

**North Carolina State University
College of Engineering
Annual Report Summary
Covering the period of July 1, 2009, through June 30, 2010**

Overview

The College of Engineering is the flagship engineering college in the University of North Carolina system. With 6,370 undergraduate and 2,399 graduate students in 12 departments, nine of which are administered in the College, it is the largest engineering college in the state and among the largest in the nation. The College is a leader in engineering education, research and outreach throughout the state, nation and world.

Despite the challenges created by the by the economic downturn in 2008-10, the College has maintained its long-term goal of “becoming and being perceived as the leading public college of engineering in the US and one of the preeminent colleges of engineering in the world.” This is consistent with the UNC Tomorrow plan for the College to become a “premier college of engineering.” The investments made by the state legislature and the University in support of this vision are appreciated. Since this goal was established in 2006, the College has realized a number of successes. These achievements have been recognized by the most recent *US News & World Report* rankings of graduate programs, which show that the College has moved up to 18th among public colleges of engineering and has risen from 31st to 30th overall. This represents a significant rise from the 2007 ranking of 34th overall.

The College’s strategic plan continues to focus on investments in people (faculty, staff) and infrastructure in interdisciplinary enabling technologies (Bio, Nano, IT) and areas of important societal need and impact such as energy and environmental systems, health systems, security and critical infrastructure. The College is also committed to providing its students an educational experience with depth in technical content and breadth in the “softer skills” consistent with the National Academy of Engineering vision of the “Engineer of 2020.” This emphasis is consistent with the five strategic areas developed by NC State and complements the academic mission of the University.

Research

These high aspirations have created a culture that has produced four NSF Engineering Research Center proposals in the last two years and other center and large group endeavors in some of the most competitive federal programs. One of the ERC efforts was funded, an \$18.5 million, five-year award that created the NSF FREEDM Systems Center at NC State. Now in its second year, the FREEDM Center has already established itself as a national leader in research and education in the area of distribution and management of renewable energy and the development of the distribution grid of the future. It has drawn significant attention to NC State as a national leader in energy-related research.

The College has seen its research expenditures increase from \$127 million in 2008-09 to a record \$134 million in 2009-10. Research awards have also increased from 514 awards totaling more than \$63 million in 2008-09 to 563 awards totaling more than \$83 million in 2009-2010. These awards indicate the strong reputation the College has at the national level and represent one of the many ways the College boosts the statewide economic development.

The College continues to have great success with new federal awards. Of particular note was the \$5.9 million in new nuclear energy research funding from the Department of Energy in 2009, more than \$3 million in continuation funding for the FREEDM Systems Center, and various other awards. The College has two proposals in the current NSF ERC competition, one of which was submitted with our College of Textiles as a partner, and another with the University of Miami. Research will continue to focus on promoting and supporting proposal efforts that are responsive to interdisciplinary group and/or center efforts as well as large external funding efforts for PhD student support, education and outreach activities. The internal challenge lies in providing the matching support and faculty growth necessary to be successful in these highly competitive efforts and their sustainability.

Highlighted Programs

While there have been many contributions to the growth in research activity, a major contributor has been the NSF FREEDM Systems Center mentioned earlier. Led by Dr. Alex Huang, the center brings together researchers to create the next-generation “Energy Internet” that will revolutionize the nation's power grid and speed renewable electric-energy technologies into every home and business. This spring, the new Keystone Centennial Science Center, home to the FREEDM Center, was completed and occupied. The new building provides a state-of-the-art high-bay laboratory for testing and development.

As mentioned previously, the College is also attracting significant funding for its nuclear engineering program. In spring 2009, the College received seven awards totaling \$5.9 million in new nuclear energy research funding from the U.S. Department of Energy (US DOE). This was the most awarded to any university for nuclear research during that round of funding.

In May 2010, US DOE announced that it is funding a major research initiative, the Modeling & Simulation for Nuclear Reactors Energy Innovation Hub, also known as the Consortium for Advanced Simulation of Light Water Reactors (CASL). NC State’s Dr. Paul Turinsky will serve as chief scientist for this Oak Ridge-led effort. DOE will fund CASL at a level of approximately \$122 million over five years – with the possibility that the contract will be renewed for an additional five years. NC State is expected to receive approximately \$11 million in CASL funding over the next five years.

