

May 30, 2018

PROFESSOR TRUONG NGUYEN, Chair
Department of Electrical and Computer Engineering

SUBJECT: Undergraduate Program Review for Electrical and Computer Engineering

Dear Professor Nguyen,

The Undergraduate Council discussed the Electrical and Computer Engineering 2018 Undergraduate Program Review. The Council supports the findings and recommendations of the review subcommittee and appreciates the response from the Department. The Council's comments and recommendations centered on the following:

Self-study. The Council found the self-study provided by the Department to be lacking a critical assessment of strengths and weaknesses of the curriculum. Instead, the self-study focused on coursework added since the last review, and addressed the issues and recommendations from the last review. The Council and the Dean of Undergraduate Education stress the need for analytical, in-depth assessment of the Department's curriculum, with an emphasis on how the curriculum is meeting the educational needs of its students. The Council feels that this type of assessment of curriculum will be especially important as the Department undergoes its upcoming comprehensive review with the Accreditation Board for Engineering and Technology (ABET) in 2019-2020.

Teaching Assistant (TA) support. UGC's understanding is that the Department's current funding level for TAs is possible because of the money that was generated from the master's growth plan. We ask that the Department provide a detailed plan on how to keep TA support at the current level, should the master's growth funding shrink or become unavailable.

Courses. The program review subcommittee's report mentioned students receiving different information in courses depending on who was teaching the course. The differing levels of information left students feeling unprepared in subsequent sequenced courses. The Council suggests that the Department form a curricular subcommittee to review courses taught as part of a sequence. This subcommittee should examine the sequenced courses to ensure that the courses cover the necessary material uniformly, despite who teaches the course, in order for students to feel prepared to advance to the next course in the sequence.

Transfer student website. While the transfer major preparation courses are listed on the Department's transfer students website, the Council recommends adding the following information: criteria for transfer admission into the Department's majors, the percentage of transfer students accepted, and the total number of students who applied to the Department as transfer applicants. We feel that the additional information will give transfer students a better sense of their likelihood of being accepted into one of the Department's majors.

The Council will conduct its follow-up review of the Department in Spring 2019. 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 Electrical and Computer Engineering

cc: F. Ackerman
J. Eggers
R. Horwitz
J. Moore
A. Pisano
R. Rodriguez
M. Sidney

Undergraduate Program Review
Department of Electrical and Computer Engineering
February 13 – 14, 2018

Professor Aaron Coleman, UCSD
Professor Terry Gaasterland, UCSD
Professor Chen-Nee Chuah, UC Davis

We have reviewed the undergraduate education program of the Department of Electrical and Computer Engineering (ECE). In doing so, we met with Department Chair Truong Nguyen and Vice Chair for Education Bill Lin, six of ECE's senate faculty, several non-senate faculty, and three undergraduate ECE students. Additionally, we met with the department's senior staff and undergraduate advisors, as well as the Dean of Academic Advising from Eleanor Roosevelt College, Sarah Spear-Barret. Although the turnout of senate faculty was somewhat low, and we were not able to meet with any teaching assistants, we feel we have had adequate input from which to form our review. In future reviews, we would recommend that at least one faculty from each of ECE's major depths attend the review. This would give the review committee a better feel for the range of disciplines within ECE and how they contribute to organization of the department and undergraduate teaching. Hearing from faculty in the eight depth areas in ECE would provide a better idea of the range of faculty opinion on key issues in undergraduate education.

ECE has a robust and flourishing undergraduate program. They have around 1100 - 1300 majors and currently graduate 250 – 350 students per year, with the large majority of the degrees conferred in Electrical Engineering and Computer Engineering. The review committee finds that having the majors capped is appropriate and recommends continuing this practice.

ECE has made excellent progress in developing their undergraduate program. In total, they have added 15 new classes over the last seven years, and this has significantly strengthened the program. The development of a series of "hands-on" laboratory courses at both the lower and upper-division levels has resolved issues brought up in ECE's previous program review. These courses were popular with the students we spoke with during the review. The students described the tangible benefits they received from supervised, hands-on design experience. ECE has also introduced four new courses in power systems and power electronics, taught by instructors with significant industry experience. This is a field of growing demand in the job market, and ECE is positioning itself well to be a leader in this area. Additional FTEs specifically for hiring ladder-rank faculty in this field this would help solidify this.

In addition to expanding its course offerings, ECE has provided many new resources to support its undergraduate students. These include:

- The Tutoring Center, which is open 9 am to 5 pm to support students in certain key classes. The students the committee spoke with found this to be a valuable resource.
- The Summer Research Internship Program, which provides a way to engage new students in research projects and helps to provides access to longer-term research in faculty labs.
- The Makerspace, which is used in various hands-on courses and is available to student clubs. This resource enhances the undergraduate experience of ECE majors.

