

Unit Plan for Assessing and Improving Student Learning in Degree Programs

Unit: Civil and Environmental Engineering (CEE)

Unit Head Approval: Prof. R.H. Dodds

Date:

SECTION 1: PAST ASSESSMENT RESULTS

Brief description of changes or improvements made in your unit as the result of assessment results since 2000.

CEE is an ABET accredited program. We are visited by an ABET Review Team every six years, and we were most recently visited in September 2007. The September 2007 visit identified two “weaknesses”, and we are confident that we will be able to resolve those issues to the satisfaction of ABET in the coming months, and obtain another six full years of accreditation.

Changes/improvements were made on the basis of our ongoing outcome assessment since 2000. Some of the major changes are:

- New Construction Management initiative called Global Leaders Program, a 5-yr program leading to an MS degree. The program includes international travel, an internship, and a practice-oriented independent study project.
- We improved staffing of our undergraduate program by creating a new position called undergraduate program coordinator. This new position improves our ability to deliver high quality advising and respond more personally to students.
- We hired a Professor of Practice, a faculty member with strong industrial experience. This faculty member enhances our ability to respond to changing industry needs and highlights our concern about students pursuing professional licensing.
- We improved the student environment and enhanced communications. We invested in a new study area in Newmark CE Lab, installed LCD “news board” in the Newmark lobby, and created an on-line student news blog.
- We initiated an Ethics Seminar in the Fall semester for students and faculty.

SECTION 2: REVISED ASSESSMENT PLAN

(a) **PROCESS:** Brief description of the process followed to develop or revise this assessment plan

We have a long-established process for ensuring that our program meets its objectives. The process, formed in response to the needs of ABET accreditation, is documented in a CEE Self-Study Report that was most recently completed in June 2007. The process starts by defining Program Educational Objectives. Then we identify Program Outcomes that represent what our students should learn to meet our Objectives. We have established an Outcomes Assessment Process to ensure that our program actually achieves what it sets out to achieve.

The CEE Administration has primary responsibility for ensuring that this process works. We have faculty committees—notably the CEE Curriculum Committee and the CEE ABET Preparation Committee—that are assigned responsibility for conducting the Outcomes Assessment Process. Our constituencies are involved at various points in the process (CEE Alumni Board representing industry, students, faculty, and peer faculty at other universities). We aim to have a system that responds to the assessment process, and leads to improvements whenever weaknesses or opportunities are identified.

Program educational objectives

Consistent with the general vision, mission, and objectives of the department, the civil engineering undergraduate program has specific educational objectives. The four primary educational objectives of the civil engineering program are as follows:

1. Prepare graduates to be professional practitioners of civil and environmental engineering with a comprehensive technical education.
2. Prepare graduates to be well-rounded engineers with an understanding of contemporary issues, historical context, multidisciplinary character, and global nature of civil engineering.
3. Prepare graduates to be leaders in engineering and society who exhibit team-building skills, professional responsibility, and effective communication skills.
4. Prepare graduates to pursue post-graduate education in engineering or other professional fields, and embrace life-long learning.

(b) STUDENT OUTCOMES: List Unit's student learning outcomes (knowledge, skills, attributes)

The program outcomes for civil engineering are listed as follows:

- A. An ability to apply knowledge of mathematics, science, and fundamental engineering principles. Specifically, each student should be proficient in mathematics through differential equations (including linear algebra), probability and statistics, calculus-based physics, engineering mechanics, computer science, and general chemistry.
- B. An ability to conduct laboratory experiments and to critically analyze and interpret data in more than one of the recognized civil engineering areas.
- C. An ability to design a system, component, or process to meet desired needs, including safety, durability, and economic considerations. Specifically, each student should be proficient in engineering economics and techniques of design optimization. Each student should develop an understanding of the broad nature of civil engineering design by means of design experiences integrated throughout the professional component of the curriculum.
- D. An ability to function on a multidisciplinary team.
- E. An ability to identify, formulate, and solve engineering problems in a minimum of five recognized major civil engineering areas.
- F. An understanding of professional practice issues such as: professional and ethical responsibility; procurement of work; bidding versus quality based selection processes; how the design professionals and the construction professionals interact to construct a project; the importance of professional licensure and continuing education; and other professional practice issues.
- G. An ability to communicate effectively.
- H. The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- I. A recognition of the need for and an ability to engage in life-long learning.
- J. Knowledge of contemporary issues.
- K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

(c) MEASURES AND METHODS USED TO MEASURE OUTCOMES:

Data that we include in our assessment of the educational outcomes for our program include the following.

(a) Course grades.

This method of assessment is the traditional one and most accurately measures the achievement of course objectives. All students in a particular course are exposed to the same subjects (i.e., those advertised in the course syllabus) and the same assignments. The course grade reflects differences in achievement on those topics and the work assigned.

(b) Instructor and course evaluation survey (ICES).

Student evaluations of instruction have been used on this campus for many years. These evaluations give a fairly accurate impression of how students feel about the experiences they had in the classroom. Although there is no direct correlation between the ICES results and the meeting of educational objectives on the part of the student filling out the survey, this tool provides an excellent means of getting student feedback on the course. Often the written comments include suggestions for improving the course. The faculty and administration at UIUC take the ICES surveys very seriously.

