

UMass Amherst

College of Engineering



REVOLUTIONARY ENGINEERING

2025 AND BEYOND
COLLEGE OF ENGINEERING
STRATEGIC PLAN

BE REVOLUTIONARY™





COLLEGE OF ENGINEERING STRATEGIC PLAN 2025 AND BEYOND

Over the past five years, by striving for excellence in education, research and innovation, the College of Engineering has made dramatic strides toward our campus vision of a 21st century public land-grant institution. We continue to be the No. 1 public college of engineering in New England and rank in the top 35 nationally. Looking forward, we aspire to achieve the bold and inclusive goals described in this strategic plan. Our strategies for reaching these goals will guide us in addressing the grand challenges facing engineering, society, and the world.

OUR VISION

The College of Engineering at UMass Amherst will be widely recognized as a leading public college of engineering—the enthusiastic first choice for diverse students and faculty, a preeminent source of engineering workforce and innovators in the region and around the world, and distinguished by excellence and equity in engineering education and revolutionary, world-class research. We strive to be a top 25 public engineering college in the nation.

OUR MISSION

The mission of the College of Engineering at UMass Amherst is: to provide a world-class, accessible engineering education that produces diverse, globally-aware, and technically strong engineering practitioners and leaders; to conduct innovative research that advances knowledge and serves the economic needs of the Commonwealth and the nation; and to contribute to solving complex societal challenges.



Sanjay Raman
*Dean, College of Engineering
Professor of Electrical and Computer
Engineering
University of Massachusetts Amherst*

UNIVERSITY OF MASSACHUSETTS AMHERST COLLEGE OF ENGINEERING

REVOLUTIONARY ENGINEERING – 2025 AND BEYOND

I am proud to share our bold strategic vision for the College of Engineering for the next five years and beyond. This plan reflects our core values, captures our extraordinary potential, and affirms our direction as we look to the future. **Ultimately, we aim to place among the top 25 public engineering colleges in the nation.**

A huge thank you to the stakeholders who helped shape these objectives, and whose collaboration will be pivotal to the execution of our strategies. This includes faculty, staff, students, alumni, industry, and advisory council members.

With ambitious goals that build upon our culture of inclusion and innovation, this plan energizes us to advance our revolutionary research in fields of significant impact and to educate diverse, globally aware, and technically strong engineers. It invites a working and learning community committed to the success and well-being of every individual and seeks to embed inclusive design and similar activities into the curriculum that promote social and environmental justice. Together with the UMass Amherst campus, we intend to be a national model for the very best of global engineering education in a new era. **These are transformative steps, and we have work to do.**

As engineers, we hold great responsibility to understand the impact of our innovations and to create solutions that better humanity and enhance social justice. Our world faces many complex and pressing challenges; to tackle them we must collaborate across disciplines while simultaneously partnering with industry to broaden the impact of our research and discoveries.

By all measures, we are well positioned for growth and excellence. We continue to be the No. 1 public college of engineering in New England. In just the last three years, our accomplished faculty received 11 National Science Foundation CAREER Awards. We have already advanced on several goals, including the launch of our rapidly growing biomedical engineering program, with the first undergraduate class graduating in 2021.

Clearly the COVID-19 pandemic will impact the early years of this plan, but we face the future of UMass Amherst Engineering with optimism. Moving forward, we are challenged to create more high-quality research, teaching and community-building spaces for the growing needs of the college. In all, our ability to achieve the ambitious long-term goals and plans outlined in this document will depend on careful financial planning and the acquisition of added resources. We encourage our community and partners to invest in our future.

FROM THE DEAN'S ADVISORY COUNCIL

The UMass Amherst College of Engineering strives to immerse future leaders in a learning environment where they are set for success. This opens a world of opportunity for eager students to engage in high-impact experiences in real-world settings. The College of Engineering has a broad set of departments, within a large research-intensive university, and is a destination of choice for students seeking to stand out from the crowd.

This strategic plan outlines the college's continued commitment to student success and the need to press forward with innovative educational initiatives that equip students to be global leaders who thrive in diverse and multidisciplinary teams. It also acknowledges that an investment in state-of-the-art facilities coupled with the targeted recruitment of faculty in high impact research programs is necessary to not just keep pace with peer institutions, but to achieve ever higher stature.

