Report for the 5-Year Review of the Masters of Engineering in Environmental Engineering

March 17, 2020

Review Committee Members

● Vicki Bier, Professor, Industrial and Systems Engineering (Chair)

● Christopher Choi, Professor, Biological Systems Engineering (Graduate Faculty Executive Committee Representative)

● Brian Pfleger, Professor, Biological and Chemical Engineering Chemistry

● Anita Thompson, Professor, Biological Systems Engineering

Review Process

The committee was formed on November 22, 2019, and directed to “analyze program quality and student learning, affirm ways that the program is working well, and implement improvements.” These charges also directed the committee to “focus on evaluating the quality and function of the academic programs,” with special emphasis placed on evaluating “the academic programs and the student experience.” The committee began by reviewing the 5-Year Self-Study Report concerning the Master of Engineering in Civil & Environmental Engineering—Environmental Engineering Named Option, in addition to the Annual Assessment Report. The committee gathered additional information by taking the following steps:

● Performing one-on-one interviews with three faculty members who teach extensively in the program;

● Meeting as a committee with the Chair of Civil & Environmental Engineering (Prof. William Likos) and the Program Director (Jane Carlson);

● Meeting as a committee with the program’s Student Services Coordinator (Cheryl Loschko);

● Conducting telephone interviews with three graduate students currently enrolled in the program; and

● Reviewing program statistics collected and published online by the Graduate School.
The Student Services Coordinator, who is a staff member in the College of Engineering, assists graduate students with matters that include advising, procedures and goals, and degree progression. The three graduate students who were interviewed included a foreign-born woman currently working in the U.S., a U.S.-born man who was an alumnus of Civil & Environmental Engineering, and a U.S.-born woman who had graduated from another program. In this way, the committee gathered both foreign and domestic viewpoints concerning gender and ethnic diversity. The students were selected by the program director. However, during the interviews, they were asked to provide a broad perspective, one representative of all students.

After reviewing the Self-Study and Graduate-School data, the committee generated a detailed list of questions and topics designed to guide discussions with the administrators, the coordinator, the faculty, and the students. The one-on-one interviews with faculty members were conducted for 20-40 minutes each, in February and March, depending on the availability of each faculty member. On December 12, 2019, the committee met with the Chair for 30 minutes and the Program Director for 60 minutes, and on February 21, 2020, with the Student Services Coordinator for 20 minutes. During February and March, the members of the committee held discussions and with the students (by telephone/Skype), for 15-40 minutes each.

Data

The Civil and Environmental Engineering Department offers an M.E. program in Environmental Engineering (online). The program is relatively new (initially proposed in 2013 with its first students enrolled in fall 2015).

Size

The M.E. program in Environmental Engineering is relatively small, having an enrollment of 25 students in both fall 2018 and fall 2019. The program’s director estimates that a minimum of 10 students will ensure a positive cash flow, and that additional advising assistance would likely be needed if enrollment were to exceed 30 students.

Time to Completion (M.E.). Most students in the program also work full-time. They typically take one or two classes per semester and therefore require about three years to complete the program, which comprises 30 credits. Occasionally, a student will withdraw for a semester or two for personal reasons or will progress more rapidly if not working full-time.

Career Outcomes. The amount of data needed to assess outcomes rigorously has not yet accumulated. It can be said that many students continue in their current jobs, some with promotions to roles of greater responsibility; some students also use the program as a
springboard to other, presumably better jobs. Some students also go on to pass the Fundamentals of Engineering Exam and/or become licensed Professional Engineers.

**Graduate Program Ranking.** The Online Master of Engineering in Environmental Engineering was recently ranked highly (#13 out of 30 online programs in civil/environmental engineering) ([https://www.bestmastersdegrees.com/top/online-masters-civil-environmental-engineering](https://www.bestmastersdegrees.com/top/online-masters-civil-environmental-engineering)).

**Staffing and Administration.** The Chair of Civil & Environmental Engineering (currently Prof. William Likos) provides general oversight for the program. However, day-to-day operations (including student recruiting and admission) are managed by the program director. The Student Services Coordinator provides academic advising to graduate students in the program, and helps with occasional questions as they arise (e.g., how to re-enroll after a student has left the program for some period of time).

**Interviews**

The one-on-one meetings with members of the faculty and the discussions with administrators, staff, and students provided first-hand accounts regarding the program and thus provided insight beyond that gained from the data and information gleaned from the Self-Study. The tenor of all the interviews was positive. None of the interviewees identified any major flaw. When encouraged to elaborate, they did provide the following comments and suggestions:

**Comments by Faculty, Administrators, and Staff**

- Teaching in the program does not reduce a faculty member’s availability and prevent them from helping to meet other needs of the department, such as service responsibilities, or reduce offerings of regular classroom courses.

