

Annual Report 2018-2019
College of Engineering
North Carolina State University

Overview

NC State's College of Engineering is the flagship engineering school in the state of North Carolina and one of the premier colleges of engineering in the United States. Through its three-fold mission of teaching, research and extension, the College plays a vital role for the state by providing a world-class education for its students and serving as a driver of innovation and economic progress.

With more than 10,000 students, the COE is ranked in the top 15 among engineering schools nationally in both undergraduate and graduate enrollment and also ranks in the top 15 nationally in bachelor's, master's and Ph.D. degrees awarded. At the same time, the College is recognized for the very high quality of its programs. The *US News & World Report* rankings of top graduate engineering programs has placed NC State at 24th nationally and 12th among public institutions two years in a row. The College has joined an elite club of engineering colleges with more than \$200 million in annual research expenditures. Providing an excellent engineering education to so many at such an affordable cost is a remarkable achievement.

The College's long-term goal is to "become and be perceived as the leading public college of engineering in the U.S. and one of the preeminent colleges of engineering the world." The University's strategic plan sets as a goal emerging as a preeminent technological research university and we believe that having a world-class college of engineering is essential to meeting this goal.

A key element in achieving this goal is our commitment to student success. That means providing graduate and undergraduate education that not only offers clear instruction on engineering fundamentals but also includes an emphasis on research opportunities along with exposure to entrepreneurship, international perspectives and the social sciences. That commitment can only be realized by continuing investments in attracting and retaining the best faculty members and in teaching and research infrastructure.

With the continuing move to Centennial Campus, the College will benefit from world-class facilities and from the proximity that encourages interdisciplinary discovery. This move, when completed, will help unlock NC State Engineering's full potential.

Our alumni continue to make us proud with their achievements and serve as the best ambassadors for the College. Bachelor's and master's electrical engineering alumna Christina Koch is serving on the International Space Station and mechanical engineering alumnus Jeff Williams continues to serve as chief operating officer at Apple and has seen his profile and areas of responsibility grow this year. Chemical engineering alumnus Frank Culberson received the Watauga Medal in February in recognition of his service to the University.

Changes in the Service Environment

The COE engineering enhancement fee continues to play a critical role in supporting significant enhancements to the undergraduate and graduate student experience. This includes upgrades of research laboratory space and acquisition of research equipment for undergraduate and graduate research efforts as well as much-needed funding for support of graduate research assistants. The College has also been able to provide enhanced opportunities for undergraduates to engage in a wider range of activities such as our Research Experiences for Undergraduates (REU) program, our NAE Grand Challenges Scholars program, Entrepreneurship programs, newly developed North Carolina Rural Internship and Federal Government Internship programs, Immersive Study Abroad programs, and others that are providing our students with both the breadth and depth consistent with a high-quality 21st century engineering education. At the graduate level, this support has expanded student travel to professional meetings, provided career services, speaking and writing support, mentored research and teaching experiences and others. In addition, the premium tuition program in three master's programs has been fully implemented. Staff positions have also been created in the career development and advising areas. Since overall student enrollments at all levels continue to increase, these new investments are critical in assuring that this increase in "quantity" is not happening at the expense of the "quality" of the student experience and ultimately the success of our students.

The fee, along with assistance from the Provost, have also allowed the College to support research equipment needs for new tenured and tenure-track faculty members, retain a number of our most outstanding faculty members, and continue to improve its facilities and infrastructure. This has resulted in significant increases in research productivity and growth in graduate enrollment. The College hired 15 new tenured or tenure-track faculty members in 2018-19 with an investment of \$7.2 million from the College, in addition to Provost support for the hires. It is projected that 19 faculty hires will be made in 2019-20.

As reflected in the campus 2020 enrollment plan, the COE is committed to expanding its number of doctoral students by 50 percent over the fall 2011 headcount. In order to achieve this goal while maintaining the College's admirable Ph.D. time-to-degree statistics, it will be necessary to continue to increase the number of faculty members available to mentor these doctoral students while also increasing the financial resources available to support the students. Studies have shown that the two greatest impediments to Ph.D. completion are lack of financial support and poor advising.

