

Department of Mechanical and Aerospace Engineering Plan (AGEP-NC)

Program History

Our graduate programs offer four research degrees: Master of Science or PhD in Aerospace Engineering and a Master of Science or PhD in Mechanical Engineering. Graduate assistantships are available for on campus research-active students at the master's and Ph.D. levels. We also offer a non-thesis master's degree and distance education master's degrees in both Aerospace and Mechanical Engineering programs. There is also an accelerated 5 year Bachelor/Masters (ABM) program.

MS degrees require 30 credit hours of class and a research project or thesis. PhD degrees require 72 credit hours, with advanced coursework beyond the master's degree, a written qualifying exam, a written and oral comprehensive preliminary examination, extended and in-depth research, a written dissertation, and a final oral defense of the research.

Changes to the PhD milestones that were intended to emphasize research and differentiate milestones include:

- **The qualifying exam is now a written exam administered by the research committee on topics relevant to the student's research fundamentals**
- **The written preliminary exam format was changed to a dissertation proposal format written in the style of an NSF or NIH proposal.**
- **A research practices overview and professional development course (MAE801) is required for all first year students**

Departmental culture

Over the last year, the department formed the DEI (now Climate) Committee to focus on support, recruitment and retention of students and faculty and more broadly how our large department can become a cohesive community. The committee is composed of faculty, the graduate program director, and student representatives. We developed a department mission statement with regard to climate and performed initial climate surveys (through the department and in concert with the College of Engineering) of students, faculty, and staff. We have regular departmental faculty and staff lunches before faculty meetings each month and the student organization focused on Women in Mechanical and Aerospace hosts professional development and networking events each semester. Recently, we approved a **Graduate Statement of Understanding** document with best practices and guidance for expectations for both graduate students and mentors. This is a complementary document to the recent [Graduate School document](#).

The results of the Climate Study had the following major takeaways:

- There was especially low response and engagement from students, which is consistent with an expressed perception of a large department with limited cohesion for students with faculty.
- There is an overall sense that the Department is performing reasonably well in different areas related to behaviors and policies towards race and gender identity, but Faculty and Undergraduate Students had the most contrast in opinion.
- A notable fraction of respondents reported that they heard insensitive or disparaging comments about race, ethnicity or gender, often from other students.
- A large fraction of respondents did not feel comfortable reporting or know how to report an act of discrimination or harassment.
- There is a need to improve our community members' understanding of the importance of DEI in our space and in the space of future employment of our students.

Immediate recommendations and some first steps we have taken are listed below:

- Additional education is needed about the importance of DEI in fostering a diverse, engaged and inclusive community. Some recommended available trainings have been posted on our Climate website and we have started MAE Conversations.
- Engaging our students outside the classroom and office settings must be explored. Additional social events (like POP and Krispy Kreme Challenge teams) have been initiated, but more is needed.
- Mechanisms for reporting discrimination, harassment, or any grievances has been publicized on our climate website.
- Improved descriptions and classification of research areas have been updated on the department website to highlight applications and connections to Grand Challenges, and make identification of research advisors more straightforward. This has also been carried into undergraduate recruitment within the Engineering First Year seminars and engineering introductory courses.

Barriers to success

Several barriers to success have been identified that comprise the climate and move to academia for graduate students (especially URM and women students)

- Limited opportunities for community-building by students with each other and with faculty outside of a classroom or research setting.
- Inconsistent processes, policies, and lab expectations across mentors and the department
- Inconsistent mentoring with regard to teaching and professional development activities
- Limited systematic review of student progress, successes, and obstacles in the program
- Limited centralized information about graduated students, their perceptions of the program, and their employment after graduation

Outcomes and objectives

Proposed PhD program overall goals

1. To tailor the PhD program to be more consistent with the desired student outcomes listed below
2. To increase the number of students who decide on careers in academia
3. To improve graduate student mental health and wellbeing
4. To improve graduate (and faculty) research productivity and recognition (e.g. awards).
5. To create a more welcoming and inclusive program environment and collegial culture within the department.

