APPLICATION FOR CHANGE IN EXISTING COURSE: MAJOR & MINOR

1. Submitted by College of Engineering
   Department/Division offering course Civil Engineering
   Date November 2001

2. Changes proposed:
   (a) Present prefix & number CE 471G
       Proposed prefix & number CE 471G
   (b) Present Title Soil Mechanics
       New Title Soil Mechanics
   (c) If course title is changed and exceeds 24 characters (Including spaces), include a sensible title (not to exceed 24 characters) for use on transcripts:
       NA
   (d) Present credits: 3
       Proposed credits: 4
   (e) Current lecture: laboratory ratio lec 2 hrs.; lab 3 hr/wk
       Proposed: lec 3 hrs.; lab 3 hr/wk
   (f) Effective Date of Change: (Semester & Year) Fall 2003

3. To be Cross-listed as: NA

4. Proposed change in Bulletin description:
   (a) Present description (including prerequisite(s):
       See attachment
   (b) New description:
       See attachment
   (c) Prerequisite(s) for course as changed: See attachment

5. What has prompted this proposal?
   The need to satisfy ABET requirements for accredited civil engineering programs and
   to better prepare students for the professional fundamentals of engineering (FE) exam.

6. If there are to be significant changes in the content or teaching objectives of this course, indicate changes:
   The change adds about 15 fifty minute periods of instruction dealing with foundation
   design that is needed for the FE exam.

7. What other departments could be affected by the proposed change?
   None

8. Will changing this course change the degree requirements in one or more programs?*
   ☑ Yes ☐ No
   If yes, please attach an explanation of the change.*

9. Is this course currently included in the University Studies Program?
   ☐ Yes ☑ No
   If yes, please attach correspondence indicating concurrence of the University Studies Committee.

10. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has
    been consulted.

*NOTE: Approval of this change will constitute approval of the program change unless other program modifications are proposed.

ORIGINAL
4. Proposed change in Bulletin description:

(a) Present description (including prerequisite(s)):

A study of the strength, deformation and hydraulic properties of soils and their relationship to settlement, stress distribution, earth pressure, bearing capacity and slope stability. Written and oral presentations of student projects will be required.

Prereq: EM 302; prereq or concur: GLY 220; and engineering standing or consent of instructor.

(b) New description:

A study of the strength, deformation and hydraulic properties of soils and their relationship to settlement, stress distribution, earth pressure, bearing capacity and slope stability. Design of footing foundations and retaining walls. Written and oral presentations of student projects will be required. Lecture, three hours; laboratory, three hours per week.

Prerequisite(s) for course as changed:

Prereq: EM 302; prereq or concur: GLY 220; and engineering standing or consent of instructor.

8. Will changing this course change the degree requirements in one or more programs? Yes.

CE 471G is a required course in the Civil Engineering curriculum. Therefore, this change by itself would increase the required credits for graduation by one (1) credit.
11. Is this a minor change? 
   (NOTE: See the description on this form of what constitutes a minor change. Minor changes are sent directly from the Dean of the College to the Chair of the Senate Council. If the latter deems the change not to be minor, it will be sent to the appropriate Council for normal processing.)

   [ ] Yes [ ] No

12. Within the Department, who should be consulted for further information on the proposed course change?

   Name: Bobby O. Hardin
   Phone Extension: 7-3247

Signatures of Approval:

[Signature]                     11/14/01
Department Chair

[Signature]                     2/20/03
Dean of the College

[Signature]                     Date
**Undergraduate Council

[Signature]                     Date
**Graduate Council

[Signature]                     Date
**Academic Council for the Medical Center

[Signature]                     Date
**Senate Council

**If applicable, as provided by the Rules of the University Senate.

Date of Notice to the Faculty

Date

Date

Date of Notice to University Senate

ACTION OTHER THAN APPROVAL

**********

The Minor Change route for courses is provided as a mechanism to make changes in existing courses and is limited to one or more of the following:

a. change in number within the same hundred series;
b. editorial change in description which does not imply change in content or emphasis;
c. editorial change in title which does not imply change in content or emphasis;
d. change in prerequisite which does not imply change in content or emphasis;
e. cross-listing of courses under conditions set forth in item 3.0;
f. correction of typographical errors. [University Senate Rules, Section III - 3.1]

Rev 11/98
Topics presented in the lecture part of the course are listed below. The first 29 periods are included in the current course (before change). Periods 30 through 44 are added by the change. The laboratory part of the course is not described, because the laboratory part of the course will not be changed.

**Soil Mechanics**

The topics by each class number are presented in one 50 minute class period.