Major Initiatives

The College has made significant investments in research efforts and to match and cost-share to attract large research grants. As a result, several large national research projects have been awarded this year – the Hub Site Portal for the IBM Quantum Computing in North America, a new NSF MRI Equipment Grant, and renewed – CASL, CNEC and FREEDM no-cost extensions, ASSIST critical seventh year renewal, and the Power America critical fourth year performance renewal.

As mentioned above, the Engineering Enhancement Fee continues to give the College an opportunity to make competitive investments in new faculty members and students. We have continued investing in expanding research opportunities and support for undergraduate and graduate students. Targeted initiatives are providing new and/or enhanced opportunities for our undergraduate students to engage in a broader range of activities linked to our NAE Grand Challenges Scholars program, such as global immersion programs, entrepreneurship, study abroad, rural initiatives and various others. At the graduate level, the fee is supporting student travel to professional meetings, career services, speaking and writing support, mentored teaching experiences, RA/TA experiences and others.

The COE continues to raise private donations toward its \$60 million commitment to the construction of Fitts-Woolard Hall and has commitments of \$48.2 million in place. Completion of this major infrastructure project in time for the fall 2020 semester represents a vital next step in the College's move to Centennial.

The College is working toward the addition of a Ph.D. in engineering education program with plans to be in operation in fall 2020. The addition of this program, which several of our peer institutions have in place, will enhance our already strong efforts in engineering education.

Diversity

The College is committed to supporting a diverse faculty, staff and student body that is welcoming to all individuals. Efforts within the College to increase diversity continue.

In 2018-19, the COE added seven female faculty hires (one tenured, five tenure track and one teaching assistant), bringing the total to 70 female faculty members. Since 2006, the College has essentially tripled the total number of women and doubled the number of underrepresented faculty members. While the College has made good progress, we still have farther to go to achieve a level of diversity in our faculty that would mark us as a leader in this regard among our peer engineering colleges.

The College has made excellent progress in recruiting female students. Our fall 2018 first-year engineering class was 27.9 percent female, which set the College well above the national average.

Instructional Program Advances

- Research experiences for COE undergraduates continue to be a high priority in the College, as is the Engineering Entrepreneurship Program. Funds made available from the engineering enhancement fee have allowed the College to increase the offerings in these and other high-impact experiences available for students.
- A new student internship program implemented in conjunction with the College of Engineering

at the University of Arkansas serves as a nationwide pilot for immersing engineering students in congressional and federal offices and attracting engineering students into public service careers. More than 60 students applied for the four internships provided by NC State.

- The COE Academic Affairs and Industry Expansion Solutions (IES) offices implemented the *Rural Works!* Program, which provides students with summer internships in underserved regions around the state. In summer 2018 (pilot year), the COE supported four students, and in summer 2019 this number grew to 18.
- The College has also been actively engaged in efforts to better define and provide a career path for non-tenure-track faculty members, particularly non-tenure-track teaching faculty members, as a way of enhancing quality and commitment to teaching. These efforts have received national attention and are being disseminated through presentations at national engineering education forums.
- The College supports faculty and staff efforts to impact and enhance engineering education across the P-20 spectrum. Examples include:
 - Continued support for P-12 outreach activities in NSF ERC proposals
 - Internal support for The Engineering Place, home of the COE P-12 engineering outreach activities
 - Support for more than 40 engineering summer camps at NC State for elementary, middle and high school students and satellite camps in Rocky Mount, Hickory, Havelock and Charlotte
 - Third year activities of an NSF Research Experience for Teachers (RET) grant, PIs Drs. Lavelle and Bottomley.
- Our faculty and staff also continue to play an important role in the development and implementation of the NC State-Wake County Early Career High School on our campus, including their role in curriculum development based on the concepts of the NAE Grand Challenges. This school recently was nationally recognized as one of the two leading magnet schools in the country.

Research

The College is committed to undertaking research endeavors that reach across traditional engineering disciplines and work in areas of great societal impact. To that end, we have undertaken a years-long effort to invest in research infrastructure, including in faculty members, graduate students, equipment and facilities.

