

Strategic Plan

Academic Years 2014 to 2020

Cullen College of Engineering
University of Houston

Our Vision:

*To become a “Top 50” Engineering Program,
as defined by U.S. News and World Report, in support
of the University of Houston’s Tier One initiative.*



Cullen College of Engineering (CCE) University of Houston

Strategic Plan Academic Years 2014 to 2020

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Strategic Plan: Academic Years 2014 to 2020

This plan was developed by a team of Cullen College of Engineering faculty, staff, administrators, students and alumni, chartered by the Dean. The instructions were to think boldly and be minimally constrained.

Mission of the Cullen College of Engineering

The mission of the Cullen College of Engineering (CCE) at the University of Houston is

- to serve the Greater Houston community, Texas and the nation by educating engineers to assume leadership positions in the identification and solution of the complex technical challenges of society,
- to advance the state of knowledge through pioneering research and scholarly work,
- to facilitate the transfer of new technology to Texas and U.S. industries,
- to play a key role in economic development for the Greater Houston region and the State of Texas, and
- to benefit the public sector through service to the university, community, industry, government and the engineering profession.

Our Vision

To become a “Top 50” engineering program as defined by U.S. News and World Report in support of the University of Houston’s Tier One initiative.

Strategic Goals and Initiatives to Achieve Our Vision

To achieve our vision of becoming a Top 50 engineering program, we will pursue a strategic plan to transform the Cullen College of Engineering (CCE) through:

- Excellence and unprecedented growth in CCE’s academic programs with an overarching emphasis on student success
- Development of strategic partnerships, focused particularly on health and energy
- Building state-of-the-art research and classroom facilities

STRATEGIC INITIATIVES

Academic Programs: With an overarching goal of Student Success, the plan is to re-tool the academic model to recruit and retain more high-quality, diverse undergraduate students; strengthen K–12 outreach programs; increase the number and quality of faculty, with a particular focus on recruiting women and underrepresented minority faculty members; improve the quality of undergraduate programs; develop and leverage online courses; strengthen and expand graduate programs and industry-serving certificate programs; and prepare diverse graduate students for future careers as faculty.

Research: Restructure the research enterprise to increase research activity, productivity and external visibility; and increase technology transfer and translational research.

Facilities: Accommodate the projected growth of double enrollment by increasing the amount and quality of classroom spaces on the main campus, as well as the emerging Sugar Land branch campus, and new facilities in Katy and The Woodlands. The expansion will accommodate enrollment growth of both traditional and non-traditional students (undergraduate and graduate), facilitate and accelerate educational innovation, provide meeting places, house state-of-the-art laboratory facilities, and create much needed additional study spaces for students. Partnerships will be sought with industry to establish mutually beneficial educational facilities that could be located within a corporation or business.

The college is also developing “virtual” facilities through the development and expansion of online course courses and certificates to meet the demands for flexibility and specialized, industry-led certifications.

Corporate & Institutional Partnerships: Develop a proactive approach to engage industry, promote university–industry collaborations, and better serve the continuing educational needs of professionals.

Advancement: Enhance and expand advancement activities to increase fundraising at the college and department levels, increase the visibility of CCE, and better serve our social responsibility goals.

Our strategic plan has been developed with special attention to three requirements: 1) Our vision must fit within the framework of CCE’s mission; 2) In order to achieve our vision we must develop new and innovative ways to locate and secure resources; 3) We will promote and advance the plan while remaining cognizant of the challenges inherent in implementing institutional change.

Strategic Plan: Where We Are, Where We Want to Be, and How We'll Get There

Below we describe our strategic plan, organized around five initiatives addressing each of the core areas. We will first discuss our desired outcomes in the context of where we currently are, and then describe our plan to achieve those outcomes.

Academic Programs

STUDENT SUCCESS

The quality of our academic programs is key to achieving our vision of becoming a Top 50 engineering college. Our strategic plan focuses on achieving unprecedented growth in our academic and research programs, and our undergraduate and graduate enrollments. We anticipate CCE enrollment to grow to 6,000 students by 2020, with an actual doubling of enrollment to 8,000 by 2025. We anticipate a 70% to 30% mix of undergraduate and graduate students, respectively, and a 2 to 1 ratio of Master's to Ph.D. students. New initiatives will be employed to improve undergraduate and graduate recruitment and retention, strengthening our K-12 outreach programs, increasing and diversifying the number and quality of faculty, improving the quality of undergraduate programs, strengthening and expanding graduate programs, and preparing some of our graduate students for future careers as faculty.

