DEPARTMENT OF CHEMICAL AND BIOLOGICAL ENGINEERING
STRATEGIC PLAN
April 2021
Final Draft

VISION

To be internationally recognized as the Chemical and Biological Engineering department that best exemplifies the dual commitment to outstanding research and student education.

MISSION

Provide a high-quality education in chemical and biological engineering at the undergraduate and graduate levels that prepares graduates for productive careers in engineering and related fields, and for life as educated, effective citizens and leaders. Discover and disseminate new knowledge in science and engineering through creative activity in research and scholarship. Provide service to the state, nation, and world by advancing the profession of chemical engineering.

DEPARTMENTAL ROLE IN THE BROADER UNIVERSITY MISSION

The Chemical and Biological Engineering Department plays a pivotal role in the Iowa State University mission to create, share, and apply knowledge to make Iowa and the world a better place. Specifically, this is achieved through the dual emphases on (1) innovative faculty research and graduate education, as well as on (2) a best land-grant undergraduate program.

Research and Graduate Education

The department's graduate program aims to improve the human condition through research that addresses contemporary societal challenges while simultaneously equipping graduate students with the skills and knowledge to carry out independent research and to become intellectual leaders. We will build upon our core strengths in catalysis, advanced and nanoscale materials, biological engineering, biomedical engineering, and fluid dynamics. We will also invest in the initiative of our faculty to advance emerging programs to maturity and strength. Permeating the graduate program is an emphasis on excellence in scholarship, which should be matched by the program’s perceived quality as determined by the visibility of its faculty in the academic research and industrial communities.

Undergraduate Program

Our undergraduate program is known for producing graduates with strong preparation for careers in industry and the ability to excel in graduate programs in chemical engineering and related fields. Strong demand for our graduates in traditional chemical process industries, as well as in emerging areas of biotechnology, advanced materials, and sustainability, is a primary indicator of its success. We are committed to developing outstanding chemical engineers by providing students with a solid foundation in chemical engineering fundamentals as well as an appreciation for the societal context of engineering decisions, so that they will be prepared to use their education and creativity to improve lives and livelihoods. Our curriculum will reach beyond the classroom and empower students with practical and hands-on learning opportunities, research activities, and team-based design experiences.

CHALLENGES AND PRIORITIES 2015-2020

Two critical challenges in the next five years strongly shape departmental priorities and the strategies enumerated below. First, the advancement of the graduate program and department reputation depends crucially upon our ability to increase research funding in an environment of flat federal budgets and limited industrial funding. Second, the unprecedented enrollment growth in the undergraduate program over the last ten years requires novel approaches to maximize the use of teaching resources while maintaining the high quality education that the department is known for. Both of these challenges also require significant levels of institutional and philanthropic support to cover the costs of facilities and personnel.

Specific Strategies, Tactics, and Metrics (note that the order of strategies does not reflect their relative importance)

Strategy 1: Strengthen the department research profile and reputation, and overall quality by hiring and retaining outstanding and diverse faculty in core areas of strength.

Tactics:

- Take advantage of institutional hiring initiatives in research areas supported by ISU administration.
- Publicize opportunities for collaboration at ISU, unique facilities, and integration of undergraduate education with research.
- Partner with central administration to acquire physical and monetary resources necessary to hire and retain high-achieving faculty.
- Facilitate the development and rapid success of junior faculty by providing mentorship and integrating them into existing research initiatives.
- Influence university-wide research initiatives.

Metrics: Current faculty and recent hiring in core areas of research strength, department US News ranking, diversity of faculty in comparison with ASEE peer group

Strategy 2: Increase externally sponsored funding by strengthening and broadening our funding base.

Tactics:

- Faculty will strengthen existing ties with government and private partners by seeking joint research/educational opportunities such as summer internships for graduate students, which in turn could lead to industry-sponsored projects.
- Departmental faculty will participate in or organize interdisciplinary centers of excellence at ISU that simultaneously leverage institutional strengths while addressing national research priorities.
- Departmental faculty will organize and participate in workshops at federal funding agencies that shape the research agendas of these organizations. This will position departmental faculty for higher success rates in responding to proposal solicitations.