The College has been recognized as being one of the most prodigious engineering colleges in the country when it comes to research expenditures and has been awarded with a number of new research awards and renewals: the Hub Site Portal for IBM Quantum Computing in North America; a new NSF MRI Equipment grant; renewed no-cost extensions for CASL, CNEC and FREEDM; a seventh-year renewal for ASSIST and a fourth-year performance renewal for PowerAmerica.

Faculty members have been productive in their pursuit of the College's next NSF Engineering Research Center (ERC); faculty members submitted four ERC pre-proposals and three received planning grants from NSF to pursue their ideas.

Other highlights include:

- Total research expenditures for the year were estimated in mid-July to be \$197,902,570.
- The College saw increases in excess of seven percent in research expenditures and six percent in F&A generated in 2018-19 compared to 17-18.
- Twenty-five faculty members within the College have had research awards of more than \$1 million this year, with two at the assistant level and six at the associate level.
- Five faculty members received National Science Foundation CAREER Awards.
- Dr. Ashley Brown, assistant professor in the UNC/NC State Joint Department of Biomedical Engineering (BME), received a five-year, \$500,000 award in support of her project, "Dynamic microgels that mimic platelet behavior to promote healing."
- Dr. Matthew Bryant, assistant professor in the Department of Mechanical and Aerospace Engineering, received a five-year, \$500,000 award in support of his project, "Muscle-Inspired Load-Adaptive Actuation for Compliant Robotics."
- Dr. Michael Daniele, assistant professor in the Department of Electrical and Computer Engineering and in BME, received a five-year, \$500,000 award in support of his project, "Reconfigurable Microfluidic-Microbalance Sensors to Monitor and Optimize the Performance of Microphysiological Models."
- Dr. Xiaogang Hu, assistant professor in the UNC/NC State Joint BME Department, received a five-year, \$500,000 award in support of his project, "Robust Decoding of Neural Command for Real Time Human Machine Interactions."
- Dr. Chris Martens, assistant professor in the Department of Computer Science (CSC) received a five-year, \$555,000 award in support of her project, "Explorable Formal Models of Privacy Policies and Regulations."

Extension and Outreach

The Engineering Place for K-20 Outreach The bridge programs for female and minority students and K-12 summer camp programs are resulting in increasing numbers of female engineering students enrolling in the College, due to the strength of COE's collaboration and outreach to K-

12 students and teachers. We are tuning our partnerships to target students from groups that are underrepresented due to ethnicity as well.

The various Engineering Place programs, including Engineering on the Road, Family STEM nights, summer camps, campus visits, the Solar House and others served more than 17,000 students in North Carolina and nationwide this year. Staff worked with schools in New Hanover and Wake Counties on incorporating engineering into school curriculum, provided teacher workshops to several hundred teachers on integrated STEM and presented at several different teacher conferences. Engineering camps continue to be a great success and have grown across the state, with partner camps in Hickory, Charlotte, Wilson, Pembroke, Lumberton, Spindale, Havelock, Roxboro and Morganton. The week-long K-12 day and residential camps hosted about 1,800 campers. The Engineering Place had twice as many applicants as slots for day camps for grades 3-10 and three times the applicants for 11th and 12th grade overnight camps. The new curriculum (integrating engineering with language arts, math, social studies and science) that was developed last year has proven to be very interesting to schools in other counties across the state, and staff produced several kits to go with it, which have been delivered to three schools with three more interested.

Industry Expansion Solutions (IES) As the statewide extension service of the College, Industry Expansion Solutions (IES) partners with North Carolina industry to catalyze the transfer of knowledge and technology in support of economic development. IES supplies North Carolina businesses with the tools and services they need to help increase productivity, efficiency, quality and profit. Over the past year, IES has realized new partnership opportunities that have better positioned it to address a myriad of challenges its customers are facing. For example, significant time and resources have been secured and dedicated to raising awareness of and compliance with the newly established cybersecurity and digital supply chain requirements that determine a company's eligibility to conduct business within certain sectors.