Proposed PhD program learning and development outcomes

1. **research:** technical research skills, research design, and interpretation of results
2. **teaching:** design of course materials and grading rubrics, and lecturing skill
3. **communication skills:** writing and presentation skills, including proposal preparation, technical writing, and oral presentation
4. **professional development as preparation for academia:** conference attendance, access to credentials and training programs, individual development plans, service and leadership opportunities

Proposed program features

- **Culture and sensemaking for faculty mentors.** The goal is to prepare department faculty to evaluate and participate in faculty activities related to enhancing diversity and inclusion, especially in teaching and mentoring. These activities will help develop a common set of expectations for mentor behavior and best practices. We are initiating the use of the **Statement of Understanding** for all graduate mentors to help define these practices. We will compile a more complete **Handbook for Mentors** based on existing resources. We will also use our **MAE Conversations** series to discuss culturally responsive mentoring. At least 1 Conversation event per semester will include topics of mentoring, teaching, or advising graduate students. This will also allow us to continually identify through faculty discussion program elements that may be obstacles to success; such as, timing of assigning faculty mentors, qualifying and preliminary exam timing, or course requirements for continual refinement.
- **Individual Development Plans with annual reporting:** All PhD students will be required to create **individual development plans** with their primary mentor to

identify areas of strength and growth; discuss research, teaching, and professional development plans; plan and record annual goals for research and program progress; and identify any barriers/obstacles to success. Annual **student activity reports (STAR)** will be submitted by students each April, with feedback from faculty mentors on progress, plans, and solutions to obstacles for the next academic year. This will provide formal benchmarking on student progress and an opportunity for feedback and make sure students and mentors are on the same page. It will also be a method for ensuring professional development is being provided to each student in accordance with their career goals. STARs will also be registered in the graduate office and reviewed for any unsatisfactory progress or discrepancies between students and faculty evaluations, as well as centralize data on student awards and achievements for better recognition and promotion of outstanding achievements.

- **Professional development:** We will create a central guidebook for potential awards, Graduate School programs and opportunities, professional societies on and off campus, and conferences and encourage IDPs to include annual professional development activities for each student. We also will review MAE801 content to include a unit on professional development opportunities, department culture, Statement of Understanding, and STAR procedures.
- **Teaching and communication development:** Encourage PhD students to teach as part of a mentored teaching experience (e.g. Preparing for the Professoriate, or the [MAE Mentored teaching program](#)). Also, encourage academic minded students to take Academia Prep Courses (Pick 2) or complete the [Teaching & Communication Cert](#)
 - EED 501 - Teaching Undergraduate Engineers
 - EED 502 - The Course Development and Implementation Cycle: Content, Assessment, and Pedagogy
 - EED 509 - Field Experiences in Engineering Education
 - EED 511 - Diversity and Social Justice in Engineering Education
 - EED 558 -Teaching Creative Problem Solving
- **Community Building:** We currently hold an annual graduate student research symposium each spring. We will institute a Fall graduate student welcome social event in concert with the GSA. We will have annual listening sessions with leadership from student organizations including MAE GSA, student professional society chapters, and student organizations that support URM, and include these organizations at the fall event. We will also have open informal brown bag lunches with faculty and students several times a semester to encourage informal interactions. Orientation activities will include information on the culture and values of the department and expectations for inclusive behavior.

Sustainability of the plan

The MAE Climate Committee and Graduate Curriculum Committee will coordinate with the Graduate Program Director to coordinate these activities and ensure continuous improvement.

Assessment of the plan

The MAE Climate Committee and Graduate Curriculum Committee will coordinate with the Graduate Program Director and MAE Academic Advisors to coordinate these activities, track progress, and ensure continuous improvement.

Tracking climate progress: Biannual climate surveys will be used to track climate perceptions. **Annual demographics and graduation records** will be recorded and analyzed for enrollment and graduation trends. **Entrance interviews** will be conducted to assess entering students' current career plans and aspirations, especially with regard to plans for academia versus industry or other positions. We will conduct **exit interviews** with departing students to understand strengths, weaknesses, and obstacles to success in the program, with special attention to students leaving before the PhD is completed. Graduating students will also be asked what their current career goals are and if they changed since enrollment, what factors led to that change. We will also continuously **track graduated doctoral students** and their employment after degree completion through a LinkedIn group and annual surveys.

Timeline

Task	Fall 2023		Spring 2024		Fall 2024		Spring 2025	
Sensemaking								
IDPs	Develop							
PD and guidebook/ orientation	orien t ation		Develop guidebook		orien t ation			
Teaching focus	Promote teaching				Ramp up adoption			
Community Building								
Assessment	Entrance interviews			Grad. surve y	Entrance interviews		Climat e survey	