

**University of Washington
Department of Civil and Environmental Engineering
Academic Program Review in 2012**

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Overview

The review committee prepared this report on the status of the Department of Civil and Environmental Engineering (CEE) at the University of Washington based on the contents of the self-study report submitted on January 3, 2012 and site visit on March 5-6, 2012. During the site visit, we met with a cross-section of faculty, staff, graduate students, undergraduate students, administrators and separately with Chair, Dean and Executive Committee. These meetings focused on a discussion of current strengths and challenges in the department.

Our overall impression of CEE is a program that has survived a tumultuous stretch and is beginning to regain its stride. It has been strengthened by recent faculty and staff hires and consistently has seen strong student demand for its engineering degrees. Over the next 5-10 years when a majority of its senior faculty will likely retire, the department will have the opportunity to define its future direction through hiring new faculty. To better insure that the department makes the most of this opportunity, we recommend that the highest priority be given to producing (with full engagement of all stakeholders) a detailed strategic and business plan. This plan should address the issues raised in this program review, in particular the future direction of the department, and the impacts of possible future growth on the faculty, staff and students.

It is clear to the review committee that all degrees currently offered through the CEE should continue to be offered and new ones be considered. Although we recommend that a strategic/business plan be submitted to the Dean of the College of Engineering within the next 18 months, we do not see a need for another program review before the next scheduled 10-year graduate school review.

In the sections below we provide more detailed feedback on specific issues that emerged during the site visit.

Strengths

Leadership -

CEE has entered a period of much needed stability since the current chair, Professor Gregory Miller, took charge in 2009 after an ~5 year period with several interim chairs and, consequentially, instability in leadership. Prof. Miller is viewed by departmental faculty and staff as being open and communicative, willing to tackle contentious issues, and interested in developing a vision for the department. Importantly, he has earned the trust of the faculty and staff who appreciate the sincerity, thought and care that he brings to his leadership of the department.

High Student Demand and Societal Need-

There is strong student and employer demand for CEE degrees and graduates. The number of incoming freshman interested in CEE as a major exceed by 6x the departmental capacity (~100 students/year) and in the typical year the department turns away about 50 undergraduate students (in their junior year) seeking to become CEE majors. Student and employment demand

is expected to increase in the future (i.e., the Bureau of Labor projects a 24% employment growth in CEE during the next decade, second only to Bioengineering).

Faculty and Staff-

Overall the morale of the faculty in all ranks was positive. The instability in the leadership of the department for several years has apparently been moderated in part by the commitment of the faculty in all ranks to the mission of the department, to their students, and the stakeholders of the programs offered. Faculty of all ranks are a notable asset to the department.

One observation worth noting is the quality of the recent faculty hires, which was consistently praised by the tenured faculty. Furthermore, the increased gender diversity of the younger faculty better reflects the student demographic. Not only are they impressive individuals with excellent credentials, but they expressed their commitment to a program of excellence in the department.

Without reservation the staff are dedicated and loyal members of the departmental team. They possess a high morale and are very supportive of the current leadership. Despite high demands on student advising, discussed below, the staff are enthusiastic about meeting student needs. Recent additions to the staff have been excellent. Overall, the review committee was impressed by the vitality of the staff with whom we met especially given the period of turnover in leadership prior to 2009.

Educational Program-

CEE does an excellent job of preparing undergraduate students for the EIT/PE qualifying exam with a 95% passing rate that is well above the national average. From the Graduate and Professional Student Senate (GPSS) survey (78/228 student responses), graduate students spoke of the strengths of their department and overall 89% of the respondents considered the CEE academic standards and faculty to be very good or excellent. Course content and professors were considered a definite strength of the program. The department has been nationally ranked in top 10 of similarly sized CEE departments.

Revenue Generating Programs-

CEE has demonstrated the potential to generate substantial revenue through the implementation of a professional masters program and on-line certificate programs (~\$500K last year). Furthermore, development of international collaborations and stronger alumni involvement are other potential revenue sources. These revenue sources will be critical to support growth within the department given the state funding environment.

Challenges and Concerns

Governance-

The chair relies heavily on input from the Executive Committee for decision making about departmental goals, future direction and implementation strategy. However, the Executive Committee is heavily (exclusively) populated with senior faculty which significantly reduces the involvement of the younger faculty and staff in governance. Broadening committee membership to include junior faculty and possibly key staff would make it more representative of the departmental constituencies and improve engagement of a broader constituency in the decision making process.

There is a perception among the younger faculty of a lack of senior faculty leadership, and as a result, uncertainty about where to seek advice. It was not apparent to the review committee whether steps are being taken by the department to identify and train future leaders in the department.

Both faculty and student groups mentioned that there is a lack of communication between the three major disciplinary groups within the department, and as a result students and faculty felt that the department was *siloed*. A plan of action to improve interaction across disciplines within the department is needed.

Based on the interviews, there appeared to be a noticeable lack of involvement of faculty in the proposed hiring plan described in the Unit Self Study. Despite being one of the most critical decisions for a department, the future hiring directions appear to be only a default plan because of incomplete participation by faculty in the process. The poor response of the faculty in this important decision may indicate the faculty's level of cynicism with regard to the likelihood of new positions actually materializing.