Improve Undergraduate Recruitment and Retention: The CCE will recruit high achieving, diverse undergraduate students with superior test scores, GPA, and class rank, to develop an undergraduate enrollment with demographics that more closely represent those of the local community.

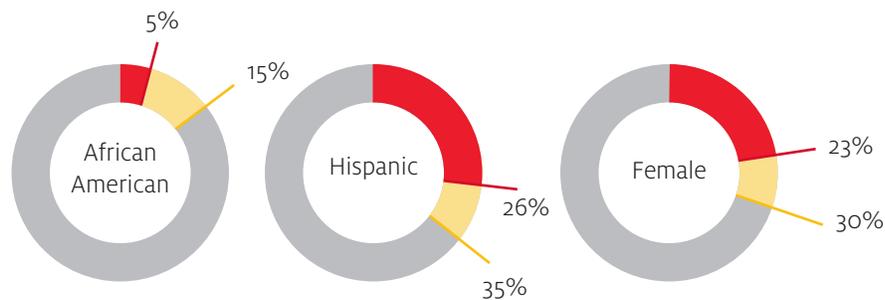


Figure 1. CCE undergraduate demographics: current (red) and 2020 target (yellow)

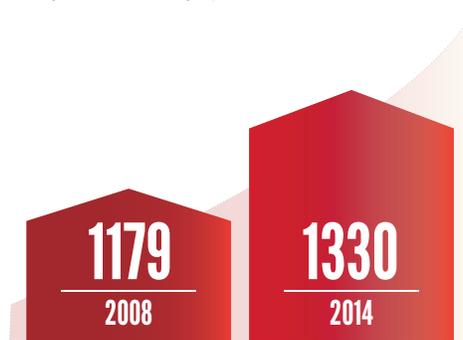


Figure 1b. **AVG. SAT SCORES**

Figure 1 shows CCE's current undergraduate demographics (red); while the diversity of CCE's undergraduate student body is high compared to most engineering colleges across the U.S., it does not reflect the diversity of the Greater Houston community. The yellow bars in Figure 1 show target CCE undergraduate demographics by 2020.

Average SAT scores of incoming undergraduates have increased from 1179 in 2008 to 1330 in 2014 (see figure 1b). Moreover, the required overall math/science GPA of transferring community college students has increased from 2.5 to 3.0; we intend to continue and accelerate this trend through enhanced recruitment. We will develop programs to improve retention, and increase our 6-year graduation rate from 25% to 60% by 2020.

Approaches to reach these targets include: 1) hiring a director of recruitment, 2) deploying effective marketing, 3) developing a more robust and engaging freshman experience, and 4) establishing evidence-based admissions criteria and improved coordination of undergraduate recruitment efforts. Improving the admissions criteria and processes that are more predictive of student success will be combined with the development of a strategic process for recruiting at the high school and community college levels. The director of recruitment will lead the launch and development of the “Engineering Ambassadors Program,” recruiting existing Engineering undergraduates to serve as student representatives to support departmental and college-wide programs. Particular emphasis will be placed on enhancing recruiting efforts at high schools that serve underrepresented minorities and economically disadvantaged populations. Engineering advising will become more centralized and uniform within the college, offering freshmen with a “bullpen” of advisors. Students will be actively encouraged to join and participate in professional student societies. Partnerships on recruiting initiatives will be developed with the Honors College and the Bauer College of Business.

