



**MAKING
THE WORLD
WORK
BETTER**



COLLEGE OF ENGINEERING
MECHANICAL ENGINEERING
UNIVERSITY OF MICHIGAN

**STRATEGIC PLAN
2022 - 2027**

GLOBAL CHALLENGES, RISING CHANGE

The major challenges our world faces - climate change, socioeconomic inequality, public health crises - will be solved with the expertise of mechanical engineers. Whether a global pandemic necessitates an expert in fluid mechanics to safeguard public transportation or threats of calamitous climate shifts inspire new technology for atmospheric carbon capture, mechanical engineers possess the will, the know-how, and the community required to make our world work better...for everyone.

The University of Michigan Department of Mechanical Engineering recognizes the profound responsibility that accompanies our discipline and is proud to present this Strategic Plan. Led by Tim Manganello/BorgWarner Department Chair, Ellen Arruda, we have taken special care to center the front line scholarship of our faculty, our internal and external communities, and social justice as essential to our vision of a better world.

Through conversations with our faculty, staff, alumni, students, and affiliates, we have identified five strategic directions that aim to address our Department's areas for growth as well as grand challenges that we are especially poised to solve.

1. Deliver Exceptional Education to Prepare Students for a Changing World
2. Advance Future Research Directions to Address the World's Most Important Challenges
3. Foster Diversity, Equity, and Inclusion to Build a More Socially Just World
4. Strengthen Collegiality, Collaboration, and Communication to Have a Positive Impact on the World Around Us
5. Create Supportive and Effective Operational Structures, Processes, and Cultures to Maximize Department Potential

This document summarizes the goals and tactics associated with each of these strategic directions and also provides their underlying rationales. While each direction assumes its own goals and initiatives, our commitments to responsible science, to our community, and to social justice are woven throughout. Compiled here, these directions manifest our vision for the future and explicitly state our ambitions.

STRATEGIC PLAN FUNDAMENTALS

Diversity, Equity, Inclusion

EDUCATION

RESEARCH

OPERATIONS

Faculty, Staff, Students

DEPARTMENT VISION

We see a future of mechanical engineering achieving an equitable, sustainable, inclusive, and innovative world by means of our exceptional contributions to education, research, service, and social justice.

STRATEGIC DIRECTIONS

Our five strategic directions constitute a strong internal plan connecting research, education, and operations, building on a strong foundation, to nurture and execute our vision.

1

Deliver Exceptional Education to Prepare Students for a Changing World

2

Advance Future Research Directions to Address the World's Most Important Challenges

3

Foster Diversity, Equity, and Inclusion to Build a More Socially Just World

4

Strengthen Collegiality, Collaboration, and Communication to Have a Positive Impact on the World Around Us

5

Create Supportive and Effective Operational Structures, Processes, and Cultures to Maximize Department Potential



STRATEGIC DIRECTION PURPOSE

We aspire to deliver an exceptional mechanical engineering education to every student. We seek to provide an equity-centered, inclusive, and engaging experience, in which we support students on a clear educational path preparing them to confidently, knowledgeably, and collaboratively address the world's most important challenges today and in the future.

STRATEGIC DIRECTION



Deliver Exceptional Education To Prepare Students For A Changing World



STRATEGIC DIRECTION:

Deliver Exceptional Education To Prepare Students For A Changing World

DIRECTION GOALS

- 1** Develop a framework to evaluate our program and to provide guidance toward providing exceptional mechanical engineering education in the long term.
- 2** Develop a process to identify curriculum needs and priorities (short term) to apply to both graduate and undergraduate curriculum.
- 3** Determine the resources and structures needed to implement the tactics for this strategic direction.
- 4** Integrate educational practices with DEI plan.



OVER THE NEXT DECADE AN AVERAGE 20,200 JOB OPENINGS FOR MECHANICAL ENGINEERS ARE PROJECTED ANNUALLY.



