METROPOLITAN STATE COLLEGE *of* DENVER
Office of Academic Affairs

REGULAR COURSE SYLLABUS

School of: Professional Studies

Department: Engineering Technology

CIP Code: 15.0201

Prefix & Course Number: **CET 4130** **Crosslisted With*:** _____

Course Title: Soil Mechanics

Check All That Apply: Required for Major: x Required for Minor: _____ Specified Elective: _____

Required for Concentration: _____ Elective: _____ Service Course: _____

Credit Hours: 4 (3+2)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 45 Lab 30 Internship 0 Practicum 0 Other (please specify type and hours):_____

Schedule Type(s): B **Grading Mode(s)**: L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned**):

____

**** NOTE: This information must be included in the course description.**

Restrictions (Variable Topics Course): _____

Prerequisite(s): CET 3130 and CET 3185 with grades of "C" or better, and senior standing

Corequisite(s): None

Prerequisite(s) or Corequisite(s): _____

Banner Enforced:
Prerequisite(s): _____
Corequisite(s): _____**Prerequisite(s) or Corequisite(s):** _____

APPROVED:

Department Chair **OR** Program Director — Date 3 Dec 08

Dean **OR** Associate Dean — Date 4/8/08

Associate VP, Academic Affairs — Date 5/9/08

*If crosslisted, attach completed Course Crosslisting Agreement Form

Prefix and Course Number: CET 4130

Catalog Course Description:
This course covers the principles of soil mechanics and fundamentals of application in geotechnical engineering. This course covers soil behaviors and 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, and slope stability. This course also provides students the opportunity to obtain "hands-on" experience with some of the laboratory tests, techniques used in geotechnical engineering data collection and analysis methods. (Senior Experience)

Required Reading and Other Materials will be equivalent to:
Das, Braja M. (2006). *Principles of Geotechnical Engineering*, 6th Edition. Cengage Learning.

Specific, *Measurable* Student Behavioral Learning Objectives:
Upon completion of this course the student should be able to:

1. Examine the importance of soil characteristics to the design of soil-support structures through engineering classification and mechanical behavior of soils.
2. Analyze soil mechanics related engineering problems using theoretical and empirical geotechnical methods.
3. Experiment with standard laboratory soil test equipment to determine soil properties.

Detailed Outline of Course Content (Major Topics and Subtopics) **or Outline of Field Experience/Internship (experience, responsibilities and supervision):**

I. Mechanical Properties of Soil
   A. Origin of soil and grain size
   B. Weight-volume relationship
   C. Structure of soil
   D. Consistency of Soil – Atterberg limits

II. Engineering Classification of Soil
   A. American Association of State Highway and Transportation Officials (AASHTO) Classification System
   B. Unified Soil Classification System

III. Soil Compaction
   A. General principles of compaction
   B. Proctor test
   C. Field compaction

IV. Permeability
   A. Bernoulli's Equation
   B. Darcy's law
   C. Hydraulic conductivity

V. Seepage
   A. Laplace's equation of continuity
   B. Flow nets
   C. Mathematical solution for seepage
   D. Seepage through earth structures
   E. Filter design

VI. Stresses in Soil Mass
   A. Normal and shear stresses on a plane
   B. Stresses caused by a point load
   C. Vertical stresses in soil

VII. Compressibility of Soil
   A. Contact pressure and settlements

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B. Fundamentals of consolidation
C. Void ratio and pressure
D. Normally consolidated and over consolidated clays
E. Compression index
F. Swell index
G. Secondary consolidation settlement
H. Calculations of consolidation settlement under a foundation

VIII. Shear Strength of Soil
A. Mohr-Coulomb failure criterion
B. Direct shear test
C. Critical void ratio
D. Triaxial shear test
E. Vane shear test
F. Stress path

IX. Lateral Earth Pressure
A. At-rest, active and passive pressure
B. Rankine theory
C. Coulomb theory
D. Common types of retaining walls

X. Slope Stability
A. Factor of safety
B. Stability of infinite slopes
C. Finite slopes – general
D. Ordinary methods of slices
E. Bishop's simplified method of slices

XI. Bearing Capacity of Shallow Foundations
A. Ultimate soil bearing capacity of shallow foundations
B. General bearing capacity equation
C. Terzaghi's ultimate bearing capacity equation

XII. Laboratory Tests
A. Water content
B. Specific gravity
C. Sieve analysis
D. Liquid Limit test
E. Permeability test in sand
F. Standard Proctor compaction test
G. Direct shear test
H. consolidation test

Evaluation of Student Performance:
1. Written examinations
2. Assigned homework problems
3. Written laboratory reports
4. Oral presentations

REQUEST FOR NEW OR CONTINUED SENIOR EXPERIENCE DESIGNATION
SENIOR EXPERIENCE

(To accompany old and new regular syllabus form and Curriculum Change Proposal forms)

Date: 01/28/2008
School: of Professional Studies
Department: Engineering Technology/Civil Engineering Technology Program

Prefix	Course Number	Credit Hours	Contact Hours	CIP Number
CET	4130	4	3+2	15.0201

Title: Soil Mechanics

Prerequisites: CET 3130 and CET 3185 both with grades of "C" or better, and senior standing

Corequisites: None

Recommended maximum enrollment per section: 15

Current Course Status (check all that apply)
☐ New course
X Existing Senior Experience Course

Criteria for Senior Experience

The following criteria must be addressed for all courses seeking Senior Experience designation. **Please type on this form; it will expand to accommodate any length of text.**

The Senior Experience must allow students to:

1. synthesize learning through critical analysis and logical thinking.

Soil mechanics is the study of the "behavior" of soils/clays as a structural entity. These materials do not strictly adhere to the classical laws of statics and dynamics as applied in the theory of structures. The "theory of the design" of structural foundations must address reactions to static and dynamic loadings and the potential actions of soils in a fluid environment.

2. apply theoretical constructs to practical applications.

The underlying theoretical principles can be traced through CET 2150-Mechanics I-Statics; CET 3100-Construction Methods; CET 3130-Mechanics of Materials; CET 3140-Mechanics of Materials-Laboratory; MET 3160-Mechanics II-Dynamics; and CET 3180-CET Fluid Mechanics I

This course requires students to apply these principles to develop an understanding of geotechnical design and construction.

Also, course work addresses soils testing required to develop construction methodologies for soils encountered on the site.

3. critique philosophical tenets and current practices.

The subject of soil mechanics is not the classical engineering problem of one-to-one engineering theory to construction. Diverse adverse site soil conditions require innovative design and remedial actions to neutralize the potential problems.

4. integrate and refine oral and/or written communication skills.

The student is required to solve the problem and make an oral presentation to their peers. Because there exist few exact theoretical solutions, the student must identify the problems and propose a redundant solution.

5. verify their expertise.

The student must write reports based upon laboratory assignments. The submitted reports, homework assignments, and examinations provide verification of the student's expertise to analyze, design the proposed solutions.

Approvals:

Zuzana Belash / 01/28/2008
Department Curriculum Committee / Date

28 Jan 08
Department Chair **OR** Program Director/ Date

1
School Curriculum Committee / Date

Kathy Heyl 2/18/08
Dean or Associate Dean / Date

Patricia A. Tischer 4/7/08
Chair, Faculty Senate Curriculum Committee / Date

Richard Wagner 5/19/08
Associate Vice President, Academic Affairs/Date