College of Engineering Plan
2004-2009

8/28/03, 10/9/03, 11/24/03

Mission

The College strives for excellence in teaching, research and service. The faculty emphasizes life-long learning and provides its graduates with problem solving skills needed to address situations relevant to technology and science and their relationship to societal issues. Excellence in instruction requires that faculty are actively engaged in research, in the practical application of research and/or in consultation. These extramural activities, when balanced with commensurate teaching responsibilities, translate into inspiration for students, resources for graduate education, and faculty development.

Primary Goals

The College's primary goals are to:

- Continuously improve all aspects of the undergraduate experience.
- Enhance graduate education and research productivity.
- Increase the visibility of the College locally, regionally and nationally.
- Create an environment that motivates the faculty to be engaged in the research, teaching, and service enterprises of the College.

These goals were broadened and reiterated by asking departments to think about the following issues in preparing their 2004-2009 Academic Plans:

- Building for Distinction
- Teaching and Learning
- Enriching the Undergraduate Experience
- Research and Graduate Programs
- Work Environment

Progress Made on Action Items from the 1999 Academic Plan

61. Action Item: Organizational arrangement to strengthen computer science, computer engineering, and management information systems.

The Department of Computer Science (CS) moved to the College in July of 2001. At the same time, a computer engineering program, jointly administered by the renamed Department of Electrical and Computer Engineering (ECE)

and CS, was developed from the existing option offered by the Department of Electrical Engineering. Fifty-seven students are currently enrolled and 5 graduated spring, 2003. The program was visited for initial ABET-EAC accreditation fall, 2003.

101. Action Item: Pursuant to the graduate enrollment plan in Section VII, Engineering should implement its plan to increase Ph.D. production.

Since the fall of 1999 the College has increased its Ph.D. enrollment from 23 to 51 or 122% including computer science. Without computer science the Ph.D. enrollment has increased from 23 to 41 or 78%. Computer Science has increased Ph.D. enrollment by 150% from 4 to 10 since joining the College in 2001. These increases occurred despite a declining interest in the Ph.D. by domestic engineering and computer science graduates, state stipends that are considerably below the market, and a climate that has, in many cases, proven difficult for international students to obtain visas.

102. Action Item: The College should develop a mechanism for assigning job descriptions differentially, using its Faculty Professional Development Database.

The College has successfully assigned differential job descriptions based on department goals and individual performance in research, teaching and service (ref. COE policy on Performance Evaluation). A Faculty Professional Development Database is not essential, would consume precious staff resources and duplicate the capability of PeopleSoft once fully implemented.

103. Action Item: The College should continue its articulation with Wyoming community colleges, possibly coordinating with the mathematical sciences in this effort. In addition, such initiatives such as engineering floors in dormitories and power groups are worth continuing and enhancing.

The College hosts annual engineering articulation meetings with the Wyoming community colleges. There is considerable crossover between mathematics, which has traditionally included computer science, and engineering articulation because many of the same faculty members are involved at the community colleges. Some efficiency might be gained in the future by including engineering, mathematics, and computer science into a single articulation effort.

The College continues to support two engineering floors in White Hall (5th and 6th floors). Specific support from the College includes an undergraduate teaching assistant who is responsible for academic programs (tutoring, review sessions, etc). Detailed analysis of the academic performance of engineering students living on the floors has indicated that this program is successful.

The College continues to offer its Power Group schedules (Fall 2002 started the 8th year of the program) and the analysis continues to show an academic benefit to the participating students.

104. Action Item: The College should increase its regional and national visibility in offering continuing professional development courses…. In addition the College should study the feasibility of offering a Master's in Engineering … via distance-learning technologies.

The College identified suitable topics for continuing education opportunities for practicing engineers. Short courses are offered on football weekends in the fall and at the annual meeting of the Wyoming Engineering Society in the spring. A survey conducted by the Outreach School in 1999 led to the conclusion that there is insufficient demand to warrant offering a distance Master's of Engineering program. Several actions related to regional and national visibility were undertaken (results are summarized in the annual planning update of the College).

105. Action Item: Following recommendations by its National Advisory Board, the College should pursue discussions with the College of Business to establish an "Engineering Business" course for its undergraduate majors.

