MEMORANDUM

TO: Michael Bruno, Provost
FROM: Brennon Morioka, Dean, College of Engineering
Wayne Shiroma, Chair, Department of Electrical Engineering
SUBJECT: Response to the "Academic Program Review - University of Hawaii at Manoa Computing-Related Programs"

The students, faculty, and staff within the Department of Electrical Engineering (EE), College of Engineering (CoE) appreciate the time and effort of the External Review Committee in reviewing the computer engineering program on November 13-14, 2019. After receiving the committee’s report on January 21, 2020, the EE Department Chair convened a meeting on February 13, 2020, with the College of Engineering Dean present, to discuss the report’s recommendations. This memo incorporates the combined response from the Department and the CoE to the recommendations in the External Review Committee’s report.

Response to Recommendations

1a. (p. 4) “The small number of faculty involved in the Computer Engineering program is a significant concern. The lower division core is taught by a single faculty member, a lecturer. The upper division core is taught largely by a single faculty member, except for the upper division software engineering course taught by ICS. Technical electives and project supervision are done by others, and one recent hire is beginning to contribute to teaching the core curriculum (and we agree that new hires should be given space to establish their research programs before taking on significant teaching load). But at the current time but only 3.5 faculty members are involved in the program. Additional faculty are required.”

1b. (p. 7) “This program is considerably under-resourced in terms of faculty; there are multiple potential single points of failure.”

Background: The Department currently has 3.5 faculty in the Computer Engineering area that are responsible for teaching seven required undergraduate courses (EE 160, EE 205, EE 260, EE 361, EE 362, EE 367/L, EE 468)\(^1\), required undergraduate project courses (EE 296, EE 396, EE 496), undergraduate electives (EE 368, EE 406, EE 491), and graduate courses (EE 602, EE 607, EE 609, EE 691, EE 360):

\(^1\) The eighth required undergraduate course, ICS 314, is taught by an ICS faculty member.

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• a full professor teaching three lecture courses plus required project courses per year,
• an associate professor teaching five lecture courses plus required project courses per year (this has been his teaching load since Fall 2015),
• an assistant professor teaching two lecture courses plus required project courses per year
• an assistant professor teaching one computer engineering lecture course plus required project courses, and a second Academy for Creative Media lecture course per year

As the External Review Committee noted, the Computer Engineering faculty have been stretched thin. Since Spring 2012, we have had to hire at least one lecturer every semester to cover at least one required computer engineering course.

Thanks to one year of committed funding from the UH President's Office, the Department was provided with an open position (#84683) for which we recruited in 2019; unfortunately the accepted offer was turned down for personal reasons and we are currently recruiting for that position again. In Fall 2019 and Spring 2020, a visiting professor from the US Government taught a Computer Engineering elective course, for the purpose of helping the program achieve recognition for a national Center for Academic Excellence in CyberOps.

Both of these efforts coordinated at the System level are much appreciated.

Action: Our Department is completing its interviews for Position #84683, and will continue keeping the administration aware of its resource needs, in parallel with taking other actions as outlined in this memo.

2. (pp. 4–5) “We also noted that the division between the three groups with EE appeared somewhat more rigid than it needs to be. These groups make sense and reflect research disciplines within EE, but teaching might be more fluid, e.g., having people from the Systems area teaching in Computer Engineering or vice versa.”

Background: We agree that teaching assignments could be more fluid between the Systems and Computer Engineering faculty. In particular, the following courses typically taught by Computer Engineering faculty were identified as those that could be taught by Systems faculty: EE 160 Programming for Engineers (if it was based on Python...see next item below), EE 362 Discrete Math for Engineers, EE 367 Computer Data Structures and Algorithms, EE 602 Algorithms.
Action: The Computer Engineering faculty member who normally teaches EE 362 and EE 367 has already shared his instructional materials on Laulima with two Systems faculty. This recommendation will be discussed in greater depth within the Systems track for possible implementation.

3. (p. 7) “Consider accelerating the introduction to high-level programming – more Python (or Java) as an introductory course or in the first two years.”

Background: For at least the past 20 years, EE and CENG students have been required to take EE 160 Programming for Engineers, which is based on C. Discussions amongst the Computer Engineering faculty surrounding the possible substitution of Python instead of C began on June 28, 2017, and then amongst the entire Department on October 19, 2018.

Action: As a result of the October 19, 2018 Department meeting, a committee was formed to discuss the issues involved with migrating EE 160 from C to Python, much of which concern ramifications to courses at the 200- and 300-level for which EE 160 is a prerequisite. The committee has made considerable progress since then and expects to present a proposal to the Department’s Curriculum Committee by the end of the Spring 2020 semester.

4. (p. 7) “Look for opportunities to connect with HI-DSI and other areas on campus. There may be opportunities to better connect the Data Science activities across campus through joint seminars or joint proposals. Some of this seemed to be happening, and the EE faculty are working on applications in medicine and elsewhere, but additional connections could both strengthen the algorithmic aspects of Data Science and increase the practical impact of the more theoretical work.”