In 2018-19, IES delivered 350 industry fee-for-service projects and 113 open enrollment courses and workshops for a total of 30,810 contact hours, serving 1,500 students. In all, IES recognized approximately \$2.2M in fees for services and \$913,305 in open enrollment and professional learning state appropriated receipts.

IES has served as the administrator for the North Carolina Manufacturing Extension Partnership (NCMEP) Center since 1995 and is the official representative of the MEP National Network™ and NIST MEP in North Carolina. IES, through NCMEP, helps North Carolina manufacturers with important networking opportunities through programs like Manufactured in North Carolina (MNC), the premiere searchable supply chain directory for North Carolina manufacturers and the newly rebranded membership-based MNC Network educational and networking program. In 2018, IES partnered with *Business North Carolina* to host the fourth mfgCON Conference, delivering two days of keynotes, presentations and breakout sessions and attracting more than 400 attendees in Durham, NC.

Biotechnology Training and Education Center (BTEC) The undergraduate and graduate enrollment in BTEC courses remains strong at more than 820 students. A new accelerated bachelor's to master's (ABM) program was approved this year. The program enables chemical engineering undergraduates to obtain a bachelor's degree in four years and master's in biomanufacturing in a fifth year. Demand for open-enrollment and custom courses for professionals was also extremely strong, with enrollment at an all-time high of more than 450 participants. The custom course program served both returning and new clients seeking to fill knowledge gaps and learn the latest biomanufacturing trends. The number of bioprocess and analytical services projects completed for industry and academic clients remained strong. Revenues from the professional development program and bioprocess and analytical services programs were at or near all-time highs.

This year, BTEC has been a lead or partner on nine projects funded by the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL). Of those nine, BTEC has led three projects in the areas of bioprocess automation, gene therapy vector production and single-use processing technologies. These topics are critically important to modern biomanufacturing, and the work will enable BTEC to expand its course offerings and to work even more closely with the industry on solving process and analytical challenges. Similar to last year, state funds earmarked for NIIMBL projects were used to support these projects by enabling the procurement of new equipment, which has significantly enhanced BTEC's laboratory capabilities. BTEC will continue to strengthen its research activities by working both with NIIMBL and other outside agencies and by hiring additional staff to support these projects and oversee research activities. Over the past few years, NIIMBL-related activities have put BTEC in a position to become a key player in applied bioprocess research and development for years to come.

Faculty

The College hired 15 new tenured or tenure-track faculty members in 2018-19 with an investment of \$7.2 million from the College, in addition to Provost support for the hires. It is projected that 19 faculty hires will be made in 2019-20.

COE's 2013 Strategic Plan called for increasing the number of tenured/tenure-track faculty members in the College to 400 by the year 2020. COE is now at 310 tenured/tenure-track faculty members. The College is also projecting 19 faculty hires in 2019-20. Together with seven retirements/faculty resignations, this will bring COE to 322 T/TT faculty. Our revised hiring plan for the next four years reflects 41 total hires, of which 11 are projected to be new hires. If this happens, it would mean that COE would level out at about 333 T/TT faculty members in 2023.

The Faculty Advancement team continues to lead faculty professional development initiatives connecting COE faculty members with federal funding agencies, each other and faculty members in other NC State colleges. New investments include: an interdisciplinary two-day COE DC Research Clinic connecting 25-35 faculty members annually with federal funding agencies in

Washington DC and new workshops on faculty skills development and enhancements in the joint 4-day COE/COS new faculty orientation workshop.

Faculty Highlights

- Dr. Roger Narayan, a professor in the UNC/NC State Joint Department of Biomedical Engineering (BME), was selected as an RTI International University Scholar for the 2019-20 academic year. Dr. Narayan was also named to the inaugural class of Provost Faculty Fellows.

- Dr. Donald Bitzer, Distinguished University Professor in the Department of Computer Science (CSC), and Dr. Youngsoo “Richard” Kim, Jimmy D. Clark Distinguished University Professor in the Department of Civil, Construction, and Environmental Engineering (CCEE), received the Alexander Quarles Holladay Medal for Excellence, the highest honor bestowed by NC State and the university’s Board of Trustees.

