Department of Civil & Environmental Engineering Graduate Program
Strategic Assessment for the Graduate College (final submission September 15, 2009)

Mission

The mission of the graduate program in Civil and Environmental Engineering (CEE) is to train students for leadership in professional practice and research in four areas of specialization: Hydraulics and Water Resources; Environmental Engineering & Science; Structures, Mechanics, & Materials; and Transportation. These areas of specialization are diverse but all focus on engineering for public services. Mathematical problem solving is common to all areas.

The Master of Science in Engineering (MS) program prepares students for engineering careers in government, consulting, and industry. The Ph.D. in engineering prepares students for research leadership in the same areas but also academia. CEE is also home to the graduate program in environmental science and both MS and Ph.D. programs are offered and have similar career paths.

Admission Process and Criteria

CEE attracts students from diverse academic backgrounds. The most common undergraduate degrees among our applicants are civil engineering, environmental engineering, hydraulic engineering, chemical engineering, environmental science, physics, chemistry, biology, and similarly named programs. Applicants are commonly motivated to specialize within civil engineering or to earn engineering credentials after a more science-focused undergraduate degree. Our ability to offer both opportunities is a strength of our graduate program that we value very much.

Graduate students in CEE are diverse and well-qualified. About half of the graduates are not US citizens and hold foreign visas. Half (51%) of the MS graduates and 40% of the Ph.D. graduates over the last five years have been women, which is significantly higher in CEE than currently observed in the workforce and in the college of engineering as a unit. The percent of women in the graduate program is also larger than in our undergraduate CEE program (17%). This may be a result of our success in recruiting of students with undergraduate degrees in science and from outside of the University of Iowa. About half the current doctoral students in CEE entered with a masters degree completed elsewhere. The other half includes students who complete a masters degree in our program and students who are admitted directly to the doctoral program. The average GRE scores for entering CEE students are similar to the average for the University of Iowa although the quantitative scores are higher and the verbal scores are lower. The average undergraduate GPA is somewhat lower for CEE students than the UI as a whole (3.34 for CEE; 3.45 for UI for the 04-07 cohort). Both GRE and GPA trends are as expected for engineering students.

CEE recruits prospective graduate students using the web page, personal responses to inquiries, through faculty visits to other universities and college, and by recommendation from our former students. The latter provides some of our most productive and highly qualified students and so we cultivate continuing relationships with our alumni. We invite them to lecture at our graduate and undergraduate seminars, to participate on our CEE Professional Advisory Board, and encourage long-term relationships through formal and informal correspondence. For example, we recognize our former environmental alumni who are professors on our CEE webpage and we recognize alumni who are working in sustainable engineering on the College of Engineering webpage. We heavily recruit accepted students prior to awarding financial aid. Domestic students who are accepted are invited to visit the program. During their visit, they meet with all the professors in their subtrack area and current graduate students. Paid travel for recruitment is common for excellent prospective students that will work with faculty affiliated with the research institutes (the CEE department rarely pays for recruitment travel).
Because of the diversity of student backgrounds and career goals, the CEE graduate program functions as four separate subtracks with four Directors of Graduate Studies (DGS). Almost all graduate students complete a curriculum in only one subtrack. Some students combine two subtracks but there is no general civil engineering curriculum for graduate students. Students identify the subtrack in their application and their complete application file is provided to the appropriate DGS. The DGS circulates the file to the other faculty in the subtrack and each faculty recommends admittance, rejection, and indicates if the faculty member would like to advise and provide a research assistantship to the student. Students who will be offered a research assistantship are contacted by the faculty member and sent a formal offer letter. Students who are eligible for fellowships from the Graduate College or from federal agencies are usually identified during the application process or during their first year.

The admission process is strongly affected by the availability of financial aid. CEE strives to provide full fiscal-year financial support for all full-time students through research assistantships and teaching assistantships. In fact, we actively discourage students from enrolling without financial support. Students who do not have long-term financial support are much less likely to complete their degrees. CEE graduate students are normally provided with an offer letter for financial support in the spring. Over the last five years, CEE has accepted about half of the students who apply to the program (53%). Many more students are discouraged informally through email discussions with DGS and individual faculty. Therefore, we do not use this statistic as an indicator of our success. We do not encourage unqualified students to apply. Nor do we encourage students to apply if their interests do not match our program. About a third of the accepted students subsequently enroll (32%). This statistic is a function of available stipend funds (research grants) and usually more students are accepted than are offered financial support. Typically, about 140 apply, and 20-30 enroll each year.