Improve the Quality of Undergraduate Programs: The CCE will improve and create new undergraduate programs to better prepare students for successful careers. Incoming Engineering freshmen will be actively encouraged to “self-prepare” over the summer prior to admission by completing currently offered online courses. The college will institute and host an annual Freshman Convocation event to welcome students and begin the process of building community. The college will work with advisors to establish college-wide standards that will create a “First Year” experience for students that will provide them with flexibility in changing majors. The CCE will increase project-based learning and undergraduate research experiences. Engineering students make up the second largest cohort of students in the Honors College. To improve retention of this significant cohort, the Engineering Honors program will deliver new programs such as tutoring, or offering a senior Capstone Design Course. Best practices from the Honors program will be transferred to regular academic programs. Honors sections of the Engineering core courses will be developed to provide additional incentives and resources to support high quality teaching and instructional innovations. The Program to Achieve Mastery in Engineering Studies (PROMES) will be expanded college-wide by implementing “Success Workshops” for key courses. PROMES will train Peer to Peer student mentors to support the Success workshops. The CCE will leverage technologies to enhance the educational experience, including online learning, learning analytics, student-owned laptops, and field experiences. Importantly, we will aggressively showcase and market our improvements externally to help attract top applicants. Providing undergraduates with hands-on research experience gives them a competitive edge and is a powerful recruiting tool. Each engineering degree program will develop at least one “Showcase Laboratory” that will be available for use in undergraduate recruiting events and programs.

Strengthen and Expand Graduate Programs: The CCE will strengthen and expand existing graduate programs (Ph.D. and Master’s) by creating curriculum that is agile, responds to industry’s needs, and includes a greater percentage of online courses. To grow the number of professional Master’s programs, each department will be encouraged to offer a minimum of one 30 hour course-only Master’s program. Enrollment and retention will be increased by recruiting top quality and diverse graduate students. Graduate student funding will be enhanced by increasing the number of prestigious fellowships. The CCE will develop programs to attract more of our own graduates into Master’s and Ph.D. programs, and provide students with better preparation for careers in academia and industry. Figures 2 and 3 show Ph.D. student enrollment and graduation rates in recent years.

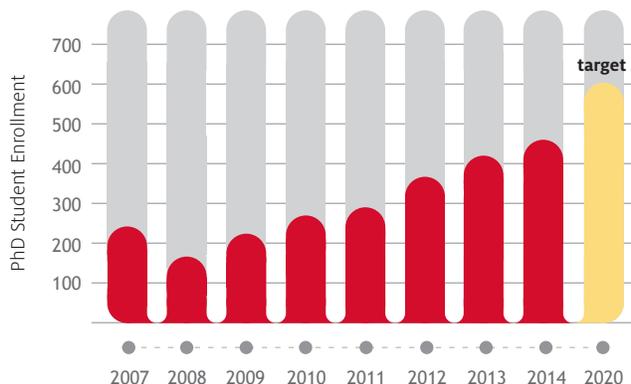


Figure 2. CCE Ph.D. student enrollment

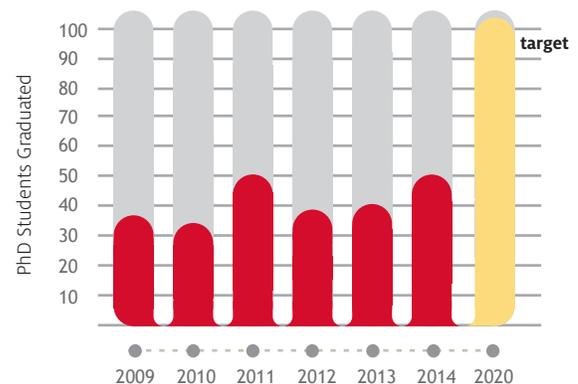


Figure 3. Number of Ph.D. graduates

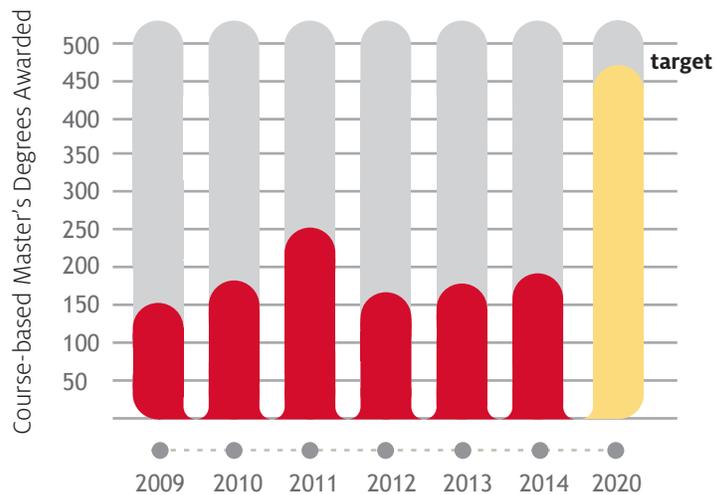


Figure 4. Course-based Master's degrees awarded

Our target is to increase Ph.D. student enrollment to 600 and Ph.D. graduation rates to 100 graduates per year (or a 100% increase over current level) by 2020.