Not surprisingly, the faculty expressed some concern with the uncertainty associated with the anticipated departure of Dean Matt O'Donnell. The current Chair and Dean work together well, and bringing in a new dean may change this dynamic.

Faculty-

A major issue mentioned by junior tenure-track faculty was recruitment of top PhD students. They stressed the need for increased departmental support for PhD students, in particular, graduate fellowships and bridge support as a security net of support for PhD students to successfully complete their degree requirements. A safety net of graduate student support would help faculty compete for the best students. There was a suggestion for offering 'seed grants' for fostering new research initiatives. Currently, the uncertainty and short cycle (typically 3 year) in external funding results in funding gaps and shifts in research topics for some MS and PhD students. Departmental fellowships and seed grants would especially help the research (non-tenure track) faculty who are under increasing pressure to acquire sufficient grant funding for themselves and their students.

Lack of funding for faculty raises in the past several years was cited as a growing problem. The junior faculty expressed the need for opportunities to interact more with other faculty and with senior faculty in particular. Other issues discussed included the lack of interaction between disciplinary groups in CEE, the need to improve communication associated with the management of grants and contracts, and ways to mitigate the trend of decreased support for teaching assistants. Overall, the junior faculty were optimistic and supportive of the current leadership in the department and college, although there was concern about the loss of leadership as a result of senior faculty retirements.

The Associate Professors brought up their concern with the department's emphasis on increasing the number of PhD students. They feel that CEE has turned out strong MS graduates that fill a societal need and that the success of the MS program will be negatively impacted by an over emphasis in support of more PhD students. The Associate professors expressed concern about lack of mentoring and team leadership and the need for better clarity in defining faculty roles. They see little opportunity and encouragement to develop research teams. They were also concerned about the loss of senior faculty through retirement.

The Full Professors also expressed the need to strike an optimal balance between MS and PhD students. The employment needs are clear for MS graduates but less so for PhD graduates.

There appears to be somewhat of a struggle between the need to keep up strength within the core disciplines in CEE and the trend towards graduating students with more interdisciplinary breadth. Although the strategy of using joint hires to meet future needs of the department (possibly through a partial merger with the College of the Environment) has been discussed, it wasn't clear to the faculty how this approach would successfully address the department's hiring needs.

A common issue that was cited by all faculty was the poor quality of the departmental facilities (in particular labs, classrooms) and the allocation of space in several buildings spread out across campus.

Staff-

The primary concerns of the staff were facilities needs (discussed below), loss of a facilities manager position, and anticipated increases in work load resulting from expansion of teaching program (e.g., professional masters, online programs). There has been a substantial increase (~3x) in graduate applications without a corresponding increase in staff support which has led to a critically overloaded situation in graduate advising. There appears to be a lack of engagement of some key staff in decision making by the department (e.g., the undergraduate coordinator is not a member of the curriculum committee).

Facilities-

The inadequacy of CEE facilities significantly diminishes the overall quality of the CEE program including instruction, research, departmental operation and recruitment. In every group meeting with faculty and staff, the issue of inadequate facilities was brought up as having a major negative impact on the successful functioning of the department. The shortcomings were described in detail (i.e., poor facility maintenance, lack of air conditioning affecting people and lab equipment, difficulty and expense to accommodate new lab equipment, lack of classroom and lab space for instruction, outdated appearance of buildings, classrooms and labs for visiting students and families, faculty and classes distributed in six buildings spread across campus). This is an unfortunate dilemma that requires both immediate attention and a long-term solution.

Although a campus master plan exists which includes a new CEE facility, the schedule for its realization is unclear. Given significant reductions in state allocations, and the competition for funds among various institutions, monies for capital facilities is not expected to be available in the foreseeable future. In fact, it was mentioned that the university has not had state funds available for any capital projects in the past four years. Thus the department is exploring an alternate funding source for facilities improvement, likely relying on private funds. This situation drives the need for a strong industry and alumni engagement process which has as one of its goals the acquisition of funds in an amount sufficient to address deficiencies of current facilities and build new facilities to accommodate anticipated growth in CEE research and instructional programs. Chair Greg Miller expressed the need for more modest near-term facilities improvements to provide a visible sign to faculty, students, and staff that improvements are on the way. Dean Matthew O'Donnell provided encouragement that the college was open to creative ways to help meet the department's facilities needs.

Graduate Teaching Program-

While graduate students ranked highly the overall quality of the faculty and program (89% excellent or very good) based on the GPSS survey review, the 'research experience' was ranked

significantly lower (only 13% ranked it high and 24% ranked it as average). Similarly, only 23% ranked 'faculty guidance' as high and only 17% were very satisfied with 'career counseling'. Furthermore, only 21% ranked the 'sense of community' as high. Although counseling for academic jobs was ranked slightly better than counseling for careers outside of academia, only 12% and 5%, respectively, of the students ranked counseling as 'high'. Ranking of advice received on practical issues (e.g., writing a resume, searching for a job, preparing for an interview) received <3% in 'high' category. Overall, this graduate student survey portrays a sense that the academic program is well received by the graduate students, whereas there is student demand for improving career counseling and community building efforts. Furthermore, based on student and staff interviews, the graduate student advisor is overwhelmed by student demands.