Aptly, the plan strives to grow and strengthen industry partnerships as a means to propel the college forward—driving economic growth, skill force development, and innovation in the Commonwealth and beyond. The revolutionary concepts and technologies generated at UMass Amherst are on par with the best in the country. Industry will benefit from investing in both research and relationships.

Engineering is a field with both huge challenges and opportunities. Anything that impacts the globe, affects all of us. We are connected in the air we breathe and the water we drink. Engineers understand how systems work and see the big picture. Engineers are in the unique position to both identify and to implement solutions to the world's most pressing challenges. Therefore, the engineers of today and tomorrow must always weigh the impact of discoveries and technical advances on humanity, with a keen eye toward issues of social justice, socioeconomic equity, and environmental sustainability. The Dean's Advisory Council's mission is to assist with the implementation of this strategic plan that enables the whole college—students, staff and faculty—to strive for the betterment of humankind.

Your engagement is essential as we tackle the actions outlined in this document and realize even the loftiest of goals. I invite your partnership.



Edwin (Ned) Thomas '69
*Chair, Dean's Advisory Council
College of Engineering
University of Massachusetts Amherst
Erle Nye '59 Chair II, Hagler Institute
Fellow, College of Engineering Texas
A&M University
Member, National Academy of
Engineering*

COLLEGE FACTS AND FIGURES

2,833 ENROLLMENT 2019-20
UNDERGRADUATE 2,248
GRADUATE 268 // DOCTORAL 317

688 DEGREES AWARDED
2019-20
493 BACHELOR'S // 149 MASTER'S
46 DOCTORAL

97% SUCCESSFUL CAREER
PLACEMENT
(REPORTED BY CLASS OF
2019, 6 MONTHS OUT)

RANKED
No. 34

2020 PUBLIC UNIVERSITIES
UNDERGRADUATE
PROGRAMS
U.S. News & World Report

RANKED
No. 30

2020 PUBLIC UNIVERSITIES
GRADUATE PROGRAMS
U.S. News & World Report

\$49.7M
R&D EXPENDITURES
(FY19 REPORTED TO NSF HERD)

15
YOUNG INVESTIGATOR
AWARDS 2016-2020
(11 NSF CAREER AWARDS)

126
TENURE-TRACK
FACULTY
2019/20

58
NEW FACULTY
HIRED FY16-FY20
(INCLUDES LECTURERS)
18 WOMEN // 7 URM

\$24.2M
ENDOWMENT FOR
ENGINEERING
(AS OF 6/30/20)

43
FELLOWS
PROFESSIONAL
SOCIETIES

4
MEMBERS NATIONAL
ACADEMY OF
ENGINEERING
(INCLUDES CICS AND PSE)

8
NAMED
PROFESSORSHIPS
& FACULTY
FELLOWS

OUR VALUES

Excellence. We strive for excellence in all aspects of engineering education, research, and societal impact.

Diversity, Equity, and Inclusivity. We are committed to the success and well-being of every individual in our college regardless of group identity, and to advancing opportunities for historically underrepresented groups in engineering.

Openness. As an academic engineering community, we are committed to free and open intellectual inquiry and expression, and welcome students, faculty, and researchers from around the world to collaborate and contribute to discovery.

Integrity and Stewardship. We set high standards for personal responsibility, engineering ethics, institutional integrity, and hold ourselves accountable in managing college resources, and for advancing society and sustainability for current and future generations.

Innovation. We stimulate, recognize, and reward innovation and creativity.

Impact. We aim to create far-reaching impact on society by addressing complex, multidisciplinary research challenges and translating discoveries to the marketplace to grow our economy.

THE UMASS ENGINEERING EXPERIENCE

Outstanding and affordable engineering education. We provide an affordable education at a Research I public university for residents of the Commonwealth and beyond.

Access to faculty. We are proud of the extensive interaction between our world-class faculty and students in classrooms, laboratories, and in our communities.

Problem solving mindset. Our students are innovative and determined. They are able to identify engineering challenges and successfully develop creative and efficient solutions. Our students work together effectively in teams to solve real-world problems.

Experiential learning. Our students have access to and participate in a diverse range of internships, student design clubs and makerspaces, research experiences, entrepreneurial experiences, and service-learning opportunities.

Diversity and inclusion. Our student body comes from diverse sociological and economic backgrounds, including many first-generation college students.

