

2019-2020: Manufacturing Research Center

Definition of Unit

Providing Department:
Manufacturing Research Center

Department/Unit Contact:
Ying Zhang

Mission/Vision Statement:

The Center for Manufacturing Research (CMR) was established in 1984 to leverage resources of the State of Tennessee, the University, industries, and government funding agencies into cooperative efforts to advance manufacturing research. The CMR's Mission is stated below, driven by core principles from the College of Engineering and the University's Mission.

CMR Mission

To advance and support scientific and engineering knowledge in areas related to manufacturing through fundamental research and technology transfer activities, and to impact the instructional program in those areas.

Research Areas

Using a strategic planning process that was based on national manufacturing roadmap strategies in alignment with the College of Engineering research focus areas, the Center for Manufacturing Research has identified two research areas: 1) Digital Design and Manufacturing including (a) additive manufacturing, (b) advanced robotics and controls, and (c) cybersecurity in manufacturing, and 2) Sustainable Materials and Manufacturing including (a) materials processing and modeling and (b) energy conversion / storage materials and devices.

Core Values

The CMR has established the core values listed below that define the behaviors we seek to reward and recognize.

1. Commitment to Personal and Scholarly Integrity
2. Teamwork
3. Commitment to Excellence
4. Commitment to Personal/Professional Development
5. Valuing Partnerships, Cooperation, and Collaboration

6. Commitment to Continuous Improvement

Goal 1. Increase national and international recognition for TTU manufacturing research

Define Goal:

Increase research activity in the CMR by increasing total funding requests through proposals submitted to external sources, and thus, increase funding impact at the University and State Level. CMR is continuing to invest in faculty members in the College of Engineering who conduct research in manufacturing research areas. In addition to this investment, it is our goal that our external proposal activity and externally funded research will increase as a result of the efforts of the faculty and increased Center activities.

Intended Outcomes / Objectives:

Objective 1. Increase externally funded research annually.

Objective 2. Increase proposal funding requests annually.

Goal 2. Increase student, faculty, & staff capabilities

Define Goal

Increase the participation and capabilities of students, faculty, and staff in manufacturing related research and education via external funding, professional activities, and outreach programs.

Intended Outcomes / Objectives:

Ensure productivity of the CMR in scholarly work and graduates.

Enhance professional development of faculty and staff.

Goal 3. Increase resources of the CMR to allow for research expansion

Define Goal:

Increase the amount of income (resources), both internally and externally, that can be used to expand research in the CMR research focus areas and improve staff support for research activities.

Intended Outcomes / Objectives:

Potential sources of additional income for the CMR comes from release time of personnel, graduate student support from externally funded research, gifts, testing/service income, F&A return, and equipment grants or gifts.

Objective: Enhance research infrastructure and acquire state of the art equipment.

Assessment Tool #1: Project Activations

Assessment Tool #2: External Proposal Submissions

Assessment Tool #4: Staff Participation in Research and Outreach

Goal/ Outcome/ Objective:

Goal 1 and Goal 2 and Goal 3

Type of Tool:

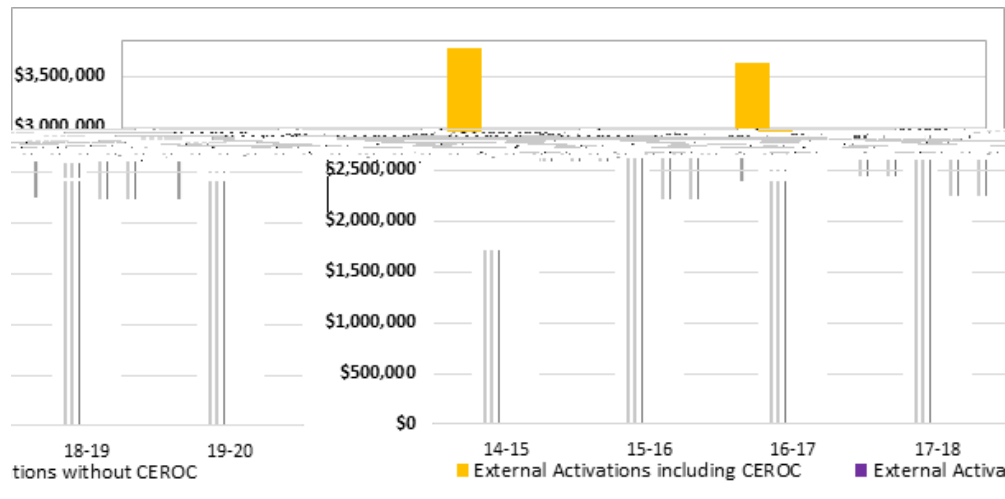
Tracking Spreadsheet

Frequency of Assessment:

Annually

Rationale:

a. The CMR uses its annual State Appropriation for basic resources including salaries, benefits,



Objective 2: Increase proposal funding requests annually

A total of twenty-nine research proposals in the amount of \$7,427,305 were submitted to be considered for external funding, some of which will be funded during the next year. The total value of the proposals was a 24% decrease from the value of proposals submitted in 2018-2019. This reflects a decrease in proposal submission during the last quarter of 2020 due to the Covid19 pandemic.

Included in the externally funded grants this past year were:

- Twenty different research projects were activated for a total of \$2,830,562 from various funding agencies, i.e., U.S. Department of Energy, National Science Foundation, National Institute of Health, U.S. Department of Defense, Oak Ridge National Laboratory, and in addition, 29 externally funded research proposals in the amount of \$7,427,305 were submitted by 23 different CMR faculty associates to be considered for funding.
- The Industrial Assessment Center (IAC), led by Dr. Glenn Cunningham and Dr. Ethan Languri, CMR Faculty Associates (Mechanical Engineering), was awarded Year 4 funding of \$315,462 by the U.S. Department of Energy (DOE). The IAC has been in existence at Tennessee Tech since 2006. The IAC has trained 190 students with 68 receiving DOE certification, and conducted 229 energy assessments for industry.
- Dr. Pinggen Chen, CMR Faculty Associate, was awarded \$476,703 for Year 1 of 3 (total award \$779,819) from the Department of Energy for “Developing an Electric Vehicle Demonstration Testbed in the Upper Cumberland Region of Tennessee, an Economy Distressed Rural Region”. This project will create a proof concept demonstration testbed for EVs and charging infrastructures in the Upper Cumberland region. Comprehensive data will be collected and analyzed to report the operation cost, issues and performance of EV to help potential fleet owners and the public at large make informed decisions in EV adoption for rural areas before making significant financial investment.

- CMR Director Dr. Ying Zhang and CMR Faculty Associate Dr. Jiahong Zhu were awar

awarded the Leighton E. Sissom Innovation and Creativity Award for their work with the Golden Eagle Additively Innovative Virtual Lecture Series. This award was established to recognize innovation and creativity in scholarship, methodology, invention, technique, processes, or other unique contributions demonstrating innovation and creativity.

- CMR Manager Suzanne Henry was awarded the College of Engineering's Outstanding Staff Award. Suzanne has worked for the CMR for twenty years.
- CMR Faculty Associate, Dr. Steven Anton (Mechanical Engineering), was awarded the Brown-Henderson Outstanding Engineering Faculty Award which rewards accomplishments that most closely reflect the mission of the College of Engineering – preparing graduates through a blend of education, research, and service.
- Dr. Mohamed Mahmoud, CMR Faculty Associate in Electrical and Computer Engineering, was awarded the 2020 Kinslow Engineering Research Award which is given for the best paper written by a TTU engineering faculty member and published in a refereed professional journal. The paper is entitled "Efficient Privacy Preserving Ride Sharing Organization for Transferable and Non-transferable Services", published in the IEEE Transactions on Dependable and Secure Computing (TDSC), 2019.
- CMR supported Electrical and Computer Engineering (ECE) graduate student Tolulope Odetola won the ECE Graduate (Masters) section of the Tennessee Tech Research and Creative Inquiry

- The CMR received revenue in its Testing Services Account income in this past year of \$3,203. Due to the expanded research capabilities, certain Testing Projects became Research Projects with well defined research objectives and tasks. Recently, the CMR revised the Research Service Rates and the new rates have been approved by the University. The CMR will use these rates going forward for the services the Center offers to Tennessee industries.
- The CMR enhanced its research infrastructure with the hiring of a part time IT staff to meet the