Through exceptional mechanical engineering education, we will prepare our students to confidently, knowledgeably, and collaboratively address the world's most important challenges, today and in the future. Through comprehensive curriculum evaluations, we will continually improve the educational experiences of our students, with focus on integrating DEI into our classrooms, and address barriers to our students' success, so that the equity-centered, inclusive, and engaging education we provide will also launch our students into fulfilling and effective careers. By providing our faculty and students with the necessary tools for evaluation and DEI integration, we will ensure the health of our graduate and undergraduate programs, in terms of their size, effectiveness, and inclusivity.



STRATEGIC DIRECTION PURPOSE

We aim to identify and build a foundation for future research priorities and directions in order to address the world's most important challenges. We will work to enhance collaboration within the department, college, university, industries, and beyond to keep innovation, creativity, and diversity at the forefront of our research.

STRATEGIC DIRECTION



Advance Future Research Directions To Address The World's Most Important Challenges

STRATEGIC DIRECTION:

Advance Future Research Directions To Address The World's Most Important Challenges

DIRECTION GOALS

- 1 Identify approaches to support and incentivize research collaborations within ME.
- 2 Identify fundraising opportunities and approaches to increase our research funding.
- 3 Integrate our research goals with DEI plans.
- 4 Determine emerging research areas that we are best positioned to lead in and what we should be doing to lead in these areas.
- 5 Determine if and how U-M Mechanical Engineering can become the leading ME department in the U.S.

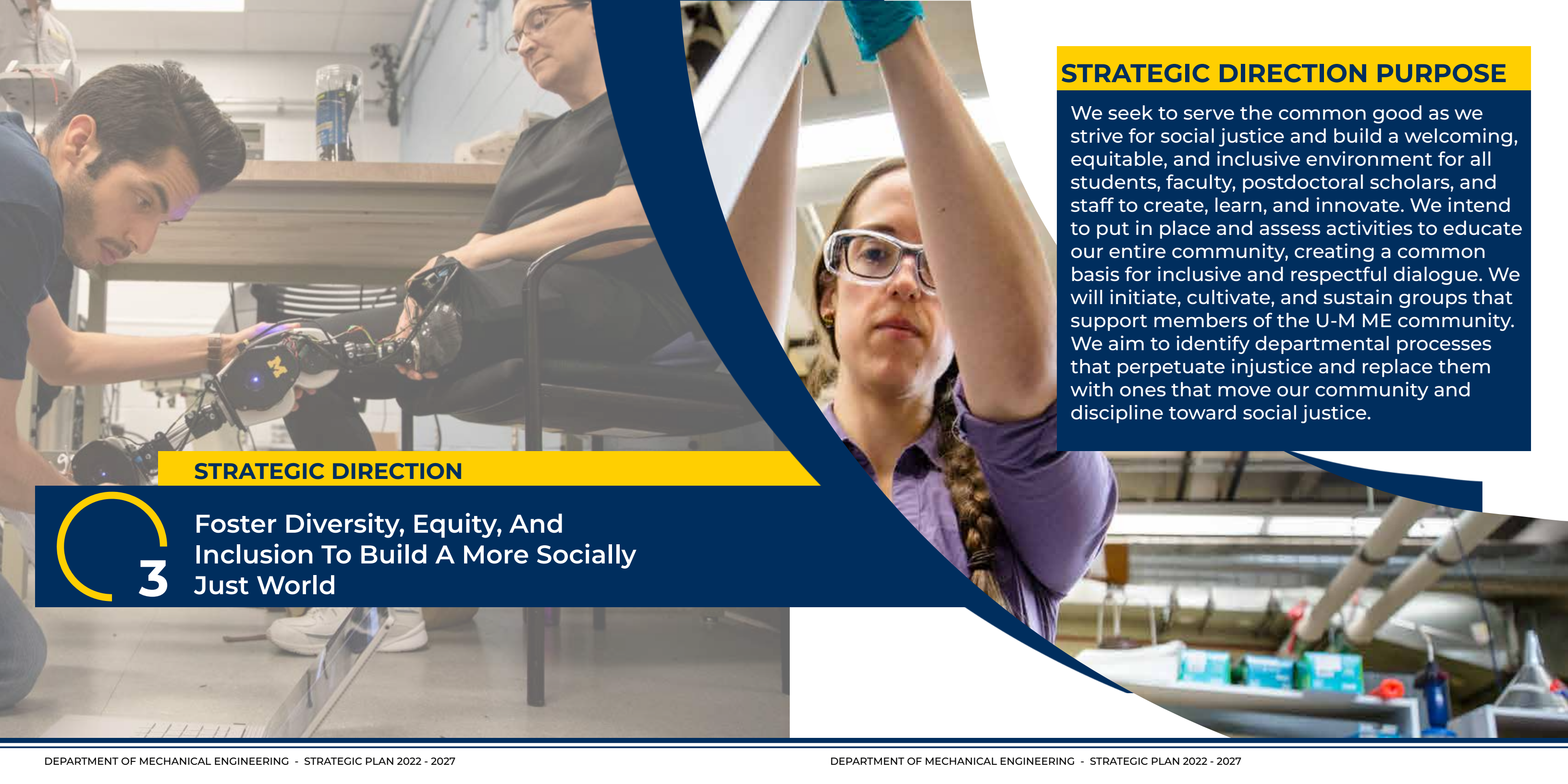
BIOMECHANICS & BIOSYSTEMS
CONTROLS
DESIGN
DYNAMICS & VIBRATIONS
ENERGY
FLUIDS
MANUFACTURING

