# Civil and Environmental Engineering Program Review 2018-19

Closing MOU

Date: August 14, 2019

## Overview

**Degree/Certificate Programs Reviewed:**
Bachelor of Science in Civil Engineering
Bachelor of Science in Environmental Engineering
Master of Science Civil and Environmental Engineering
Ph.D. in Civil and Environmental Engineering

**Department Chair & Dean:**
Krishna Pagilla, Chair; Emmanuel Manos Maragakis, Dean

**External Reviewers & Affiliation:**
Undergraduate:
Brian J. Swenty, College of Engineering and Computer Science, University of Evansville, Accreditation Board for Engineering and Technology (ABET) Chair
Mark Osborn Federle, Academic Affairs, Marquette University, Accreditation Board for Engineering and Technology (ABET) Chair
Jean Ragan Stephenson Blair, United States Military Academy, Accreditation Board for Engineering and Technology (ABET) Chair
Heather Mackey Ford, Nobis Engineering, Inc., Accreditation Board for Engineering and Technology (ABET)
Mark Neil Goltz, Air Force Institute of Technology, Accreditation Board for Engineering and Technology (ABET)
Graduate:
Dr. Sashi Kunnath, Department of Civil and Environmental Engineering, University of California, Davis
Dr. Michael Stenstrom, Department of Civil and Environmental Engineering, University of California, Los Angeles

**Date of External Visit:**
September 17-19, 2017 and March 14-15, 2019

## Review Process Summary

The Civil and Environmental Engineering program was scheduled for regular program review as mandated by the Board of Regents and University policy. A self-study document for the department and its programs was developed by the department faculty and completed in the Summer 2017 for undergraduate programs and in Spring 2019 for graduate programs. These respective reports were provided to the undergraduate reviewers from the Accreditation Board for Engineering and Technology (ABET) before they conducted an on-campus visit on September 17-19, 2017 and provided to the graduate reviewers before they conducted an on-campus visit on March 14-15, 2019. The external reviewers appraised the program and met with relevant faculty, staff, students and administrators to determine the department's accomplishments, examine strengths and weaknesses, and identify opportunities as it plans for the future. A final report was issued by the site visitors shortly after the review visit. In accordance with institution practice, responses to the review were solicited from the department and the dean. A final meeting of senior

administration from the Provost's Office, the College of Engineering and the Department of Civil and Environmental Engineering took place on August 14, 2019. This document represents the final MOU of recommendations and findings from the review.

## Signatures

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| Executive Vice President & Provost: | Kevin R. Carman | Date: | 9/27/19 |
| Vice Provost, Undergraduate Education: | David Shintani | Date: | 9/27/19 |
| Vice Provost, Graduate Education & Dean, Graduate School: | David Zeh | Date: | 9/27/19 |
| Dean, College of Engineering: | Manos Maragakis | Date: | 9/30/19 |
| Chair, Civil & Environmental Engineering: | Krishna Pagilla | Date: | 9/30/2019 |

## Major Findings and Conclusions

1. The Civil and Environmental Engineering program at the undergraduate level is well organized and highly productive.
2. Both the Civil and the Environmental Engineering programs within the department were recognized for having strong ties to industry and the community, which is beneficial to the study body.
3. The graduate program it is performing well, the faculty and graduate students are enthusiastic and optimistic, and the faculty is highly productive.
4. The structural labs are considered among the best nationally for research universities and serve as an excellent recruiting tool for faculty and graduate students.
5. There is potential to grow the program, which can be done in collaboration with the college and campus administration.

## Next Steps for this Program/Department

**1. Strategic Planning and Building a Vision for the Department:**

Given the productivity of faculty and world-class structural labs, it would be expected that the program would have a higher ranking in US News and World Report. It is advised to work with administration to determine what are the roadblocks to achieving a higher ranking and how to address them. The department is committed to working with the college to undertake initiatives to increase the department's ranking. Two items identified as possible areas to address are support staff to assist with grant pre-award preparation and post-award management, and increasing Graduate Teaching Assistantships (GTAs) to support undergraduate instruction and graduate student recruitment. Given that research expenditures generate a need for increased support staff, the department will work with the college to increase grant support staff. The department has endeavored to increase GTA opportunities via differing

funding sources and is committed to continue working with the college to increase the number of GTA lines, particularly with regard to GTAs that provide support in graduate laboratories.

