COE and OSU Faculty Involvement in Bioengineering Graduate programs

The proposed interdisciplinary Bioengineering graduate degree programs will involve faculty from across all of the COE Schools (with an administrative home in CBEE), as well as faculty from across campus who are expected to participate. Colleges/Programs expected to participate include:

College of Public Health & Human Sciences
  Kinesiology, Public Health, Nutrition
College of Pharmacy
College of Veterinary Medicine
  Biomedical Sciences, Clinical Sciences
College of Science
  Biochemistry and Biophysics, Chemistry, Mathematics, Microbiology, Physics
College of Agricultural Sciences
  Botany & Plant Pathology

Key
- Undergraduate programs are Green
- Graduate programs are Red
- Interdisciplinary graduate programs are light Red
- (x/y) are three-year average (enrollments/graduates)
- (x/y) for proposed Bioengineering degrees are (enrollments/graduates) as projected for when these programs have grown to steady-state
New Academic Program:
MEng, MS and PhD in Bioengineering

BACKGROUND

Program Proposed Start Date
Fall 2016

Program Description
Master of Science (MS), Master of Engineering (MEng) and Doctor of Philosophy (PhD) in Bioengineering. The full program proposal is available at: https://secure.oregonstate.edu/ap/cps/proposals/view/92511

Bioengineering is an interdisciplinary field that applies engineering principles and quantitative methods to the advancement of knowledge at the molecular, cellular, tissue, organ, and system levels, and to the development of new biologicals, materials, devices, and processes. The main objective of the proposed graduate programs is to provide students with training in bioengineering, including broad exposure to the discipline through coursework and seminars as well as a focused research experience. The program will provide students with resources and faculty expertise to conduct advanced studies in the core areas of biomaterials, biomedical devices and instrumentation, human performance engineering, medical imaging, and systems and computational biology.

Program Context
The interdisciplinary Bioengineering (BIOE) graduate program will be administered within the School of Chemical, Biological, and Environmental Engineering and will include faculty and students from across the College of Engineering (COE). Participating faculty outside of the college will also be able to serve as mentors/advisors for graduate students. While OSU offers a Bachelor of Science (BS) degree in Bioengineering and has significant bioengineering research activity, graduate-level training in bioengineering is not currently available. The proposed BIOE graduate program will be unique at OSU. The following programs at OSU have some similarities but focus on biological and biomedical sciences rather than engineering: Molecular and Cellular Biology (PhD), Applied Biotechnology (PSM), and Comparative Health Sciences (MS, PhD). Within COE, there are also programs in Radiation Health Physics (MS, PhD) and Medical Physics (MS, PhD), but these programs do not provide the interdisciplinary breadth of the proposed BIOE graduate program. In addition, the COE offers graduate programs in Biological and Ecological Engineering (MEng, MS, PhD). According to the course catalog, the concentration areas for the Biological and Ecological Engineering programs are: “bio-based products and fuels, bioprocessing, biological systems analysis, ecosystems analysis and modeling, water quality, water resources.” These areas of concentration are distinct from those in the proposed BIOE graduate program (i.e., biomaterials; biomedical devices and instrumentation; human performance engineering; medical imaging; and systems and computational biology). In particular, the BIOE program will provide a broad interdisciplinary education with an emphasis on medical applications, whereas the Biological and Ecological Engineering program emphasizes non-medical applications.

Program Purpose/Relationship to University Mission and Strategic Plan
OSU’s strategic plan (http://leadership.oregonstate.edu/strategicplan/) seeks to advance three signature areas of distinction: Advancing the Science of Sustainable Earth Ecosystems; Improving Human Health and Wellness; and Promoting Economic Growth and Social Progress.
As stated in the plan, improving human health and wellness depends on “building more holistic and interdisciplinary approaches to healthy aging, chronic infectious disease control, new drug development, mental health, and disease prevention to enhance the human lifespan, decrease health care costs, and maintain a healthy population.” The proposed Bioengineering graduate program strongly aligns with this signature area of distinction. In addition, we expect that creation of this new graduate program will lead to growth of bioscience-based industries in Oregon through development of new technologies and strengthening of the bioengineering workforce. The proposed graduate program in Bioengineering also directly aligns with the final signature area of distinction, “Promoting Economic Growth and Social Progress.”