The College has made significant progress in strengthening the business skills of its majors. Results have been limited by College of Business resources and the desire to move toward a 128-hour engineering curriculum. Civil and Architectural Engineering (CAE) integrates business topics into its curriculum through courses that include cost engineering, project management, contracts, legal issues, economics, decision science and finance. Mechanical Engineering (ME) now requires a business course and allows majors to satisfy technical elective requirements with business courses. Chemical Engineering has also made curricular changes that allow students to satisfy elective requirements using business courses. Electrical and Computer Engineering has brought business topics into their capstone design course and plans to further strengthen this component of the curriculum during the next planning cycle. For those students with a strong business interest the Management Information Systems program offered by Computer Science requires in excess of 30 hours of business coursework in the business option. A joint committee of the College of Engineering's National Advisory Board and the College of Business' Advisory Board is currently exploring additional options and will make recommendations during AY04.

Additional detail on accomplishments related to the 1999-2004 Plan is available in the annual updates.

Undergraduate Education

The primary goal is to continuously improve all aspects of the undergraduate experience. In doing so we wish to develop and maintain programs that distinguish us from our regional and national competitors, improve teaching and learning in the College, enrich the undergraduate experience and insure an excellent work environment.

Specific Goals:

1. **Goal:** Maintain ABET EAC/CAC accreditation for all undergraduate programs.
2. **Goal:** Deliver, in some cases jointly with other Colleges, a selection of programs and options in engineering and the applied sciences that will be attractive to prospective students, allow graduates to function as informed citizens and productive professionals, and distinguish the UW College of Engineering and our graduates from our peers regionally and nationally.
3. **Goal:** Instill in graduates the ability and motivation to be lifelong learners.
4. **Goal:** Maintain an undergraduate enrollment of 1200 students (fall semester) while attracting more students who are calculus ready and have ACT scores above 26.

Assessment: The College utilizes a full range of assessment tools. These include alumni surveys, graduating senior surveys and interviews, required participation in a national exam (Fundamentals of Engineering Exam, FE), utilization of external advisory boards, student portfolios, and pre and post assessment for specific courses. In addition, the outcomes of our capstone design courses are routinely evaluated by practicing professionals. (Details can be found in the pamphlet "College of Engineering - Educational Objectives, Program Outcomes, and Assessment Plans"). The College will continue to develop assessment tools that are efficient and effective.

Areas of Distinction: The College of Engineering's undergraduate programs are distinguished by a low student-faculty ratio, relatively small classes, a philosophy that promotes excellent access to faculty and opportunities for one-on-one learning, and well-equipped laboratories that enable students to gain hands-on experience. The International Option and the Center for Excellence in Engineering Education (CEEE) offer opportunities to further distinguish undergraduate engineering education at UW from our regional and national competitors.

Actions for 2004-2009:

1. **Action:** Lead Computer Science through the process followed by engineering programs to prepare for the CAC (Computer Accrediting Commission) visit scheduled for fall, 2004. This action includes bringing an experienced visitor to campus for a "trial visit" early in CY2004.
2. **Action:** Establish and nurture a Center for Excellence in Engineering Education laying the groundwork for sustainability, increased visibility and eventually national recognition as a leader in undergraduate engineering education.
3. **Action:** Utilize Hewlett Foundation support and the leadership of the Center for Excellence in Engineering Education to redefine the core curriculum common to all engineering and computer science programs and revitalize the Engineering Science program with efficient organization and creative pedagogy.
4. **Action:** Procure internal or external support necessary to develop a strong and sustainable International Engineering Option having participation by 5% of the College's graduating seniors.
5. **Action:** Develop and implement creative strategies for recruitment and retention including better utilization of options in bioengineering in Chemical and Petroleum Engineering and Electrical and Computer Engineering.
6. **Action:** Increase the participation of undergraduate students in research, achieving a goal of 15 to 20% participation by graduating seniors by 2009.

7. **Action:** Work with the Colleges of Agriculture and Arts and Sciences to establish an undergraduate interdisciplinary degree in Earth Systems Science.
8. **Action:** Work with the College's National Advisory Board to develop a marketing strategy to increase the visibility of the College of Engineering with regional and national industries and businesses.

Graduate Education and Research

The goal is to enhance graduate education and research productivity. In doing so we will identify and build areas of distinction consistent with the University's direction and create an environment that inspires excellence.

Specific Goals:

1. **Goal:** Increase graduate enrollments in the College. By 2009 the College will enroll 200 graduate students including 65 to 75 Ph.D. students. Because the majority of the College's graduate students rely on external funding for support this implies and increase in externally funded research. It also implies competitive stipends and an aggressive recruiting effort.
2. **Goal:** Increase research productivity. The College will increase annual awards to $9.5 million by 2009 and measure the quality of our effort through increased publication in the highest regarded forums.
3. **Goal:** Increase the number of interdisciplinary research activities within the College and with other Colleges.
4. **Goal:** Maintain research thrusts in areas critical to the State including energy production and utilization, transportation, and environment/water.