Petroleum Engineering and Geosensing Systems Engineering and Science have recently been approved as new Ph.D. programs. We will increase the number of course-based Master's degrees awarded to 480 (Figure 4). Our strategy is to recruit graduate students from the top 25% of the class of schools that are ranked Tier One in the U.S. or other countries. Strategies will include increasing funding to support graduate students, and making financial information available online to help students understand the costs associated with degrees.

Emphasis will be placed on developing new industry-relevant, classroom-based, and on-line Certificate programs. The dramatic growth of the Subsea Engineering program is due in large part to the ability to create on-line courses. In 2015 the college is offering two Certificate programs in Subsea, as well as an entire M.S. Subsea Engineering curriculum. Two proposals are pending to create two new, on-line Master's programs, one in Mechanical Engineering, the other in Civil Engineering. Several other M.S. degree programs are in the planning stages.

The college will develop enhanced recruiting and retention tools and resources, such as virtual lab tours and video faculty interviews. New incentives and awards will be offered for productive graduate students. Resources will be allocated to develop online course offerings to facilitate distance learning, which is critical for the growth of the Master's programs.

The CCE will better prepare graduate students and post-doctoral fellows for careers in academia through a new Future Faculty Program. Our goal is that by 2020, at least six of our graduate students or post-doctoral fellows will have chosen a career in academia through this program.

Strengthen K-12 Outreach Programs: UH recognizes that STEM education is a pivotal issue for the greater Houston region. While the College is engaged in numerous K-12 outreach activities to help prepare college-ready students, there is currently no comprehensive mechanism for tracking and reporting these activities. As a first step to expanding and strengthening our K-12 outreach, the CCE will establish such a tracking and reporting system. The CCE will partner with the UH STEM Center to build on existing programs and leverage their success in reaching out to the larger K-12 community.

Increase the Number, Diversity and Success of CCE Faculty: A key factor of the effectiveness of our academic and research programs is the number, diversity, and qualifications of our faculty. Student enrollment growth also necessitates increasing the number and types of faculty. To support this effort, the CCE will work to develop more endowed chairs and professorships with highly competitive startup packages. Since 2008, CCE has expanded its number of faculty members by 29% and welcomed nine new National Academy of Engineering (NAE) faculty members. By 2020, our goal is to increase the number of faculty by 50%, from our current number of 117 to 160, focusing particularly on recruiting highly qualified senior faculty (including 10 new NAE members), and increasing the gender equity and diversity of the faculty. The College of Engineering will continue to play a leading role in the newly created, NSF-funded, five-year (2014–2019) Center for ADVANCING UH Faculty Success, designed to recruit and retain more women faculty and underrepresented minorities in the Science, Technology, Engineering, and Mathematics (STEM) disciplines. Engineering faculty and administrators will receive diversity search committee training, attend inclusion workshops, build a departmental mentoring program, as well as participate in a unique e-mentoring network comprised of five Texas ADVANCE institutions.