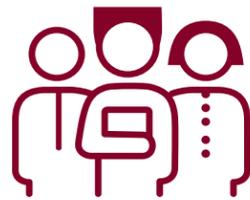
COLLEGE OF ENGINEERING GOALS

- Establish the College of Engineering as a destination of choice where seekers of a world-class engineering education succeed in an impactful, research-enriched, inclusive learning environment.
- Establish the College of Engineering as a world leader in advancing transformational engineering research for the betterment of society.
- Expand holistic relationships with industry to increase the impact of the College of Engineering in research, innovation and workforce development.
- Transform the College of Engineering into a model community for students, staff, and faculty that provides an inclusive working environment for the respectful exchange of ideas and professional growth.



GOAL 1

Establish the College of Engineering as a destination of choice where seekers of a world-class engineering education succeed in an impactful, research-enriched, inclusive learning environment.



ATTRACT AND RETAIN A DIVERSE COMMUNITY OF HIGH-POTENTIAL STUDENTS

ACTION STEPS

1. Prepare students to impact the Massachusetts and national economies, and contribute to solving complex societal challenges by offering high-quality, high-value engineering degree and certificate programs and experiential learning opportunities.
2. Continue to grow the biomedical engineering program to address workforce needs for the Massachusetts life sciences economy.
3. Develop a vibrant recruitment effort via communication and outreach, and a commitment to diversity to attract the highest-quality engineering students from the broadest possible segments of society.
4. Expand financial support through research grants, scholarships, fellowships, and assistantships to attract and retain outstanding undergraduate and graduate students.
5. Embed the college's curricula with content and activities that promote social and environmental justice. Become leaders in "Inclusive Design."



SUPPORT STUDENT SUCCESS

ACTION STEPS

1. Improve academic support for undergraduate and graduate students by providing expanded access to instructional staff, makerspaces and state of the art laboratory and classroom facilities.
2. Enhance the student experience with transformative experiential learning opportunities such as internships, research experiences, student design teams, and service learning as early in the engineering education process as possible.
3. Provide outstanding mentoring and advising to students throughout their academic programs with new mentoring programs and increased advising staff.
4. Create a collaborative learning environment for students to develop team-based skills via early stage laboratory courses and team activities embedded in the curriculum.
5. Expand the study and use of computing and data science across the curriculum to better prepare students for the next generation workforce.



EXPAND CAREER DEVELOPMENT OPPORTUNITIES

ACTION STEPS

1. Include career and professional development in all components of a student's education and advising including integration into seminars and core courses.
2. Grow master's and certificate programs, including new online and multimodal courses, and education at the Mount Ida Campus, to offer students increased opportunities for postbaccalaureate education. Collaborate with other colleges, such as the College of Information and Computer Sciences and the Isenberg School of Management, on interdisciplinary degree programs that will enhance opportunities for our graduates and address market needs.
3. Expand access to accelerated (4+1) master's programs across engineering disciplines by streamlining course requirements, and improving course availability.
4. Increase interactions with alumni to provide engineering students with mentoring, experiential learning, and employment opportunities.

NEW DEPARTMENT OF BIOMEDICAL ENGINEERING

Driven by continued growth in the Massachusetts life sciences sector.

Additional 12,000 jobs expected by 2024*

Launched in 2017 with the first undergraduate class receiving their bachelor's degrees in the 2020-21 academic year.

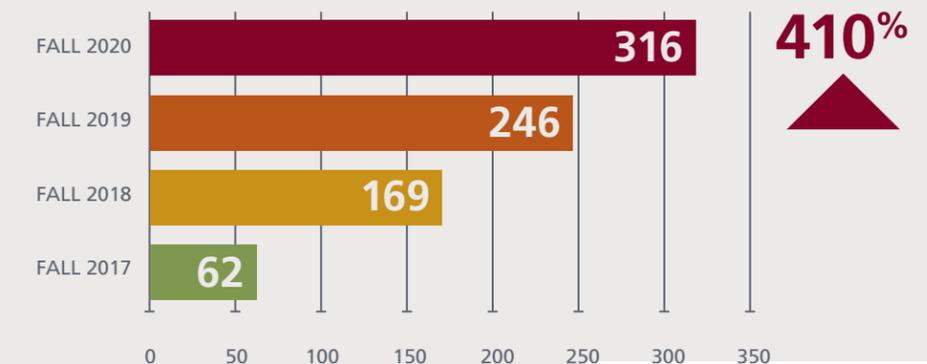
Located in new state-of-art research space in the Life Sciences Laboratory and in facilities at the UMass Medical School.