<table>
<thead>
<tr>
<th>Class</th>
<th>Topic to be Discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course information</td>
</tr>
<tr>
<td></td>
<td>The concept of effective stress</td>
</tr>
<tr>
<td></td>
<td>How to determine initial stresses in the ground</td>
</tr>
<tr>
<td>2</td>
<td>Site investigation</td>
</tr>
<tr>
<td></td>
<td>Why we need PHASE relationships (relative amounts of solid, water and air)</td>
</tr>
<tr>
<td>3</td>
<td>Use of phase relationships</td>
</tr>
<tr>
<td>4</td>
<td>Phase relationships (continued)</td>
</tr>
<tr>
<td>5</td>
<td>How to Solve a Settlement Problem</td>
</tr>
<tr>
<td></td>
<td>Computation of surface pressure</td>
</tr>
<tr>
<td></td>
<td>How to plot stress paths</td>
</tr>
<tr>
<td>6</td>
<td>Total stress increments resulting from surface pressures</td>
</tr>
<tr>
<td></td>
<td>Theory of Elasticity solutions (equations, charts and tables)</td>
</tr>
<tr>
<td>7</td>
<td>Total stress after loading</td>
</tr>
<tr>
<td>8</td>
<td>Pore water pressures resulting from surface loadings</td>
</tr>
<tr>
<td></td>
<td>DRAINED and UNDRAINED conditions</td>
</tr>
<tr>
<td></td>
<td>Pore pressures before and after loading</td>
</tr>
<tr>
<td>9</td>
<td>Partially drained conditions</td>
</tr>
<tr>
<td></td>
<td>Darcy’s law and one-dimensional steady flow of water through soils</td>
</tr>
<tr>
<td>10</td>
<td>Effective stress increments resulting from surface loadings</td>
</tr>
<tr>
<td></td>
<td>Effective stress paths for the oil tank loading</td>
</tr>
<tr>
<td>11</td>
<td>Evaluation of series solution for one-dimensional transient flow</td>
</tr>
<tr>
<td></td>
<td>Condition of drainage and time for settlement of oil storage tank</td>
</tr>
<tr>
<td>12</td>
<td>Additional lecture time or review</td>
</tr>
<tr>
<td>13</td>
<td>Time for tests</td>
</tr>
<tr>
<td>14</td>
<td>Numerical solution for one-dimensional transient flow</td>
</tr>
<tr>
<td>15</td>
<td>Inaccuracies in stress computations</td>
</tr>
<tr>
<td></td>
<td>One-dimensional strain approximation for computing settlement</td>
</tr>
<tr>
<td>16</td>
<td>Stress-strain relations for soils</td>
</tr>
<tr>
<td></td>
<td>Stress-strain curve for one-dimensional strain</td>
</tr>
<tr>
<td>17</td>
<td>Void ratio increments</td>
</tr>
<tr>
<td></td>
<td>Strain resulting from effective stress increments</td>
</tr>
<tr>
<td></td>
<td>Estimation of settlement</td>
</tr>
<tr>
<td>18</td>
<td>Allowable settlements</td>
</tr>
<tr>
<td>19</td>
<td>Construction of compacted fill</td>
</tr>
<tr>
<td></td>
<td>Description of highway cross-section and soil profile</td>
</tr>
<tr>
<td></td>
<td>Moisture-density relationships for the borrow area</td>
</tr>
<tr>
<td></td>
<td>Control of field density during construction</td>
</tr>
<tr>
<td>20</td>
<td>Investigation of slope stability</td>
</tr>
<tr>
<td></td>
<td>Two-dimensional steady flow of water through soils</td>
</tr>
<tr>
<td></td>
<td>Construction of flow nets</td>
</tr>
<tr>
<td>21</td>
<td>Student’s practice flow net construction</td>
</tr>
<tr>
<td></td>
<td>Numerical Solution for Two-Dimensional Steady Flow</td>
</tr>
<tr>
<td>22</td>
<td>Use of flow nets</td>
</tr>
<tr>
<td></td>
<td>Pore water pressures resulting from seepage</td>
</tr>
</tbody>
</table>
Specific Learning Outcomes:

1. Students should understand the concepts of effective stress and pore pressure generation and dissipation in soils.

2. Students should be able to compute the settlement of structures due to consolidation of soils, analyze seepage through soils that surround structures, compute factors of safety for stability of slopes and factors of safety for bearing capacity of footings considering appropriate drainage conditions, and compute Rankine earth pressures on retaining walls.

Computer Usage: Students learn to use computers to solve problems with spreadsheet software.