**2. Graduate Curriculum & Education**

Credit requirements, which is 32 semester hours for the MS degree and 72 semester hours for the Ph.D. degree, were cited as excessive. It has been observed that employers value employees with graduate degrees in CEE due to the advanced curriculum at the graduate level when compared to the more foundational curriculum at the undergraduate level. As such, providing a well-focused "fast track" specialization for graduate students, particularly at the master's level, benefits students, their future employers and is becoming typical for research institutions. The suggestion was made to consider the UC model for the master's program that allows students to graduate in one calendar year, which is not possible for students under the current model utilized in the program. Review of the Ph.D. semester hour requirement and model is also encouraged, and lowering the number of Ph.D. required credits would also provide an opportunity to offer minors in the Ph.D. program. The department is open to the lowering the credit requirements for the graduate programs, and will work with the Graduate School to explore this opportunity.

"Big Data" analysis curriculum was identified as an addition to the program which would be beneficial and is being requested by the student population, particularly students enrolled in Geographic Information Systems (GIS) courses. Some CEE areas are offering a version of these subjects, but often students take such courses outside of the department. It is recommended that consideration be given to developing a Big Data course within the CEE curriculum that focuses on the skill sets needed by CEE graduates. The department will discuss the need for offering such courses with the faculty.

**3. Curriculum-Undergraduate**

The ABET report regarding Civil and Environmental Engineering found no issues with the program, and made observation regarding recognized strengths of both programs.

The Civil Engineering program recently worked with the industrial advisory board (IAB) to update CEE 426/427, which is a capstone course series that provides a wide selection of design projects. This yearlong series includes a focus on project management; ensuring students understand components of actual projects and allowing them to be productive immediately upon graduation. An impressive list of firms that participate in the design projects, and alumni act as role models for projects, career discussion and job offers.

The Environmental Engineering program benefits from faculty with strong ties to local municipalities, regulatory agencies, and utilities. These ties have resulted in the establishment of the Nevada Water Innovation Campus (NWIC); this collaboration allows students to work with real-world issues as part of course work and research. The NWIC provides educational outreach opportunities for students and faculty, and mentorship and employment prospects for students, resulting in an enhanced experience.

**4. Graduate Recruitment/Enrollment/Progression**

Significant increases have been made in graduate enrollment since the last program review in 2008, although it was noted for the last five years doctoral numbers have been somewhat flat. Financial support for graduate students via Research and Teaching Assistantships were identified as being at realistic levels.

Efforts toward recruiting more Hispanic students was encouraged, noting that levels of enrollment could be increased for this group given the size of the Hispanic population in the state. This is an effort that is been undertaken at the college level, specifically working with the local high school population, the department acknowledges the benefits of participating in this effort and will pursue involvement.

Re-engaging in on-campus recruitment events through the Graduate School's Gradventure program was recommended, taking into consideration that changes have occurred since the last time Civil and Environmental Engineering participated. The department is open to pursing Gradventure particularly as it applied to recruiting domestic Ph.D. applicants. Finally, it was recommended that the Graduate Handbook be revised to clarify language regarding graduate student timelines and achievement benchmarks. The language should be revised to promote the consistent application of standards across students while also providing graduate advisory committees with appropriate levels of flexibility.

**5. Space**

The facilities utilized are suitable for the program, with special note made regarding the structural labs which are considered one of the best among research universities and an excellent recruiting tool for faculty and graduate students. Environmental labs would benefit from growth, particularly an increase in analytical equipment, and current space would allow for such growth. The existence of a full-time technician to support the environmental labs was identified as a highly positive benefit. Access to this type of support to students is beneficial to lab work beyond their graduate studies as it provides realistic expectations regarding those future interactions with contracted labs.

**8. Faculty**

The ABET report on the undergraduate programs noted the strong mentorship program between new staff members and those with more experience, recognizing that the robust mentorship program helps to improve teaching, fosters a strong sense of community and enhances retention. This collaboration among faculty was noted to extend to administrative staff, lecturers, students, and the industrial advisory board (IAB).

