

CE 414 – Structural Design Laboratory

Elective

2007 Catalog Data: CE 414 – Structural Design Laboratory 3 (1-6) Prerequisites CE 431, 433 or c//, Engl 402. Senior lab requiring integration of previous coursework into the execution of design projects and the assessment of experimental test data.

Prerequisites: CE 431, CE 433 or c//.

Textbooks: 2006 International Building Code (IBC), International Code Council (ICC), Whittier, CA, 2006.
ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, American Society of Civil Engineers (ASCE), Reston, VA, 2005.

Course Objectives:

1. Determine structural loads on buildings in accordance with current design standards and specifications.
2. Integrate skills from previous structural engineering courses to solve complex, open-ended design problems.
3. Conduct experiments and analyze test data to determine mechanical properties and behavioral characteristics of structural materials, members, connections, and/or systems.
4. Communicate effectively in written format.

Topics:

1. Determination of structural loads (dead, live, snow, wind, seismic)
2. Use of commercial engineering software
3. Concrete mix design and experimental determination of concrete strength
4. Experimental determination of masonry prism strength
5. Experimental assessment of the behavior of reinforced concrete beams

Class Schedule: One fifty-minute lecture and two 170-minute laboratory/design studio sessions per week.

Contribution of Course to meeting the Professional Component: This course is an engineering topic, with contributions in engineering design.

Course Outcomes: This course is contributing toward the following the educational outcomes. The table below offers details by outcome.

Outcome	Role of CE 414
Outcome 1: A firm foundation and knowledge of mathematics, science, and engineering principles and ability to apply the knowledge (Outcome a).	A fundamental understanding of basic mathematics, statics, dynamics, solid mechanics, structural analysis, geology/geotechnology, and behavior of structural materials is required to successfully complete the laboratory exercises, structural load calculation assignments, and open-ended design projects in this course. Students must apply this fundamental knowledge to solve complex design problems and analyze experimental data.
Outcome 2: An ability to design and conduct experiments and the ability to analyze the data, interpret results and draw conclusions (Outcome b).	Students are required to work in teams to conduct laboratory tests of structural material behavior. Comprehensive laboratory reports are required for each experimental exercise, and must include a thorough description of the test specimens and procedures, presentation and analysis of test data, interpretation of results, and appropriate conclusions.
Outcome 4: The ability to think logically, critically, and creatively.	Students are required to work in teams to solve open-ended design problems. Critical thinking skills and creativity are key factors in the selection and analysis of design alternatives. A logical presentation of results and conclusions is required in all written assignments.
Outcome 6: The ability to identify, formulate, and solve civil engineering problems (Outcome e).	Open-ended design projects in this course require students to identify important design parameters and formulate reasonable solutions. Many of the assignments were missing key elements of required information, forcing the students to locate and assess external sources of information, make assumptions, and provide rational justifications for their assumptions.
Outcome 7: The ability to use appropriate modern techniques, skills, and tools, including computer applications, necessary for engineering practice (Outcome k).	Current design codes and load standards are used throughout the course. Students use AutoCAD, interactive mapping software for seismic design, and commercial spreadsheet and word processing software for the design projects and laboratory reports in this class.
Outcome 9: The ability to communicate effectively in written, oral and graphical forms (Outcome g).	A majority of the course assignments require students to develop and submit comprehensive design project reports and laboratory reports. Grades are based on a combination of technical content and effectiveness of written communication.

Prepared by: David G. Pollock, June 2007.