Grading of Graduate Students

Fourteen tests are given approximately weekly plus during the final exam period to assess performance in the lecture part (75%) of this course. The other 25% is based on performance in the laboratory portion of the course. Graduate students in laboratory will be expected to provide leadership for teams of students as they conduct tests. For the lecture part of the course, test scores necessary to receive a given grade will be expected to be 3 points higher for graduate students than for undergraduate students (100 points maximum).
I. Instructor Information

Clark Graves - cgraves@engr.uky.edu, 281 Raymond Bldg, ext 248
Tony Beckham - tbeckham@engr.uky.edu, 280 Raymond Bldg, ext 247
Tom Hopkins - thopkins@engr.uky.edu, 282 Raymond Bldg, ext 249
Phone: 257-4513
Office Hours: (by appointment)

Teaching Assistant: Mike Schneider

II. Course Goals and Objectives

The goal of this course is to provide the students with an understanding of the fundamental methods of soil laboratory tests through hands-on experience.

The learning objectives of this course include:

- Recognize sources of error in laboratory tests and estimate how errors affect the measured soil properties.
- Communicate laboratory test results and issues using written and oral technical communication skills.
- Set up well-organized spreadsheets for reducing laboratory data.
- Classify soils using the Unified Soil Classification System and the ASTM Visual classification method.
- Identify appropriate test methods when presented with basic site and project information as well as engineering objectives for a project.
- Solve phase diagram problems.
- Solve geotechnical engineering problems using data from laboratory soils tests.

III. Laboratory Manual

The required laboratory manual for this course is *Engineering Properties of Soils and Their Measurement, 4th* edition by J.E. Bowles. The manual may be purchased at the University Bookstore or Kennedy Bookstore.
IV. Course Requirements

In order to ensure a positive learning experience for all students, the following requirements are to be strictly followed by students in this course.

A. Laboratory attendance is mandatory. Any unexcused absence will result in a grade of zero for the lab. If a student cannot attend the scheduled lab under extraordinary circumstances, the instructor or teaching assistant must be contacted no later than 24 hours after the absence to schedule a make-up. Each student is permitted one such make-up lab per semester. Excused absences are defined in the University Rules.

B. All work turned in by each student must be his or her own work. Any and all acts of copying, plagiarism, or other unethical acts will be dealt with according to university procedures and regulations. Note that according to University Rules, the minimum penalty is an “E” for a grade in the course.

C. Clean up all the equipment and working space after each lab experiment. Each group is responsible for their work area. The instructor will inspect each group’s work area after the lab for proper clean up, 2% will be deducted from the final grades of the students in the responsible groups per incident. All equipment must be returned to where it was found and the countertop and floor must be clean.

D. Assignments MUST be turned in at the beginning of the period on the due date!!! Assignments will NOT be accepted after this time.

E. Take good care of the lab equipment. Lab equipment is expensive.

F. Observe laboratory safety regulations!

V. Course Organization

The class will be divided into 4 groups of students. Each group will work as a team and be responsible for organizing and completing each laboratory test. Students must work together and share data within their assigned group. Each student is required to submit his or her own laboratory test report. Remember no copying or plagiarism will be tolerated!

Before attending each lab meeting, students need to read the assigned reading material. Reading the assignment will help you complete the laboratory assignment.

All students must attend the lab lecture before performing the experiment. Attendance will be taken at the beginning of each lab lecture. The lecture usually lasts for half an hour. At the beginning of the lecture, a quiz will be given on either the reading assignment or content from the previous week’s laboratory class meeting. After the quiz, the instructor will introduce the theory, the application, and summarize the important points of the test(s) to be performed. The equipment to be used for the lab will also be explained or demonstrated.
After the lecture, students will go to the laboratory to finish the experiment assigned. The teaching assistant will be present at the laboratory to answer questions regarding to the experiment. After finishing the tests and collecting required data, the students will clean the working space.

VI. Quizzes

A brief quiz may be given at the start of any lab lecture to test the student’s comprehension of the assigned reading for that day or the calculations from the previous week’s lab.

VII. Laboratory Memorandums

Laboratory memorandums will be used to communicate test results to the instructor the week after a lab is performed. These memorandums should contain a description of the tests performed, any deviations from standard procedures, and the test results. Laboratory memorandums will also be used to communicate assignment results of special assignments to the instructor.

VIII. Laboratory Report

Each student will submit two lab reports during the semester. Each report will present the results of four or more completed labs (refer to the attached course schedule). Lab reports provide you with an opportunity to sharpen your technical writing skills in a format that practicing engineers use daily. Lab reports will be graded on format, language usage, neatness, and presentation. Each report should be arranged according to the sequence given below.

A. TITLE PAGE. Give the title of the experiment contained in the report, your name, section number, group number, and the date of the report submission.