- Dr. Veronica Augustyn, assistant professor in the Department of Materials Science and Engineering, received a Sloan Research Fellowship.

- Dr. Michael Escuti, professor in the Department of Electrical and Computer Engineering (ECE), was named a Senior Member of the National Academy of Inventors

- Dr. Afsaneh Rabiei, professor in the Department of Mechanical and Aerospace Engineering (MAE), and Dr. Cranos Williams, associate professor in ECE, received 2019 Alcoa Foundation Engineering Research Awards.

- Dr. Youngsoo “Richard” Kim, Jimmy D. Clark Distinguished University Professor in CCEE, was named the thirty-fourth recipient of the RJ Reynolds Tobacco Company Award for Excellence in Teaching, Research and Extension.

- Dr. Lilian Hsiao, assistant professor in the Department of Chemical and Biomolecular Engineering (CBE), received the 2019 Marion Milligan Mason Award for Women in the Chemical Sciences.

- One faculty member received a Named Professorship

- Dr. Saad Khan was named the INVISTA Professor in CBE

- Seven faculty members received Distinguished Professorships

- Dr. Yousry Azmy was named the Duke Energy Distinguished Professor in the Department of Nuclear Engineering (NE)

- Dr. Jay Baliga was named the Progress Energy Distinguished University Professor in ECE

- Dr. Subhashish Bhattacharya was named the Duke Energy Distinguished Professor in ECE
- Dr. Paul Franzon was named the Cirrus Logic Distinguished Professor in ECE
- Dr. Ayman Hawari was named a Distinguished Professor in NE
- Dr. James Lester was named a Distinguished University Professor in CSC
- Dr. Orlin Velev was named the S. Frank and Doris Culberson Distinguished Professor in CBE
- Fellows of their professional organizations
 - Dr. Lisa Bullard, Alumni Distinguished Undergraduate Professor in CBE, was named to the American Society for Engineering Education Academy of Fellows
 - Dr. Louis Martin-Vega, dean of the College of Engineering, was named a Fellow of the American Association for the Advancement of Science
 - Dr. Koji Sode, professor in BME, was named a Fellow of the National Academy of Inventors
 - Dr. Timothy Menzies, professor in CSC, was named a Fellow of the Institute of Electrical and Electronics Engineers
 - Dr. Frank Mueller, professor in CSC, was named a Fellow of the Association for Computing Machinery
 - Dr. Alejandra C. Ortiz, assistant professor in CCEE, was selected as a 2018 Early-Career Research Fellow within the National Academies' Gulf Research Program
 - Dr. Srinath Ekkad, R.J. Reynolds Professor and head of MAE, was named an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA)

Students

Undergraduate enrollment The fall 2018 undergraduate enrollment was 6,919 (1,371 first-year, 308 new transfer, 191 first-year, 1,176 sophomores, 1,501 juniors, and 2,372 seniors). Enrollment of women increased to 1,752 (25.3 percent). Enrollment of minority students was 667 (9.6 percent) in fall 2018. Fall 2018 minority enrollment included 227 African Americans, 332 Hispanic students, 19 Native Americans and 89 minority students of more than one race.

Graduate student enrollment Graduate student enrollment for fall 2018 was 3,364 (2,046 master's and 1,318 doctoral). International students made up 61.9 percent (2,081 students) of the enrollment; 25.1 percent (845) of the students were women. Minority enrollment was 3.2 percent (110) of all students or 8.6 percent of domestic students.

Growth in student enrollment Our current total enrollment of 10,283 (undergraduate plus graduate) represents a 36-percent increase from the total COE enrollment of 10 years ago.

Undergraduate degrees awarded The number of bachelor's degrees awarded during 2018-19 was 1,699, compared to 1,552 for the 2017-18 year.

Graduate degrees awarded The number of graduate degrees awarded during 2018-19 was 1,203 (1,008 master's degrees and 195 doctoral degrees). That compares to 1,209 graduate degrees awarded during 2017-18 (1,027 master's degrees and 182 doctoral degrees).