Goal to grow department to 20+ faculty over this strategic plan period.

**2019 MA Life Sciences Employment Outlook*



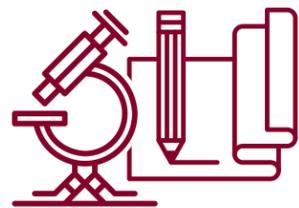
BIOMEDICAL ENGINEERING ENROLLMENT TOTALS





GOAL 2

Establish the College of Engineering as a world leader in advancing transformational engineering research for the betterment of society.



EXPAND RESEARCH AND SCHOLARLY IMPACT

ACTION STEPS

1. Aggressively work to increase support for research from federal, state, and industry sources through a spectrum of funding programs, including large-scale, center-level proposals, such as NSF Engineering Research Centers and Materials Research Science and Engineering Centers.
2. Build and maintain a world-class research-active faculty via proactive faculty recruitment, faculty mentoring programs, and efficient support services.
3. Expand access to state-of-the-art research facilities in critical multidisciplinary fields.
4. Build an “excellence cluster” in robotics and automation in collaboration with the College of Information and Computer Sciences and other partners.
5. Establish an interdisciplinary School of Materials Science and Engineering in collaboration with the College of Natural Sciences and other partners.



HELP SOLVE COMPLEX, MULTIDISCIPLINARY SOCIETAL PROBLEMS

ACTION STEPS

1. Fulfill the mission of a 21st century land-grant university by identifying and conducting revolutionary research in fields of significant global importance and impact.
2. Collaborate seamlessly with partners in other disciplines including the natural sciences, information and computer sciences, management, nursing, public health, and social and behavioral sciences, among others. Create pan-campus teams to attack major cross-cutting societal and global challenges, such as energy transition and health care.
3. Train students to address the ethical and social impacts of technology and create engineering solutions that benefit society and enhance social justice.



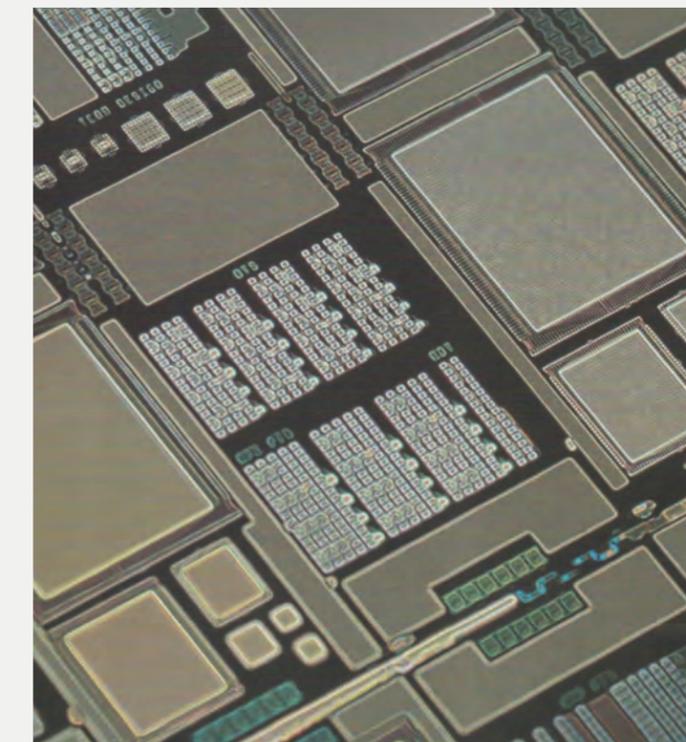
GLOBAL GRAND CHALLENGES

- ADVANCING HEALTH CARE
- AI AND THE FUTURE OF WORK
- CLEAN ENERGY
- CLEAN WATER
- SMART CITIES/INFRASTRUCTURE
- REVERSE-ENGINEERING THE BRAIN
- SECURITY



