

October 31, 2017

PROFESSOR P. BENSON SHING, Chair
Department of Structural Engineering

PROFESSOR HYONNY KIM, Vice Chair
Department of Structural Engineering

SUBJECT: Undergraduate Program Review for the Department of Structural Engineering

Dear Professors Shing and Kim,

The Undergraduate Council discussed the Structural Engineering 2017 Undergraduate Program Review. The Council supports the findings and recommendations of the review subcommittee and appreciates the thoughtful and proactive response from the Department. The Council's comments centered on the following:

Teaching Evaluations. In addition to the review subcommittee's suggestions for augmenting the Course and Professor Evaluations (CAPEs), the Council recommends that the Department create their own evaluation to use in addition to Course and Professor Evaluations (CAPEs).

Staffing. The Council shares the subcommittee's concern over insufficient laboratory staffing and student advising staffing. The Council is encouraged that the Department plans to hire an undergraduate assistant and more laboratory staff. We look forward to learning about the Department's progress in implementing staff hires.

The Council will conduct its follow-up review of the Department in Spring Quarter 2018. At that time, our goal is to learn about the Department's progress in implementing the recommendations of the program review subcommittee and the Undergraduate Council. The Council extends its thanks to the Department for their engagement in this process and we look forward to the continued discussion.

Sincerely,

Sam Rickless, Chair
Undergraduate Council

Attachment

(1) Undergraduate Program Review Report and Responses for Structural Engineering

cc: A. Pisano
J. Eggers
R. Rodriguez
R. Horowitz
J. Moore
M. Sidney

**Undergraduate Program Review:
Structural Engineering**

Professor Justin Opatkiewicz, Review Committee Chair
NanoEngineering, UCSD

Professor Joanna McKittrick
Mechanical Engineering, UCSD

Professor Dawn Cheng
Civil Engineering, UC Davis

A.) Current Operation of Program

The review committee met with the following: the department chair and vice-chair of undergraduate affairs, 10 other faculty members, the department MSO and undergraduate advising staff, one member of the undergraduate lab staff, approximately 15 teaching assistants, three undergraduate students, and the Dean of Academic Advising for Revelle College. We examined the department's self-study report, resource profile, course descriptions, faculty workload, teaching statistics, student profiles and surveys, and the previous CEP review from 2008. The most recent ABET (Accreditation Board for Engineering and Technology) review was in 2014, where the department earned a 7-year certification.

The Department of Structural Engineering was established in 1997 and currently has an enrollment of approximately 530 students, a decrease from a peak of 750 in Fall 2013. The department has grown from 19 to 24 tenure-track faculty, yielding a UG/Faculty ratio of 22. The undergraduate major offers four specializations through upper division focus sequences: civil structures, aerospace structures, geotechnical engineering, and structural health monitoring / non-destructive evaluation. Students in the major are required to complete 145 units of coursework, including 13 general education courses (in humanities and social sciences), 10 lower division courses in math, chemistry and physics, 19 core courses, 4 focus courses, and 3 technical elective courses.

The department focuses on structural systems cutting across many engineering disciplines in contrast to traditional civil engineering programs, which include topics of surveying, construction, waste water treatment, etc. Despite this more focused approach, the Department of Structural Engineering has been ranked 17th in the nation for civil engineering by U.S. News in 2017; a major accomplishment, being compared to classic civil engineering programs which are far less focused.

The department's 24 tenure-track faculty include five associate professors and one teaching professor (previously labeled LSOE). The department has three student affairs staff members advising its undergraduate and graduate students. There are currently two development engineers coordinating all the undergraduate labs in the department.

Since the last review, the department has undergone several changes. A second, unaccredited major, Engineering Sciences, has been terminated due to low student enrollment. No new students will be enrolled in this major effective Fall 2017. The department moved to the new Structural and Materials Engineering (SME) building four years ago, relieving space issues, especially with new undergraduate laboratory facilities and computer labs made available. Finally, a curriculum change has been implemented that increases the number of laboratory courses taken by students, which will be discussed further below.

B.) Strengths and Weaknesses of the Department's undergraduate program

Strengths:

Advising for all students, undergraduate and graduate, has proven to be very effective and well-coordinated. We were delighted to hear of numerous occasions where faculty reached out to struggling students to help them pass their classes and improve their academic standing. The town hall program and departmental suggestion box appear to be very successful in mediating student-department interaction and receiving up-to-date student opinions on the curriculum.

With the creation of multiple new classes and the transition to a more hands-on, laboratory-based curriculum, the department is taking the education of its students in a new direction. The number of lab courses available to the students is impressive. The added lab component to the senior capstone courses is unique, although there have been some challenges in the initial implementation. Alternate capstone sequences for some of the different focuses suits the individual students better than the previous curriculum. We fully anticipate that this curriculum change, once fully implemented, will aid in future ABET reviews and help the department further climb the U.S. News rankings.

Weaknesses:

The Course And Professor Evaluation (CAPE) system seems to be the primary assessment process for faculty teaching when undergoing review and promotion, much to the frustration of virtually all faculty. CAPEs are student-run and never intended to serve as an evaluation process for faculty. Specifically, faculty seem to be judged mostly on two questions from the CAPEs: "would you recommend this professor?" and "would you recommend this course?" Recommendations for augmenting the CAPEs or using an alternate means of evaluation will be provided at the end of this report.