Undergraduate recruiting During fall 2018, Engineering Academic Affairs hosted four on-campus recruiting events for prospective fall 2019 applicants. Beyond the University's Open House, the College hosted three fall recruiting visitation days, two of which were specifically targeted toward women and underrepresented minorities in engineering. Additionally, Engineering Academic Affairs hosted and paid visits to a number of NC community colleges, high schools and partner institutions to speak directly to prospective first-year and transfer students alike.

During spring 2019, Engineering Academic Affairs offered nine yield events for students accepted for fall 2019. One such event was offered specifically for women and highlighted the Women in Science and Engineering (WISE) and the Women in Engineering (WIE) programs. Another program focused on minority freshmen students and highlighted both the Minority Engineering Programs (MEP) and WIE. Both events were designed to increase enrollment of women and underrepresented students and make the opportunities and community support aspects for these populations more visible to prospective students.

Included in the College's spring yield events were five Experience NC State visitations offered by the university for accepted freshmen. Each College event included information sessions, student panels made up of Engineering Ambassadors, parents' sessions and tours of Centennial Campus. Additionally, the Engineering Open House in March 2019 drew approximately 3,500 people including admitted and prospective high school, middle school and community college students plus parents.

Graduate student recruiting. Master's applications for the five years ending in 2018-19 decreased by 6 percent. While any decrease is undesirable, COE has been much less affected by the national reduction in international applicants than have many of our peers. Interest remains strong, despite the fact that most masters' students are self-supporting.

Doctoral applications during this same period decreased by 7 percent, which represents a challenge to our ability to grow at the doctoral level. COE master's and doctoral applications for the 2018-19 year represented 49 percent and 39 percent of the university total, respectively.

In the last five years, expenditures on COE graduate student recruiting and educational enhancements from all sources, including the engineering enhancement fee and the Provost's office, have increased by more than a factor of 5X. For the 2018-2019 academic year, the College awarded 37 full fellowships, with a stipend of \$30K for 12 months, and tuition and fees included.

Other externally funded fellowships include 10 from the GAANN (Graduate Assistance in Areas of National Need) program, 15 National Science Foundation Graduate Research Fellowships, four DOE NEUP fellows and 10 NSF Research Traineeships.

Distance Engineering Education Programs

The College offers a broad and diverse set of distance engineering education courses and degree programs for students in North Carolina, across the United States and in other countries. Sixteen online master's degree programs in engineering and computer science, an undergraduate Computer Program Certificate program, three 2+2 undergraduate site-based programs and two four-year site-based degree programs are part of the distance education programs administered by the College. Five new graduate certificates are now in the approval stage for future offering in 2019-20. Both the Mechatronics Engineering program in Asheville and the Mechanical Systems Engineering program are ABET accredited as distance programs and have had an increase in enrollments and in graduation rates.

Approximately 526 working professionals were enrolled in graduate classes as matriculated students, the majority of whom are located in North Carolina and the surrounding states. Graduates of the online programs totaled 106, with 35 students graduating from the site-based programs. The College offered 273 graduate and undergraduate online courses during 2017-18 and 50 courses during the 10-week summer term. *US News & World Report* ranked both the Graduate and Computer Science online programs in the Top Ten Best Online Programs in 2019.

Women and Minority Engineering Programs (WMEP) at NC State are known as a national leader in recruitment, retention, graduation and placement of outstanding engineers. The merger of previous disparate programs for women and for underrepresented minority students has accelerated the effectiveness and reach for WMEP. Although some programs are targeted more closely at underrepresented minority students, by definition, they include some female students. Similarly, programs targeted at women include students who identify as belonging to underrepresented groups. The accounting for intersectional identities has been a positive factor toward program efficacy.

Programs such as the Tools Workshop in the fall and Taste of Engineering in the spring remain signature programs for WMEP during the school year. During the summer, two bridge programs were hosted for students. The Summer Transition Program for minority students remains a six-week program to bring new students to campus during the second summer session before their freshman year to help them make a smooth transition from high school to college. For the summer of 2018, STP was offered in partnership with a University bridge program, known as Smart Start.

