### RICE UNIVERSITY DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING



**STRATEGIC PLAN FOR 2017-2022** 



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I. The Rice University Department of Civil and Environmental Engineering







### INTRODUCTION O







The civil and environmental engineering challenges facing society have never been more urgent. Understanding how to predict and respond to disasters such as hurricanes and earthquakes is a matter of life and death, as evidenced by recent storms in Texas, Florida, and the Caribbean and by recent earthquakes in Mexico. Existing United States infrastructure for transport, energy, industry and commerce is aging and facing unprecedented demands. Poor water and air quality, and the associated health impacts, make critical the identification, design, building and operation of systems to restore, preserve and protect urban systems and the environment.

Within this context, the Department of Civil and Environmental Engineering at Rice University strives to educate the civil and environmental engineering leaders of tomorrow, while providing an unparalleled experience for our students, and to lead innovation in our selected areas of high impact research. These efforts relate directly to the Rice University mission of "path-breaking research, unsurpassed teaching, and contributions to the betterment of our world" and are consistent with the strategic plan of the University.

The faculty of our Department is uniquely diverse and known internationally for the excellence, relevance and focus of its research. Our research covers the full range of areas that comprise civil and environmental engineering, yet we identify focus areas that draw upon our strengths. One such area is cities, which showcase the importance and value of civil and environmental engineers, from design of utility grids to construction of skyscrapers to implementation of mitigation programs for environmental protection. Urban systems in the United States and around the world, and the linkages among them, are increasingly challenged by aging infrastructure, changing climate, natural resource scarcity and economic constraints.

These issues lie at the heart of the field and provide unparalleled opportunities for strengthening even further the excellence of all of our research areas.

Similarly, our faculty members are dedicated educators who strive to impart technical knowledge, practical training and commitment to excellence to the future leaders of the fields of civil and environmental engineering. Our student body, both graduate and undergraduate, is diverse and motivated by both learning and "making a difference." Together, our faculty and students, along with our research and administrative staff, create a welcoming environment where innovation, outside-the-box thinking, creativity and altruism are highly valued.

The department is world-renowned for its efforts in education, research and service, yet we aspire to achieve bold goals in the immediate future and to take advantage of new opportunities in education and research. Today's rapidly changing environment requires thorough, continuing evaluation of the Department's strategic objectives to ensure that we thoughtfully anticipate new and emerging opportunities and challenges.

This strategic plan seeks to rigorously chart a path to capture the opportunities that we see now and in the future. We have the potential to be the leaders in engineering education and to set examples that other universities will follow. Our "discovery to solutions" approach to research provides a platform for national and global impact. The five-year plan described here addresses education at all levels, the need to better engage alumni, the potential to be meaningfully engaged in the University's fundraising strategies, and engagement of our students at a new level. We believe this plan, when fully executed, will yield the nation's leading civil and environmental engineering program in quality, leadership and excellence.

## MISSION AND VISION O

#### MISSION

To educate the civil and environmental engineering leaders of tomorrow and contribute to solving societal challenges through discovery and innovation.

and the second

#### VISION

To be the nation's preeminent civil and environmental engineering program, dedicated to improving the quality of life for all.

### STRATEGIC GOALS O

To move assertively and imaginatively towards the realization of its vision, which is focused on the improvement of the quality of life for all, the Department will focus its efforts and resources on five interrelated key strategic objectives over the next five years.

#### I. EDUCATE THE CIVIL AND ENVIRONMENTAL ENGINEERING LEADERS OF TOMORROW

The Department is committed to providing undergraduate and graduate curricula that educate students in the fundamentals of the field, while being innovative and meeting the needs of future graduate schools and employers. We equip our students to serve the nation and the world as engineers, scholars, academic leaders and entrepreneurs. We will take advantage of our unique position at a university that values interdisciplinarity by encouraging development of skills in physical science, social science, humanities, communication and leadership. As the needs of the discipline of civil and environmental engineering and of our students change, we will continually assess, with input from external stakeholders, and improve our course offerings and pedagogy. Accordingly, we will:

- Recognize the importance of interdisciplinarity and teamwork. Our curriculum emphasizes that civil and environmental engineering is a rapidly changing field with needs that can be filled when students are literate in computer science/machine learning, data science/statistics, and social aspects of engineering associated with human behavior and economics. Students will be encouraged to participate in the Rice Center for Engineering Leadership, the Doerr Institute for New Leaders, and programs offered by the Baker Institute for Public Policy so that they are accomplished not only in technical fundamentals but also in communication, entrepreneurship and leadership upon graduation.
- Deepen faculty-student interaction. We will leverage small classes and the personal relationships between faculty and students that provide the opportunity for one-on-one mentoring.
- Maintain an inclusive environment that is welcoming and supportive of students from all backgrounds. We recognize and embrace the changing demographics, backgrounds, and learning styles of students to ensure that all students, regardless of background, feel included in our community.
- More actively recruit and retain undergraduate and graduate students. We will design and implement focused, imaginative ways of recruiting first-year undergraduate students, retaining first- and second-year undergraduate students, and recruiting excellent domestic (especially those eligible for fellowships) and international graduate students.