Collaborations with other colleges are also important to the College. Examples of current collaborations include joint

academic programs with CALS, COT, CNR, PAMS and COM as well as numerous ongoing research, educational and outreach collaborations with practically every college at NC State. Examples of more recent major efforts include collaboration with the College of Textiles in a new NSF ERC proposal in nano-textiles, with the COM in the development of a new academic program in supply chain engineering and management, and the creation with CHASS of a new university-wide seminar series in Engineering and Public Policy. Other significant and continuing collaborations include pioneering work in the rapid prototyping of prosthetic devices for animals between faculty in the College and the College of Veterinary Medicine, collaboration with the College of Education in a number of new proposals related to K-12 education, collaboration with PAMS in nanotechnology and high performance computing related activities, joint efforts with CALS in many biofuels-related areas, collaboration between our Computer Science department and the College of Design in joint undergraduate senior projects, joint honors programs with CHASS (e.g., Franklin Scholars program), and the joint Biomedical Engineering department with the College of Medicine at UNC-CH .

Faculty

The successful results of the College's research program are directly tied to its faculty growth, which is why a major investment continues to be in faculty hiring. Fourteen new faculty joined the COE in 2009-10. Three of these were new department head hires including the College's first female department head. The hires also included three named distinguished professors as well as two additional female faculty hires. Substantial investments were also made in faculty start-up needs, staff support where appropriate, and other operating needs including those required by the College's growing undergraduate and graduate enrollment. The ability to provide competitive start-up packages in a responsive manner continues to be a challenge. This situation has been adversely impacted by the budget reductions of the last two years.

Over the last three years the College has added 9 women, 4 African Americans and 1 Hispanic faculty member, bringing its totals to 23 women, 14 African Americans and 5 Hispanics. A significant milestone was the hiring of the College's first female department head, Dr. Nancy Allbritton, in Biomedical Engineering. While the College is making steady progress we still have a ways to go to achieve a level of diversity in our faculty ranks that would mark it as a leader in this regard among its peers. The efforts of Dr. Christine Grant, Associate Dean for Faculty Development and Special Programs, have had a very positive impact on the College's faculty recruiting and retention efforts and have helped it move forward in an even stronger way to enhance faculty diversity.

Students

Even with the cuts required by the economic downturn, 2009-10 was one of the College's most successful recruiting years. The College welcomed a record number of first-year students in 2009. With an average GPA of 4.34 and 53 percent of those admitted in the top 10 percent of their high school graduating class, this was also the strongest first-year class in the College's history. Our total enrollment now stands at 8,769 students of which 6,370 are undergraduate students and 2,399 are graduate students. This is a 17 percent increase from the 7,446 students enrolled in the College just three years ago. The 6,370 undergraduate students now represent the 4th largest undergraduate enrollment among all US engineering colleges while the 2,399 graduate students represent the 11th largest engineering graduate enrollment in the country.

Distance education programs, which include the Engineering Online Graduate Program, the Computer Programming Certificate, and Bachelor of Science in Engineering (BSE) degree programs offered exclusively for residents in western and eastern North Carolina, have continued to grow. More than 1,200 students were enrolled in distance education courses during the last academic year, making Engineering Online the second largest engineering distance education program in the nation. Engineering Online continued to grow in 2009-10 with enrollment from residents in North Carolina increasing 10 percent. Residents in 65 of the state's 100 counties were enrolled in the program.

The College also offers 2+2 programs on the campuses of UNC-Asheville, UNC-Wilmington, Lenoir Community College and Craven Community College-Havelock. A complete four-year Bachelor of Science in Engineering (BSE) with a concentration in mechatronics is also available for students in Asheville, and students in southeastern North Carolina can pursue the BSE degree with a concentration in mechanical systems engineering in Havelock.

Efforts continue to focus on providing opportunities for undergraduate students to be involved in research and pursuing external support to scale up international opportunities. Investments continue to be made in the Engineering Entrepreneurship Program to provide a larger portion of the student body with this outstanding opportunity. Many of these efforts are guided by the National Academy of Engineering (NAE) "Engineer of 2020" report and the evolution of the College's curriculum to better address the needs of future engineering graduates. These efforts are also critical to preparation for the upcoming ABET accreditation visit in fall 2010.