ESCAPE to Engineering is a one-week experience for accepted female students before their first year. Offered either just before or just after Orientation, ESCAPE is designed to provide social capital, engineering experiences and expertise with the campus that will help the women feel as if they are coming home when they arrive for fall semester. Between 50 and 70 young women participate in ESCAPE each year.

Additional WMEP initiatives are specially designed to recruit and retain talented minority engineering students. The Overnight Minority Recruitment Weekend, geared toward high school seniors who have been admitted to the College, hosted 16 admitted minority students (nine females and seven males) along with approximately 40 family members/ guests in spring 2019, with 21 (13 females and eight males) NC State minority engineering students serving as hosts/volunteers. Of the 16 participants, eight paid enrollment deposits at NC State.

Engineering Career Fair

The NC State Engineering Career Fair continues to be one of the largest career fairs of its kind in the country, drawing top companies in sectors that include energy, healthcare, transportation, computer networking and software development.

During the two-day fall event, 338 companies registered to attend (of those, 31 cancelled in the aftermath of Hurricane Florence). There were 6,211 job, internship and co-op seekers in attendance (of those, 1,272 were from outside NC State). During the single-day spring event, 179 companies participated and 2,973 job, internship and co-op seekers attended (of those, 674 were from outside of NC State).

Dinners with the Dean

Held in November of the 2018-19 academic year, this event gives the dean of engineering an opportunity to have informal interactions with members of several student groups and gather valuable information about how well the College is meeting its goal of enhancing student success. Dinners with the Dean is sponsored by the COE and implemented by the Engineering Student Council.

Fundraising

Fueled by strong support for Fitts-Woolard Hall and the Think and Do the Extraordinary campaign, the NC State Engineering Foundation had another excellent fundraising year with giving totals to the College at \$19,090,566.

Endowments to the College generally fall into one of three categories: scholarships, named professorships and fellowships. There are now 313 permanently endowed scholarships in the College and 56 permanently endowed named professorships. Total endowment support for the College is \$139.7 million as of Dec 31, 2018, including directly owned assets as well as endowments held outside of the Engineering Foundation.

The annual giving program for the COE raised a total of \$1,504,343 for the College of Engineering Leadership Fund and all nine department enhancement funds. The Dean's Circle, the leadership annual giving society, grew by 17 members, bringing our total membership to 504 alumni and friend donors, representing a 3-percent increase from the previous year. These gifts often represent our “pipeline” for major gifts and an important part of the College’s overall advancement plan.

The Think and Do the Extraordinary Campaign began in 2013 and concludes in 2021. The College of Engineering's goal is \$230 million and thus far has raised \$182,108,859.

The College and Foundation continue to enjoy strong support from alumni volunteers serving on the Foundation Board of Directors and across the departments. Suzanne S. Gordon (CSC '75, MA '75, ST '80) serves as the president of the board and is the first woman to hold that position. Gordon has also served as a member of the NC State Board of Trustees, the Alumni Association Board of Directors and the College of Management Advisory Board. She is a Distinguished Alumna of both the College of Engineering and the College of Physical and Mathematical Sciences.

In an effort to increase involvement by young graduates, the Foundation’s Young Alumni Advisory Board has grown to include 26 young professionals, representing various engineering disciplines from NC State classes of 2003 and later. The board held social events during the 18-19 academic year tied to homecoming and spring commencement.

Building on the momentum from a transformative \$25-million gift from engineering alumni Edward Fitts and Edgar Woolard in 2018, the Foundation has continued to raise funds for Fitts-Woolard Hall. Of the \$60 million in private donations promised by the College, \$48.2 million has been committed. The facility, which broke ground in April 2018, is scheduled for completion in June 2020.

The Foundation is committed to closing the remaining fundraising gap so that the College will not have to incur debt service to finance its commitment to the cost of constructing this vital new facility.

