

Strategic Priorities

COLLEGE ENGINEERING AND TECHNOLOGY

The College of Engineering & Technology has one priority - to be nationally recognized as a Top 40 engineering college in the U.S. in the next ten years.

The college's priority will be accomplished by achieving high levels of excellence in teaching and learning; research, scholarship, and creative activity; outreach; and service. This outcome will be accomplished by the collective efforts of the faculty and staff in the following departments or programs along with the Dean and support staff in the college: Architectural Engineering, Biological Systems Engineering, Chemical Engineering, Civil Engineering, Computer Science and Engineering, Computer Engineering and Electronics Engineering, Construction Management, Construction Engineering, Electrical Engineering, Engineering Mechanics, Industrial and Management Systems Engineering, and Mechanical Engineering.

Currently, the college ranks 76th out of the 324 engineering colleges in the 2004 U.S. News and World Report survey, which places the college in the top 23% in the United States. Our priority will place us in the top 12%. Obtaining such national recognition is reasonable and desirable. In comparing nationally published statistics by the American Society for Engineering Education in 2004, the college's productivity surpasses many of the engineering colleges currently ranked ahead of it. Thus, marketing the college is a vital component of our priority.

RELATION OF PRIORITY TO CORE VALUES

Judgment by peers is the primary assessment method used in measures of academic quality and achievement. The collective creativity and performance measurements of the faculty, students and administration are reflected in how an organization is perceived. The priority to be highly ranked by one's peers is a hallmark of the pursuit of excellence.

Priority Action 1: The college will recruit a high number of well-qualified undergraduate and graduate students commensurate with Top 40 institutions. The college continues to be focused on increasing and retaining the number of engineering students, particularly women and minorities, in its undergraduate and graduate programs. Such efforts will lead to a university culture that values diversity of ideas and people. The college is expected to increase marketing and retention efforts to grow and retain the engineering student body by increasing its spending by over \$100,000 per year. In the last ten years, the college has seen a 16% growth in enrollment of undergraduate students and a 50% growth in graduate students for an overall growth of 20%. The college currently attracts excellent students. The average ACT scores of entering freshmen in the college typically ranks first or second among Big 12 schools.

Recruiting and retaining highly qualified students with diverse backgrounds is an action that is underway. The college continues to use the UCARE project funding, Multicultural Teaching Fellowships and special departmental efforts to enhance student support and recruitment. Current endowment funding provides \$1.5 million annually for undergraduate scholarships and graduate fellowships. With annual state support of \$500,000 for scholarships, there currently is \$2 million annually for support of programs for outstanding students. The college expects to double the annual funding of scholarships and fellowships.

Priority Action 2: The college will attract, retain and stimulate the development of high quality and diverse faculty. Outstanding faculty are key components in the core value of stimulating research and creative work that fosters discovery, pushes frontiers, and advances society. This will lead to an environment where research and creative work is the foundation for teaching and the engagement of faculty. Furthermore, faculty research experience contributes to the fundamental learning process of preparing the student for life by experiencing learner-centered education. We want to hire and retain the very best teachers and researchers to meet the needs of our comprehensive college mission and continue our outstanding record of accreditation.

Although the national level of competition has been high for the hiring of minority and women faculty, the college is making progress and is committed to furthering its efforts. Increasing the number of women and minority faculty and retaining current faculty are expected to positively impact the recruiting of women and minority students. Focused cluster hiring for areas of excellence will be used. Funding for spouse/partner or cluster hiring will increase the cost of hiring of top faculty. The college expects to hire 14 more faculty members with a concerted effort to hire at least three women or minority faculty. An additional 30% of the total salaries of the 14 faculty will be required to accommodate special circumstances.

In a survey of engineering programs in the five states surrounding Nebraska, Nebraska has the lowest number of engineering faculty and students graduating per capita. Additional faculty will contribute to more students in the college. As a comparison, Iowa State University which is ranked among the Top 40 engineering schools, has 1.5 times more faculty and 2.6 times the number of students in engineering as UNL.

The salaries for 14 new faculty members will cost \$1,000,000 annually. Cluster hiring and/or funding of spouses/partners will cost \$300,000 annually.

