

**Department of Biological and Irrigation Engineering
Utah State University Department Teaching Excellence Award
Preproposal 2007**

1. Teaching/learning mission of the department

The Department of Biological and Irrigation Engineering (BIE) believes that excellence in teaching is core to students, staff, and faculty success. By providing students with the best possible education, the department benefits from outstanding students and enhanced quality of research. The department has made a commitment to combine best practices in education, with a caring faculty, and a focus on integrating research into the education experience.

Eight years ago the Biological Engineering (BE) undergraduate degree program was at a low point of only ten undergraduates. The program had suffered from a lack of clear vision for the undergraduate program. After seven years of development and a commitment to continuous improvement, the program currently has ninety-three undergraduate students. Critical in the revitalization were the core values of active learning for the students, integration of research in all levels of the undergraduate experience, and a commitment of the department to each student as an individual.

Active learning is an essential element in making the learning experience of any student come alive. In engineering the students learn by doing rather than just listening to a lecture as the dominant teaching method. Courses have been restructured to include active learning elements such as discussions, team problem-solving, experiments, and research projects. Traditional lectures have been minimized and are being supplemented with electronic media and student-led presentations.

The department believes that undergraduate participation in research is a fundamental part of the undergraduate experience. Students that have experience in research are more engaged in their coursework, confident in their abilities, and are more motivated to pursue advanced degrees. Additionally, they are more desirable to potential employers.

The department has a strong commitment to the success of each student. We encourage and help students with different learning styles and abilities to succeed in the program. This marks a departure from the traditional engineering approach where it is our job to "weed out those that can't cut it." The traditional attitude tended to select only students that fit a specific mold of learning, while others tended to drift away with the feeling that engineering was an impersonal and inflexible field. Historically if students were not completely focused from early on in their studies they would fail out of engineering and be forced to change colleges. We recognize that not all undergraduates enter the university with the same exposure, study skills and motivation to succeed right away. The BIE faculty learn about each of the students individually and help them to gain the skills and enthusiasm for the major to be successful. In response to a recent open-ended survey question students clearly indicated that "enthusiastic," "caring," personal interaction with the teachers was the most effective aspect of their educational experience.

2. Department-sponsored activities that establish a commitment to learning excellence

The BIE faculty has been active in establishing best practices in engineering education on the local, national and international levels. The department recently completed (6/2006) a National Science Foundation Department Level Planning Grant (NSF #0431824) focused on improving undergraduate education. The grant aims included:

- Form an integrated curriculum providing greater fluidity, continuity and reinforcement across the courses.
- Deliver supporting content for the core courses over the Internet as digital resources or reusable "learning objects," while focusing on an applied learning and team-based environment on campus.

- Define a core biological engineering curriculum that encompasses bioprocess, biomedical, and bioenvironmental engineering with emerging fields such as proteomics, nanotechnology, biosensors, and micro-fluidics.
- Extend the applied learning environment with a one semester co-operative experience with a partner organization.

The department continues to integrate undergraduate research into the curriculum. All students are required to participate in a three-semester capstone design and research experience. They are encouraged to present findings at national meetings and to publish the results in peer reviewed scientific publications. Since 2003, over forty poster/papers have been presented at national meetings that included undergraduate authors. In the last two years the BIE department obtained ten of the Undergraduate Research and Creative Opportunities (URCO) Grants. This was nearly one third of the grants given to the entire university.

At a national level the BIE department has been active in defining the core body of knowledge and skills that a Biological Engineer needs to learn while in school. This effort is critical in establishing standards and creating an identity for graduates in this new field.

Internationally, the BIE department has established the International Irrigation Center (IIC) in response to an increasing need for providing training and research that enhances the capabilities of professionals and scientists outside of the USA for improving irrigated agriculture in their countries. As part of these activities the IIC established the World Irrigation Information Network (Irri-Net). The main goal of the Irri-Net is to assemble, develop, and disseminate information needed by agricultural water institutions and personnel involved in research, training, and assistance. The Irri-Net includes on-line courses and software available to practitioners worldwide.

3. Department engages in assessment of learning competency and applies that knowledge to continual improvement in the department culture of learning excellence

The BIE department has a continuous improvement process in place that involves the entire department in assessment and evaluation steps to ensure that the educational experience for the students is always improving. As part of the process each faculty member fills out a course self-evaluation each semester in addition to the traditional student evaluations. All graduating students also go through an exit interview process with the department's industrial advisory board that provides a report to the department. The department curriculum committee reviews this information and recommendations are made to the faculty for changes to individual courses or the entire curriculum. This process occurs on a yearly cycle to ensure the department is always looking for ways to improve the educational quality and experience of the students.

Summary

Our department is committed to planning and implementation of the necessary steps to develop a modern, applied learning environment as we redefine biological engineering. The proposed changes are aligned with student, faculty, and ABET recommendations for our program:

Department Strengths as noted from the most recent ABET Accreditation Summary

- "The Department of Biological and Irrigation Engineering has a strong history of involvement in undergraduate and graduate education in the irrigation area. This history and reputation extends well beyond the North American continent to countries around the world."
- "The department has hired two new faculty members (Britt and Taylor) to teach in the new biological engineering undergraduate program. In addition, the Dean of Engineering has recently committed three additional positions to the biological engineering program."
- "The future of the department, based on the current student numbers, historic faculty strength, the dean's commitments regarding new faculty hires, and State's commitment to engineering, is excellent."