REGULAR COURSE SYLLABUS

College of: Professional Studies
Department: Engineering and Engineering Technology
Prefix & Course Number: SSE 4160  Crosslisted With*: ___

Course Title: Geotechnical Engineering
Banner course title (30 characters): Geotechnical Engineering

Check All That Apply:  Required for Major: X  Required for Minor: ___ Specified Elective: ___
Required for Concentration: ___  Elective: ___  Service Course: ___

To receive Title IV financial aid funds, all institutions of higher education must comply with the federal definition of a credit hour. The Higher Learning Commission requires institutions to maintain policies and procedures for verifying compliance with this definition.

**Federal Credit Hour Definition:** A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:

1. one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or
2. at least an equivalent amount of work as required in paragraph (1) of this definition for other activities as established by an institution, including laboratory work, internships, practica, studio work, and other academic work leading toward the award of credit hours. 34CFR 600.2 (11/1/2010)

Credit Hours: 3 (3+0)

Face-to-Face or Equivalent Hours per course:
- Lecture 45
- Lab 0
- Internship 0
- Practicum 0
- Other (please specify type and hours): ___

Additional Student Work Hours per course: 90

Schedule Type: L  Grade Mode: L

Variable topics umbrella course: No X Yes ___ If Yes, number of credit hours allowed ___

Specified repeatable course: No X Yes ___

APPROVED:

Department Chair OR Program Director  Date: 10/12/2015

Dean OR Associate Dean  Date: 10/14/15

Associate VP, Academic and Student Affairs  Date: 11/28/16

*If crosslisted, attach completed Course Crosslisting Agreement Form
Prefix and Course Number: SSE 4160

Prerequisite(s): SSE 3135 and SSE 3185 both with grades “C” or better, or permission of instructor

Catalog Course Description:
Students in this course are introduced to the basic principles of soil mechanics and fundamentals of geotechnical engineering. Students will learn mechanical properties of soil, engineering classification of soil, permeability and seepage, consolidation and settlement, shear strength, lateral earth pressures, fundamentals of retaining structures, soil bearing capacity, slope stability and fundamentals of foundation designs.

Required Reading and Other Materials will be equivalent to:

Specific, Measurable Student Behavioral Learning Objectives:
Upon completion of this course the student should be able to:
1. apply knowledge of mathematics and science to solve fundamental soil mechanics and geotechnical engineering problems.
2. interpret geotechnical experiment data and select appropriate parameters for geotechnical engineering designs.
3. identify, formulate, and solve mechanical properties of soil based on weight-volume relationship.
4. classify soil by AASHTO and USCS system.
5. identify, formulate, and solve seepage problems, soil compaction problems, in-situ stresses and stress increases in soil mass, consolidation and settlement problems.
6. identify and select shear strength of a given soil based on experimental data and field observation.
7. identify, formulate, and analysis slope stability lateral earth problems.
8. design basic traditional retaining structures, soil reinforced retaining structures, shallow foundations and pile foundations.
9. demonstrate understanding of the impact of engineering solutions of geotechnical engineering in an economic, environmental, and societal context.
10. demonstrate understanding of a knowledge of contemporary methods used in subsurface explorations.

Detailed Outline of Course Content:
I. Engineering Properties of Soil
   A. Grain Size and Soil Particle Size Distribution
   B. Weight-Volume Relationships
   C. Plasticity
   D. Structure of Soil Normal Stress

II. Soil Classification
   A. AASHTO Classification System
   B. USCS Classification System

III. Soil Compaction
   A. Laboratory Compaction
   B. Field Compaction

IV. Seepage and In-situ Stress
   A. Hydraulic Conductivities
   B. Seepage and Flow Net
   C. Total Stress, Pore Water Pressure and Effective Stress

V. Stresses in Soil Mass
   A. Vertical Stress Caused by Point Load
   B. Vertical Stress Caused by Line Load
   C. Vertical Stress Caused by Strip Load
   D. Vertical Stress Caused by Embankment Loading
   E. Vertical Stress Caused by a Rectangularly Loaded Area
   F. Vertical Stress Caused by a Circularly Loaded Area

VI. Consolidation and Settlement
   A. Normally Consolidated Soil
   B. Over-Consolidated Soil
   C. Elastic Settlement
   D. Primary Settlement
   E. Secondary Settlement
   F. Time Rate of Consolidation

VII. Shear Strength of Soil
   A. Mohr-Coulomb Failure Criteria
   B. Laboratory Determinations of Shear Strength of Soil

VIII. Slope Stability Analysis
   A. Modes of Failure of Finite Slope
   B. Ordinary Method of Slices

IX. Lateral Earth Pressure and Retaining Structures
   A. Earth Pressure at Rest
   B. Active and Passive Pressure
   C. Rankine and Coulomb Earth Pressure

X. Introduction of Soil Reinforcement
   A. Soil Nail Wall
   B. MSE Wall
   C. Geosynthetics Wall

XI. Introduction of Subsurface Exploration
   A. Standard Penetration Test (SPT)
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B. Cone Penetration Test (CPT)
C. Geophysical Exploration

XII. Shallow Foundation Bearing Capacity
   A. Terzaghi’s Bearing Capacity Theory
   B. Generalized Bearing Capacity Theory

XIII. Pile Foundation Analysis Method
   A. Equations for Estimating Pile Capacity
   B. Meyerhof’s Methods for Estimating $Q_p$
   C. Friction Resistance ($Q_s$)

Evaluation of Student Performance:
1. Examinations
2. Assignments
3. Class projects and/or presentations and/or reports