Graduate students in CEE receive financial aid through research assistantships, teaching assistantships, and fellowships. Virtually all the full-time Ph.D. students hold 50% assistantships. Financial aid comes from external grants directly to the students (National Science Foundation, US. Environmental Protection Agency), internal grants from the Graduate College (Presidential Scholarships), grants to faculty members and through research institutes, and teaching assistantships. In the last five years, our students have included five NSF Graduate Research Fellows and four Iowa Presidential Fellows. Most students are funded through external grants to individual professors. Teaching assistantships are funded by the department from funds provided by the College of Engineering, the Graduate College, and course-buyout from faculty with large research programs. Teaching assistantships in CEE are limited to grading undergraduate homework, assisting in undergraduate laboratory classes, and holding office hours for additional student assistance. CEE graduate students do not act as primary instructors for any class.

CEE offers highly competitive stipends. Funding rates are non-standard across CEE and are typically determined by either the advising faculty member (based on their grant funds) or by the research institute that handles the grant. Research assistantships offered for the fall 2009 ranged from the COGs minimum ($20,258) to $24,288 for incoming MS students (annual year) and $25,128 for incoming Ph.D. students (annual year). Usually (although not this year), graduate students get raises as they proceed. Generally, the highest stipends are offered to students of faculty affiliated with research institutes (IIHR-Hydroscience and Engineering, Center for Computer Aided Design, and Center for Global and Regional Environmental Research). It is difficult to get accurate and relevant stipend data from our direct (Big10) competitors but believe we exceed the average. For example, the Chronicle of Higher Education reported on five categories of student stipends and our stipends were much higher than the average and similar to the highest reported values\textsuperscript{v}. The only engineering category listed was for mechanical engineering and the academic year stipends averaged $14,536 for the academic year or $19,381 on an annual year basis.
Program Outcomes

Of students who entered the Ph.D. program between 1996 and 2000, only 7% of enrolled Ph.D. students left without any UI degree at all. During the same period, 68% completed their Ph.D. by 2008 and the average time to degree was 5.0 years. These statistics have remained consistent over many years and are reflective of positive outcomes. Some students are admitted to the Ph.D. program but decide to leave with only an MS. In fact, most students earn their MS as part of the path toward the Ph.D. For the 1996-2000 entering cohort, 23% of entering Ph.D. students left with a MS. We do not have the opposite statistic — how many MS students left with a Ph.D., although we know there are a good number. In any case, the number of incoming Ph.D. students who leave with an MS is not viewed as a negative outcome because the job market for students with an MS in civil engineering is very good, regardless of subtrack. Certainly, some students decide that the MS degree fits their career goals better than the Ph.D.

Of the 50 recent (last 5 years) MS alumni for whom we have records, 35 (70%) now work in private consulting, 5 (10%) now work in government, and 10 (20%) continued to work towards a Ph.D. at Iowa or elsewhere. We have complete data for the Ph.D. alumni. Of the 49 recent (last 5 years) Ph.D. alumni, 14 (29%) now work in private consulting; 5 (10%) now work in government; 29 (59%) work as assistant professors, postdocs or in other research/teaching positions; and 1 is currently a stay-at-home mom.

CEE research is primarily conducted by graduate students and their advisors and therefore our national rankings are a measure of the quality of our graduate program. CEE is well ranked compared to our peer institutions according to US News & World Report and Academic Analytics LLC. Among civil engineering graduate programs, CEE is ranked 41st in the nation by U.S. News and World Report. Compared only with other public universities, CEE is ranked 28th in the country. (There are 109 civil engineering Ph.D programs in the US listed by the Am. Soc. Eng. Education.) The Environmental Engineering and Science Program (EES) is the only CEE subtrack that is ranked separately by USNWR. EES ranked 17th in the country for graduate programs under the general category “Environmental Engineering/Environmental Health” and 9th among public universities. Academic Analytics LLC publishes rankings for universities and programs based on publications, citations, research funding, and awards. Their Research University Faculty Scholarly Productivity Index ranked CEE in the top ten of programs in Civil Engineering (2006/07 data). Of the four criteria they track, CEE is especially productive in external funding and citations to peer-reviewed scientific papers. CEE supports a productive and competitive research intensive graduate program.