MECHANICS & MATERIALS
MECHATRONICS & ROBOTICS
MICRO/NANO ENGINEERING
MOBILITY, AUTOMOTIVE,
AND TRANSPORTATION
MULTI-SCALE COMPUTATION
THERMAL SCIENCES



13 RESEARCH AREAS WITHIN THE DEPARTMENT ALLOW FOR DIVERSE COLLABORATION AND ENDLESS OPPORTUNITIES TO CREATE CHANGE.

The Department aims to address the major challenges facing our world today through highly-collaborative and innovative research. We will provide our faculty with critical resources, staff support, and marketing promotions, work to identify new research areas in which U-M ME is especially poised to lead, and coordinate fundraising efforts to ensure support for these new areas. Engagements and collaborations with government, alumni, and industry leaders will be supported and encouraged to build connections with the Department and to bolster our reputation nationally and internationally. Diversity, Equity, and Inclusion will claim a central role in our research enterprise, through the development of a seminar series, recruitment and support of graduate students, and active engagement with ME faculty whose work promotes social justice.



STRATEGIC DIRECTION PURPOSE

We seek to serve the common good as we strive for social justice and build a welcoming, equitable, and inclusive environment for all students, faculty, postdoctoral scholars, and staff to create, learn, and innovate. We intend to put in place and assess activities to educate our entire community, creating a common basis for inclusive and respectful dialogue. We will initiate, cultivate, and sustain groups that support members of the U-M ME community. We aim to identify departmental processes that perpetuate injustice and replace them with ones that move our community and discipline toward social justice.

STRATEGIC DIRECTION



Foster Diversity, Equity, And Inclusion To Build A More Socially Just World

STRATEGIC DIRECTION:

Foster Diversity, Equity, And Inclusion To Build A More Socially Just World

DIRECTION GOALS

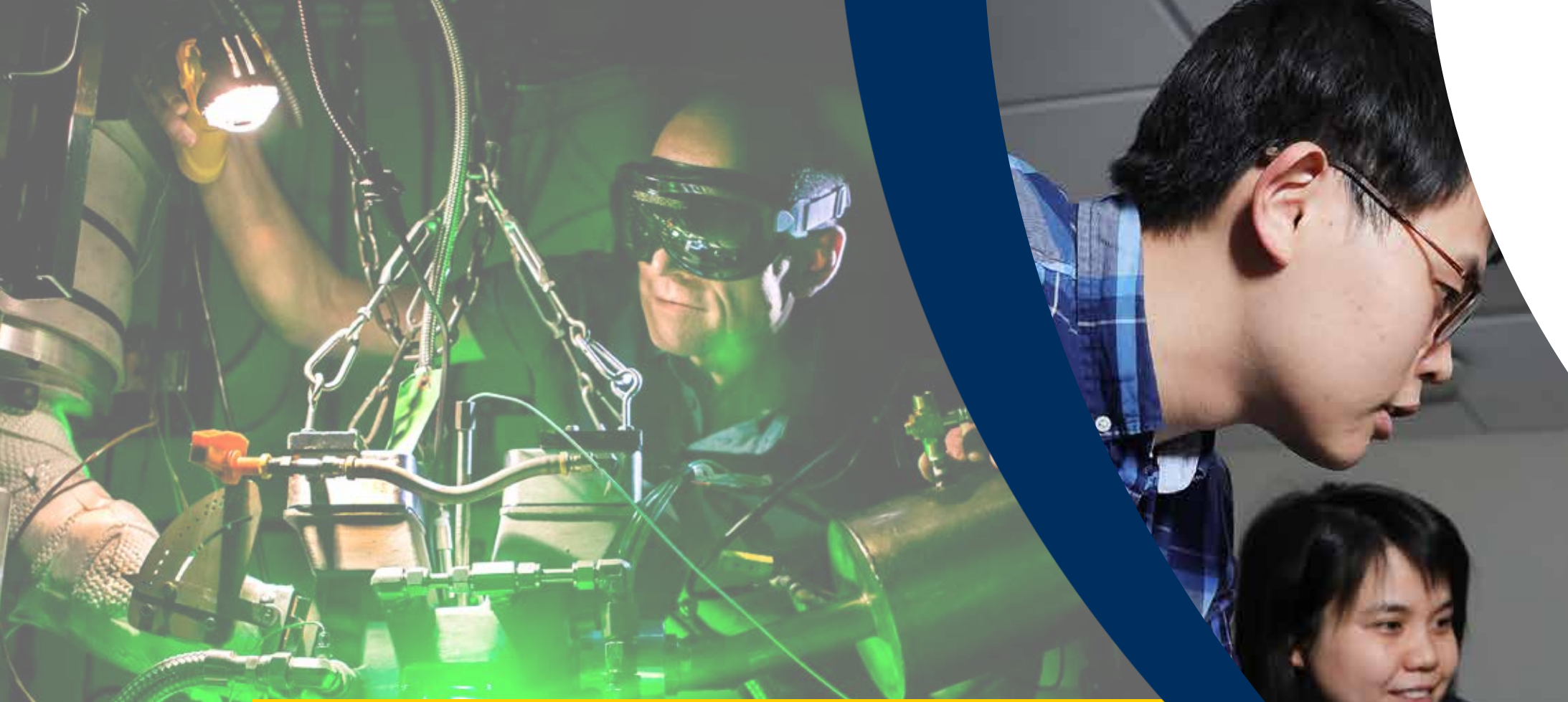
- 1** Recruit and retain a diverse ME Community.
- 2** Build and value DEI skills.
- 3** Communicate transparently.
- 4** Develop an inclusive, healthy, and safe environment for the ME community and research.
- 5** Achieve inclusivity and social justice as core values in engineering education, practice, and research.



SCIENCE BENEFITS FROM PRACTITIONERS WITH **DIVERSE BELIEFS, BACKGROUNDS, AND VALUES** TO BALANCE OUT THE BIASES THAT MIGHT OCCUR IF SCIENCE WERE PRACTICED BY A NARROW SUBSET OF HUMANITY.₂



With these goals, the Department will prepare all in our community to reevaluate our work and goals in a new light. Diversity, Equity, and Inclusion will be at the forefront of all we do. From faculty to staff to students, we will recruit a diverse ME community. We will educate and equip our community with knowledge, fundamental understanding, and training to create and to sustain a thriving culture of DEI excellence. Platforms will be created for safe reporting of misconduct and for suggesting improvements to departmental climate—along with a clear response and outcomes process. These efforts will foster an inclusive environment where all feel welcome to learn, grow, and prepare to change the world.