## -O STRATEGIC GOALS

#### **II. LEAD INNOVATION IN HIGH IMPACT RESEARCH AREAS**

The Department is committed to conducting high impact, cutting-edge, and societally important research across the spectrum of civil and environmental engineering. Innovation in the field will contribute to the betterment of our world but also will shine a spotlight on the excellence of our Department. Accordingly, we will:

- **Contribute to the advancement of sustainable and livable cities.** A focus on integrated systems and infrastructure that are resilient to natural and other hazards serves as an umbrella for our research on smart cities (incorporating the associated adaptive and resilient infrastructure and cyber-physical systems), sustainability, water resources and security, and development/application of environmental nanotechnology for safe drinking water.
- **Focus on research challenges at multiple scales and apply specialized and interdisciplinary approaches.** The issues facing modern civil and environmental engineers range from the molecular to the global in scale and from the moment to decades in time. Our ability to generate solutions applicable across these ranges differentiates us because they require both core civil and environmental engineering proficiency and integration of fields outside of traditional civil and environmental engineering, including advanced materials, data science, computer science and social sciences.
- Selectively recruit additional faculty of exceptional ability. Expansion of research productivity will require an increase in the number of faculty members representative of the changing demographics of the United States. Future areas of faculty expertise could include, but are not limited to, infrastructure resilience in the face of hazards, urban systems, water quality, coastal sustainability, and water resources/hydrology. In addition, we will seek to link faculty hires to such departmental initiatives as Smart Cities and University initiatives such as Molecular Nanotechnology and Data Science.

#### **III. ENHANCE THE IMPACT OF OUR STUDENT EXPERIENCE**

A large fraction of the student experience occurs through such extra/co-curricular activities as community events, seminars, and professional development opportunities. The benefits of these programs are increased when there is a strong sense of community within the Department. Students who have an unparalleled experience both inside and outside of classroom learning and research serve as enthusiastic ambassadors of our program. Accordingly, we will:

- Expand our distinguished lecture series with external speakers from academia industry, and the public sector. We will provide increased opportunities for meaningful interactions between visitors and students to allow for mentoring and networking opportunities and to strengthen the attractiveness of our students for leadership positions upon graduation.
- Position graduate students to play an active role in our education efforts. Because many of our graduate students wish to pursue careers in academia, opportunities for them to lecture and act as teaching assistants are critical for their professional development. Faculty, when appropriate, will be encouraged to involve in their course delivery graduate students who wish to participate.
- Support activities that expand our students' opportunities. Active student chapters of professional societies serve to connect our students with alumni and professional engineers who can provide real-world insight into post-graduation life. Attendance of research and professional conferences will also accomplish these goals. Departmental events also facilitate interaction between graduate and undergraduate students. The Department will continue to support activities (i.e.; Engineers Without Borders) that allow our students to develop a global perspective of the field. We also will encourage team-building activities (such as use of campus facilities such as the Oshman Engineering Design Kitchen or other maker spaces to pursue a Design Minor) that foster an entrepreneurial spirit.

### STRATEGIC GOALS O-

#### IV. INCREASE THE DEPARTMENT'S VISIBILITY AND RECOGNITION

We are dedicated to ensuring far wider understanding of the strengths and capabilities of civil and environmental engineering at Rice. Increasing visibility, both on- and off-campus, as well as both domestically and internationally, will better inform the larger world about our strengths, improving our reputation and bolstering our ability to recruit exceptional students and faculty and attract external support. Accordingly, we will:

- Better communicate our strengths and our curricular and research areas of focus. We will continue using traditional means of communication while building our capabilities in social media to better inform students, faculty and staff as well as alumni, employers, donors, and the larger academic community about our activities, initiatives and achievements.
- Involve alumnae/alumni actively in the life of the Department. We will strengthen engagement of our alumni include through such initiatives as partnerships with industry and governmental agencies, one-on-one student mentoring (including networking in areas outside of Houston), provision of internships and shadowing opportunities, classroom activities including both the introductory and senior capstone courses, presentations to student groups, and attendance at social events.
- Increase award nominations for faculty. External awards from professional societies, and their associated nominations, increase the recognition and acknowledge the accomplishments of our faculty. Such awards often require a nomination from faculty in the Department closest to the field of expertise, the Department Chair, and/or the awards committee. We will actively seek input from faculty regarding awards for which they are eligible and work towards increasing the number of award nominations.