RESEARCH AREAS OF EXCELLENCE

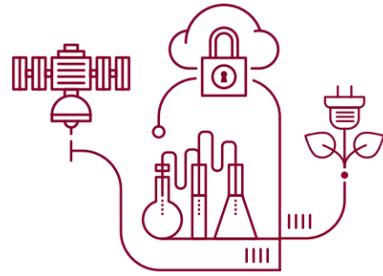
- ADVANCED MANUFACTURING
- ARTIFICIAL INTELLIGENCE
- COMPLEX SYSTEMS MODELING AND SIMULATION
- CYBER AND EMBEDDED SECURITY
- ENVIRONMENTALLY-FRIENDLY MATERIALS
- HIGH PERFORMANCE, QUANTUM AND EDGE COMPUTING
- PERSONALIZED MEDICINE AND BIOENGINEERING
- PERVASIVE SENSING AND COMMUNICATION
- TECHNOLOGY FOR CLEAN WATER AND SUSTAINABLE ENERGY
- TRANSPORTATION AND AUTONOMOUS SYSTEMS





GOAL 3

Expand holistic relationships with industry to increase the impact of the College of Engineering in research, innovation and workforce development.



BUILD INDUSTRY PARTNERSHIPS

ACTION STEPS:

1. Establish a college-level team to engage local, regional, and international corporations in expanding student career opportunities and stimulating collaborative research, including teaming on large-scale federal research programs.
2. Work with industry partners to secure a broad range of experiential learning opportunities for students, including industry sponsored research and capstone design experiences.
3. Establish a multitier industry partnership program that provides financial support for industry-university collaborative activities, and forge master alliance agreements with mutually beneficial terms and conditions.
4. Leverage the Mount Ida Campus for industry-sponsored research, education, and experiential learning.



BUILD ON A CULTURE OF INNOVATION AND ENTREPRENEURSHIP

ACTION STEPS:

1. Actively promote intellectual property creation, technology transfer, and the formation of startup companies based on engineering innovations and patents.
2. Collaborate with the UMass innovation and entrepreneurship ecosystem to provide pathways from research and ideation to commercialization for students, faculty, and researchers.
3. Provide educational experiences in innovation and entrepreneurship opportunities for students at all levels. Continue to engage entrepreneurs in residence in the college to provide mentoring and support for students and student-faculty teams.



EXEMPLAR RESEARCH CENTERS AND INSTITUTES

CENTER FOR COLLABORATIVE ADAPTIVE SENSING OF THE ATMOSPHERE

CENTER FOR E-DESIGN

CENTER FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY

CENTER FOR EVOLUTIONARY MATERIALS

CENTER FOR NURSING AND ENGINEERING INNOVATION

CYBERSECURITY INSTITUTE

ENERGY TRANSITION INSTITUTE

INSTITUTE FOR APPLIED LIFE SCIENCES

NORTHEAST CLIMATE ADAPTATION SCIENCE CENTER

UNIVERSITY OF MASSACHUSETTS TRANSPORTATION CENTER

WATER INNOVATION NETWORK FOR SUSTAINABLE SMALL SYSTEMS

WIND ENERGY CENTER





GOAL 4

Transform the College of Engineering into a model community for students, staff, and faculty that provides an inclusive working environment for the respectful exchange of ideas and professional growth.



BUILD A MORE DIVERSE AND INCLUSIVE COMMUNITY

ACTION STEPS:

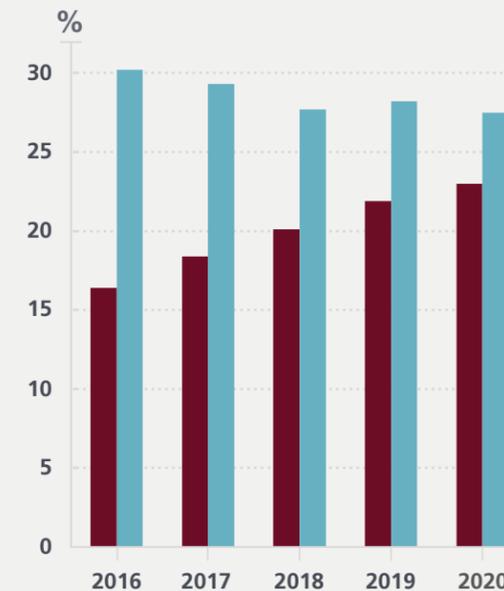
1. Increase the diversity of the graduate and undergraduate student populations by growing strong recruiting relationships with K-12 schools, community colleges, and other universities and organizations.
2. Increase the diversity of the faculty and staff by aggressively and proactively identifying strong employment candidates through early career engagement, improved communication strategies, and strategic alliances.
3. Proactively establish an inclusive environment in the College of Engineering for all members of the college community through education and positive examples.
4. Assess and address barriers to the retention and success of students, faculty, and staff from diverse backgrounds by expanding access to academic, personal and professional development resources, and leadership opportunities.



