**Institutional Effectiveness**
**2022-2023**

**Program:** Mechanical Engineering MS
**College and Department:** College of Engineering, Mechanical Engineering (ME) Department
**Contact:** Mohan D Rao
**Mission:**

The Mechanical Engineering (ME) Department, within a regional and global context, will prepare its students for productive career in a competitive, dynamic, technologically-based society; will advance the knowledge of mechanical engineering principles and applications; and will serve the public.

**Attach Curriculum Map (Educational Programs Only):**

| Table 3a: Curriculum Map of M.S. Program in Mechanical Engineering | | | |
|---|---|---|---|
| | Student Learning Outcomes | | |
| Courses & Degree Requirements | Demonstrate an enhanced expertise in their area of specialization in Mechanical Engineering. | Conduct basic, applied and/or empirical research and/or design. | Give professional presentations or write scholarly manuscripts worthy of publication in conferences and or peer reviewed journals. |
| Graduate Level Coursework. * (Minimum 21 credit hours for thesis Option; 30 credit hours for non-thesis). A maximum of 9 credit hours can be at the 5000 level. | X | | |
| ME 6990- Research and Thesis (6 to 8 credit hours for thesis option). | X | X | X |
| ME 6960- Independent Project Course (3 credit hours for non-thesis option). | X | X | X |
| ME 6910-1 credit. Introduction to Graduate Research | | X | X |

## Student Learning Outcomes

**Define Outcome:**
Student Learning Outcomes (SLO):

Upon completing the MSME program, graduates will be able to:

1. Demonstrate an enhanced expertise in their area of specialization in Mechanical Engineering,
2. Conduct basic, applied and/or empirical research and/or design,
3. Give professional presentations or write scholarly manuscripts worthy of publication in conferences and/or peer reviewed journals.

**Assessment Methods:**
The ME Department uses the following assessment tools to evaluate the achievement of the program and student learning outcomes

- Grades in core ME graduate courses,
- M.S. thesis evaluation,
- Publications in journals and conferences, and patents,
- GPA of students at graduation,
- Graduate student exit interviews,
- Recognition received for student research or teaching from internal and external organizations,
- Alumni surveys,
- Feedback from the ME EAB,
- Informal feedback from students, employers, and alumni, and
- IDEA teaching evaluations for GTAs for communication enhancement.

For instance, SLO #1 focuses on the technical competence of MSME graduates. This outcome is evaluated through the accomplishments and performance of students in their M.S. coursework. For SLO #2, advisors and graduate committees provide guidance and training to students in research methods. Successful completion of the thesis requirement provides evidence of the ability for further study. SLO #3 requires graduates to give professional presentations and write scholarly manuscripts worthy of publication in conferences and journals. Graduate students are required to make oral presentations of their thesis. Evaluation feedback for these oral presentations is provided to the students, which helps them to improve their technical communication skills. Many of the core courses also require oral presentations that are evaluated as part of the course grades. Evidence of achievement in technical writing is provided through the accomplishment of written theses that are reviewed and approved by the student's advisory committee. Additional evidence of achievement comes from scholarly manuscripts that were submitted and accepted, and presentations given at regional and national meetings.

**Criteria for Success (Thresholds for Assessment Methods):**
The ME department has adopted a holistic approach to measuring the success of its MS program, recognizing that setting thresholds for each assessment metric, while useful, is not the best way to assess overall effectiveness. This new approach is detailed below. The overall effectiveness of the MSME program is now assessed through various metrics, including student placement and employability, student exit surveys, and thesis evaluation data. Our goal is to achieve 100% employability for our graduates, ensuring they thrive in their jobs and advance in their careers.

**Link to 'Tech Tomorrow' Strategic Plan:**
1.A Experiential Learning,2.B Research, Scholar, Intellect, and Creativity

**Results and Analysis:**

A re-examination of the above assessment tools for this year's Program Review revealed the following weaknesses:

- Graduate Student Exit Interviews
  - Questions need to be re-examined and made more specific to the assessment of the MSME Program Educational Objectives and Student Learning Outcomes.
  - Surveys have not been administered consistently every semester.
- Alumni Surveys
  - Questions need to be re-examined and made more specific to the assessment of the MSME Program Educational Objectives and Student Learning Outcomes.
  - Surveys have not been specifically administered to graduate students.
- Feedback from the ME EAB
  - Feedback has not been consistently and systematically solicited in considering MSME program decisions.
- Informal feedback from students, employers, and alumni
  - This feedback was not a true assessment tool; it has been useful as supporting information only.
- IDEA Evaluations
  - This University required tool is for the assessment of teaching.

In addition to improving the existing tools, the ME GSC recommended that the following additional tools/measurements be added to better track program quality and productivity:

- Co-op survey ratings from employers who have hired graduate Co-Ops from the program,
- Average number of journal vs. conference publications per student per year,
- Average number of funded research projects (external and internal) per year per ME faculty member, and

- Percentage of MSME students who are employed upon graduation or who have been admitted to Ph.D. programs.

The above recommendations are being used in the current and future continuous improvement of the graduate program.

**Use of Results to Improve Outcomes:**

Due to the research and independent learning focus of the MSME program, assessment of teaching and learning is a significant challenge, as many of the methods used in undergraduate curricula are either not applicable or do not yield useful information. In addition, the small class sizes and the specialized nature of the graduate courses provide both some advantages and also some challenges to the teaching and learning process. On the plus side, the small class sizes allow very individualized attention to students who may be having difficulty with the course material. On the minus side, the small number of students in the classes makes the use of direct learning assessments statistically suspect. Consequently, more indirect ways of measuring student learning must be utilized, with the focus on whether or not the students have gained sufficient knowledge to achieve the educational objectives of the course.