- **Enhance relationships with funding agencies and shape the national research agenda.**
- **Individual investigators aggressively pursue funding opportunities.**

Metrics: Overall research funding/faculty, industrial funding in comparison with ASEE peer group, diversity of funding sources including non-federal in comparison with ASEE peer group.

Strategy 3: Increase departmental scholarly output, impact, graduate degrees, and visibility.

Tactics:

- Enhance the ability of graduate students and post-doctoral associates to produce publication quality manuscripts by providing them training through resources provided by the department and graduate college.
- Encourage technology transfer and recognize it as part of faculty evaluation.
- Reward faculty for taking on highly visible prestigious leadership roles in professional societies, editorships of journals, etc.
- Initiate a systematic and concerted effort to nominate faculty and students for progressively more prestigious awards beginning with internal ISU awards and moving to national and international awards, including fellowships in societies.
- Regularly highlight significant research accomplishments through national publications such as C&E News or ASEE First Bell, as well as through local communication channels.
- Upgrade departmental and faculty web pages with professional design and updated content.
- Better communicate with stakeholders via enhancements to the department's social media presence.

Metrics: Publication and citation rates, h-index, PhD production rate, invited talks, editorships in prestigious journals, number of editor and editorial board positions, national and international awards, patent applications, startup companies, professional leadership positions.

Strategy 4: Produce highly trained undergraduates who are exceptionally well-prepared for careers in industry or for pursuit of advanced degrees through a curriculum that is rigorously grounded in the fundamentals and includes many opportunities for hands-on and experiential learning.

Tactics:

- Maintain high academic standards throughout the curriculum with clearly-defined expectations of high student performance and ethical conduct.
- Increase the level of hands-on learning through the incorporation of experiential projects throughout the curriculum and as an integrated part of the traditional lecture-

based courses.

- Strongly encourage all students to pursue experiential learning opportunities through industrial internships, cooperative education, and research experiences.
- Exploit technology to deliver high quality instruction and make efficient use of teaching space and personnel by using hybrid learning methods, on-line content delivery, and webcasting.
- Use our dual-advising/mentoring process to provide students with resources necessary to make appropriate career and education decisions, including an emphasis on excelling in coursework, proper elective planning, and pursuit of research and internship opportunities.
- Focus student recruiting efforts on highly qualified members of under-represented groups as well as the very best in-state and out-of-state applicants.

Metrics: Internship/coop placements, research experiences, placement rates, success rate in gateway course, graduate school placement percentage, degree production figures, numbers of women and underrepresented minorities

Strategy 5: Increase philanthropic support that will simultaneously strengthen the graduate and undergraduate programs.

Tactics:

- Work with ISU Foundation, alumni, and current donors to educate them about departmental needs. Communicate the rationale for prioritizing gifts that directly affect overall department priorities: enhancing the quality of undergraduate and graduate education, the size of the graduate program, and the impact of research and teaching activities.
- Strengthen relationships with alumni by regular communication, updates, and events, and strategic engagement in department activities.
- Seek funding for improvements in facilities and infrastructure from philanthropic organizations and foundations.
- Identify compelling theme to motivate large-scale fundraising for department naming gift and funds for new CBE building.

Metrics: Number and value of graduate fellowships, endowed chairs/professorships and faculty fellowships, amount in CBE Excellence fund, support for upgrading facilities and infrastructure, change in overall yearly giving.

Strategy 6: Increase diversity and inclusivity by implementing recruiting, retention, teaching, mentoring, and advising policies such that potential students and enrolled students perceive a supportive learning environment that is free from harassment and discrimination.

Tactics:

- Develop and implement a departmental diversity plan with the goal of providing a

supportive learning environment free from harassment and discrimination.

- Assess and modify recruiting media, with the goal of increasing the ability of potential students to understand and identify with the field of chemical engineering.
- Assess and modify material presented in the first three semesters of CBE curriculum with the goal of increasing the ability of students to understand and identify with the field of chemical engineering.
- Modify advising and mentoring structure to identify and communicate with inactive students.
- Develop and implement tools for increased monitoring of harassment and discrimination and develop response strategies.

Metrics: Graduating senior survey; demographics of students graduating from and enrolled in CBE and transferring in or out of CBE from another ISU department; number and demographics of inactive students, receipt of graduate fellowship support for underrepresented groups.