- Discretionary funds have been useful, enabling faculty members to purchase on-line teaching-related equipment (including computers).

- The program has a reasonably diverse student body, with a good gender balance in particular, relative to other M.E. programs of the same kind.

- The students have the opportunity to get to know each other and work together online through collaborative presentations, forums, etc.

- Most students make reasonable progress towards their degrees. A few had to leave the program due to circumstances beyond their control (hurricane, illness, etc).
The students seem to be able to cope with the stress of graduate school, but they sometimes struggle due to work-related conflicts.

To meet their interests, the students in the program have adequate flexibility when choosing courses, particularly with regard to the many elective courses made available.

The program’s curriculum includes an adequate mix of electives, seminars, independent study, etc.

The accelerated M.S. program offered by the department does not compete directly with the M.E. program.

The program has the right core curriculum for its starting point. However, in the long term, the program may need to broaden the scope of its core requirements to deal with problems such as contaminated soils, hazardous waste, or water resource management.

The program provides an advantage to undergraduate students on campus by exposing them to the work experiences of the M.E. students (e.g., through class discussions).

**Comments by Current Students**

The program met or exceeded student expectations, learning goals, and career needs. The practical content of the courses was rated favorably. Students also reported that the course offerings met their needs.

The program is challenging for those working full-time jobs, especially when their jobs involve business-related travel or important deadlines. However, the professors were good at accommodating these students.

Working together online to complete projects and meeting in person during business trips helped a great deal. In-person meetings with other students and/or faculty members provided valuable help even if those meetings occurred only once a year. Students found working with other classmates with different career paths and knowledge to be enriching.

Various online tools (such as WhatsApp, Google Drive, and Blackboard Collaborate) have proved useful.

The program (as one student indicated) could be useful when making certain changes (e.g., from the oil industry to consulting in environmental engineering).
One of the students interviewed chose the program because of UW-Madison’s reputation, and because the student could not find another online program in environmental engineering.

Faculty were available and helpful anytime the student had questions or concerns. Feedback was provided in a timely manner.

Aside from several minor criticisms, the interviewees indicated they were happy with the way the program was administered.

Overall, the Masters of Engineering in Environmental Engineering is healthy, the quality of the students appears excellent, and student learning goals are being met. The Department should be commended for creating and expanding such a strong graduate program.

The program’s most notable strengths and also its concerns/challenges are summarized below, followed by recommendations. For the most part, the recommendations pertain to areas of concern that the program administrators should consider addressing, rather than those that represent significant flaws that must be corrected.

**Program Strengths**

- **Program Administration.** The transition to Jane Carlson as the new Program Director seems to have gone extremely smoothly. The committee heard no concerns about her leadership, and she seems proactive in reaching out and keeping in touch with the students in the program. This policy is valuable in that it ensures intended student outcomes, achieves the program’s goals, and helps to create a positive learning experience.

- **Faculty Involvement.** The faculty members who teach core courses in the program seem to be doing an excellent job. In particular, the review committee was impressed by how many of the program’s independent-studies students have been able to function (in some instances, a single student has managed two and even three such courses). This outcome speaks to the faculty’s commitment, since supervising independent studies is typically a task conducted in addition to other teaching duties.

- **Favorable Outcomes for Students.** Although it is too soon to rigorously assess career outcomes, the students who were interviewed expressed favorable opinions regarding the program, and many professed a belief that completing the program successfully would benefit them in their careers and help them to advance professionally.

- **Flexibility in Regard to Course Selection.** Although one faculty member speculated that permitting students to take a wider range of the courses available on campus might benefit them,
most members, and also most of the students who were interviewed, expressed satisfaction with
the current graduate-level course offerings. The committee also believes that the number of
courses now being offered enables students to develop course plans that meet their interests.
Moreover, the schedule of course offerings (with many or most courses offered once per year) is
sufficiently regular that it will not force students to delay in completing the program in a timely
fashion. Besides, students can pursue independent studies, and/or transfer a number of credits
(up to 14?) from another institution (the program at Johns Hopkins was frequently mentioned).

- **TA Support.** Both students and faculty members expressed appreciation for the level of TA
  support made available in the program. Most of the students interviewed deemed the level of TA
  support as adequate and believed the TAs helped them learn the material and make progress in
  the program. Certainly, because the TA/ student ratio is significantly higher for M.E. students
  than for on-campus students, the faculty members who teach significant numbers of M.E.
  students receive a higher overall level of TA support, which at least partially compensates for the
  extra workload involved in teaching both on-campus and off-campus students in a single course.

