

Interdisciplinarity@WMU- Phase One planning Template

1. **Brief Overview:** Provide a brief overview of the proposed interdisciplinary initiative. What types of questions would the initiative ask? What types of complex problems would it seek to solve?

Mobility engineering (ME) is the modern evolution of automotive engineering and it requires a fundamentally different skill set than what is earned in a traditional automotive engineering curriculum: it requires an interdisciplinary skillset. The upending of the automotive engineering industry by new technology such as automation, electrification, and system interconnection (e.g. ride-sharing) has many societal benefits that will go unrealized unless two critical problems are addressed: (1) the lack of adequately trained engineers who can design and implement autonomous, electrification, and systems-enabled technology and (2) a sufficient training program that utilizes hands-on and custom learning environments for diverse students. We believe that WMU needs to develop a new interdisciplinary ME certificate program that could become a cornerstone for a new interdisciplinary identity: individualized and affordable education for cutting-edge and high-paying jobs available right here in Michigan. The only other college in Michigan with an ME program is Wayne State and theirs is housed in the Computer Science department. At WMU, we have an advantage in that we already have physical vehicles and evaluation equipment, meaning that our program can be hands-on and applied (note that this also distinguishes us from online programs such as Udacity Coursera, and others). Michigan governor Gretchen Whitmer has identified ME education as one of the core objectives for her new Office of Future Mobility and Electrification (OFME). They estimate that the state of Michigan needs to educate 12,000 ME in the next ten years. Our WMU program could be first to market thus earning a first movers advantage in a high-demand educational initiative. We seek to leverage existing efforts and courses in the College of Engineering and Applied Sciences (CEAS) focused on autonomous vehicles, electric vehicles, artificial intelligence, and more.

2. **Impacted units:** What existing units, programs, and colleges would be involved in the proposed initiative? What other possibilities for collaboration across campus or in the broader community might exist now or in the future?

Impacted departments include Mechanical Engineering, Computer Science, Electrical Engineering, Chemical Engineering, and Communication. This could also leverage the recently passed Automotive Engineering Concentration by the Department of Engineering. Existing courses to leverage include:

- ME-5950 - Autonomous Vehicles
- ME-TBD - Hybrid & Electric Vehicles
- CS-5821 - Machine Learning
- CS-5820 - Artificial Intelligence
- ECE 5150 - Real-Time Computing
- ECE-5200 - Power Electronics

CE-5200 - Renewable Energy and Storage
ME-5430 - Mechanical Systems Control
CS-5550 - Computer Networks and Distributed Systems
CS-TBD - Additional Robotics Course

Expansion are possible that include

College of Business for Entrepreneurship

Encouragement of ME Entrepreneurship in collaboration with the Michigan Department of Economic Development, MEDC and NSF I-Corps

College of Health and Human Services

Enabling ME for persons with disabilities and persons with low-vision/blindness

Collaboration with government entities and industry is a major component as well. We are currently seeking to join the Mobility On-Ramp organized by the Michigan Mobility Institute (see: <https://michiganmobilityinstitute.org/moc/>)

- 3. Impact on teaching, learning, and curricula:** Describe the anticipated impact of the proposed initiative on teaching, learning, and curricula. How might this initiative help to grow enrollment, including by reaching new audiences of learners through continuing education, dual enrollment, or professional certification? How will the proposed initiative positively impact the training of undergraduate and graduate students? How does it enhance our institutional commitment to diversity, equity, and inclusion?

This is an interdisciplinary program attracting all engineering majors for both traditional students as well as continuing students from industry. Existing courses remain relatively unchanged but students can now pursue courses across many disciplines as part of an ME certification.

- 4. Impact on research and creative activity:** Describe the anticipated impact of the proposed initiative on research and creative activity. How will this initiative promote discovery and creative scholarship? How might it result in increased external funding?

Pursuit of this interdisciplinary initiative unlocks numerous external funding avenues through the Office of Future Mobility and Electrification, the Michigan Economic Development Corporation, the Michigan Department of Transportation, NSF education initiatives such as Improving Undergraduate STEM Education (IUSE) and Research on Emerging Technologies for Teaching and Learning (RETTL), for which a \$850k proposal has already been submitted), as well as rigorous research into ME for which we have submitted numerous NSF, DOE, and industry proposals to date.

- 5. Efficiencies and/or cost savings:** How might the proposed initiative contribute to increased efficiencies and/or cost savings, for example by reducing administrative positions (e.g. chairs/directors), sharing staff support services and/or by sharing facilities?

We anticipate improved efficiency and cost savings on impacted units due to potential increase in enrollment numbers. This initiative unlocks a new category of students who are interested in the new generation of automotive careers in Michigan. It would attract more students who are interested in ME and it would attract diverse students including those working in industry with traditional (now obsolete) automotive engineering degrees.

- 6. Impact on course offerings and workload:** At present, proposed initiatives will only be feasible and sustainable if they can be supported by existing resources, including instructional capacity, faculty and staff time, and facilities. Will the proposed initiative streamline existing course or program offerings? Could the initiative help create more equitable and sustainable workload for faculty, for example, by reducing the need to offer under enrolled courses, reducing the frequency of course offerings or eliminating the need to teach some courses?

WMU already has high-quality cutting-edge courses in place that can support this initiative. The key is to free up students' abilities to take courses across all of the engineering domains. These existing courses can be used to increase enrollment to a point at which future expansion can be put into place. Additionally, we will continue to submit ME education proposals and having an official program in place using existing courses will help in these efforts.

- 7. Additional Information:** What additional information would you like to provide in support of this proposal?

We are also proposing to the Interdisciplinary Team Excellence Enhancement Grant

8. Contact

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