B. TABLE OF CONTENTS. Give the contents of the entire report by section title with page numbers.

C. ABSTRACT. Summarize the entire report in no more than 250 words. Write the abstract after the rest of the report is finished. Good organization, language usage, and focus are critical in an abstract. The abstract should be understandable by itself—it should not reference other parts of the report, and it must be on a page by itself.

D. INTRODUCTION. State the objective or objectives of the lab test(s). End the introduction with a summary statement and a description of the organization of the report.

E. PROCEDURE. You may cite the lab manual or other references instead of writing out the entire procedure. It is very important to note and document any deviations from referenced procedures.
F. EXPERIMENTAL RESULTS. Summarize the data obtained in the lab. Present results with tables and graphs to communicate results vividly and concisely. Please refer to the section on drawing graphs in the lab manual introduction.

G. CONCLUSIONS. Relate the lab results to the objective(s) of the lab. Discuss any limitations or discrepancies. Interpret the results.

H. REFERENCES. If you use published material while writing your report, document your sources in this section.

I. APPENDIXES. Identify all attachments to the report as Appendix A, Appendix B, and so on. Completed data sheets and sample calculations must be included in the report as appendixes. Any spreadsheets used to calculate lab results should also be included.

IX. Final Project

Each group will be required to select a topic in the geotechnical engineering field for more detailed study. A list of suggested topics will be provided or other relevant topics may also be selected pending instructor approval. Additional information regarding report content, presentation guidelines, and project grading criteria will be provided at a later date.

X. Course Grade and Grading Policy

The grade for the laboratory will be computed from the following components and their respective weights:

Laboratory test report 1          10 %
Laboratory test report 2          30 %
Quizzes                          20 %
Laboratory memorandums           25 %
Final Project (report and presentation)  15 %

Laboratory reports and memorandums will be graded for completeness, organization, neatness, presentation, and reasonableness of data.

Letter grades will be assigned as follows:

\[
\begin{align*}
\geq 90 \% & \quad A \\
\geq 80 \% \text{ and } < 90 \% & \quad B \\
\geq 70 \% \text{ and } < 80 \% & \quad C \\
\geq 60 \% \text{ and } < 70 \% & \quad D \\
< 60 \% & \quad E
\end{align*}
\]
### XI. Course Schedule

<table>
<thead>
<tr>
<th>Lab Number</th>
<th>Date</th>
<th>Topic</th>
<th>Reading*</th>
<th>Assignment Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/15 - 1/17</td>
<td>Liquid and Plastic Limits of a Soil Moisture Content Test</td>
<td>Chapter 1, 3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1/22 – 1/24</td>
<td>Particle Size Analysis – Sieve Test Specific Gravity</td>
<td>Chapter 5, 7</td>
<td>Lab 1</td>
</tr>
<tr>
<td>3</td>
<td>1/29-1/31</td>
<td>Particle Size Analysis – Hydrometer</td>
<td>Chapter 6</td>
<td>Lab 2</td>
</tr>
<tr>
<td>4</td>
<td>2/5-2/7</td>
<td>Soil Classification</td>
<td>Chapter 8</td>
<td>Lab 3</td>
</tr>
<tr>
<td>5</td>
<td>2/12-2/14</td>
<td>Moisture-Unit Weight Relationship</td>
<td>Chapter 9</td>
<td>Lab 4</td>
</tr>
<tr>
<td>6</td>
<td>2/19-2/21</td>
<td>Coefficient of Permeability – Constant Head and Falling Head Tests</td>
<td>Chapter 11, 12</td>
<td>Lab 5</td>
</tr>
<tr>
<td>7</td>
<td>2/26-2/28</td>
<td>Consolidation Test</td>
<td>Chapters 13</td>
<td>Lab 6 Lab Report #1</td>
</tr>
<tr>
<td>7 cont.</td>
<td>3/5-3/7</td>
<td>Consolidation Test Analysis</td>
<td>Chapter 13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3/12-3/13</td>
<td>Spring Break</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3/19-3/20</td>
<td>Direct Shear Test – Unconfined Compression Test</td>
<td>Chapter 14, 17</td>
<td>Lab 7</td>
</tr>
<tr>
<td>9</td>
<td>3/26-3/27</td>
<td>Triaxial Test -- Unconsolidated Undrained Test on Sand</td>
<td>Chapter 15</td>
<td>Lab 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Final Project Outline Due</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4/2-4/4</td>
<td>Triaxial Test – Consolidated Undrained</td>
<td>Chapter 16</td>
<td>Lab 9</td>
</tr>
<tr>
<td>11</td>
<td>4/9-4/11</td>
<td>Topic TBA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>4/16-4/18</td>
<td>Topic TBA</td>
<td></td>
<td>Lab Report #2</td>
</tr>
</tbody>
</table>

* Reading assignments are from the laboratory manual.