For the most part, graduate faculty staffing levels were viewed as adequate across the program; two areas were identified where an increase is recommended. Those areas are Transportation and Geotechnical Engineering. Both areas have two faculty members. The recommendation is to increase those numbers to three, which allows for adequate backup and diversity of experience to provide an adequately varied breadth of course offerings. With regard to Geotechnical Engineering, collaboration with Geology was suggested to address staffing levels particularly due to the University's robust mining program. The department has been engaged with Geology faculty and will continue to do so in the future. The department and college recognize the need to increase faculty in these areas and have identified it as a goal in the strategic plan.

Levels of female faculty across the program was also discussed, noting there was only one currently on staff which accounts for 5% of the total. Recent recruitments have resulted in offers extended to female candidates, two of whom accepted the positions and started in the fall 2019. Ongoing efforts should continue to increase these numbers.

It is encouraged that the college and department work with University administration to address issues that have resulted due to a lack of merit pay increases for several years, particularly as it applies to faculty recruitment and retention. While the department has not experienced issues regarding the recruitment of faculty due to lack of merit, there are recognized negative impacts, specifically for associate professors, that have resulted from the lack of state funding for merit-based salary increases. The department is committed to work with administration on this issue.

The department should keep in mind that it is the expectation at the university that tenured faculty in all departments continue to build a portfolio of scholarly work following the achievement of tenure so as to progress successfully through the promotional ranks to full professor.

**Action Items**
**The department will:**

1. CEE will put forth a plan to the Graduate School to change the Masters and Ph.D. requirements to allow for accelerated completion of degrees.
2. Comparison with peer institutions regarding program requirements will be completed. Using Curricular Analytics and Navigate (EAB), the college and department will examine degree pressure points (where students are not on track to be successful in the program), identify ways to simplify degree paths, and give advising to those students who appear not to be on a successful track. Emphasis on student success should be on both the undergraduate and graduate levels. This is being asked of all program across the University. The goal is to have reports by the end of the fall 2019 semester.
3. Create consistency between areas regarding required graduate progression steps (e.g., timing of comprehensive exam) through regular monitoring and tracking all students centrally.
4. The Gradventure on-campus recruitment program will be discussed with faculty in collaboration with the Graduate School to explore participation again (e.g., Graduate School Dean will visit chairs meeting to discuss). In addition, the department will explore the GradFIT program, which brings undergraduate first-generation and historically underrepresented students on campus for a week to learn about graduate education. This effort will target domestic students.
5. With the completion of the new Engineering building, some laboratory needs can be addressed; but comprehensive lab renovation would require the updating of SEM. The college and department will work together to determine what needs are emergent and can be feasibly addressed.

## Vital Statistics on NSHE Reports (for each program reviewed)

Bachelor of Science in Civil Engineering

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|---|---|
| Number of students with declared major in the program area 2018-19: | 324 |
| Number of graduates from the program, 2016-17: | 59 |
| Number of graduates from the program, 2017-18: | 66 |
| Number of graduates from the program, 2018-19: | 74 |
| Headcount of students enrolled in any course related to the program (duplicated), Fall 2018: | 1513* |

Bachelor of Science in Environmental Engineering

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|---|---|
| Number of students with declared major in the program area 2018-19: | 78 |
| Number of graduates from the program, 2016-17: | 17 |
| Number of graduates from the program, 2017-18: | 20 |
| Number of graduates from the program, 2018-19: | 18 |
| Headcount of students enrolled in any course related to the program (duplicated), Fall 2018: | 1513* |

Masters of Science in Civil and Environmental Engineering

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|---|---|
| Number of students with declared major in the program area 2018-19: | 35 |
| Number of graduates from the program, 2016-17: | 24 |
| Number of graduates from the program, 2017-18: | 21 |
| Number of graduates from the program, 2018-19: | 13 |
| Headcount of students enrolled in any course related to the program (duplicated), Fall 2018: | 196** |

Ph.D. in Civil and Environmental Engineering

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|---|---|
| Number of students with declared major in the program area 2018-19: | 44 |
| Number of graduates from the program, 2016-17: | 8 |
| Number of graduates from the program, 2017-18: | 7 |
| Number of graduates from the program, 2018-19: | 10 |
| Headcount of students enrolled in any course related to the program (duplicated), Fall 2018: | 196** |

* Cannot differentiate between Civil and Environmental
**Cannot differentiate betweem MS and PhD