

School of Mechanical Engineering (ME)
Summary of School Activities during Calendar Year 2020
12/30/2020

1. Developed and implemented ME Mission & Core Values

- Conducted special team building event with faculty, staff and students facilitated by ME Advisory Council (MEAC) member (<https://engineering.purdue.edu/ME/AboutUs/Mission>).

2. Faculty Recruiting & Retention

- Hired one Distinguished Professor (NAE Member).
- Hired six Assistant Professors (4 female); one to start in August 2021.
- Promoted four Assistant Professors to Associate Professors with tenure.
- Promoted three Associate Professors to Full Professors.
- Promoted two Named Professors to Distinguished Professors.

3. Growth

- 90 tenure track faculty; 6 of them started during the pandemic in 2020.
- Undergraduate students = 1493 in F20 (up from 1364 in F19; 9.4% growth).
 - Awarded 363 BSME degrees (266 in May, 23 in August, and 74 in December).
- Graduate students = 747 in F20 (up from 613 in F19; 21.8% growth).
 - Awarded 74 PhD degrees (26 D-PhD and 45 PhD).
 - Awarded 114 MS degrees (89 on-campus, 18 online, 7 PMP).
- Research expenditures: \$38.1M (up from \$33M in FY19; 15% growth).
- Restructured ME Corporate Partners program; it grew from 11 in 2019 to 22 in 2020; 100% growth (<https://engineering.purdue.edu/ME/CorporatePartners>).
- Growth in ME has played a major role in maintaining undergraduate student enrollment at Purdue. When the pandemic hit in March, there was a concern that students would not return to campus for the fall semester, causing financial problems for Purdue. To entice them to come back, ME agreed to accept **all** freshmen who completed the First-Year Engineering program in good academic standing and chose ME as their first choice major. This resulted in ME accepting 100 more FYE students than we usually would.
- ME staff has done a heroic job managing the increase in students: creating multiple sections of classes, scheduling rooms to stay within Protect Purdue guidelines, and counseling students, who have struggled more than in any semester in memory. Faculty have also stepped up to the burdens of teaching large numbers of undergraduate students: creating hybrid in-person/online classes, teaching classes multiple times in multiple venues, and offering new forms of “lab” experiences where hands-on work was not possible.
- Even before the pandemic, ME had planned to increase the emphasis on online education. In April 2020, ME officially launched the collaboration with edX to deliver ME graduate courses online. The results have been significant: >20% of ME graduate students are now completing their MS degrees fully online. Online MS student enrollment grew from 56 to 190 students. The ME online master’s program was recently ranked #1 by *U.S. News and World Report*.

4. Research Activities

- The breadth of ME research activities and collaborations is truly unmatched. ME faculty conduct research in 19 different locations on- and off-campus. This year, ME restructured academic areas and research areas to truly show the breadth of activities and collaborations.

- See Figure 1 of Restructured Academic Areas & Research Areas in Appendix.
- Website: <https://engineering.purdue.edu/ME/Research>
- Successfully reopened research labs after initial closure due to the pandemic and kept all research labs fully operational until now.
- Conducted major research space renovations for ME faculty, such as ZL1 test cell and ZL4 energetics lab at the Zucrow Labs and RETHI test facility at the Herrick Labs
- ME faculty has been extremely successful in securing large-scale research grants. For example, since August 2020, ME faculty received:
 - \$24 million from the US Army for energetic materials research
 - \$5 million from the National Science Foundation (NSF) to use augmented reality in manufacturing worker education
 - \$5 million from the NSF for precision agriculture using Internet-of-things
 - \$3.2 million from the Department of Energy (DOE) for hydraulics in agricultural tractors
 - \$2 million from NSF LEAP HI Award to study new solutions to reduce the burden of skeletal fracture
 - “ME faculty make up a significant portion of CoE industry-funded research. Of the 24 “Rain-makers” (those with \$1M total over 5 years in industry funding in CoE), 7 of them are in ME.”
- ME faculty teamed across multiple Purdue Colleges and peer leading institutions to kick-off new initiatives to address national and global problems for impact.

5. Awards & Honors

- ME faculty have gone above and beyond in 2020. Seven ME faculty became Fellows of the American Society of Mechanical Engineering (ASME) Fellow, one became an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA), and one became Fellow of the American Physical Society (APS).
 - External: <https://engineering.purdue.edu/ME/News/2020/faculty-awards-and-honors>
 - CoE: <https://engineering.purdue.edu/ME/News/2020/faculty-excellence-awards>
- Also, ME staff, students and alumni received significant awards and recognitions
 - <https://engineering.purdue.edu/Engr/People/Awards/Institutional/Staff/2020/ptIndexYear>
 - <https://engineering.purdue.edu/ME/News>
 - ME graduate students did extremely well in national fellowships: 4 NSF Graduate Fellowships, 4 NASA Fellowships, and NDSEG Fellowship.