- **Adequate Course Materials to Support Online Education.** The committee was provided
  access to the Canvas pages for four courses offered over the last year. Each course was distinctly
different, using a variety of platforms for providing lecture materials and assignments. The
  content and delivery of a sample of lectures viewed indicate that the quality is strong, consistent
  with in-person delivery. In addition, the students interviewed indicated that they also had
  opportunities to become acquainted with members of the faculty (especially via independent
  studies), and with some of their classmates (via group projects), even though the interactions
  were online.

- **Generally Positive Climate.** Online students and on-campus students will of course use
different measures to assess “classroom climate,” but both groups indicated that the faculty has
  been supportive and respectful. Several students in each group reported that balancing the
  responsibilities associated with full-time work with those imposed by an online graduate
  program, but these students also indicated that faculty has been in general quite accommodating
  in its efforts to help them resolve such conflicts of interest.

- **Reasonable Levels of Student Diversity.** Although the engineering field as a whole faces
  challenges related to gender and racial/ethnic diversity, the M.E. program does not appear to be
  significantly less diverse than similar programs on campus. For example, roughly 30% of the
  students who have completed the program thus far were female. Similarly, the program includes
  a mix of undergrad alumni who chose to continue their education at the same institution (the
  University of Wisconsin-Madison), and students who completed their undergraduate studies at
  other schools.
Program Concerns and Challenges

- **Graduate Student Handbook.** Currently, the department has but a single Graduate Student Handbook. This can pose problems because the requirements for the online M.E. program (and the issues associated with online programs in general) differ significantly from those imposed on most of the other students enrolled in the on-campus graduate programs. Just for example, the Student Services Coordinator recently reported that students in the online program were much more likely than on-campus students to withdraw for a semester or two and then re-enroll later. The students interviewed did not believe this to be a problem because they were usually able to get their questions answered online or via a phone call. However, developing a handbook more closely aligned with the needs of the online M.E. program (providing one-stop shopping for course requirements and clearer more specific policies and procedures pertaining to such actions as arranging for independent study or re-enrolling after a break) would significantly benefit students and reduce the staff’s administrative burden (especially if the program were to grow significantly).

- **Possible Need for Additional Staff.** The program currently has approximately two dozen students, which allows for a personal approach. If enrollment were to grow significantly (which might be financially beneficial), additional staffing and advising resources might be required to maintain this quality of service without putting undue burden on either the Program Director or the Student Services Coordinator. Moreover, the burden would fall especially on the Student Services Coordinator for the program, Cheryl Loschko, because she is also supporting a number of other graduate programs in the department that require significantly different procedures.

- **Consequences Associated with Program Flexibility.** As the members of the committee understand it, the program currently allows up to 14 of the 30 required credits to be earned at an institution other than the University of Wisconsin-Madison. While this policy appears to be consistent with the minimum expectations of the Graduate School, several committee members view it as unusually flexible and fear that it could undermine the program’s revenue-generation goals. Therefore, the committee recommends that program leadership consider the feasibility of further restricting the policy to an extent that would not significantly impair recruiting efforts and the program’s further development. Would allowing a student to transfer six credits from another program, for example, still give the student significant flexibility without jeopardizing the program’s financial sustainability?
Recommendations

● **Monitor and Assess Career Outcomes for Students.** The program should find ways to stay in touch with its alumni and monitor their career outcomes (e.g., keep track of who was promoted or changed jobs after completing the program).

● **Monitor Students who Disenroll.** It might be helpful to create a formal method for tracking students who decide not to enroll for a semester or two but still intend to complete the program at a later time.

● **Reduce the Number of Credits that Can Be Transferred from Other Institutions.** The CEE department and the M.E. program should seek to determine whether the number of outside credits permitted could be reduced without harming student recruitment and progress.

Other Observations by Committee and Interviewees

● **Course Flexibility.** Although one faculty member suggested that students might benefit from being given greater flexibility when selecting courses, such a measure might not be practical; many faculty members may not be prepared to adequately accommodate online students in their courses.

● **Compensation to Faculty.** The current approach of providing limited discretionary funding plus generous TA support seems a reasonable compromise, given the difficulties associated with providing direct compensation during the academic year.

Conclusions

The committee appreciates the effort by the faculty and staff to create this program and maintain its vibrant nature. We hope that the program continues to grow and provide positive outcomes for students.