Mechanical Engineering MS

College of Engineering – Mechanical Engineering

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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.

The Mechanical Engineering M.S. program at Tennessee Tech provides students advanced engineering skills and state-of-the-art knowledge in selected areas for positions in industry or pursuing a PhD. Students focus their programs on specific interests among several areas:

• Acoustics and Vibrations

• Design / Mechanical Systems

• Energy Harvesting / Smart Materials

• Energy Storage / Fuel Cells / Battery

• Smart Materials / Sensors

• Material Characterization and Modeling

• Robotics / Mechatronics / Controls

• Thermal Science / Fluid Mechanics

The program is research oriented and includes both thesis and non-thesis options for M.S. students. Graduate faculty work with students in advanced and in-depth studies on topics of mutual interest; provide guidance in fundamental and applied research; help develop powers of analysis, synthesis and critical thinking; and prepare students to follow academic and research careers through doctoral-level studies. The master's degree program consists of 30 hours for a thesis option and 33 hours for a non-thesis option.

The graduate program in Mechanical Engineering contributes directly to the missions of the Department, College, and University by preparing advanced level graduates consistent with the following mission statements:

COLLEGE OF ENGINEERING MISSION: To graduate innovative engineers who solve technological challenges to meet societal needs.

VISION: The Mechanical Engineering Department at Tennessee Tech aspires to be recognized globally for outstanding education and research, leading to well-qualified engineers who are adaptive professionals, inquisitive, entrepreneurial and successful in engineering practice, research, and public service.

PG 1: Recruit and mentor very talented, research active faculty who will excel in teaching, research and scholarly activities and enhance the reputation of the Department of Mechanical Engineering at both regional and national levels.

PG 2: Increase the number and quality of MS and PhD graduates until they are about 10% of the undergraduate population. The goal is to have a thriving graduate program with quality students.

PG 3: Increase externally funded research activation, proposals and journals submitted, and conference publications of the Department of Mechanical Engineering faculty per year.

SLO 1: Improve communication skills of Mechanical Engineering graduate students through mastery in both verbal and written communication skills.

SLO 2: Demonstrate the ability to conduct basic theoretical and/or applied research (MSME Thesis Option) or Independent study (MSME Non-thesis Option).

SLO 3: Students will give professional presentations or write scholarly manuscripts worthy of publication in conferences and/or peer reviewed journals.

1. **Graduate Student Exit Interviews:** Written survey and oral discussion with students are targeted toward determining the quality of the program, attainment of selected learning outcomes, and the adequacy of resources and facilities to achieve these. See Graduate Student Exit Interview Form for the survey questions included. The survey results are analyzed and updated once every two years.

2. **Percentage of MSME Students Employed or Attending Graduate School in another university:** The ME Department, along with the Centers of Excellence, perform exit interviews with graduating students and collect data on their next placement, feedback to the program, and level of their success. The data are collected, compiled and analyzed by the Centers and departments as a tool to improve the quality and environment of the graduate program. Percentage of MSME students who are employed upon graduation or who have been admitted to PhD programs is a good indicator of the quality of our graduate program. The results are analyzed once every two years.

3. **Co-Op Employer Surveys:** Administered by the Office of Career Services to employers of students participating in the Co-Op program. Employers provide feedback regarding (1) individual student performance, and (2) more general assessment-related questions regarding performance of the M.E. program. Results from this tool are included if and when available.

4. **Alumni Surveys:** One way of evaluating the effectiveness of the graduate program is to track the placement and performance of MS graduates either in their places of employment or doctoral programs in which they are enrolled. Results of such surveys help identify any weaknesses in the program for appropriate remedial measures to be crafted and implemented. They also help

determine the strengths of the program. The surveys are conducted once every two years and results presented accordingly.

5. **ME External Advisory Board Feedback:** Feedback from the ME External Advisory Board is an important source of program improvement, guidance, and supporting evidence regarding the performance of students who are graduates of the MSME program. The Advisory Board contains representatives of several key constituency groups of the program, i.e., employers, alumni, and the professional community at large.

6. **IDEA Teaching Evaluations:** IDEA evaluations are a university required tool for assessment of teaching of graduate faculty. The average IDEA ratings on Progress on Relevant Course Learning Objectives, Teaching Effectiveness, and Usefulness of the Course are used. The IDEA survey instrument makes provision for students to provide comments on each course. Some students use this as a vehicle to provide feedback on course topics and course requirements.

7. **Average Number of Funded Research Projects:** A summary of external funds generated by the M.E.

Over the period from 2012-2017, a total of 715 complete student applications to the MSME program were received. Two hundred and eighty-four applications (40%) were granted admission (including provisional standing). A total of 165 actually enrolled during this time. Sixty-one MS degrees have been awarded during this period. These data reflect the high standards related to retention and quality control of MS graduates that is implicit in the MSME program. These data collected once in five years during the THEC MS Program review will be updated in 2022.

We have had some decrease in both applications and student enrollment of MS students during AY 2021-22, particularly from international students due to lingering COVID-19 concerns. The good news is that we have had a number of our own domestic UG students apply and join our program. In addition, we have also had over a dozen of our own UG students sign up to our fast-track MS program. The total number of MS students in the program as of Fall 2021 was 32 compared to 30 a year ago. The student enrollment trend in ME including undergraduate and graduate students over the past years is shown in Figure 1 below. It should be noted that the MS student enrollment has seen a decrease during the past four years because of increase in emphasis on recruiting graduate students at the PhD level. The overall graduate student enrollment in the ME department has been stable at around 70 students for the past 0 612 792 reWuW* nB 8.02

projects facilitate research and scholarship, which consequently help build intellectual capital

ME 7650/CEE 7650 Continuum Theories of Materials
ME 7660/CEE 7710 Fracture Mechanics
ME 7670/CEE 7720 Fiber-Reinforced Composite Materials
ME 7680/CEE 7820 Theory of Elastic Stability
ME 7810 Advanced Materials Science II

Acoustics, Vibrations, Dynamics, and Controls

ME 5120 Intermediate Dynamics
ME 5640 Dynamics of Machinery II

ME 6370/CEE 6370 Vibrations of Continuous Media
ME 6430 Fundamentals of Acoustics

ME 6510 Motion Programming of Planar Mechanisms

ME 6730 Modal Vibration Analysis
ME 7510 Space Mechanisms
ME 7710 Dynamics of Machinery
ME 7720 Transfer Function