STRATEGIC DIRECTION PURPOSE

We endeavor to become a richly collaborative department of mechanical engineering by leveraging the diverse strengths, passions, and talents of our faculty, staff, postdocs, and students. We aspire to have an impact in all that we do—locally and globally—and will develop ways to communicate to both internal and external audiences within the University community, the State of Michigan, as well as nationally and internationally. Strong collaboration at all levels, a focus on our community's well being, and an active recognition of everyone's contribution to our mission are critical to addressing the most important issues facing our work.

STRATEGIC DIRECTION



Strengthen Collegiality, Collaboration, And Communication To Have A Positive Impact On The World Around Us

STRATEGIC DIRECTION:

Strengthen Collegiality, Collaboration, And Communication To Have A Positive Impact On The World Around Us

DIRECTION GOALS

- 1** Build new and strengthen existing relationships between individual faculty, staff, and students, both within and across these different groups.
- 2** Explore ways to center individual and community wellbeing in our interactions. Introduce practices that value staff members, students, and faculty members as whole people.
- 3** Inform the department's internal and external audiences—at the local, state, national, and global levels—about our research and teaching.



EMPLOYEES WHO FEEL THEIR VOICE IS HEARD ARE **4.6 TIMES MORE LIKELY** TO FEEL EMPOWERED TO PERFORM THEIR BEST WORK.³



U-M ME aims to provide a collaborative and welcoming community for all faculty, staff, and students and to be a magnet for exceptional scholars and students from around the country. Robust internal communication pathways will be used to make clear the importance of each U-M ME community member to the mission of the Department, while targeted external communications will publicize our research and teaching accomplishments across the world. As a community, we will prioritize wellness and create opportunities for deepening our relationships with each other. We will create resources for promoting synergy between research and teaching and for sustaining more flexible work arrangements, so that our community may engage creatively with their work.



STRATEGIC DIRECTION

5

Create Supportive And Effective Operational Structures, Processes, And Cultures To Maximize Department Potential



STRATEGIC DIRECTION PURPOSE

We strive to ensure every member of the ME community has a strong sense of belonging and value within the department, confidence in the support of the department's leadership, and access to needed resources to move towards excellence and success.



STRATEGIC DIRECTION:

Create Supportive And Effective Operational Structures, Processes, And Cultures To Maximize Department Potential

DIRECTION GOALS

- 1** Enhance departmental leadership to cultivate trust in supporting and serving the ME community and address departmental “grind culture” regarding policy, regulations, administrative burdens, and faculty governance.
- 2** Enhance staff resource planning, career development, and mission success.
- 3** Develop a structure to examine all processes continuously and add, improve, or eliminate processes as needed.



EFFICIENT OPERATIONAL STRUCTURES ARE KEY WHEN RUNNING A DEPARTMENT WITH MORE THAN 100 FACULTY MEMBERS, 59 STAFF MEMBERS, AND HUNDREDS OF STUDENTS.



Through supportive and effective operational structures, processes, and cultures, the Department will ensure that each community member feels valued. We will endeavor to carve out clear pathways for each staff member to plan and to achieve their career goals. We will assess and enhance department processes so that they work for everyone and are the most sensible for achieving mission success. Through generous incentive structures and a culture of wellness, the Department will foster the careers of our staff, address staff turnover, and nurture the efficiency and productivity of all teams in our community.



SOURCES

1. U.S. Bureau of Labor Statistics. (2022, April 18). Mechanical engineers : Occupational outlook hand-book. U.S. Bureau of Labor Statistics. Retrieved July 29, 2022, from <https://www.bls.gov/ooh/architecture-and-engineering/mechanical-engineers.htm>
2. Understanding Science. 2022. University of California Museum of Paleontology. July 29, 2022 <<http://www.understandingscience.org>>.
3. Salesforce. (2017, January). The Impact of Equality and Values Driven Business.

CREDITS

Photo: Brenda Ahearn, Evan Dougherty, Levi Hutmacher, Marcin Szczepanski, Joseph Xu, Michigan Engineering, Communications & Marketing



COLLEGE OF ENGINEERING

MECHANICAL ENGINEERING

UNIVERSITY OF MICHIGAN