SOIL MECHANICS W/LAB
CET 2112

Class Hours: 3.0  Credit Hours: 4.0
Laboratory Hours: 3.0  Revised: Fall 07

Catalog Course Description:
This course covers basic soil mechanics including index properties of fine and coarse soil, soil classification, stress analysis, permeability, compaction, strength concepts, and settlement and compressibility. The laboratory covers standard ASTM soil tests. Word processing and spreadsheet software are used to prepare professional technical reports that include text, tables, data reduction and graphs. Spreadsheet templates are developed for use in data reduction.

Entry Level Standards:
Students should be capable of critical and analytical thinking and should have sufficient mathematical skills to formulate and solve algebraic equations. They should have the ability to perform laboratory tests, record data, draw conclusions and prepare reports that meet prescribed technical and grammatical standards.

Prerequisites:
MATH 1730

Textbook(s) and Other Course Materials:
Textbook:
Reference:
American Society for Testing and Materials
Laboratory Instructions
Instructor Handout

I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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</table>
| 1    | Lecture: Physical Character of Soil Constituents  
Lab: Excel Spreadsheets |
| 2    | Lecture: Natural Soil Deposits  
Lab: Excel Spreadsheets |
| 3    | Lecture: Soil Index Properties  
Lab: Introduction to the Soils Laboratory |
Lecture: Soil Index Properties; Exam I
Lab: Specific Gravity

Lecture: Soil Classification
Lab: Moisture Content

Lecture: Soil Classification
Lab: Density Sand cone

Lecture: Strength Concepts
Lab: Gradation analysis (Hydrometer)

Lecture: Stress Analysis and Engineering Properties
Lab: Gradation analysis (Mechanical)

Lecture: Stress Analysis and Engineering Properties
Lab: Atterberg Limits

Lecture: Stress Analysis and Engineering Properties; Exam II
Lab: Constant Head

Lecture: Embankment Construction and Control
Lab: Compaction

Lecture: Embankment Construction and Control
Lab: Unconfined Compression

Lecture: Foundation Construction
Lab: Direct Shear-Granular Soil Cohesive Soil

Lecture: Design of Footings
Lab: Direct Shear- Cohesive Soil

FINAL EXAM

II. Course Objectives*:

A. Understand the physical condition of a soil mass and the associated descriptive terms. (A, D, G, L)

B. Perform the basic tests on soils using standard procedures and prepare a professional report. (A, D, E, G, J, L, H)

C. Determine soil classifications, names and descriptive adjectives according to standard classification procedures. (A, D, G, H)

D. Understand the stresses created by water, the effect of buoyancy and the movement of water through soil. (A, D, G, L, K)

E. Understand the concept of strength in a soil mass. (A, D, G)

F. Understand settlement and compressibility of a soil mass. (A, D, G)

G. Present oral reports. (F, J)
H. Demonstrate self initiative to complete all assignments on time.  (I, J)

*Letters after course objectives reference CET Program Outcomes (as required by ABET).

III. Instructional Processes*:

Students will:

1. Participate in classroom discussions which challenge the students' ability to think creatively.  
   *Communication Outcome, Active Learning Strategies*

2. Visit commercial soil laboratories and construction sites and hear guest lecturers from the engineering community to help in the transition from the classroom and laboratory to work.  
   *Transitional Strategies, Communication Outcome, Active Learning Strategies*

3. Work in teams to conduct laboratory tests and solve special problems to foster interpersonal skills of teamwork. Frequently this leads to development and refinement of leadership skills and the ability to express one's thoughts and ideas and seek, through negotiation, consensus of the team.  
   *Communication Outcome, Technological Literacy Outcome, Informational Literacy Outcome, Active Learning Strategies*

4. Use computers to process information obtained through laboratory tests and problem assignments to enhance information literacy skills. Spreadsheets are used to record laboratory data, to perform data reduction and to prepare logical tabular and graphical presentations of the laboratory results. Word processing software is used to prepare reports and the Internet is used for special assignments.  
   *Communication Outcome, Technological Literacy Outcome, Active Learning Strategies*

5. Prepare professional level reports describing standard soil laboratory tests requiring mathematical analysis as well as written communication to advance the basic skills of writing and mathematics.  
   *Communication Outcome, Mathematics Outcome, Active Learning Strategies*