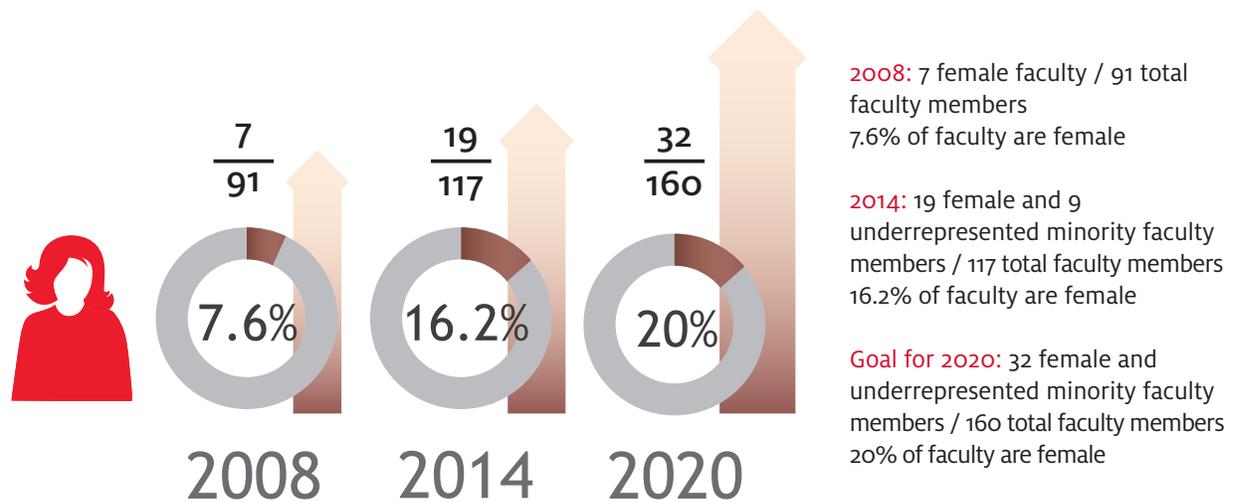


Figure 5. Goals for recruiting and retaining female and underrepresented minority faculty members

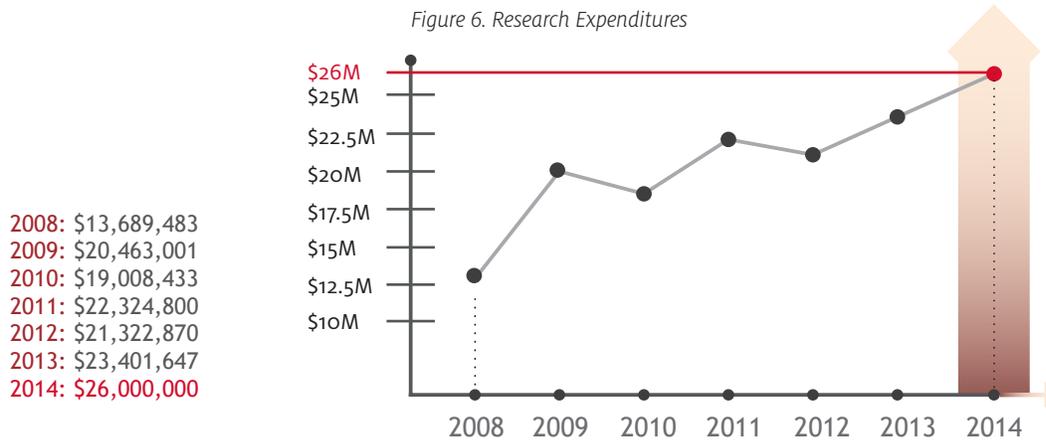
CCE will recruit non-tenured, Instructional faculty (assistant, associate, full or otherwise referred to as “Professors of Practice”) to teach both undergraduates and graduates. Instructional faculty will have their own formal promotion structure and will have renewable, five-year contracts. In all cases, the CCE will ensure that our recruiting and hiring processes are proactive, allowing us to recruit diverse, highly qualified faculty.

The CCE will commit the resources and support required to ensure the success of CCE faculty, double the number of National Academy of Engineering members among our faculty, from the current number of 11 members to 20 in 2020. We will strive for a faculty profile, in terms of research expenditures and publications that is comparable to those of their colleagues at our aspirational peer institutions. We will also work to increase the number of faculty who are fellows in professional societies such as ACI, ASCE, ASME, IIE, IEEE, etc.

Research

The University of Houston is classified as a Very High Research Activity University by the Carnegie Foundation, and research is a core part of CCE's mission. Since 2008, CCE's research expenditures have increased by 90% – from \$13.6 million to \$25.8 million. By 2020, the CCE will continue to significantly increase research activity, productivity and visibility, as well as increase technology transfer and translational research.