Separately, while the time to degree (TTD) is good compared to other engineering programs (13.4 quarters), it is still over 4 years. It is desired for the TTD to be shortened further, although this is an issue for many programs, not just Structural Engineering. It would be suggested to further review course offerings to determine if course consolidation is possible to free up some units.

Moreover, the quality of the technical writing of many graduating students has been an issue for many engineering programs. The lack of any form of technical writing course requirement could be detrimental to students in the program. Again, this is an issue not limited to only Structural Engineering.

Finally, despite general improvements in diversity in the undergraduate students and faculty, there is still much to be desired. While there has been an increase in the number of Chicano/Latino and African-American students, there has also been a decrease in female students. Amongst the faculty, the percent that are under-represented minorities has dropped to 12.5%, however the female faculty ratio has increased to 16.7%.

C.) Strengths and Weaknesses of the Department in the context of campus and University policies

Strengths:

We were pleased to see that the department is utilizing the “Professors in Practice” faculty line to hire industry professionals and design experts for more practical, less theory-based, courses. These are likely to be especially valuable in the new capstone design courses.

We were also pleased to learn of the improved TA/reader resource allocation since their last review. The funds were obtained from an increased in M.S. student enrollment and helped deal with the previous resource limitations.

Finally, the advising of the department is still well coordinated with the advising provided by the six colleges.

Weaknesses:

While the students are pleased with the staff advisors, it is clear that the undergraduate affairs team is stretched to the limit. The advising staff has not grown in proportion with the increases in both the undergraduate and graduate populations. 1.5 staff members for the undergraduates and 0.5 for graduate students are simply not enough. The total student-to-advisor ratio is high (~350) relative to similar programs, like NanoEngineering (~300), Bioengineering (~200), and CSE or ECE (both ~ 220). The student affairs manager has to allocate significant time to aiding in the advising to alleviate some of the pressure, but it is not enough. The staff needs more help.

Although a faculty advising program has been established, it is not effective as it is currently set up. Only the most proactive faculty meet with students, while many faculty never meet with their assigned students. Some recommendations will be provided at the end of this report.

There is a severe need for improved funding and staffing for the undergraduate laboratories. The labs are operating with the same budget today as it when the program was created 25 years ago, despite the massive expansion in number of students and lab courses. There are roughly 8-10 courses with labs associated with it – approximately 4-5 each quarter. Some of these courses are also offered during the summer, allowing for no down-time for repair and

replacement. With only two development engineers and little funding, most equipment is home-made or purchased with the staff's own money. To meet expected deadlines, the staff are expected to log significant overtime each month, putting a strain on the departmental budget. While the curriculum change, with more lab-based courses, is impressive, if the proper funds are not satisfactorily allocated to those labs, they cannot be expected to meet their desired objectives. The transition into the new curriculum and the setup of the new lab courses has been too sudden and there has not been enough time allocated for preparation of each.

D.) Recommendations for alleviating any problems suggested by the description and analysis

Recommendations:

As noted in section B, the advising staff and (especially) the lab staff are overworked and shorthanded. With the major increase in enrollment in both the B.S. and M.S. programs, at least one additional staff member would not only alleviate the stress on the advisors, but also further improve the advising experience for the students. With regards to the lab staff, several additional permanent staff and interns are needed immediately. As it stands, if one of the development engineers falls ill, the labs would likely cease to operate. If no further staff can be added, the following measures are suggested:

- (1) Halt the creation of new lab courses, postpone offering of some of these recently developed courses, and pause the transition to the new curriculum.
- (2) Refrain from offering summer lab courses until the courses have been fully fleshed out and proven to operate smoothly during the regular academic year.
- (3) Reduce restrictions on overtime pay for the lab staff until additional help can be found or some other solution presents itself.

Although these measures are drastic, they may be necessary until the laboratory staff can get themselves on stable footing and be comfortable with running the plethora of new experiments/courses.

It is also recommended that the budgeting process become more transparent and provide more for the undergraduate labs. The lab staff should have an upgraded budget to track the progression of the program over the past several years. New funds need to be found to properly fund the labs and the staff.

Since CAPEs cannot be outright removed or fundamentally altered, it is suggested an alternate means of evaluation of faculty be considered. Some possibilities include:

- (1) CAPEs allow for five course-specific questions to be added. The department can design five universal questions for all its courses that can better gauge professor performance and course value.

- (2) Utilize the 'Teaching + Learning Commons' evaluations for mid-quarter evaluations or some other more constructive evaluations.
- (3) Incorporating some form of peer review of the faculty in the department. It may be uncomfortable for faculty to review their peers, so this could be an interdepartmental endeavor. Other programs in the Jacobs School likely face similar issues, so coordinating to have engineering professors from other disciplines review the SE faculty and courses (while SE faculty review their courses) could prove beneficial to all.

Finally, the department may consider collaborating with other engineering departments/programs to develop one or more technical writing courses – perhaps one for undergrad and another graduate students. These courses could fine-tune students writing and presentation skills and further emphasize issues of plagiarism and laboratory ethics.