6. Discuss the importance of such personal qualities as ethics and personal responsibility in school and in the workplace.  
   *Communication Outcome, Active Learning Strategies, Transitional Strategies*

*Strategies and outcomes listed after instructional processes reference TBR’s goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

Upon successful completion of this course, the student should be able to:

1. Understand and use the terminology.  A,B,C,D,E&F

2. Determine the different phases of a soil.  A

3. Determine the void ratio and porosity of a dry two-phase soil.  A

4. Determine the significance of unit weight, specific gravity and water content.  A,B

5. Determine the significance of the degree of saturation of a soil mass.  A,B
6. Describe the interrelationship of soil mass properties. A
7. Determine the importance of Grain Size Distribution. A, B
8. Determine the importance of Liquid, Plastic and Shrinkage Limits. B
9. Determine the importance of Compactibility. B
10. Determine the importance of Permeability. B
11. Determine the importance of Direct Shear. B
12. Determine the engineering classification of soil by the major classification systems. C
13. Calculate the total stress, effective stress and hydraulic stress. D
14. Calculate the movement of water through soil. D
15. Describe the use of flow nets to estimate seepage, uplift pressure on dams and piping and creep ratios. D
16. Calculate the stresses on a soil mass using Mohr's Circle. E
17. Apply Coulomb's Law. E
18. Discuss the performance of strength tests: compression, penetration and direct shear. B,E
19. Calculate the settlement due to loads on cohesive and cohesionless soils. F
20. Determine the time-settlement relationships for a cohesive soil. F
21. Prepare reports to meet professional standards. G

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures: 60%

Examinations will be given covering the lecture materials. These exams will be given as shown on the schedule above. The examinations may consist of problems and essay, short answer or multiple choice questions. One examination may be made up if the student has a valid excuse for missing the examination. The examination must be made up within one week.

The examinations will account for 60 percent of the final grade.

B. Laboratory Expectations: 30%

A number of laboratory tests are scheduled and at one or more field trips will be scheduled. A laboratory journal will be kept by each student and reports prepared in accordance with the procedure described in Appendix A for all laboratory tests. The student will be graded on laboratory technique, the journal and the reports. Reports will be graded for technical content
but they must meet acceptable grammar standards or they will be returned to the student to be redone. It is suggested that the student consult with an English tutor in the Learning Center regarding the preparation of reports.
A short quiz will be given at the beginning of each laboratory period on the procedure for the test being conducted that day. The score on the quiz will be added to the grade of the report. The student must complete all laboratory assignments and submit an acceptable report to receive a passing grade in the course

The laboratory grade will account for 30 percent of the final grade.

C. Field Work:

N/A

D. Other Evaluation Methods: 10%

Quizzes and Homework: 
Unscheduled short quizzes may be given covering the previous class lecture or the assignment for the current day. Quizzes may not be made up.

Homework will be assigned regularly.

Quizzes and homework will account for 10 percent of the final grade.

E. Grading Scale:

<table>
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<tr>
<th>Score Range</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90-100</td>
<td>A</td>
</tr>
<tr>
<td>86-89</td>
<td>B+</td>
</tr>
<tr>
<td>80-85</td>
<td>B</td>
</tr>
<tr>
<td>76-79</td>
<td>C+</td>
</tr>
<tr>
<td>70-75</td>
<td>C</td>
</tr>
<tr>
<td>60-69</td>
<td>D</td>
</tr>
<tr>
<td>0-59</td>
<td>F</td>
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</tbody>
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VI. Policies:

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course (Pellissippi State Catalog). Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent.

It is the student's responsibility to attend every scheduled class activity on time. Students are responsible to get assignments missed and to make-up any work missed during an absence.

B. Academic and Classroom Misconduct:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices: Cheating, including but not limited to unauthorized assistance from material, people,
or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments. In addition to other possible disciplinary sanctions that may be imposed as a result of academic misconduct, the instructor has the authority to assign either (1) an F or zero for the assignment or (2) an F for the course.

C. Accommodations for disabilities:

If you need accommodations because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please inform the instructor immediately. Please see the instructor privately after class or in his/her office. Students must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127 or 131 or by phone: 694-6751(Voice/TTY) or 539-7153.