#### V. BUILD A STRONG FINANCIAL FOUNDATION TO SUPPORT PHYSICAL AND HUMAN RESOURCES

The preeminence of our programs and initiatives depends on the availability of sufficient financial, physical and human resources, all of which require significant enhancement. Accordingly, we will:

- **Undertake active, focused fundraising efforts.** We have unparalleled, but under explored, opportunities to raise significant philanthropic support for the Department. Doing so will allow us to make important improvements in our facilities, establish additional endowed faculty chairs, enhance student support, and deepen our administrative capabilities. We are keen to engage alumni, friends, corporations and foundations in actively supporting our faculty and students.
- Enhance and better maintain our physical infrastructure. We need to develop better departmental common space to facilitate collaborative and social interaction and to consolidate our facilities. To ensure that we continue to provide excellent pedagogical experiences, we will continually perform upkeep of instructional laboratory equipment.
- Strengthen administrative support of faculty and students. While our staff members are committed to moving the Department to preeminence, it is critical that they be more fully involved in the planning for and realization of our strategic goals. In addition, we need to augment our current staffing support in such areas as development, communications, and alumnae/ alumni relations; laboratory manager/technician; and educational, accreditation and undergraduate capstone senior design support.

### -O CONCLUSION

The strategic goals outlined in this Strategic Plan are fundamental to ensuring that the Department of Civil and Environmental Engineering at Rice University realizes its core mission: *To educate the civil and environmental engineering leaders of tomorrow and contribute to solving societal challenges through discovery and innovation.* 

The Department's commitment to innovation, pedagogical excellence, diversity and inclusiveness, research impact, outreach and service all are inter-related and designed to ensure that we anticipate and respond imaginatively to the rapidly changing needs and interests of society. We are dedicated to building upon our considerable strengths in order to impact positively the quality of life, economic resiliency, and societal health of the United States and the globe in the years ahead.

### **)** APPENDIX I

# THE RICE UNIVERSITY DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

The Rice University Department of Civil and Environmental Engineering was formed in 2001 through the merger of the Department of Environmental Science and Engineering and the Department of Civil Engineering. The Department currently includes 14 full-time faculty members whose teaching and research interests span the full spectrum of civil and environmental engineering. Our community includes a diverse and vibrant group of students and staff who engage actively with each other and with faculty members. Department members are global citizens who together contribute to the betterment of the Earth through service to the academic community and the general public.

Department curricula lead to a doctoral degree, a thesis-based master's degree, a professional/course-based master's degree, a Bachelor of Science (B.S.) degree, and a Bachelor of Arts (B.A.) degree. Graduate degrees and the B.A. degree are focused on either environmental/hydrology areas or civil/structural areas. The curriculum of the B.S. degree consists of University distribution requirements, a set of core fundamental courses in mathematics and science, and a set of core Departmental requirements. A student completing the B.S. degree must select one area of focus (environmental, hydrology, structural, and infrastructure) and complete four courses in that area and two electives from each of the other three. Current graduate enrollment is approximately 60 students, and typically the Department graduates on the order of 20-25 undergraduate students annually.

The faculty, research staff, and graduate students in the Department have been recognized globally for their efforts in their various specific fields. Current research foci of the Department include environmental applications and implications of nanotechnology; structural mechanics and smart structures; materials; network optimization; hazard assessment; flood prediction; water treatment processes; atmospheric monitoring programs; and air pollution modeling studies. Research is funded by a variety of federal, state, industrial, and philanthropic organizations and is widely published in peer-reviewed scientific journals and media outlets. Many faculty members have received national and international awards, including being named Fellows of Professional Societies and members of the National Academy of Engineering, recognizing their research productivity and impact.

Department faculty members contribute to Rice, the academic community and the general public through their service activities. Such activities include School and University-level administrative positions, editorships of field-specific journals, memberships on advisory boards, leadership positions in professional societies, community presentations and outreach, and review activities for journals and funding agencies. These activities contribute to the visibility of the Department and enhance our reputation.









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