Figure 6. Research Expenditures



Increase Research Activity across the College: Currently, 35% of CCE faculty generates 80% of the research expenditures for the college. By 2020, the CCE's goal is not only to increase overall research activity, but to broaden research activity among faculty so that a substantial majority of faculty are contributing to the research enterprise. To support this goal, the CCE will ensure that faculty have adequate research space, increase internal research funding, work to promote inter-departmental collaborations, and increase outreach to industry partners, particularly those in health and energy.

RESEARCH EXPENDITURES PER FACULTY MEMBER

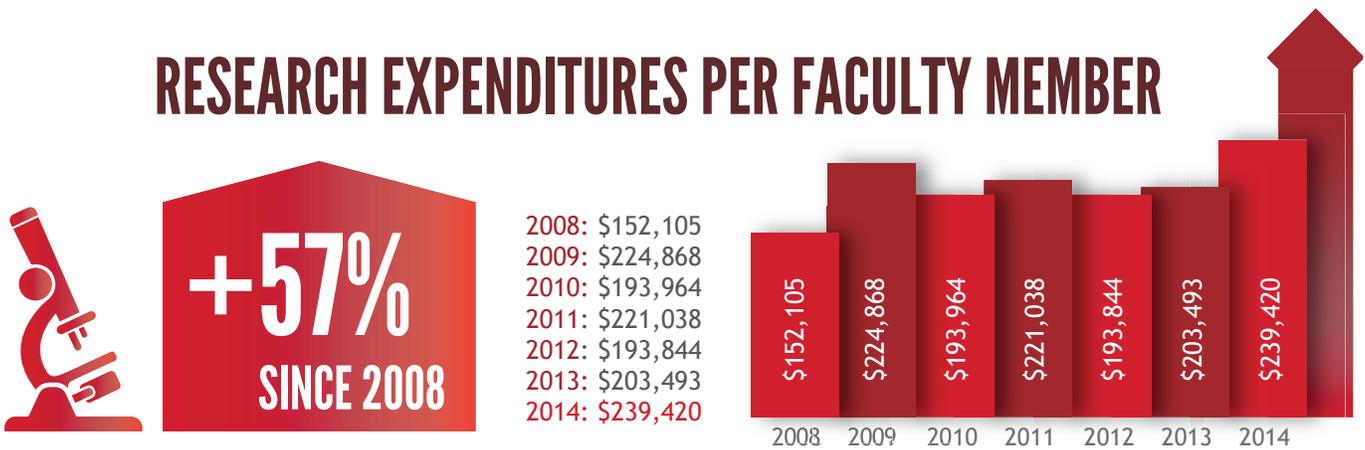


Figure 7.

Increase Tech Transfer and Translational Research: The CCE will also strive to increase technology transfer and translational research and increase our industrial partnerships and collaborations. Our goal will be to double corporate-sponsored research funding. CCE will work to attract companies to collaborate with university faculty, and fund graduate students for collaborative research projects. To enable greater collaboration with industry, the CCE will work closely with the Division of Research to develop more flexible Intellectual Property (IP) policies. Engineering-centric core facilities are planned with state-of-the-art equipment, including high performance computing and supporting personnel, that can be a resource for industry/UH collaborations. The CCE will build upon its prior successes in developing university/industry consortia as a tool for expanding our industrial relationships. To accomplish this goal, the CCE will leverage unique resources, such as the UH Energy Research Park.

Facilities

The success of our strategic initiatives will depend on the availability of facilities and infrastructure to support those activities. High quality academic programs and student success will require sufficient classrooms and meeting and work spaces for students. By 2020, the college will need an additional academic building of approximately 100,000 square feet to accommodate student and faculty growth. (This is in addition to the Multidisciplinary Research and Engineering Building that is scheduled for completion in fall 2016, see below). The additional space will extend beyond the main campus to the UH Sugar Land branch campus to new facilities in Katy and The Woodlands. Other innovative options under consideration include co-locating research facilities with other educational partners, such as community colleges, and possibly at in-house corporate labs. A strong research enterprise requires high quality laboratory facilities, meeting rooms, and cyberinfrastructure for faculty and student researchers.

Increase Facilities for Research: Our 2020 goal is to increase research space productivity, measured as dollar of research funding/ assignable square feet of space/, to a level on par with the average for top 50 U.S. Colleges of Engineering. The college was successful in raising the necessary resources to fund the Multidisciplinary Research and Engineering Building (MREB). The four-story, 120,000 gross square feet building will house research labs, computational training facilities, visualization lab, high performance computational server room, and a NMR spectrometer lab. Groundbreaking for the MREB was in fall 2014 and completion is scheduled for the summer of 2016.

