

Definition of Unit

Definition of Unit: Center for Manufacturing Research

Reporting Year:

Providing Department:

Manufacturing Research Center

2. Teamwork
3. Commitment to Excellence
4. Commitment to Personal/Professional Development
5. Valuing Partnerships, Cooperation, and Collaboration
6. Commitment to Continuous Improvement

Goal/Objective/Outcome

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.

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

manufacturing-related research conducted through our Center. Several faculty have been added to the college and the university has significantly invested to increase research productivity.

Assessment Tool #2: External Proposal Submissions

Goal/ Outcome/ Objective:

Goal 1 and Goal 2 and Goal 3

Type of Tool:

Tracking Spreadsheet

Frequency of Assessment:

Annually

Rationale:

a. Proposal valuations have been shown statistically to be a significant leading indicator of Project Activations. This will help to identify processes that can be implemented or modified to boost proposal activity. b. Successful results will indicate an annual increase as described above. Proposal valuations are a function of both the number of proposals as well as the size of larger collaborative proposals. As the College of Engineering increases their number of on-track faculty, the number of proposals should increase. As the College's research areas grow and become self-sustaining, the number of larger collaborative proposals should increase as well.

Assessment Tool #3: Publications and Supported Graduate Student Degree Completion

Goal/ Outcome/ Objective:

Goal 1 and Goal 2

Type of Tool:

Other

Frequency of Assessment:

Annually

Rationale:

1. Publications 2. Outreach Activities 3. Graduate Students Completing Degrees 4. Awards & Recognition

Assessment Tool #4: Income Generation

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, graduate assistantships and fees. In order to expand capabilities and increase seed funding in exploratory areas, the CMR must rely on supplementing State appropri

which will be funded during the next year. The total value of the proposals was a 23.7% decrease from the value of proposals submitted in **2018**.

Included in the externally funded grants this past year were:

- x Thirty-one different research projects were activated for a total of \$3,627,332 from various funding agencies, i.e., U.S. Department of Energy, National Science Foundation, National Institute of Health, Air Force Office of Scientific Research, Oak Ridge National Laboratory, etc. In addition, 33 externally funded research proposals in the amount of \$9,754,283 were submitted by 21 different CMR faculty associates to be considered for funding.
- x The Industrial Assessment Center (IAC), led by Dr. Glenn Cuhaim and Dr. Ethan Languri, CMR Faculty Associates (Mechanical Engineering), was awarded 2018 Center of Excellence by the U.S. Department of Energy (DOE). This award places the IAC as the top ranking center out of 28 centers nationwide. \$346,687 in Year 3 funding was awarded by DOE. The IAC has been in existence at Tennessee Tech since 2006.
- x CMR Faculty Associate Dr. Ambareen Siraj (Director, Cybersecurity Education, Research and Outreach Center, CEROC) continues to serve as PI for the Tennessee CyberCops: Scholarship for Service Program with Dr. Douglas Talbert serving as Co-PI. Year 4 funding from the National Science Foundation (NSF) was awarded to

continue supporting the efforts for this Program.

Smart Cities infrastructures and provided undergraduate research experiences for a total of ten interns from eight different universities.

- x Dr. Stephen Canfield, CMR Faculty Associate, continued to lead the Innovation Corps Sites Training Grant at Tennessee Tech during the third year. Funding of \$99,956 was awarded for Year 3 to support this research effort.
- x The CMR Faculty Associates and R&D engineers have published 46 journal papers, 59 conference papers, and four book chapters during the past year.
- x The CMR had two Visiting International Researchers at Tennessee Tech during the past year. Dr. Yuliang Zhang joined the Center'2 (a)eee2 (a)eee2 ()JTJ 25.he inlia9CentTT6-6 (i)ntfp

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Several faculty associates, staff, and students of the CMR have received significant honors and awards this past year with some of them being the direct result of successfully manufacturing related research and education supported via external funding.

- x CMR Faculty Associate, Dr. Stephen Canfield (Professor of 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.
- x Dr. Stephen Canfield was also awarded the 2019 Kinslow Engineering Research Award which is given for the best paper written by a TTU engineering faculty member and published in a referred professional journal. The paper is titled “Controllability Ellipsoid to Evaluate the Performance of Mobile Manipulators for Manufacturing Tasks”, published in the ASME Journal of Mechanisms and Robotics, October 12, 2017.
- x Dr. Dale Wilson (Mechanical Engineering), CMR Faculty Associate, was awarded the 2019 Leighton E. Sissom Innovation and Creativity Award. This award was established to recognize innovation and creativity in scholarship, methodology, invention, technique, processes, or other unique contributions demonstrating innovation and creativity.
- x CMR-supported Manufacturing and Engineering Technology (MET) graduate students Aslan Nasirov and Shane Terry tied for the MET Graduate (Masters) section of the Tennessee Tech Research and Creative Inquiry Day. Nasirov’s paper was titled “Prediction of Mechanical Properties of Fused Deposition Mode Made Parts using Computational Models” and Mr. Terry’s was titled “Innovating the FDM Process – Metal Powder PLA Printing”. Mahdi Mohammadzadeh won the MET Graduate (PhD) section of the Tennessee Tech Research and Creative Inquiry Day with his paper titled “Thermomechanical Investigation of Continuous Fiber Reinforced Additively Manufactured Components”.
- x In the Mechanical Engineering section of the Tennessee Tech Research and Creative Inquiry Day, CMR-supported student Nathan Ghattas won the Undergraduate section of the Tennessee Tech Research and Creative Inquiry Day with his paper “Investigation of Mechanical Boundary Conditions on Impedance Based Structural Health Monitoring in a Biomedical Environment”. In the Graduate (Masters) section, Farzin Mashali won with his paper “A Particular Nanodiamond Suspension for Thermal Management”.

Goal/Objective/Outcome Number:

Goal 3. Increase Resources of the CMR to Allow for Research Expansion

Results:

- x The CMR secured thirty

**New Modifications and Continuing Improvement to
Goals/Objectives/Outcomes Item**

Goal/Objective/Outcome Number:

Program Changes and Actions due to Results:

Link to Assessment:

Link to 'Tech Tomorrow' Strategic Plan:

**New Modifications and Continuing Improvement to
Goals/Objectives/Outcomes Item**

Goal/Objective/Outcome Number:

Program Changes and Actions due to Results:

Link to Assessment:

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