School of Engineering
Construction Engineering, B.S.Con.E.
Broad Learning Goals

The undergraduate program in civil engineering will:

A. Prepare our graduates for successful professional practice or advanced study in construction engineering.

B. Provide our graduates with a broad education as a foundation for professional licensure and life-long learning.

C. Produce graduates with an appreciation for social, economic and ethical issues related to civil engineering.

Student Learning Outcomes

Construction Engineering graduates will demonstrate:

a. An ability to apply knowledge of mathematics, science and engineering.

b. An ability to design and conduct experiments as well as to analyze and interpret data.

c. An ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.

d. An ability to function on multi-disciplinary teams.

e. An ability to identify, formulate and solve engineering problems.

f. An understanding of professional and ethical responsibility.

g. An ability to communicate effectively.

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

i. A recognition of the need for and an ability to engage in lifelong learning.

j. A knowledge of contemporary issues.

k. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

Construction Engineering Outcomes Assessment Plan

The Department utilizes Course and Student Work Assessments (CSWAs) in producing data for the Outcomes Assessment. The CSWAs are produced by the course instructors at the end of the semester and have evolved over time to be increasingly focused on the degree to which specific outcomes are being met. Where comparable data is available from previous semesters, the current CSWA includes a trend over time of how well the outcome is being achieved. Current assessments may be found in this document; previous assessments are included in the Outcomes Assessment Notebooks.

The other assessment tool employed to evaluate the Department's Program Outcomes is student performance on the Fundamentals of Engineering (FE) Examination, both the overall pass rate compared to national averages as well as scores from subject-specific questions. FE Exam results are used to assess outcomes a, e, and f. The AM (morning) results on the general exam are used to evaluate Outcomes a. and f., while the results of the PM (afternoon) Civil Exam are used to evaluate Outcome e. In particular, AM subjects, related to mathematics, chemistry, and mechanics/strength of materials, are used to assess Outcome a., while the ethics and business practices subject in the AM is used for Outcome f. PM Exam averages in the Civil Engineering subjects are used to assess Outcome e.

The process used to assess the achievement of outcomes is given in **Figure 1**. The Department Accreditation Committee assigns which outcome(s) is to be evaluated by a particular course. Only required courses taken by all students are used to produce CSWAs. Once the CSWAs are complete, they are forwarded to the Accreditation Committee which reviews each CSWA in two principal areas. First, they consider whether the CSWA is providing appropriate assessment data. Second, they consider the implications of the CSWA for recommending changes in course content or curriculum. Once per academic year, the Accreditation Committee produces a brief summary of their review for the course instructor.

The other assessment tool employed to evaluate the Department's Program Outcomes is student performance on the Fundamentals of Engineering (FE) Examination, both the overall pass rate compared to national averages as well as scores from subject-specific questions. The CWSAs are subsequently used, along with FE Exam data, in the assessment of Program Outcomes. The Program Outcomes assessment process is on a 3-year cycle.

