Department/School/College: Engineering – Second Level Review

The department would fall under which of the following Vice Chancellor’s offices?

___ X ___ Academic Affairs
_____ Research and Graduate Education
_____ Student Services
_____ Administration, Finance, and Operations

Advisory Committee Members (list names and titles):

Peter Crouch – Dean of Engineering (Chair)
Magdy Iskander – Director HCAC
Wayne Shiroma – Co-Director HSFL
Ron Riggs – Chair - CEE
Ron Knapp – Chair - ME
Anthony Kuh – Chair - EE
Todd Reed – EE faculty
Chittaranjan Ray – CEE faculty
Lloyd Hihara – ME Faculty
Bruce Liebert – Associate Dean Academic Affairs
Isaac Fujioka – Senior Administrative Officer
Pete Mouginis-Mark – Associate Dean Research
Michael McCormick – undergraduate CEE student and President of ECUH (Engineers Council of the University of Hawai‘i), an engineering students’ organization

Administrative Unit (e.g. College) Prioritization Summary:

<table>
<thead>
<tr>
<th>New/ In Transition</th>
<th>Target for Growth or Investment</th>
<th>Maintenance</th>
<th>Reorganize/ Restructure/ Merge/ Consolidate</th>
<th>Reduce in Size or Scope</th>
<th>Phase Out Close Eliminate</th>
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</thead>
<tbody>
<tr>
<td>Hawai‘i Space Flight Lab</td>
<td>Mechanical Engineering, Undergraduate</td>
<td>Civil and Environmental Engineering Undergraduate</td>
<td>Electrical Engineering Undergraduate</td>
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<td></td>
<td>Mechanical Engineering Graduate</td>
<td>Civil and Environmental Engineering Graduate</td>
<td>Electrical Engineering Graduate</td>
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<td>Hawai‘i Center for Advanced Communications</td>
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Discussion:

The College of Engineering has been partitioned into 7 programs -- one organized research program, Hawai‘i Center for Advanced Communications (HCAC), and three undergraduate programs in Electrical Engineering, (EE), Mechanical Engineering (ME) and Civil and Environmental Engineering (CEE), and three graduate programs in the same departments. Each of these undergraduate programs consists of one bachelor’s degree and each graduate program consists of a master’s degree and a doctoral degree. We have treated the MS and PhD programs as an integral graduate program rather than splitting them into different programs. The rationale for this is that without doctoral programs in each department, the College would not be able to attract the research level faculty appropriate to an engineering college in a research university. In addition undergraduate engineering programs do not typically provide service teaching functions in a University and so a stand-alone undergraduate program cannot be rationalized in this way. Programs offering only BS and perhaps MS programs should be offered at four year colleges. Eliminating research in engineering programs from UH Manoa is not consistent with the desire to diversify the Hawaii economy with technology-focused industry.

Over the years the College at UH Manoa has become relatively small and organized relatively simply, compared with Colleges of Engineering nationally for several reasons:

- Relatively small undergraduate student populations compared with Engineering Colleges nationally.
- UH Manoa houses 2 other engineering programs not in the College of Engineering, which is highly unusual. These are Biological Engineering (CTAHR) and Ocean Engineering (SOEST).
- The Computer Science Program at UH Manoa is not in Engineering – roughly 50% of Universities nationally have the same structure and 50% have Computer Science residing in Engineering, and many of those with CS programs in other colleges have some sort of Computer Science/Computer Engineering program also residing in Engineering.
- Organized research units such as the Hawaii Natural Energy Laboratory (HNEI) have been moved from Engineering to build SOEST, as was Ocean Engineering.

Thus in many senses the “reorganization” of “engineering” in the spirit of this review of programs has already taken place. Relative to national norms for engineering colleges, rationality would indicate returning various units to the College of Engineering.

The ME department has a strong enrollment at the undergraduate level, weak enrollment at the graduate level but historically high external funding, which is however declining. The number of faculty currently in ME is insufficient for a department with both teaching and research missions. So in the short term the ME department must be “Targeted for Growth” so that the department can offer a reasonable number of electives for its graduate students.

The EE department has a weak undergraduate enrollment, relatively strong graduate enrollment, but weak external funding. In the short term while enrollment and productivity is low, “Reduction in Size” is indicated.

The CEE department has relatively strong undergraduate and graduate enrollments and good external research productivity which is increasing. While its name indicates two programs in Civil and Environmental Engineering, in practice these are not independent programs. Its relatively strong performance indicates “Maintenance.”
By national norms all departments have relatively weak PhD programs and research funding bases. However, these are necessary for the development of the programs overall as already argued.

All departments support, and are supported by, the College’s very active Native Hawaiian Retention Program.

The three departments have no official tracks that could be reasonably eliminated without seriously damaging the breadth of offering of the undergraduate programs as required for Accreditation by ABET.

HCAC was originated 9 years ago, but has only had stable leadership for the last 7 years. It has made good progress in establishing itself over the last few years in terms of its research agenda and external funding and has actively participated in funded K-12 outreach functions. Its relatively strong performance indicates “Maintenance.”

The College has determined a set of cross disciplinary themes around which it intends to develop its strengths:

- Exploration Engineering
- Sustainable Engineering
- Bio-Medical engineering
- Dual-Use Engineering
- Engineering for a secure Hawaii and US

These themes do not lie within any particular department and have been developed synergistically with the special constraints and opportunities presented to the College with respect to its position and roles within UH and Hawaii. Developing faculty expertise in the College is being guided by the process of building capability in aspects of these strengths. For example, despite the relatively few students in EE, it is imperative for Hawaii to hire some faculty in the power engineering area so that the College can graduate students in this area. Also, because the Dual-Use and other industries in Hawaii utilize a spectrum of talent from electrical engineering through computer engineering to computer science, EE has developed a proposal to offer a computer engineering undergraduate degree.

Restructuring possibilities considered but not offered:

- Restructure HCAC by moving dedicated faculty into Electrical Engineering. Given the relatively good progress HCAC has made since arrival of its current Director, it is too soon to make a decision to restructure HCAC. However it would be possible to restructure HCAC as a classical center within the College, without tenure track faculty.
- Eliminate the HSFL, Hawaii Space Flight Laboratory. The College in the last 2 years has collaborated with SOEST to develop this program, consistent with the theme of Exploration Engineering and receiving a large influx of funding from congressional set asides. While too young to include in the survey this year, it is viewed as another unit within the College that can develop a focus for research and academic programs as does HCAC.
- Merge all three departments EE, ME and CEE into one academic unit. There are some models of Colleges of Engineering, most notably in the Colorado School of Mines, without specific academic Departments. Given the very low staffing enjoyed by the College there are useful aspects to such reorganization, such as centralizing staff resources. It seems premature to contemplate this move at this stage because of its non traditional nature and the legacy of community support for individual units.