Ph.D. in Mechanical Engineering
Assessment Plan

The mission of the Mechanical Engineering doctoral program is to provide students with advanced learning in the classroom and mentoring to conduct cutting-edge research in the areas of thermo-fluid sciences, mechanical systems, or manufacturing/controls. The primary goal of the program is to develop technical experts that become world-class scholars and leaders in either academia or industry.

Students graduating from the CSR (Computational Sciences & Robotics) master's degree program, who wish to continue on to earn a doctoral degree, can easily do so within the ME PhD program. Robotics faculty on campus (those within and outside the mechanical engineering department) can direct PhD dissertation study in robotics through the mechanical engineering department.

The ME department has close ties with both the following research centers and laboratories on campus:

- Advanced Materials Processing center – which has a world-class friction stir welding system
- The Additive Manufacturing Laboratory – which houses both the Laser Powder Deposition Laboratory and Direct Write Laboratory.
- The Polymer Technology, Processing, and Composites Laboratory
- The Experimental and Computational Mechanics Laboratory

Outcomes
Students undertaking education in PhD/ME program are expected to

- expand the knowledge and understanding of methods and approaches in 1 or more focused areas of Mechanical Engineering
- formulate solutions to problems related to thermo-fluid sciences, mechanical systems, or manufacturing/controls
- be able to conduct basic or applied research and development in Mechanical Engineering
- become an engineer who will serve their profession and community as valuable contributing leaders

Overall program assessment
The Ph.D. Mechanical Engineering programs undergo a comprehensive self-study and external review every seven years. An external evaluator is retained, and the Curriculum Subcommittee of the Department's Industrial Advisory Board is also engaged in the review. A comprehensive self-study report is prepared, and an on-site review is conducted by an external reviewer. The next external review will; take place in fall 2019.

Student learning assessment

Each student's advisory committee evaluates progress through qualifying and comprehensive exams, seminars, the publishing and presentation record of the student, and the dissertation defense process.

A required qualifying examination tests the student's background knowledge and ability to pursue advanced courses and dissertation research. The exam has three parts:

1. Competency in coursework will be evaluated through oral and written examinations.
2. A written research proposal
3. An oral presentation of the proposal to the Advisory Committee.

The doctoral dissertation and final defense of the scientific validity of the work, as well as basic and specialized knowledge in the field of study is the summative assessment. Submission of papers to journals and proposals to funding agencies are expected throughout the course of study, as verification of the professional quality of work and research.

The Dissertation must represent the culmination of at least of the equivalent of one academic year of full-time research. It must advance or modify knowledge and demonstrate the candidate's technical mastery of the field.

The dissertation can consist of a compilation of three published and/or submitted journal manuscripts that are derived from the candidate's doctoral research and are either authored or co-authored by the candidate.

The rubric below is used to assess the student’s attainment of the program’s learning outcomes at the final oral dissertation defense.

Program Level Learning Outcomes Assessment Rubric

Program: Ph.D. Mechanical Engineering	**Date:**
Student:	**Evaluator:**

Program Learning Outcome	***Excellent***	***Average***	***Poor***
Outcome # 1: Contribution to Expanding Knowledge (*circle* one)	Sound, logical, and efficient application of advanced knowledge to mechanical engineering has yielded new knowledge and understanding as evidenced by peer reviewed publications or presentations.	Student has demonstrated most of the "*Excellent*" traits. Some performance issues were observed with respect to some of the traits.	Student has failed to demonstrate the majority of the "*Excellent*" traits.
Outcome #2: Problem Solving Ability (circle one)	Advanced analytical, experimental, or computational skills used to define problems. Problems are solved in a sound, logical and efficient manner using advanced skills of analysis, experiments, or computing.	Student has demonstrated most of the "*Excellent*" traits. Some performance issues were observed with respect to some of the traits.	Student has failed to demonstrate the majority of the "*Excellent*" traits.
Outcome #3: Research Ability (circle one)	Sound, logical, and efficient application of advanced knowledge to solve mechanical engineering problems. Research problems and their solution are effectively and efficiently communicated as evidenced by a dissertation, thesis, peer reviewed publication, or graded course work.	Student has demonstrated most of the "*Excellent*" traits. Some performance issues were observed with respect to some of the traits.	Student has failed to demonstrate the majority of the "*Excellent*" traits.
Outcome #4: Servant Leadership (circle one)	Career goals and aspirations, we well as conduct during graduate studies, justify a high confidence that the student will be a leader that serves the profession and community.	Student has demonstrated most of the "*Excellent*" traits. Some performance issues were observed with respect to some of the traits.	Student has failed to demonstrate the majority of the "*Excellent*" traits.