Priority Action 3: The college will enhance funded research. The five research initiatives listed below will be used to engage the faculty and provide every faculty member the opportunity to make meaningful contributions to core values. These programs will showcase the research in the college and be used to attract top students, graduate students, and faculty. The research initiatives are examples of the college's commitment to the uncompromising pursuit of excellence to stimulate research and creative work that fosters discovery, pushes the frontiers of science and engineering, and advances society. It is essential that current core research facilities such as specialized measurement equipment be maintained and new equipment purchased. Core facilities serve as the foundation for expanded efforts by collaborative teams of faculty to pursue research programs associated with the new initiatives. The college and the university have started

to see economic spin offs from previous research investments and marketing of intellectual property. Specific examples are the recently formed companies such as the John Woollam Company, i2rd, and Photonic Solutions, Inc.

A national search will be conducted to fill the Associate Dean for Research position in the college. The Associate Dean will be charged with leading faculty in collaborative research initiatives to obtain large grants in the major research initiatives. The college's research initiative areas are identified below. All of these research focus areas have direct applicability to the State of Nebraska and the nation. Excellence in these and future emerging areas are keys to meeting the college's priority.

Transportation and Infrastructure Research Focus Area: Transportation and infrastructure research are of vital interest to major local and national design and construction firms. The United States depends on transportation and infrastructure for its basic commerce and community health. Current research includes driver performance, road-side safety, new materials, optimal designs of infrastructures, value engineering and performance based project delivery in construction, and efficient use of resources.

Design and Construction of Buildings Research Focus Area: Construction is a key element in the nation's economic development and growth. Current research includes worker safety, efficient building procedures, building design processes, sustainable design and construction, energy efficiency, new materials and preventing material loss and damage. Major corporations that are located in Nebraska are among the nation's leaders in design and construction.

Bio-Medical Engineering, Bio-Environmental Engineering and Engineered Bio-resources Research Focus Area: Biomedical engineering research at UNL (some in conjunction with UNMC) has resulted in basic research into causes of disease, cure and prevention and a vast number of applications such as developing bio-processing systems, creating monitoring and diagnostic equipment, exploring new surgical processes and devices, producing medicines, creating bio-compatible materials, developing bio-signal and imaging technologies, processing foods and vaccines, designing rehabilitation systems, and developing devices for human uses. Bio-medical engineering also includes the assessment, analysis and design of health, safety and clinic systems as well as the development of devices and systems to enhance independent living for the disabled. Engineered bio-resources includes several research areas that are vital to enhancing Nebraska's strengths and critical to the development of renewable and sustainable energy resources. Bioenvironmental engineering seeks to increase the sustainability of resources through bio-product recovery and utilization, sustainable manufacturing and the efficient use of water resources.

Manufacturing Nanotechnology, Processes, Systems and Logistics Research Focus Area: Manufacturing systems, logistical support and the processes of turning raw materials into products are building blocks of any economy. Advanced manufacturing and especially nanotechnologies are key elements to the development of new processes for creative solutions to production needs. Sophisticated procedures and equipment necessary for engineering measurement and data collection are recent examples of successful UNL research. Creating new

materials and material structures and developing new manufacturing processes to be used on very small components are examples of current materials research. Research using radio frequency identification which significantly influences the logistical management systems of manufacturing and construction worldwide is underway.

Sensors, Communications, Software and Information Engineering Research Focus Area: Computing, software and information systems are necessary to process, visualize and understand large amounts of data. Advanced computing and information technologies such as wireless and optical systems are needed to sense (collect), communicate and process information and are vital to future of social and economic development in agriculture, business, education, medicine, and other fields. Current research includes sensor materials, sensing devices, integrated intelligent sensors, identification of neutron sources, biological agents and commercial inventory, high performance computing systems, reliable software, and informatics for multi-faceted cross-disciplinary applications such as intelligent transportation systems and smart buildings, bioinformatics and geospatial decision-support systems, distance education and medicine, electronic commerce, and defense and security.

The research improvement opportunities in support of the focus areas have been identified as (a) \$400,000 annually for core facilities equipment, maintenance and operating materials, (b) \$100,000 annually for staff administrative support, and (c) \$1,000,000 annually for new faculty start-ups for equipment, graduate student support, professorships, and matching funds where appropriate.