Building a new Petroleum Engineering Building is a pressing and top priority! Due to the dramatic increase in student (undergraduate and graduate) enrollment from 100 in 2009 to 950 for fall 2014, the program has quickly outgrown its original building. State-of-the-art facilities will include renovated or newly constructed lab spaces, custom designed to meet the needs of faculty researchers, industry, and other UH external partnerships which continue to provide the fuel and funding for our growing research enterprise.

Enhance Classrooms and Work/Meeting Spaces for Students and Faculty: Another top priority is to develop modern, attractive student spaces that are essential to the success of our students and our strategic plan. Computer classrooms will be renovated to accommodate larger classes and a growing enrollment. Our goal is to secure funding for a new building as previously described, as well as ensure that all classroom, meeting and student spaces have been renovated within the last 20 years and are kept well-maintained. The new building and renovations will ensure that we can provide top quality space for student organizations and a designated student competition facility.

To encourage communication, collegiality and collaboration within the college, we will establish informal meeting areas and study halls to facilitate interaction and collaboration among faculty and students. By 2020, CCE will have a minimum of ten classrooms that are well-equipped for distance learning, laptops in the classroom, robust wireless networking support, all supported by qualified staff.

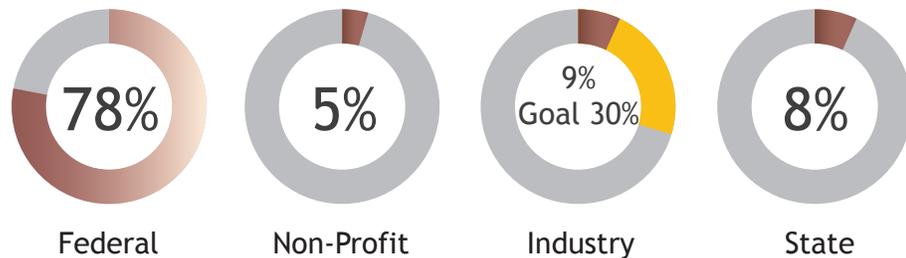
Corporate & Institutional Partnerships

Expanded collaborations and partnerships with corporations, foundations and government entities (broadly referred to here as “institutions”) are a top priority.

Increase Funding From Industry: Our goal is to increase industry-sponsored research funding to a level representing at least 30% of CCE’s total external research funding (a significant increase from our current level of 9%), with more than half of that funding for long-term (more than 3-year) collaborations. It is also our goal to double the amount of external federal funding for projects that involve collaborations with industry and/or a federal lab. In addition, the CCE will focus on securing larger research projects (>\$1M), and seek funding from a broad base of industry, and federal labs, complementing the smaller projects (\$25K–\$200K) which are currently the norm. The CCE will secure 10 new endowed professorships sponsored by industry by 2020.

Sources of Research Funding

Figure 8.



Increase Industry Advisory Role: CCE will support efforts to build stronger industry engagement at the department level. This will be accomplished by developing dynamic and effective industrial advisory boards (IABs). Our current department-level IABs are heavily oriented toward meeting ABET requirements for industry oversight of student projects - with the leadership-oriented IAB at the college level only. By 2020, IAB membership will include industry leaders who will take a proactive development role, and actively support the departments with referrals, partnerships, and financial support.

Strengthen Industrial Internship and Co-op Programs: Historically, industry internships have tended to be filled by upperclass students, resulting in some cases, in situations where there are more internships than students. The college Career Center will work with industry partners to increase the number of opportunities and support for undergraduate industrial internships at all academic levels (freshman through senior year).

Enhance Collaborations with External Partners: To build stronger partnerships with industry and collaborate on research that meets their needs, major academic research groups will create consortia with members from industry that will support research. CCE will place priority on partnering with industries with a major local presence including oil and gas, electric power, subsea engineering, petrochemicals, transportation, and healthcare.