Background: The Systems track faculty within the EE Department are active in fundamental data science research with applications in medical imaging, photography, neuroscience, autonomous vehicles, health informatics, social connections, and more. The faculty would welcome opportunities to work more closely with HI-DSI, complementing its existing expertise with ours to strengthen expertise in “fundamental” data science, e.g. dependence of AI systems on training data, data abnormality, and (non)convex optimization, particularly in working with unique data such as big data, images, and graphs.

Action: Our Department would welcome the opportunity to collaborate further with HI-DSI. Suggested avenues are:

- CS, EE, and other UH units that are interested in using HI-DSI resources form a DSI board committee to better distribute HI-DSI resources throughout the UH system. (All those UH units interested in sharing HI-DSI resources provide equal amounts of support to HI-DSI.)
- HI-DSI could consider affiliations with all data scientists across the UH System, similar to the University of Michigan's Data Science Institute (midas.umich.edu) that has over 280 affiliates across the campuses. This can be extremely useful for cross-institutional grant proposals, and any researchers can find their potential collaborators via a diverse data scientist pool.

- Consider implementing additional DSI certificates/degrees at the Manoa campus. The DS curricula could be designed based on existing curricula in EE, CS, and other units, and some of them can incorporate specific applications, e.g., business analytics and data mining in social science. We believe that the implementation of the DS programs on the Manoa campus can improve UH’s research and education by exposing the programs to more UH students.

5. (p. 7) “Reduce the foreign language requirement from 2 years to 1 year. (We appreciate the importance of a broad education, including an understanding of the language, history, and culture of some other part of the world. But one year at the college level seems like enough, and is far more common.)”

Background: For over 20 years, the BS program in all engineering degree programs in the College of Engineering has been exempted from the two-year foreign language requirement.

Action: None required.

6. (p. 7) “We observe that UHM’s introductory course sequences in mathematics and the physical sciences are longer than is typical at other institutions - for example, four semesters (two years) of Calculus, vs. two semesters or three quarters (one year), which is the norm. Is some compression possible, which would enable a combination of more diverse enrichment and more courses in the major? Variability in background is a common problem. The university may need to be flexible by allowing specific programs to replace some of the current general requirements with other courses. The review committee did not have sufficient time to study this in depth, but, for example, one might consider replacing the 4th semester of calculus with discrete math and probability, or giving students more options for outside science specialization which might come later in the program.”
Background: The “default” calculus sequence of Math 241, 242, 243, 244 is listed in the catalog, College website, College check sheet, OVCAA program sheet, and OVCAA plan template. The accelerated calculus sequence of Math 251A, 252A, 253A is listed as an alternative route; it is not surprising that students opt to take the “default” versus alternative route. On February 18, the College's Academic Advisor forwarded a February 6 memo from the Math Department clarifying that any of the following four sequences (not just the first two) satisfy the calculus requirement:

- Math 241 - 242 - 243 - 244
- Math 251A - 252A - 253A
- Math 241 - 242 - 253A
- Math 241 - 252A - 253A

Identifying these last two sequences as viable alternatives will be a welcome addition to the array of alternatives that students can consider.

A similar situation exists for the chemistry sequence. In the past (> 25 years ago?), only one semester of chemistry Chem 171/L was required, and that was replaced with the “default” two-semester sequence of Chem 161/L and 162 (with Chem 171 only being sporadically offered). Similar to the observation on the advertised math sequence above, Chem 161/L and 162 are promoted on the various websites and check sheets as the default sequence, with Chem 171/L mentioned as an “alternative”.

Action: Although the deadline has already passed for submitting changes for the Fall 2020 program sheets, the EE Department will work the CEE and ME Departments as well as the College’s Academic Advisor to re-brand the quicker routes to graduation as the standard ones, and the longer routes as alternatives.

7. (p. 7-8) “The road ahead....Below are four options to consider. Please view these only as “food for thought and discussion.” We sketch them in very general terms...”

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3 https://manoa.hawaii.edu/catalog/schools-colleges/engineering/
4 https://www.eng.hawaii.edu/students/current-students/curriculum/
Response: At its February 13, 2020 meeting, the faculty discussed the four options in depth. We agreed that the goal should be to strengthen the Computer Engineering and Computer Science programs, and that these improvements should improve the EE program as well. It is also important to preserve the collaborative environment of the EE Department. As such, we unanimously prefer Option 2, in which current ICS faculty that are aligned with the principles of teaching, research, and service of the existing EE Department could be transferred into the Department, and then the Department can be renamed to an EECS Department. Since any faculty transferring to the existing EE Department would presumably require meeting the existing tenure and promotion requirements of our Department, the process would entail the EE Departmental Personnel Committee evaluating the academic profile of each transitioning faculty member.