Since the "Engineer of 2020" is already sitting in a middle school classroom, there is a sense of urgency in continuing to support faculty and staff efforts to enhance engineering education across the K-20 spectrum. Examples include support for the K-12 outreach activities in the NSF ERC and STC proposals, internal support for the Engineering Place, home of the COE K-12 engineering outreach activities, support for over 14 Engineering summer camps at NC State at elementary, middle and high school levels, and many other related activities. Most of these activities are supported through external grants from federal sources.

Rankings

The latest *US News & World Report* rankings of graduate engineering programs has the College 30th among our peers nationwide, up from 31st last year. The College has also moved up to 18th (from 19th) among public colleges of engineering. This improvement was fueled primarily by a 7 percent increase in research expenditures, a 37 percent increase in number of PhDs granted (from 114 to 157) and one of the most selective admission rates in the country. But since “no one is standing still”, maintaining and improving upon this ranking will continue to be a significant challenge.

Extension and Engagement

A major activity in the COE continues to be the Industrial Extension Service (IES), an organization that impacts the state in many different and vitally important ways. In addition to its traditional support of small businesses and manufacturers, it now serves the healthcare, pharmaceuticals and financial sectors, among others. In 2006, IES set a goal to create \$1 billion in economic value to manufacturers in North Carolina during calendar years 2006-2010, a campaign called 1B4NC. With results of a survey conducted in the last quarter of 2009, that goal has been reached one year early. This year, IES also led the development and implementation of a four-part workshop series around different manufacturing-related themes (advanced materials, aerospace manufacturing, biomanufacturing and “green” manufacturing) that have linked many faculty members with industries throughout the state in these areas.

Another important extension and engagement activity in the COE is the NC Solar Center, which acts as a focal point on solar energy technologies and building practices. The College continues to support this activity and assists the center’s efforts to obtain legislative support for continuing its efforts.

BTEC, or the Biotechnology Training and Education Center, is also a critical player in extension and economic development, particularly in providing the human resources needed to grow and enhance the biomanufacturing sector in North Carolina. Its efforts, which include the involvement of the NC community college system, are supported by bio-related industries in the state as well as the Golden LEAF Foundation.

During 2008-09, the College saw the fruits of its collaborations with the NC Department of Commerce with the news that Spirit Aerospace had decided to establish a major aerospace manufacturing facility in Kinston, NC. Projections are for more than 1,100 jobs including more than 300 new engineering-related positions once the plant is in full operation. More recently, the College played a major role in an ongoing effort to attract another aerospace manufacturer to the Western Carolina area.

External Relations

NC State Engineering Foundation Inc.: The economic situation also had a negative impact on endowments within the College, with 69 percent of its endowments "underwater" as of June 30, 2009, estimated lost spending for 2010-11 will be about \$1.4 million; \$448,445 in scholarships, \$136,180 in fellowships, \$483,680 in professorships, and \$287,400 in programmatic endowments. Once again donors will be contacted and asked to supplement their endowments during these challenging times. Due to positive responses from donors and a special allocation from the Chancellor, the College was able to renew all commitments for 2009-10.

Fiscal year 2009-10 gifts and grant commitments from corporations, foundations, and individuals exceeded \$13.5 million and gifts and pledges made directly to the NC State Engineering Foundation totaled more than \$10.5 million. The Foundation Board of Directors and staff continue to focus on increasing alumni involvement and giving to benefit all areas of the College, as well as educating current students on the role of the Foundation and its philanthropic impact on their education. Private support enhances the College's ability to attract and retain the best faculty and students, develop new programs, enhance existing initiatives, create and renovate facilities, upgrade equipment and licenses, and more, by providing a flexible revenue source above and beyond monies that are provided by state.

Alumni: Over the last four years the College has made a strong effort to increase the level of alumni activity and support through its "Meet the Dean" event program. Although most of this activity was undertaken in 2006-07 and 2007-08, the College has continued on a more limited scale in 2008-10 with various events in Florida (North Palm Beach, Melbourne, and Orlando) as well as Baltimore, Maryland (Northrop-Grumman) and RTP (NetApp). The College has now held more than 24 of these events and met directly with over 700 alumni and guests delivering a message on where the College is today, its vision and goals, and the support that it seeks. These interactions have been particularly critical in increasing the College's active alumni base and addressing the "underwater scholarship" situation created by the economic downturn of the last two years.