6. Restructured ME Leadership

- ME restructured the School leadership, including new appointments and new positions to better delegate tasks and address new initiatives, such as
 - Improved the graduate student recruiting model, including ME fellowships
 - Improved the TA assignment model to provide consistent TA allocations across all courses
 - Developed a consistent teaching load model for instructors
 - Worked on bringing edX program online
 - New experiential learning summer program (Undergraduate Team Projects)
 - Significantly increased nominations of faculty and staff for internal & external awards
- The latest ME organizational chart is shown in Figure 2 of the Appendix.
- Revitalized and restructured ME Advisory Council (adopted new by-laws). For the first time, also conduct a second spring web-based MEAC meeting.
- Formed 9-member ME Junior Advisory Council (MEJAC) to supplement 19-member [MEAC](#).
 - Through their experience completing the ME curriculum and their early careers, the

mission of the ME Junior Advisory Council is to provide insight to the ME Curriculum Committee regarding the efficacy of the curriculum in preparing them for their careers and recommend changes to enhance the preparedness of current and future ME students to make an incredible impact on our world.

7. ME Response to COVID-19 Educational Changes

- Successfully converted 100% of the last 1/3 ME instruction to online instruction
- Communication with faculty and staff via weekly or bi-weekly ME Open Forums
- Developed an updated ME exam policy
- Received approval for an increased online instructional percentage of PMP students

8. Expanded Experiential Learning

- Conducted 2020 ME Undergraduate Team Summer Projects:
 - 303 applications (interest from ME students across the country: IA, GA, CT)
 - 169 Purdue ME students participated in 37 projects
 - Website: <https://engineering.purdue.edu/ME/Undergraduate/SummerProjects>
 - Video: <https://engineering.purdue.edu/ME/News/2020/purdue-me-students-fill-their-lockdown-summer-with-realworld-research>
 - Won 2020 CoE Staff Team Award of Excellence
 - Initiative will continue annually (submitted NSF REU Site proposal)
 - Students each earned a \$1000 stipend made possible through the generosity of an ME alumni, and got the chance to conduct real-world research for our faculty (some of which are still going on to this day). It was so successful, that students from other universities contacted us, wanting to participate.
- Created new web portal to connect undergraduate students to undergraduate research opportunities: 119 applicants across 29 research projects for spring 2021
 - <https://engineering.purdue.edu/ME/Undergraduate/ResearchOpportunities>
- Created ME+ to house all ME experiential learning opportunities and programs:
 - <https://engineering.purdue.edu/ME/Undergraduate/Plus>
- ME's relationship with corporate partners continues to grow stronger; Office of Industrial Experience continues to match students and companies: not just for internships and co-ops, but for undergraduate design and research projects, mentoring, and alumni connections. 97% of ME undergraduates gain industry and/or research experience while they are here.

9. Development Efforts

- Conducted “meet the ME head” events in Indianapolis, Chicago and Houston.
- Saw several ME alumni on individual trips.
- Conducted coffee conversations with ME alumni.
- Started to raise money for ME Building renovation (approx. \$2M in hand and \$5M committed).
- 90+ ME faculty and staff participated in the Purdue Day of Giving.
- Received approval to add a Director of Development to the ME Development Team.

10. Diversity and Inclusion Efforts

- Initiated a major task force on Equity, Anti-Racism and Inclusion (TEAM-I) and developed recommendations including responses to Call-to-Action by NSBE student chapter.
- Started implementing early recommendations including Pete's Pals Program for student mentoring and graduate student fellowships for recruiting and retention.

School of Mechanical Engineering (ME)
School Activities planned for Calendar Year 2021
12/18/2020

1. Successfully providing exceptional education activities for ME undergraduate and graduate students amid many changes required by the response to the COVID-19 pandemic.
2. Successfully conducting exceptional research activities amid many changes required by the response to the COVID-19 pandemic.
3. Recruit outstanding new faculty via two approved faculty searches and one dream hire evaluation process.
4. Promote deserving Assistant and Associate Professors
5. Continue significant ME fundraising activities:
 - For the renovation and expansion of the original ME Building.
 - Further research expansion of the Herrick Labs and Zucrow Labs.
 - Secure funding for new air compressor plant at Zucrow.
 - Scholarships for URM and female undergraduate students.
 - Fellowships for URM and female graduate students.
 - Increasing the number of named professorships (there are not enough named professorships for deserving ME faculty).
6. Spearhead and enable coordination and development of bigger interdisciplinary research efforts, build centers, and in tandem pursue non-traditional funding through partnerships, foundations and donors.
7. Continue the process of revising and updating the ME undergraduate curriculum.