Program Characteristics

The graduate program in CEE is one of the largest programs at the University of Iowa. Over the last five years (2004-2009), the program has graduated the most doctoral students (49) in the College of Engineering and the fourth largest number of doctoral students in the University of Iowa. The MS program is also among the largest in the college of engineering: 83 MS students graduated between fall 2004 and spring 2008. Currently, the department supports 44 doctoral students and 39 MS students. In addition, CEE faculty advise students that receive their degrees in other programs. In the last five years, there are at least 2 Ph.D.s in other programs advised by CEE faculty.

In 2009-10, the CEE consisted of 22 primary faculty members (21.25 FTE) all of whom advise graduate and undergraduate students. The faculty includes a National Academy member, four research center directors or associate directors, and many editors and associate editors of research journals. The CEE graduate program is closely affiliated with several research centers, particularly IIHR-Hydroscience and Engineering; the Center for Computer Aided Design; and the Center for Global and Regional Environmental Research. Virtually all of the graduate students in Hydraulics & Water Resources and many of those in the Environmental Science & Engineering Graduate Programs are supported through research grants at IIHR. Similarly, many graduate students in the Structures, Mechanics, and Materials Program are supported through research grants in the Center for Computer Aided Design. The faculty also includes affiliated
faculty members from other departments and organizations, including 6 secondary, 13 adjunct, 5 emeritus, 1 lecturer, and 2 visiting faculty members. Affiliated faculty members have primary responsibilities in other University of Iowa academic departments, at other Universities, or in local engineering firms. Almost half of the affiliated faculty members are practicing engineers at IIHR-Hydroscience and Engineering or at the University of Iowa Facilities Management Group. Our affiliated faculty members are quite active in the department and provide guidance to graduate students, assist in some graduate classes, and participate in graduate research.

The CEE Graduate Program interacts closely with many other graduate programs on campus. These affiliations are reflected by the home departments of our secondary and adjunct affiliated faculty and participating in large research projects. The most active collaborations are with the Department of Occupational and Environmental Health (College of Public Health), the School of Urban and Regional Planning (Graduate College), the Department of Chemical and Biochemical Engineering (College of Engineering), Department of Geoscience (College of Liberal Arts and Sciences), and the Department of Electrical and Computer Engineering (College of Engineering). CEE faculty members are very active in cross-disciplinary collaborations with these and other departments. One of the most recent ventures includes CEE faculty involved in the President’s Initiative in Sustainability, an area of focus for graduate research in CEE. Several faculty associated with IIHR participate in the Iowa Superfund Basic Research Program with faculty in the Colleges of Pharmacy, Medicine, and Public Health. CEE faculty share teaching and research collaborations with other departments in the College of Engineering. For example, several CEE faculty associated with the Center for Computer Aided Design interact closely with faculty in the Department of Biomedical Engineering on large external research grants.

The CEE graduate program benefits from excellent research facilities. Major physical and computational resources are available through IIHR, CCAD, and CGRE R and include the Lucille A. Carver Mississippi Riverside Environmental Research Station, the Keck Phytoremediation Environmental Engineering and Science Laboratories, the Stanley Hydraulic Laboratory, and the Engineering Research Facility.

Assessment of Challenges and Opportunities

The most significant challenge facing the CEE graduate program is graduate student recruitment. We have for many years relied on our individual and group reputation to bring students to Iowa primarily by word of mouth. In the past several years, many of our peer programs have become much more sophisticated in their recruitment by investing significant resources to organize formal recruitment visits with larger groups of students and to seek out students earlier in the year and personally inviting them to apply. Another potential weakness is the perceived or real leadership within each group. The DGS position is voluntary, has no funding, and has no reduced teaching load. Although the research programs are successful and the faculty members are collegial, we still operate on an essentially ad-hoc basis for covering each subtrack’s day to day expenditures associated with the graduate student recruitment and support. This ad-hoc approach makes it difficult to strategically plan for future initiatives and opportunities.

Thanks to excellent facilities, a large graduate student body, and existing research successes, the CEE graduate program is well positioned to grow and also to lead new research initiatives in interdisciplinary and transdisciplinary research throughout the University of Iowa.

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1 http://www.cee.engineering.uiowa.edu/advisors.php
2 http://www.cee.engineering.uiowa.edu/Environment/EESGradswhoareProfessors.php
3 http://www.sustainability.engineering.uiowa.edu/alumni-activities.php
5 www.uiowa.edu/~isbrp