act and react under stress and how they can be manipulated and modified. Standard soils testing procedures will be used to produce a basic knowledge of soil and its pertinent properties.

B. **Related Program Outcomes:**

Upon successful completion of the Construction Engineering Technology program, graduates will have:

ABET/Student Outcomes

1) an ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering, and technology to solve broadly-defined engineering problems appropriate to the discipline;
4) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
5) an ability to function effectively as a member as well as a leader on technical teams.

The course also supports coverage of the following curricular areas:

Program Criteria Outcomes

c) the utilization of measuring methods, hardware, and software that are appropriate for field, laboratory, and office processes related to construction;
d) the application of fundamental computational methods and elementary analytical techniques in sub-disciplines related to construction engineering;
g) the selection of appropriate construction materials and practices;

Discipline Specific Content

+ Industry standards & codes

Evidence of the success of these outcomes is provided by the collection and analysis of:

- Proctor and Soil Compaction Lab Reports
- Unconfined Soils Compression Lab Reports
- Differential Settlement Calculation Problems

C. **Course Objectives:**

Upon completion of the course the student will:

1. Obtain the ability to identify soil types using standard nomenclature and identify soils related characteristics and problems at a construction site.
2. Gain an understanding of and an ability to determine soil grain size distributions and Atterberg Limits.
3. Gain an understanding of the compaction of soils, including the theory and application of Proctor tests and California Bearing Ratios.
4. Gain an understanding of soils compressibility, consolidation and the ability to calculate settlement and load analysis/pressure distribution in a soils mass.
5. Obtain the ability to estimate appropriate bearing pressures for soil and groundwater conditions.
6. Obtain the ability to estimate total and differential settlements for soil and groundwater conditions.
7. Obtain the ability to analyze designs for appropriate factors of safety.
8. Gain an understanding of groundwater aquifer types, flow mechanics with the ability to calculate associated seepage rates and flow nets.
9. Obtain the ability to perform and apply unconfined compression tests and calculate allowable foundation bearing loads.

D. **Course Outline – Major Content Areas**

1. Formation of Natural Soil Deposits
2. Engineering Properties of Soils
3. Soil Compaction and Stabilization
4. Stress Distribution In Soil
5. Water in Soil
6. Consolidation and Settlement
7. Shear Strength in Soil
8. Shallow Foundations
9. Soil Exploration

E. **Suggested Laboratory Tests**

1. Soil Particle Size by Sieve Analysis
2. Soil Particle Size by Hydrometer Analysis
3. Standard Proctor Compaction Analysis
4. Modified Proctor Compaction Analysis
5. California Bearing Ratio Analysis
6. Soil Consolidation Analysis
7. Direct Soil Shear Analysis
8. Relative Density of Cohesion less Soils Analysis
9. Soil Permeability Analysis using Constant Head Devices
10. Soil Permeability Analysis using Falling Head Devices