Appendix:

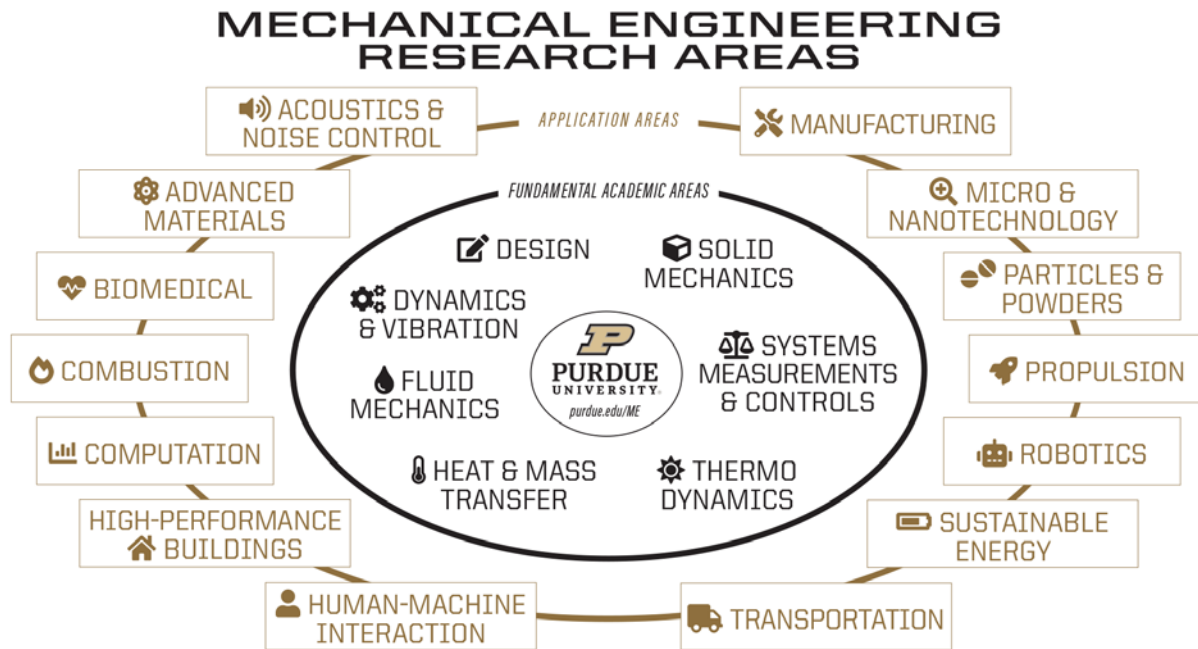


Figure 1: Restructured Academic Areas & Research Areas

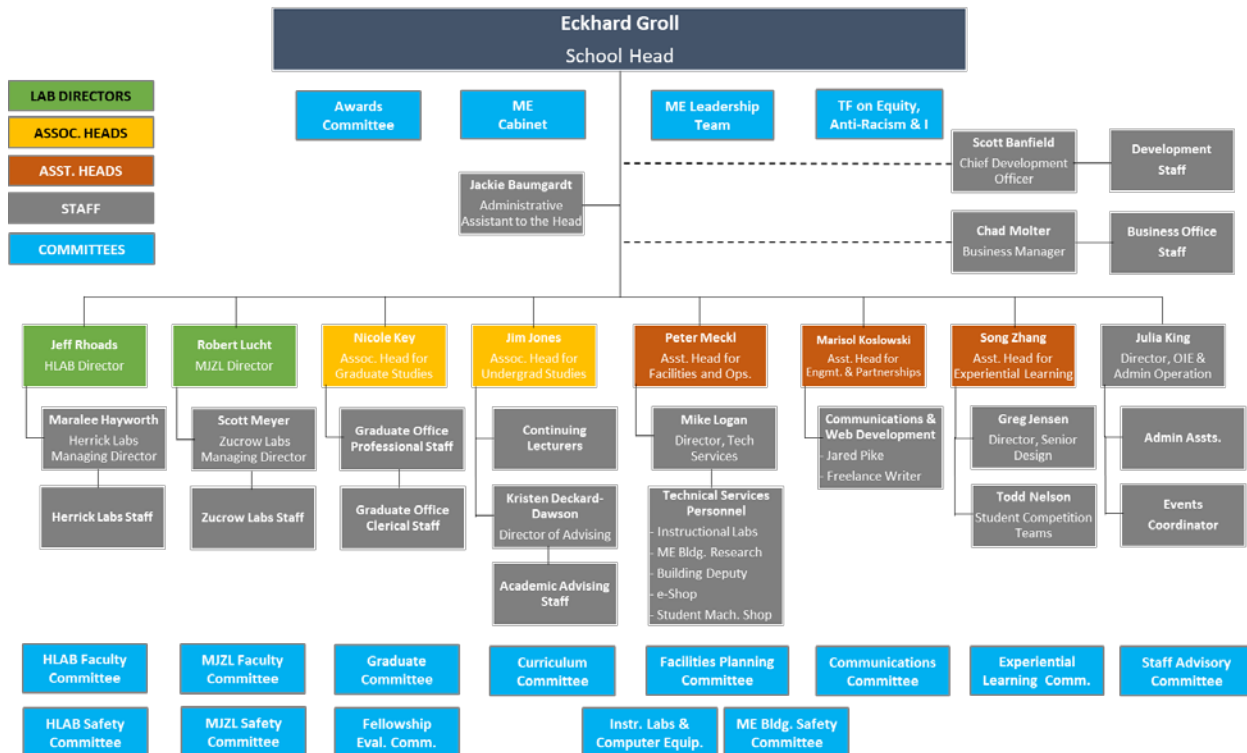


Figure 2: Restructured ME Leadership Team