Administration

- Griffin Lamb began her tenure as assistant dean for development and college relations and executive director of the NC State Engineering Foundation on May 1, 2019.
- Virginia Teachey announced that she will leave her position as assistant dean for finance and business management to accept a position as vice chancellor at UNC Pembroke. The College has begun the search process to find her successor.
- Dr. Gregg Rothermel assumed the position of head of the Department of Computer Science on Nov. 1, 2018.

- Dr. Nancy Allbritton, Kenan Professor, announced that she will step down from her role as chair of the UNC/NC State Joint Department of Biomedical Engineering effective Dec. 31, 2019.

Recommendations and Concerns for the Future

As the COE continues to move up in most every category—research expenditures, quality of students and faculty members, graduation rate of undergraduates, quality of programs, and *US News* rankings—our peer institutions continue to improve as well. So, while we celebrate the many accomplishments outlined in this report, we are mindful that “*no one is standing still*” and that we must continue to work hard toward our goal of becoming a preeminent college of engineering.

In particular, other states continue to make significant commitments to our peer colleges of engineering and aspirational peers to grow faculty size and improve existing or build new infrastructure. These investments are strategic to increase the recruitment and retention of top faculty members and students but also to garner attention from top industry and business. The investments in new infrastructure among engineering colleges emphasizes the importance of our efforts to complete Fitts-Woolard Hall and continue to move toward completing the move of the COE to Centennial Campus.

Funding for recruiting top faculty members and retaining our excellent faculty is critical to the success of the COE and NC State. As other states and private universities make significant investments in engineering education the competition for the best faculty increases. Our ability to attract and retain outstanding faculty members has been the cornerstone of our success over the last decade, but we are now being challenged more than ever to retain our most outstanding performers. This challenge is exacerbated by the lack of funding for new faculty positions and the lag in faculty salaries, which are still arguably 15-20 percent below that of our peer colleges of engineering. The need for a targeted effort to bring salaries up to a competitive level, together with available new faculty recruiting and retention funding, will need to go hand in hand if we are to maintain the reputation and research achievements that we have worked so hard to attain.

A growing concern is our ability to attract outstanding international graduate students. This presents problems for the future of the College as it continues to grow as a research powerhouse. Efforts to improve the recruitment of graduate students, and international graduate students in particular, are being made, but as we are all aware, outside factors are influencing the success of our efforts. While we cannot control outside impacts, we can influence our competitive standing among international graduate student candidates through enhancements in our graduate stipends.

The potential for a continued increase in undergraduate enrollment would also present a challenge to the College. Although we have increased our T/TT faculty to 310, accompanying increases in undergraduate enrollment still place us among the highest student-faculty ratio among engineering colleges. Reducing the student-faculty ratio, or at the very least assuring that it does not increase, is a priority that is necessary for the College to maintain, and improve, its

rankings and research productivity as well as being important in the retention and recruitment of top faculty members and in maintaining of the quality of education our students receive. During this last year we submitted a white paper to our University legislative liaisons that envisions a future COE enrollment of 12,500 students along with the accompanying faculty size needed to serve this population without decreasing educational quality and increasing research productivity. We look forward to the opportunity to discuss this plan in more detail as a blueprint for a future COE that will be an even stronger engine of growth for the continued economic development of our State.

Philanthropic support for the Fitts-Woolard building remains a major priority and a concern. With \$11.8 million more to raise toward the construction of the building and the additional fundraising goals of the Think and Do the Extraordinary campaign, we are working closely with University Advancement to assure that we reach both goals. If we fail to meet the fundraising goal for Fitts-Woolard Hall, we will have to explore other options for financing its completion. Our alumni have been very supportive of our fundraising and are becoming more aware that while our state legislature continues to provide support, we can no longer rely on the state for all of the capital funds necessary to support a growing engineering college. We continue to rely on assistance from the university administration and the central development office in this effort.

In summary, our College is moving up in almost every category, but continued investments must be made to maintain our upward trajectory. The groundbreaking and construction of Fitts-Woolard Hall has our faculty, staff, students and alumni excited about the future of the College of Engineering at NC State. We will continue to strive to provide the best education as well as conduct the highest quality research for the betterment of the people of North Carolina and our nation.