One issue of concern with the graduate students was their experience with inconsistent funding for projects. Students stated they would begin a project, the project would run out of funding, and then have to switch focus and start another project that had funding. This meant advisers have to manage multiple projects, leading to less time for advisers to spend with students. Graduate students have noticed that current TAs are expected to take on higher workloads than previously to help deliver quality courses (a result of reduced TA support), which translates into more time spent doing TA work and less time spent on their individual research. The graduate students noted the lack of interactions (social and academic) between students in each of the disciplinary groups which diminished overall departmental camaraderie.

Unfortunately, the visiting committee had little opportunity to interview graduate students because the student's meeting to evaluate the strengths and weaknesses of CEE occurred on the same day as the review committee's site visit. Thus, direct input from graduate students on their satisfaction with CEE is based primarily on the GPSS Focus Group Study (submitted after the site review) in which only 7 graduate students participated.

Undergraduate Teaching Program-

Although the undergraduate curriculum restructuring efforts were highlighted by the Executive Committee during our interviews, it was not clear how the current curriculum overhaul would benefit students and meet their future learning needs based on the lack of discussion in the Self Study report. However, additional materials provided after the site visit by the chair helped clarify progress made on the restructuring process during the last year. A primary goal of the restructuring is to reduce the number of undergraduate courses taught annually from 120 to 90 in order to reduce the faculty course load from the current 4 courses per faculty. Naturally the size and availability of adequate classrooms remain an issue to be addressed.

One issue the committee discussed is the practice of admitting undergraduates into the CEE program in their junior year. As a result, the junior year curriculum is very rigid and full for undergraduate students. Delivering the junior year curriculum requires a great deal of faculty time and effort. The supplementary materials provided to the committee describe a restructuring of the junior year curriculum that reorganizes fundamental content into fewer, but larger courses with smaller sections (8 required courses, 5 credits each, 300 level). This would allow the Department to run two separate "cohorts" of juniors through the curriculum, and could be a solution to the high demands on faculty time. Impacts of this restructuring should be anticipated and measured. The review committee did not see materials or discussion of the potential impact

of admitting more students *before* the junior year, especially on how that might affect curricular flexibility or student recruitment to the department.

The few undergraduate students we were able to interview (only 3) felt locked into a set of courses without really having a chance to decide on their own focus and thought that the timing of “course blocks” was not optimal. They felt there was a noticeable lack of hands-on lab experiences. Like the graduate students, these undergraduates also mentioned the sense of siloing within discipline areas in the Department. That only 3 undergraduates showed up for the interview was not only disappointing but prevented the committee from getting an accurate picture of the undergraduates perception of CEE.

Regarding student advising and the demand on limited staff there are a variety of effective models used by other programs that may be worthy of further examination.

Engagement –

Engagement of alumni and industry practitioners has considerable potential and promise with regard to facilities improvements and increased learning opportunities for faculty, students, and staff. Students expressed the need to learn more about professional opportunities and industry practices, networking opportunities, and internship experience. The faculty expressed the need to find new avenues of funding for research programs and for support of graduate students.

As a result of discussions with various groups, the review committee’s consensus is that public funding of needed CEE facilities cannot be expected in the foreseeable future. This would suggest that gift funds, and perhaps some kind of bonding based on marginal department revenues or pledges of future gift funds, may likely be needed to pay for facilities additions or improvements. Carefully planned and executed engagement activities, involving coordination of efforts at the departmental, college, and university level would be a good strategy to successfully involve alumni and other stakeholders in seeking a solution.

Although the strong involvement of outside partners appears critical to address some of the department’s needs, the efforts of the department to foster involvement of external stakeholders was not clear. For example, the review committee was not given the opportunity to meet with members of the CEE’s Visiting Committee nor was there any discussion in the Self Study of how this external expertise is being encouraged or used by CEE.

Summary of Recommendations

We recommend that all degrees currently offered through the CEE should continue to be offered and new ones be considered. We do not see a need for another program review before the next scheduled 10-year graduate school review.

We recommend that the department submit a detailed strategic and business plan to the Dean of the College of Engineering within the next 18 months. This plan should address the concerns raised in this review, the future direction of the department and the impacts of future growth on the faculty, staff and students. This plan should be constructed with comprehensive input from faculty, staff and students with full engagement of external stakeholders. It should include both a long-term vision and a short-term action plan. Current specific issues that need to be addressed in the plan include, but are not limited to, the following:

- Improving facilities

- Improved mentoring of junior faculty and development of future leaders
- Optimal balance between PhD and MS graduate students.
- Improving engagement of external partners and alumni
- Impact of admitting majors before the junior year
- Future hiring plan including role of joint hires
- Impact of proposed growth plan
- Strategy for funding growth
- Increasing departmental support of graduate students
- Impact of curriculum restructuring on students, faculty and staff
- Improving career counseling for non-academic positions and practical issues (resume writing, etc.)
- Improving faculty and student interactions between discipline groups
- Detailed budget plan