CONTINUOUSLY IMPROVE THE COLLEGE CLIMATE

ACTION STEPS:

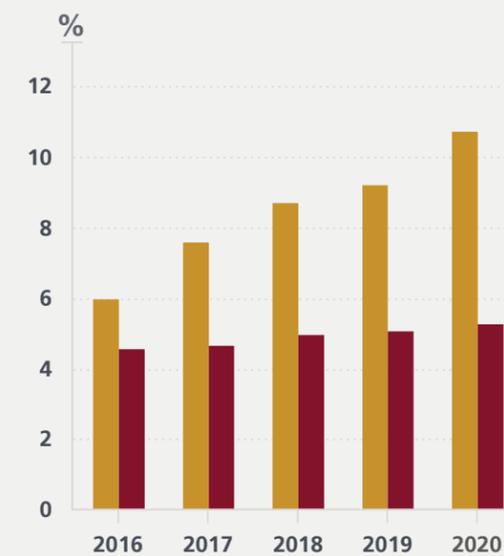
1. Commit resources to improving the college climate for students, staff, and faculty through educational programs and training.
2. Allocate and utilize college resources to support the success of all members of our diverse community by providing meeting spaces, organizing events, and supporting program coordinators.
3. Ensure that our policies and practices promote diversity, inclusion, and equity, while also discouraging all forms of harassment and intolerance.
4. Encourage the free exchange of ideas in the classroom while promoting a climate of respect and understanding for the college's diverse population.



WOMEN IN ENGINEERING

UNDERGRADUATE AND GRADUATE

■ UNDERGRADUATE
■ GRADUATE



URMs IN ENGINEERING

UNDERGRADUATE AND GRADUATE

■ UNDERGRADUATE
■ GRADUATE

**URM: Includes American Indian/Alaska Native, Black/African American, Hawaiian/Pacific Islander, Hispanic Latino, and those who declared multiple race/ethnicities (except Asian and White).*

Percentages are based on the number of U.S. citizens or immigrants who report race/ethnicity.