Need for the Program
From 2001 to 2010, the US bioscience industry grew by 6.4%, despite an overall drop in private sector employment of 2.9% during the same time period [1]. This growth is largely due to new technologies and advancements that have spawned new businesses. According to the US Bureau of Labor Statistics, employment in bioscience-based industries is projected to grow even more significantly over the next decade, at a rate much faster than average. Employment of biomedical engineers in particular is projected to grow by 27% [2]. This growth is particularly apparent in Oregon where employment in bioscience-based industries increased by over 30% from 2001 to 2010. There are over 700 bioscience industry establishments in Oregon, providing more than 13,000 jobs. The largest bioscience subsectors in Oregon are bioscience-related distribution (4446 jobs), medical devices and equipment (3962 jobs) and research, testing and medical laboratories (3659 jobs). There was strong job growth in all bioscience industry subsectors from 2001 to 2010, including 53% growth for research, testing and medical laboratories and 31% growth for medical devices and equipment [1].

Currently, OSU graduate students interested in bioengineering must choose one of the existing engineering programs and complete courses that neither align with nor capture the multi-disciplinary nature of modern bioengineering research. In addition, the vast preponderance of undergraduates with interest in pursuing graduate study in bioengineering (mainly from OSU but also Oregon Institute of Technology [Oregon Tech], Portland State University [PSU], the University of Oregon [UO], others) must leave the state. As evidence of the strong demand for graduate training in bioengineering in the Northwest, the University of Washington bioengineering program receives over 300 applicants per year and can only accept about 6% of those applicants. Establishment of a graduate program in bioengineering will provide an environment for collaborative research and training along interdisciplinary themes and will serve to attract and retain talented students in the state.

The most closely related program in Oregon is the Biomedical Engineering (BME) graduate program (MS and PhD) at the Oregon Health & Science University (OHSU). The proposed OSU BIOE graduate program would complement the current BME program at OHSU while also providing more opportunities for current Oregon undergraduates (from Oregon Tech, OSU, PSU, UO, etc.) to pursue a graduate degree in bioengineering within the state. OHSU is supportive of our plans to create a new graduate program in Bioengineering (see letter in Category I proposal), and we have had several meetings with OHSU faculty about opportunities for joint research and educational activities. We will continue to explore these opportunities as the OSU Bioengineering program is launched and grows.

Program Financials
The College of Engineering has added 41 new faculty members in the last four years, and searches for several additional faculty members are underway. These new faculty members provide the increased capacity needed to deliver the new BIOE graduate program. The annual cost in terms of faculty time for delivering the new BIOE graduate program core courses (15 credits) is estimated at about $190,000. This estimate is based on an assumed $90,000 academic year salary, 40% OPE, and a typical teaching load of about 10 credits per year. The number of faculty lines required to deliver the core is approximately 1.5.

There will also be some cost associated with the service activities of the BIOE graduate program director. Assuming the director dedicates 10% of his or her time to program-related service duties over the entire year (including summer), the cost of these service activities will total approximately $17,000 (salary plus OPE).

In addition, there will need to be some administrative and advising support. We expect, for example, that the CBEE operations manager will need to devote approximately 15% of her annual effort to this program (in concert with her existing efforts already devoted to support of the existing CBEE graduate degree programs). This equates to $14,000 (salary plus OPE) annually.

In the first two years of the new BIOE graduate program, we anticipate relatively high promotion costs of about $18,000 per year in order to create promotional materials, build a new website for the program as well as more comprehensive efforts to promote the launch of the program (including top student recruitment and visits). The College of Engineering has committed $50,000 over the next two years to support the launching and promotion of the new Bioengineering graduate program. In the long term, the costs of program promotion and student recruitment are estimated at about $10,000 per year. This cost will be paid by the School of Chemical, Biological and Environmental Engineering.

The budget is summarized in the table below.

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<th>Academic Year 2016</th>
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<th>Academic Year 2018</th>
<th>Academic Year 2019</th>
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TAB H

RECOMMENDATION

All appropriate University committees and the OSU Faculty Senate have positively reviewed the proposed program. The Provost recommends that the Academic Strategies Committee recommend to the Board that it approve the establishment of an instructional program leading to MS, MEng and PhD degrees in Bioengineering, effective in Fall 2016, pending the approval of the Higher Education Coordinating Commission and the Northwest Commission on Colleges and Universities.