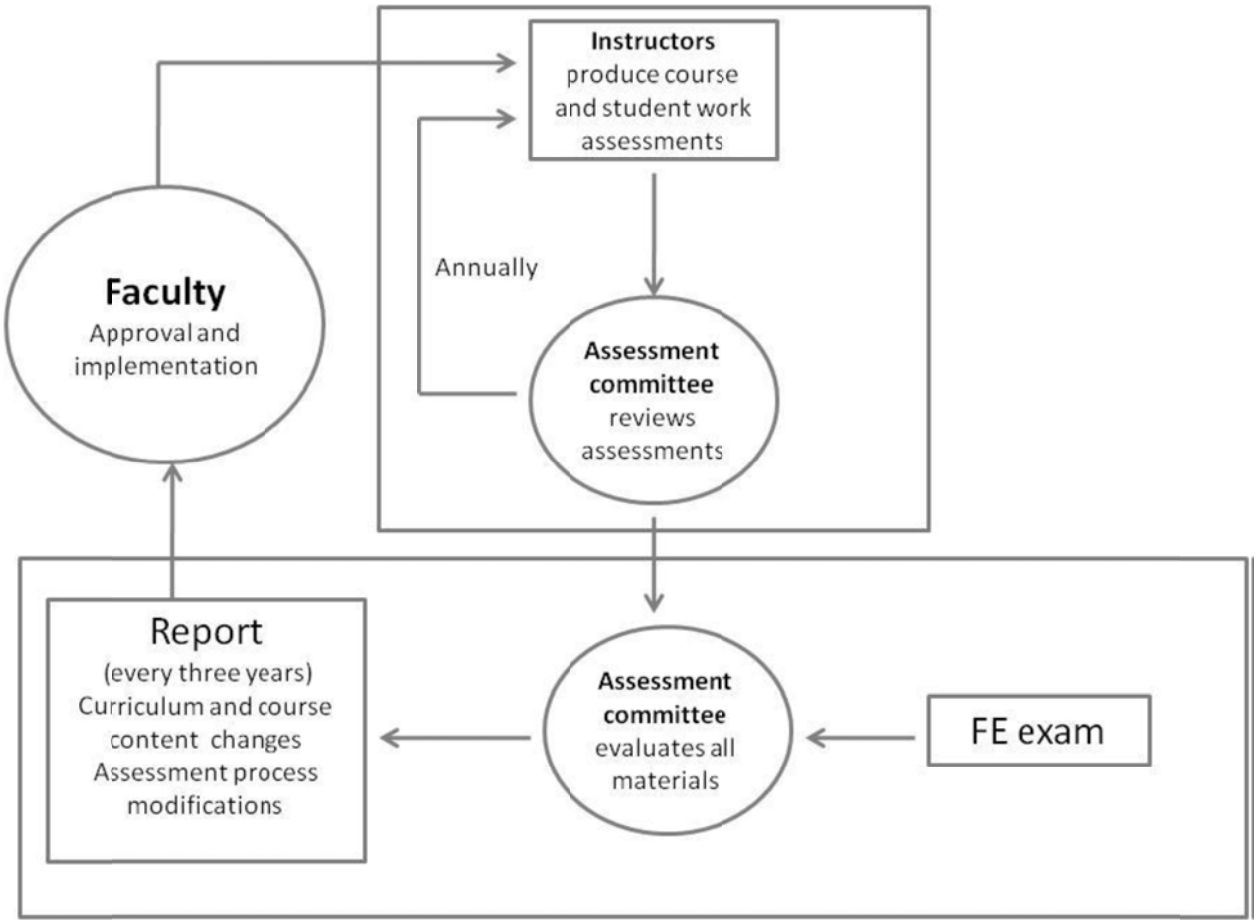

Figure 1

Schedule for the Program Outcomes Assessment Process

In order to provide a sustainable Program Outcomes' process, as well as to allow individual faculty some flexibility in documenting achievement of outcomes, the Department Assessment Committee developed a schedule for the collection of assessment information. Required courses scheduled only in the Fall Semester (CE 305L Materials Science, CE 331L Fluid Mechanics, CE 372 Construction Contracting, CE 382 Transportation Engineering and CE 442 Hydraulics and Hydrology) conduct CSWAs during and at the completion of the Fall Semester. Spring-only courses (CE 308 Structural Analysis, CE 310L Structural Design, CE 335 Water and Wastewater Treatment, CE 352 Computer Applications in CE and CE 360L Soil Mechanics) produce CSWAs during and at the completion of the Spring Semester.

CSWAs for the two courses (CE 350 Engineering Economy and CE 409 Engineering Ethics) taught every semester are performed at a minimum of once per year. Because of its importance in the Program Outcomes' process, the assessments connected to CE 499L Design of Civil Engineering Systems, the Capstone Design Course, are performed every semester, every year, for reasons previously described.

CSWAs are collected every semester for those outcomes being evaluated; results from the FE

exam are also compiled each semester. CSWA data is used to provide feedback to instructors for use in both improving the assessment process as well as in suggesting course improvements. CSWA data and FE Exam results are also provided on a bi-yearly basis to the Department Accreditation Committee in order to conduct outcomes assessments and suggest curriculum modifications.

Metrics and Rubrics for Outcomes Assessment

All course-related assessments use a three-scale rubric as follows: 3 = Exemplary, 2 = Satisfactory, 1 = Unsatisfactory. Specific target levels for outcomes attainment have been established (e. g. 75% of students achieving an outcome of 2 or better).

A set of Performance Criteria have been established for each Program Outcome. The Performance Criteria break each Outcome into more specific, measureable elements. Course instructors were given the option to perform assessments at the Performance Criteria level and then roll the assessment up to the Outcome level or to perform the assessment at the Outcome level.

The performance criteria are listed below for each of the Program Outcomes:

Outcome a. An ability to apply knowledge of mathematics, science, and engineering
- applies knowledge of mathematics
- applies knowledge of science
- applies mathematics and science to solve engineering problems

Outcome b. An ability to design and conduct experiments as well as to analyze and interpret data
- able to conduct experiments and collect data
- comprehends the need and procedures for conducting experiments
- analyzes experimental results to verify hypothesis/theory

Outcome c. An ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability
- able to design components
- able to integrate components into a system
- comprehension of the design process and constraints

Outcome d. An ability to function on multi-disciplinary teams
- share equal responsibility
- communicate effectively among team members
- make effective decisions as a team

Outcome e. An ability to identify, formulate and solve engineering problems
- comprehension of the type of problems encountered/solved by civil engineers
- ability to formulate an approach to solve a problem
- applies solution methods to solve a problem

Outcome f. An understanding of the professional and ethical responsibility
- recognize ethical issues
- deliberate ethical questions
- resolve ethical challenges in a group environment

Outcome g. An ability to communicate effectively
- effective at technical writing
- effective at oral presentations
- engages in classroom discussions

Outcome h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- comprehend the role of infrastructure in quality of life issues
- knowledge of economics as a tool in decision-making
- comprehend the environmental impact of engineering decisions

Outcome i. A recognition of the need for and an ability to engage in lifelong learning
- comprehend the need for, and the importance of, lifelong education
- a knowledge of sources of continuing education
- an ability to formulate a lifelong learning plan

Outcome j. A knowledge of contemporary issues
- knowledge of contemporary issues
- comprehension of the impact of contemporary issues on the engineering Profession

Outcome k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
- knowledge of the capabilities of contemporary engineering tools
- comprehension of the process of selecting engineering tools for specific goals
- applies engineering tools for solving problems