The CCE will also develop an active program to promote faculty sabbaticals with industry, and reciprocal arrangements. Our goal is that a significant percentage of faculty members will spend their sabbaticals in industry and that a significant percentage of industry engineering researchers from local companies who take research sabbaticals will spend those sabbaticals at CCE.

The CCE will work to develop more collaboration with the Texas Medical Center, the world’s largest medical center with the highest densities of clinical facilities for patient care, basic science and translational research. The CCE will build partnerships with other universities in the region to promote multi-institutional and multi-disciplinary research initiatives.

Develop New Entrepreneurship and Continuing Education Programs: To better serve the needs of local industry, CCE will develop a strong continuing education program in each department. These programs should provide a rich set of evening, weekend, and online courses aimed at the needs of working professionals. Courses will be taught by CCE professors and industry professionals, and will award certificates and degrees that will be valued by industry. To ensure that students are well-prepared for careers in industry, the CCE will develop curricular programs and a culture that fosters innovation and entrepreneurship.

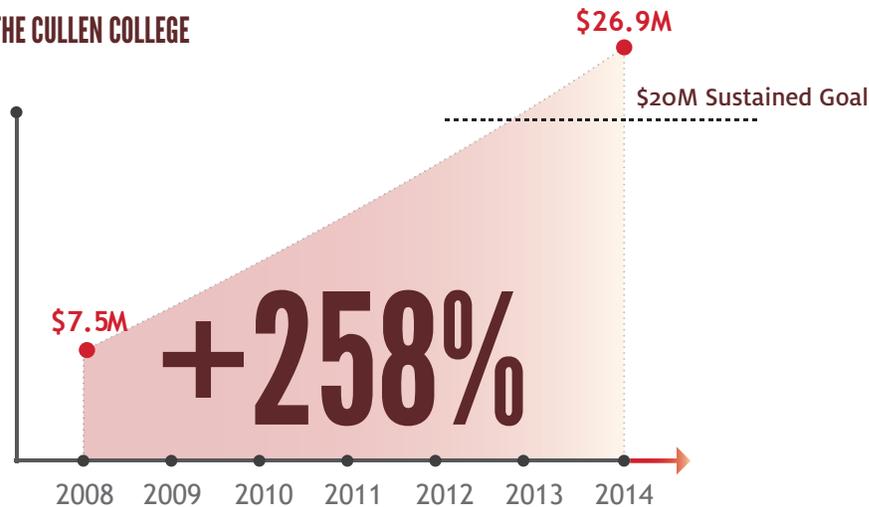
Develop Technology Incubator: CCE will establish a technology incubator by 2020. This incubator will provide infrastructure, including space and staff, to support collaborative activities with industry, increased student and faculty IP generation, and student and faculty-driven start-ups.

Advancement

Enhanced college advancement activities will focus on increasing fundraising, increasing the visibility of CCE, and better serving our social responsibility goals.

Increasing Fundraising: Since 2008, annual support for the CCE has increased from \$7.5 million to \$26.9 million. CCE's goal is to increase sustained annual fundraising (including annual giving, major gifts, and corporate & foundation giving) to at least \$20M per year. In addition, the CCE will aim to increase the number of Engineering Endowed Chairs. Currently, there are 4 Engineering Endowed Chairs, and 9 Engineering Professorships. The goal is to increase the number of Engineering Endowed Chairs to 10 and professorships to 20 by increasing the college endowment by \$20M.

ANNUAL SUPPORT FOR THE CULLEN COLLEGE



Increase CCE Visibility: The CCE will increase the visibility of the college by developing a sophisticated marketing and branding strategy that incorporates social media and other effective communication channels. The CCE will also track and publicize academic events in which CCE faculty and students are involved such as keynote talks, publications, invited talks at conferences and other institutions.

Increase Community Engagement: The CCE will more extensively engage the local and regional communities. As a Hispanic Serving Institution, UH is in a unique position to impact underserved communities. We will proactively reach out to those and other communities through K-12 programs, recruiting, and philanthropic efforts. As a first step, the CCE will measure and assess our community engagement efforts by collecting and analyzing public opinions of the university and tracking the amount of sponsored and co-sponsored charitable and community-outreach events. The CCE will also track philanthropic efforts and outreach activities. The CCE will significantly enhance our philanthropic and outreach efforts.