Industry: During 2009-10, a number of meetings were held with industrial partners and clients of the COE such as IBM, Cisco, Northrop-Grumman, Exxon-Mobil, Progress Energy, Duke Energy, Harris, NetApp and many others to request support for the research, learning and outreach efforts of the College. The College's Engineering Career Fair continues to be one of the largest in the country with over 300 companies attending events in the fall and spring semesters of 2009-10. The Dean also served as an invited panelist at the NC Business and Education Summit sponsored by the NC Chamber last August in Durham. This activity was attended by numerous industrial entities and organizations.

Infrastructure

Engineering Buildings I and II have provided much-needed research labs and equipment. Engineering Building III is expected to be completed in the summer of 2010 with move-in anticipated to occur in August 2010. EB III will house the Joint NCSU/UNC Department of Biomedical Engineering and the Department of Mechanical and Aerospace Engineering and will provide state-of-the-art laboratory space, a new wind tunnel facility and much-needed office and classroom space. Once EB III is occupied, more than two-thirds of the College will be located on Centennial Campus.

Unfortunately the current economic downturn and the legislative budget cuts have put funding for the fourth and fifth engineering buildings on NC State's Centennial Campus in jeopardy. The NC Senate pushed forward a bill to provide a bond for funding the planning and construction of EB IV and other buildings and capital improvements; however, as of the writing of this report, the House has not taken up the bill for consideration. Support for the design and construction of these buildings remains a priority and is critical to the growth and success of the College and University.

Issues of Concern for the Future

NC State and the state of North Carolina can take pride in the outstanding accomplishments and excellent national and international reputation of its flagship College of Engineering. While the College made significant progress in many areas of engineering research and education prior to 2007, this progress had not kept pace with that of other colleges of engineering that were once comparable peers. With the support of our state legislature, efforts since 2007 have focused on addressing faculty and capital infrastructure needs that are critical for the College to take its rightful place among the leading colleges of engineering in the world.

The operational support received in 2009-10 allowed the College to hire 14 more faculty in interdisciplinary areas such as bioengineering and health systems, energy, and environmental systems. Investment in this area is an important step in increasing the number of research active faculty to a level more comparable with peer colleges of engineering. The College's ability to continue to recruit and retain outstanding faculty will be a major challenge as we move forward with the growth of the College. This challenge is made more difficult by the recent downturn in the economy and the resulting budget cuts realized in FY08-09 and planned for FY09-10.

Similarly, the capital infrastructure support provided since 2007 has facilitated the construction of Engineering Building III, scheduled to be completed in 2010. This is also a critical step in the College's move to Centennial Campus, its future growth, and the realization of its mission. While the current budget situation has delayed support for the planning and design of EB IV and V and their eventual construction, funding for these buildings *and the completion of the move of the College of Engineering to Centennial Campus is our highest priority.*

Future success depends significantly on the continuation of the legislative support that has already played such a vital role in the College's improvement over the past several years. Investments in 2009-10 brought the College back to 30th in the *US News* rankings; however, its peers have also increased investments in key areas. It is critical for the College to maintain the positive momentum that has improved its stature nationwide. Of equal importance is the impact legislative support has in growing both the quality and quantity of engineering talent the College provides to the state and the economic impact of the many endeavors carried out by the College throughout the state. Many of these endeavors are a result of the federal and external support generated by these same faculty that have been hired through the legislative allocation. College faculty have already focused on attracting federal stimulus funding and have successfully attracted important investments from the Department of Energy, the National Science Foundation and other federal agencies. These other sources of support are critical; however, they do not replace the necessary investments from the state.

With one of the largest enrollments in engineering in the country, the College is a major producer of high-quality engineering talent for the state and nation. This distinction helps North Carolina attract major companies and helps fuel the state's economy. The ability to grow the College's enrollment and provide greater access to engineering education throughout the state depends on legislative support. Other concerns and challenges include increasing research expenditures, increasing endowment holdings for scholarships, fellowships and professorships, and expanding distance education activities across the state, nation and world.