(c) Course Assessments

Every course is assessed by its instructor at the end of the semester. We use a standardized form to help instructors assess their courses' effectiveness in meeting the (A-K) program outcomes. The expectation of outcomes for each course is unique, and is defined by the course syllabi. The syllabi are included in Appendix I, and the most recent course assessment and syllabi will be included for review in our course materials for the ABET visit.

(d) Five-year survey of B.S. graduates.

Each year the College of Engineering surveys its graduates 5, 10, 20, 25, and 30 years after graduation. The five-year survey is the most relevant outcomes assessment tool because the memory of the features of the education is still crisp and career success is still fairly closely tied to the college education. Although the later years are also interesting and valuable, it is more difficult to make use of them in outcomes assessment because the formal education is so long in the past and because life-long learning eventually dominates the formal education.

(e) Fundamentals of Engineering (FE) examination.

The FE examination provides the only nationally normed comparison of student achievement in engineering subjects. As such, this tool provides an excellent means of comparing the education of our students with other civil engineering students across the nation. These data are included in this self-study report and will be discussed below.

(f) Senior surveys.

There are several surveys of graduating seniors that we use in the assessment process. These are described below.

- *Chancellor's Senior Survey on the Undergraduate Experience at UIUC.* The chancellor's senior survey is administered each year to graduating seniors on an elective basis. The data show that about half of the graduating seniors respond to the survey. The survey is meant to assess the general feeling about the educational experience at the university and it probes areas from educational achievements to the social environment on campus. One of the most interesting features of this survey is that it asks students to rate their abilities entering and exiting UIUC for a wide range of topics.
- *Survey of students in CEE 495.* We have recently implemented a survey of our students who take the course CEE 495—Professional Practice. This is a good survey point because all students are required to take the course, and they generally take it in their senior year. This survey is in its developmental stages. The survey will be reviewed and improved by the outcomes assessment committee in the future.

(g) Survey of the civil and environmental engineering alumni board (CEEAB).

We prepared a simple survey and asked the 18 members of our civil and environmental engineering alumni board to respond. The survey asked them to rate the performance of our graduates in the educational

outcomes (A-K). The discussions that followed at the board meeting were very informative, both about the instrument and about the outcomes. We will continue to survey the CEEAB periodically.

(h) Data available on graduates that measures their performance as students.

The associate head in charge of undergraduate programs periodically monitors certain cohorts of students who have graduated from our program. These data include admission information (e.g., ACT and HSPR values), courses taken at UIUC and the grades in those courses, and demographic information. This means of outcomes assessment is very important in a program like ours that has substantial latitude in the selection of elective courses. Through this means we can track the specific educational path that our students elect to pursue. We examine those data for trends that help to improve the advising and instruction of our students.

(i) Employment statistics.

The Engineering Career Services (ECS) office in the College of Engineering maintains records of first employment for all students who elect to provide that information. From this information, we can determine who first employs our students. We encourage our students and employers to use ECS because it has become a very effective and responsive college service.

(j) Anecdotal information collected from graduates and employers.

We have long collected information from our graduates and their employers on an anecdotal basis. Although these sources are much less quantitative, they are nonetheless very useful. In fact, these data are often very direct in their relation to our mission and our objectives.

(k) Reputation as measured by *U.S. News & World Report* survey.

The annual *U.S. News & World Report* survey of engineering programs is an independent measure of the esteem for our program, and it influences prospective students. Hence, we track this survey carefully. The UIUC civil engineering program has been rated among the very top programs in the country for the entire time the survey has been available.

(l) ABET accreditation.

Certainly, the accreditation of our program tells us, every six years, through a very careful review, if we meet our educational objectives.

SECTION 3: PLANS FOR USING RESULTS

(a) PLANS: Brief description of plans to use assessment results for program improvement.

The processes currently in place to assess the degree to which our graduates achieved the program outcomes are as follows:

- Collection of data from the sources mentioned above is continual and asynchronous. Most of the data flows either to the head or the associate head in charge of undergraduate programs. Data are shared with the curriculum committee and other faculty committees as appropriate to support their deliberations.
- The associate head in charge of undergraduate programs evaluates the data and makes recommendations to the department head.
- The head seeks the advice or action of the appropriate committee or individuals in the department, (e.g., curriculum issues are directed to the department's curriculum committee).
- If an action is proposed as the result of the assessment, the head either accepts or rejects the proposal (if the matter is a small one) or presents the proposal to the faculty for discussion and vote (if the matter is a large one).
- If the proposal is accepted, the head establishes an implementation plan and assigns tasks to faculty or staff to carry out the implementation.

It is worth noting that the essential features of this process have been in place for a long time. Assessment of outcomes data is made primarily by the head and the associate heads of the department who involve the faculty at large through the committee structure of the department. Issues that fall within the purview of a standing committee are then sent to that committee for action. Ad hoc committees are often developed for issues that did not fall within the purview of a standing committee. In a department organized with a head (as ours is), actions that affect the mission of the department or institution, actions that require the allocation of resources, and actions that modify the policy or procedures of the department must ultimately gain the approval of the head, the dean of the college, and in some cases, the provost.

(b) TIMELINE FOR IMPLEMENTATION:

The outcome assessment process is continual. On a semester basis, our faculty assess their individual courses, and implement improvements. On an annual basis, the administration identifies and assigns goals to the faculty committees. On a six-year basis, our program undergoes preparation for the ABET Review.