Priority Action 4: The college will enhance its infrastructure and facilities. The most significant immediate need in the college is space. Both the lack of space and the poor quality of current spaces are important issues. Space is needed for research laboratories, classrooms for teaching medium sized classes (50 -75 students), offices for graduate students, and work space for support personnel. At the present time, the college has only one classroom on either the Lincoln or Omaha campus that can be used to teach a class of over 100 students. Additional access to classrooms will be essential as the college enrollment continues its ten year trend upwards. The current need is an additional 100,000 square feet in Lincoln and 150,000 square feet in Omaha. Renovation of Walter Scott Engineering Center, the GE Building and Nebraska Hall are needed to modernize laboratories, install improved safety barriers, enhance power systems, improve ventilation and replace deteriorating structural components. Recruiting undergraduates and graduates is being hampered by the lack of quality space. Gifts of research equipment have declined because of lack of available space.

The college requests that all space in Nebraska Hall be assigned to the college as it becomes available. The college will provide a detailed plan for the use of the space and justify the need for such space. The college requests that the Reunion Building be assigned to the college such that the college can either renovate or build a new building on the site with funding obtained by the college. The college will work to obtain an endowment to renovate/rebuild these facilities.

Priority Action 5: The college will promote public awareness of the college's contributions to Nebraska and the United States. Programs of excellence in nano-manufacturing, bio-processing,

and roadside safety are examples of activities that are well known nationally but lack public awareness locally. It will be a coordinated effort between UNL (Public Relations, Admissions, Graduate Studies, Distance Education and others), the College Advisory Board, the administration of the college, and the college departments to increase the public awareness of the successes of the college.

Within the last five years more college resources have been used to raise public awareness of the accomplishments of the faculty and students. Participation by students in international programs has grown tenfold. Distance education for master's degrees via Internet delivery outside of Nebraska began in 2004. Publications from the college include quarterly magazines, an online research journal, dynamic Web site and newsletters. The college recently began the Nebraska Engineering Forums. The program takes engineering faculty to various cities in the state to demonstrate the latest engineering practices and research updates to practicing engineers and interested others.

The public also needs to be made aware of the impact engineering can have on a local economy. For every \$1,000,000 of engineering research expenditure 36 new jobs have resulted. A graduate engineer, for example, will on the average earn \$3.5 million in salaries in their working career. The University of Alberta surveyed 10,000 engineering graduates and the 6.28% that responded reported starting 342 companies, which employed more than 20,000 persons. In addition, 257 of the companies started by engineers reported total annual gross revenues of \$7.2 billion. Thus the graduate engineers who answered the survey made substantial economic impact. Although the college has not taken an economic impact survey, it expects its results to be similar the one taken by the University of Alberta.

An additional \$50,000 per year is projected to meet the need for public relations.

College Resource Summary

Increasing the resource base in the college to be more closely aligned with colleges in the Top 40 engineering schools is part of the college's plan. Iowa State University will be used as benchmark because it is a regional competitor and detailed information was provided by Iowa State University. For example, Iowa State University spends \$188,746 per engineering faculty FTE annually (ISU faculty size is 183). In comparison Nebraska spends \$153,210 per engineering faculty FTE annually (college faculty size is 124 plus the 14 searches underway or 138). An additional \$35,536 per faculty for the 138 UNL engineering faculty would require an additional \$4,903,968 annually for the college to have the same resource base as Iowa State University. With this benchmark the college has the following plan to generate those funds and infuse those funds into its efforts to meet the opportunities described above.

First, the college expects to establish a professional fee from students in order to generate some additional funds. A fee of \$20 per credit hour per student per semester will be requested. The expected revenue from student fees would be \$1M annually. Second, resources will come from an expected increase of \$50M in endowments, which will generate \$2.25M annually. Third, an expected increase in indirect cost return from \$12M more in grants and contracts will generate \$1M annually. Fourth, other sources for \$0.655M annually will be raised, for a total of \$4.905

M annually.

The \$4.905 M increase in annual funding will be distributed as \$1.3 M for hiring new faculty; \$1 M for start-up costs; \$2 M for scholarships and fellowships; \$0.2 M for new staff hires to support recruitment and research efforts; \$0.4 M for improvements to core facilities; and \$.005 M for public relations.

Timeline to Achieve College Priority:

The timeline for the college to be in the Top 40 engineering schools is 10 years. The measure of our success will be evidenced by our ranking in the annual college issue of U.S. News & World Report.