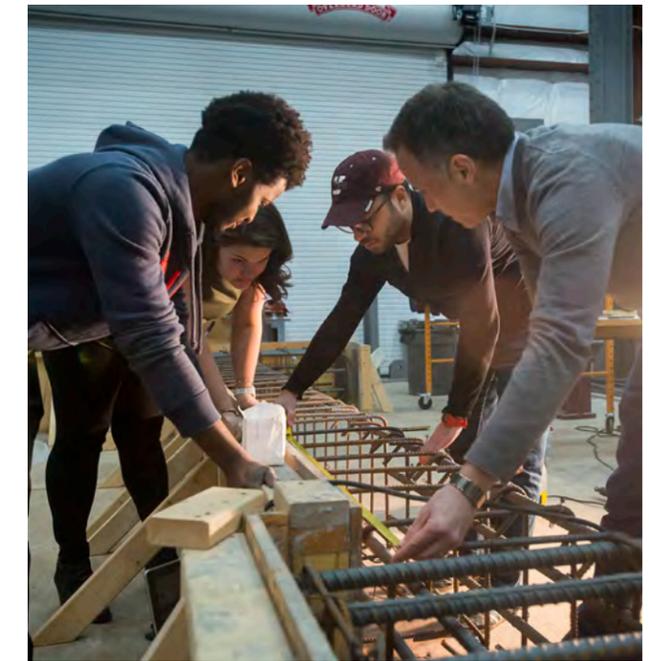
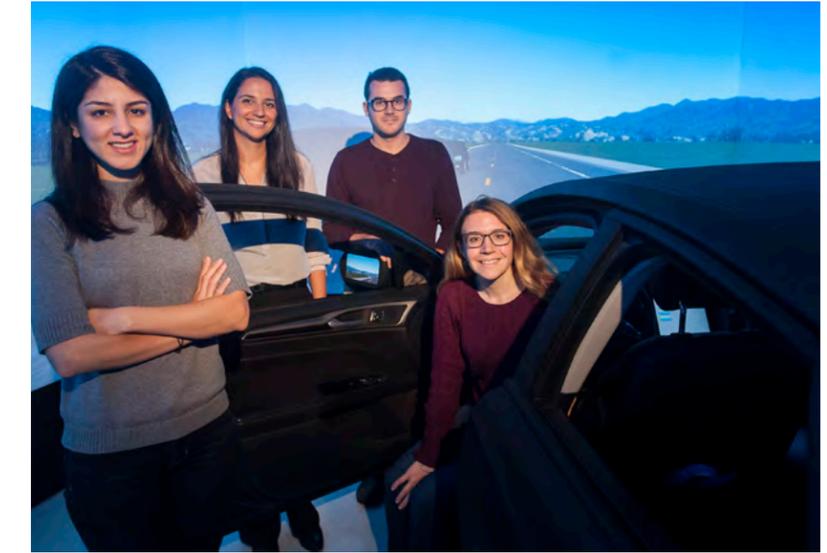
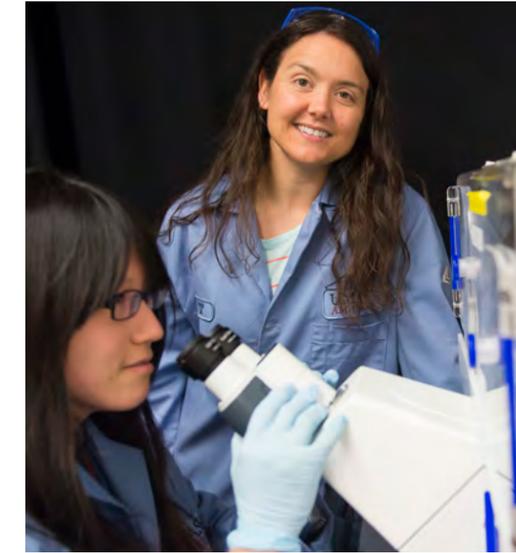
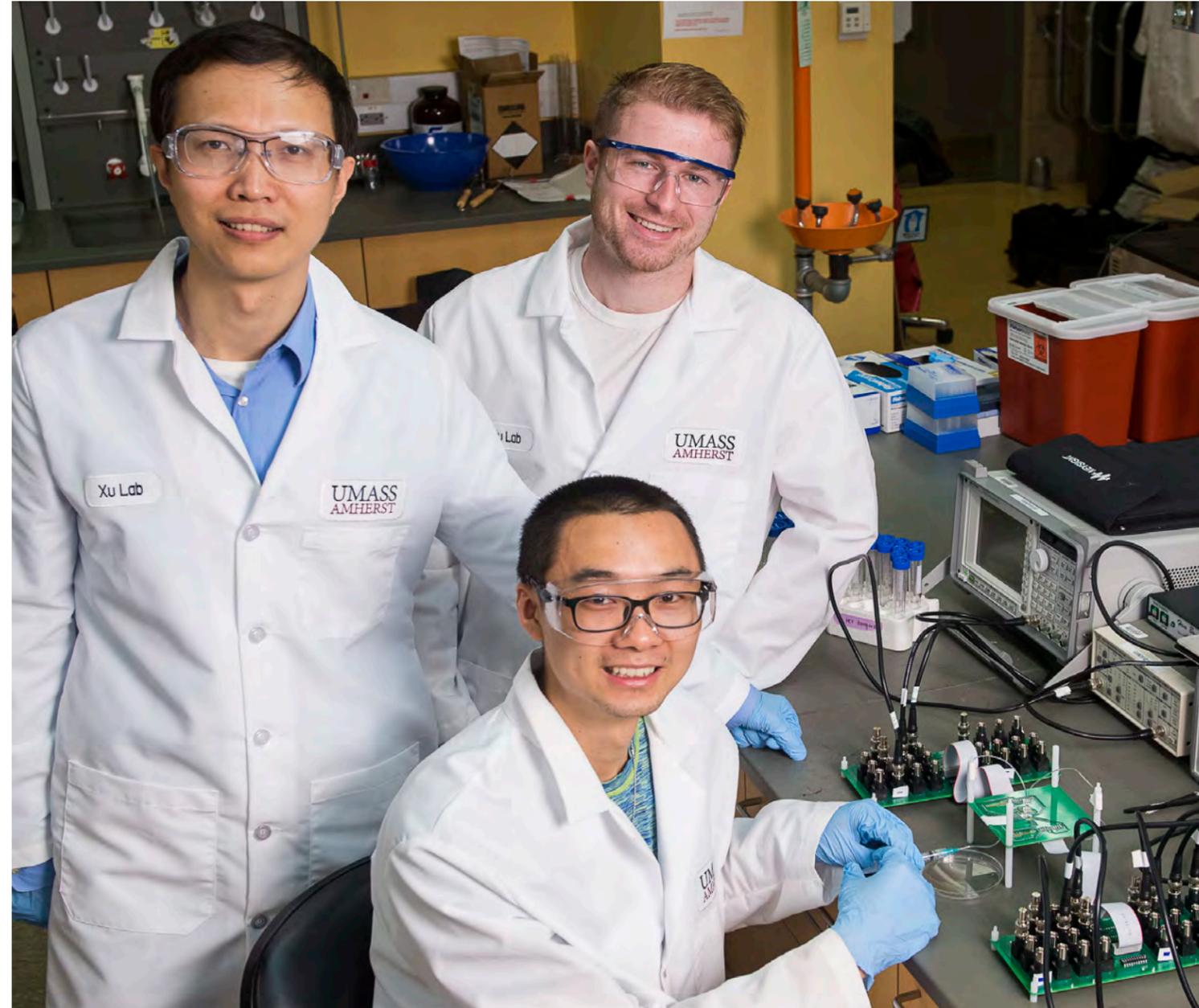
RESOURCE DEVELOPMENT