Assessment:

During the period 2004-2009 each graduate program in the College will implement assessment plans to assure that graduate education is continuously improved.

Areas of Distinction:

The College of Engineering will continue to develop strengths in environment and natural resources. This includes maintenance of strong presence in cloud and aerosol physics, boundary layer meteorology and state of the art instrumentation focusing on aircraft and balloon based observations; strengthening the environmental engineering and water resources areas; and providing the central focus for research on energy production, processing and utilization.

The College plans to play a continuing role in building a strong presence in fundamental and applied research related to the development and utilization of advanced materials. This will involve faculty in the mechanics of materials, structures, transportation, polymers, and biomaterials areas.

The College will also contribute significantly to building research areas of strength in the computational sciences. We now have a solid presence in computational fluid dynamics

to complement strength in experimental fluids and have built a core of faculty working in formal methods, control systems and signal/image processing.

The College will continue to build strengths in areas of technology that hold significant promise for research and employment opportunities for our graduates. These include information sciences, encompassing communications and networking technologies, biotechnology and nanotechnology. The development of distinction in these areas represents longer-term vision than those mentioned in preceding paragraphs.

Actions for 2004-2009:

1. **Action:** Continue to augment State stipends for Ph.D. students to assure competitive offers to highly qualified students.
2. **Action:** Invest in creative and aggressive graduate student recruiting activities proposed by departments and participate in the activities of the Graduate School.
3. **Action:** Identify the resources necessary for the College to move forward with filling the Cline Chair in Environment and Natural Resources by fall, 2005.
4. **Action:** Continue to consider graduate student supervision, including the Ph.D. level, as an important element in faculty performance evaluation.
5. **Action:** Continue to support opportunities for faculty to interface directly with federal research program managers
6. **Action:** Evaluate research productivity using quality measures including successful competition at the federal level for research awards, citations, journal impact factor, best paper awards, indicators of application, etc.
7. **Action:** Host internal interdisciplinary workshops to get young faculty from different Colleges together to explore research opportunities. Opportunities exist with Agriculture, Health Sciences, Arts and Sciences and Business.
8. **Action:** Coordinate cross-college support for the development of the Interdisciplinary PhD program in Science and Engineering of Materials (SEM).
9. **Action:** Continue to play a central role in bringing energy related research funding to the University that targets the state's energy resources.

The Work Environment

A first-rate work environment that includes competitive salaries, excellent facilities, an industrious support staff, and adequate support budgets remains a significant challenge. Support budgets have declined annually over the past decade as a result of budget cuts and inflation and numbers of support staff has remained fixed as programs, particularly research, expand. The only near-term mechanism for addressing these two areas is through external support or student fees.

The College's facilities are in reasonably good condition except for 23,500 square feet in the "sawtooth facility". As this was not addressed as a high priority in the University's facilities plan, this area must be addressed through the definition of a series of remodeling/deferred maintenance projects or privately supported projects that will render this space suitable for research and educational programs of the future.

Specific Goal: Create an environment that results in a highly motivated faculty engaged in the research, teaching, and service enterprises of the College.

Actions for 2004-2009

1. **Action:** Continuously assess the College's performance evaluation/reward system to assure that performance that supports College goals is rewarded.
2. **Action:** Propose and implement an increase in student fees for engineering and computer science students to partially cover the impact of budget cuts and a decade of inflation on the College's operating budget and student fees.
3. **Action:** Develop and implement a plan to make the space in the "sawtooth facility" useful in serving the College's highest priority education and research needs.
4. **Action:** Make faculty travel a high enough priority across the College to assure that junior faculty can be engaged professionally at the national level.

Service to the State and Nation

Service to the State is a part of the institution's mission. Service activities also provide educational experiences for our students, are critical to the professional development of our faculty and enhance our visibility.

Specific Goal: Enhance the College's visibility and improve education and research programs through service activities.

Actions for 2004-2009

1. **Action:** Continue to actively encourage and support faculty to become involved professionally at the national level focusing on technical and education-related committees in professional societies.
2. **Action:** Continue to encourage the active engagement of faculty in assisting small companies in the State through joint SBIR/STTR proposals, consulting, continuing education and other forms of technical assistance.
3. **Action:** Maintain research thrusts in energy production and utilization, transportation, and environment/water that result in service to State agencies and industries.