Other strengths include the recent hiring of two teaching professor (L(P)SOE) faculty, who are incorporating evidence-based teaching strategies to improve student outcomes in some classes. ECE35 has historically been a class in which many students struggle, and the use of a “flipped classroom” approach seems to be improving outcomes. In the last two years, ECE has also increased TA support for its classes by changing the ratio of TA time to students from 10 hours/50 students to 10 hours/25 students (with every 50 more students getting an additional 5 TA hours). This was done in response to faculty requests for more TA support.

The review committee applauds that fact that ECE is using funds from the Masters Growth Incentive Program to support their undergraduate program. They have used these funds to create the Makerspace and to support their Summer Research Internship Program. These funds have also supported ECE’s increased TA support for its classes. The additional TA support changed ECE’s TA/reader/tutor budget from a \$54,960 surplus in 2015/16 to a \$479,747 deficit in 2016/17. This funding gap was covered by money from the Masters Growth Incentive Program. While this is an admirable and appropriate use of these funds, the review committee does recommend some caution in this regard. First, it was mentioned by ECE faculty that, throughout the department, there is a range in opinion about the growth of the masters program. While some see this growth as a strength, others feel the increased enrollments are diluting the quality of the graduate classes. As increased masters’ enrollments are changing the dynamics of the graduate program, this bears some examination. Second, the sustainability of funds from the Masters Growth Incentive Program should be considered. How would ECE meet its TA funding demands if the program were to terminate?

We have also identified a few areas in which ECE shows room for improvement.

1. ECE should work toward developing a more streamlined path for transfer students from community colleges. The average time-to-degree for transfer students in ECE is just over three years and the university target is two years. While the greater than average time-to-degree is understandable considering the greater number of units required of engineering majors, we believe that ECE could take steps to shift some of the lower-division courses taken by transfer students to the community colleges. This would not only improve time-to-degree, it would relieve some of the enrollment pressure in ECE’s lower-div courses. ECE already allows transfer students to waive some lower-div classes by exam, and their summer bridge program allows transfer students to complete ECE5. However, the following could improve the situation.
 - ECE should establish lines of communication with local community colleges to work toward accepting pre-engineering or programming classes for transfer credit (once they are confident that the content is equivalent), and to encourage them to develop new course offerings on their campuses that could satisfy some ECE lower-div requirements.
 - This coordination with local community colleges could also be used to enhance recruitment of women and URM students, an area that needs improvement in engineering in general.

2. As ECE is a popular and impacted major, many UCSD students want to transfer into ECE. For students who are unable to meet the requirements after considerable effort (for example, redoing lower division courses two or three times to achieve the required passing grade), this increases these students' time-to-degree (*i.e.*, non-ECE degree) and consumes ECE resources. ECE could alleviate some of this by more being more transparent about its admission criteria and communicating them to the college advising offices. Specifically, from the previous year's admissions of UCSD students (which understandably may change on a yearly basis) they should provide the percentage of applications that were accepted and the GPA cutoff for acceptance.
3. The review committee believes that ECE would benefit from further developing their student advising practices. ECE should work to connect its students with faculty advisors, and to better identify students who are at high risk for not succeeding in the major. The committee has two recommendations here.
 - Establish better lines of communication with the college advising offices regarding ECE students at risk for not succeeding in their major. Students who fail multiple courses or a single course multiple times, including pre-requisite mathematics courses as well as engineering courses, should be flagged and directed to their college counseling office.
 - Mandate that ECE sophomore students (or during their first year for transfer students) meet once with an ECE faculty advisor to guide them in their choice of depth emphasis in the major. ECE faculty are equipped to advise students on the range of subject areas within ECE in ways that staff advisors cannot. Further, faculty can help students assess, based on their track record to that point, their prospects and best paths for successfully completing the major. For students who may be struggling in the major, faculty are in a position to help students be aware of alternatives that may leverage students' strengths.
4. Another issue that came to light was lack of uniformity of the topics taught in the same course by different instructors. It was mentioned by two students that for some courses taught in a series, taking the first and second courses with different instructors often left them unprepared for the topics covered in the second course. Also, the three undergraduate students who spoke with the review committee found that they sometimes had different experiences in the same course depending on the instructor, suggesting more effort could be made to ensure consistency in the instruction and grading structure.
5. Finally, students commented on a lack of available space for undergraduate activities such as TA office hours, on-campus study space, and space for student clubs and organizations to meet. It was commented that the tutoring center is sometimes used by student clubs as a meeting space, decreasing the ability of students to utilize this valuable resource.

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