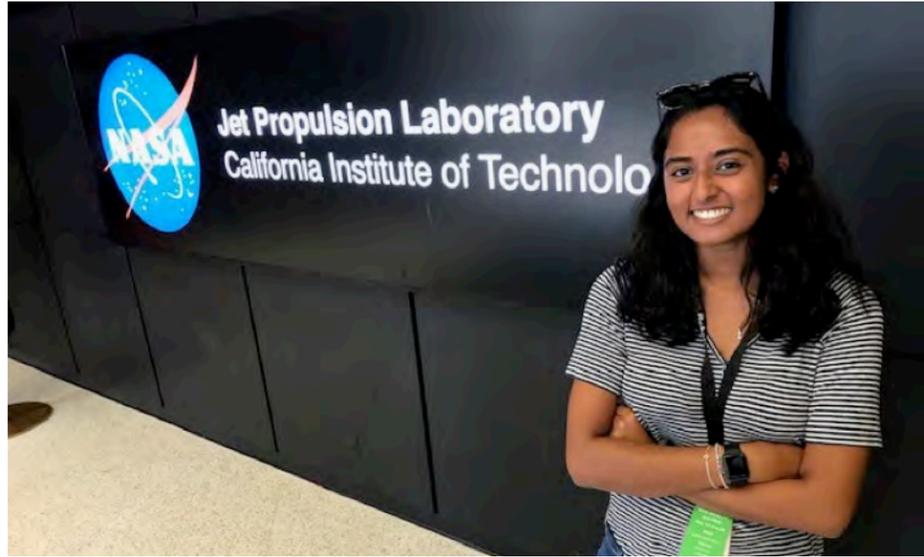
OVERVIEW

Our ability to achieve the goals outlined in this strategic plan depends on careful financial planning and the acquisition of additional resources. Over the next five years, we plan to grow our diverse student, faculty, and staff populations through targeted investment in the strategic areas outlined in this plan. In addition to human resources, the successful implementation of our plan to become a top 25 public engineering college will most urgently require the acquisition of additional high-quality research and teaching space for the growing needs of the college. Enhancements to our research and teaching enterprises will require additional public and private investment and the availability of additional revenue sources to the college.

ACTION STEPS:

1. Grow the College of Engineering through university strategic investments in key areas.
2. Secure resources for endowed professorships and faculty fellowships.
3. Expand graduate student enrollment through targeted recruitment and marketing and by increasing the availability of fellowships and assistantships. Expand fee-bearing MS student programs, including 4+1 programs.
4. Develop plans and identify funding sources for new state-of-the-art college research and teaching facilities, including a new thematic engineering building, and student design/build experiential learning facilities.
5. Secure donor funding to name the college.
6. Develop a multitier industry partnership program, including expanded workforce development programs, and effectively leveraging the Mount Ida Campus.
7. Expand online and multimodal education offerings globally to include additional degree and certificate programs to generate additional revenue streams.





University *of*
Massachusetts
Amherst

BE REVOLUTIONARY™