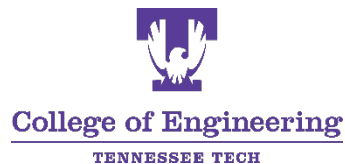


ANNUAL REPORT FY 2024—2025

**Center for Manufacturing Research
College of Engineering
Tennessee Tech University**



About the Cover

August Jenkins (Manufacturing and Engineering Technology) demonstrates how to pour liquified aluminum into molds created by participants in the METAL Hub Bootcamp workshop. METAL Hub offers TN Tech students and non-university affiliated individuals the opportunity to gain technical knowledge and practical skills in casting, forging, and plate rolling to expand workforce development in the in-demand field of metalworking. This week-long, hands-on experience culminates in a certification from Metallurgical Engineering Trades Apprenticeship and Learning.

Center for Manufacturing Research

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Cookeville, TN 38505

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Tennessee Technological University Center for Manufacturing Research Annual Report – FY 2024 – 2025

Mission Statement (Unchanged since 2001)

“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.”

The Center for Manufacturing Research (CMR) at TTU was established in 1984 and named a THEC Established Center of Excellence in 1990.

Director

Ying Zhang, Ph.D.
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CMR External Advisory Board

Ane Marie Harb, Comefri USA, Hopkinsville, KY
Becky Hull, Upper Cumberland Workforce Development Board, Cookeville, TN
Thomas Lawson – Nissan North America, Decherd, TN
Brad Long – Atmus Filtration Technologies, Cookeville, TN
Dr. Richard Mu – TSU Interdisciplinary Graduate Engineering Research Institute, Tennessee State University, Nashville, TN
David Nesbitt – Applied Thermal Coatings, Chattanooga, TN
Dr. Jason Witman – Beyond New Horizons, Arnold Air Force Base, TN

CMR Faculty and Staff

Brian Bates, Senior R&D Engineer
Dr. Trevor Cannon, Postdoctoral Research Associate
Michelle Davis, Grants Administration Specialist II
Dr. Nan (Terry) Guo, Assistant Research Professor
Karen Harris, Financial Analyst
Lisa Hoane, Grants Analyst
Giovanni Mainardi Neto, R&D Engineer
Tyson Matheney, R&D Engineer
Micah Midgett, Lab Manager
Tammy Martin, Financial Associate (part-time, temporary)

CMR Faculty Associates*

Dr. Ali Alouani, ECE
Dr. Steven Anton, MNE
Dr. Pedro E. Arce, ChE
Dr. Andrea Arce-Trigatti, Curriculum & Instruction
Dr. Indranil Bhattacharya, ECE
Dr. J. W. Bruce, ECE
Dr. Stephen Canfield, MNE
Dr. Pinggen Chen, MNE
Dr. George Chitiyo, Curriculum & Instruction
Dr. Jie Cui, MNE
Dr. William Eberle, CSc
Dr. Tarek Elfouly, ECE
Dr. Ismail Fidan, MET
Dr. Melissa Geist, Nursing
Dr. Bahman Ghorashi, ChE
Dr. Manaak Gupta, CSc
Dr. Syed Rafay Hasan, ECE
Dr. Ada Haynes, Sociology & Political Science
Dr. Bruce Jo, MNE
Dr. Duckbong Kim, MET
Dr. Ethan Languri, MNE
Dr. Allen MacKenzie, ECE
Dr. Satish Mahajan, CESR
Dr. Mohamed Mahmoud, ECE
Dr. Md Zulkar Nine, CSc
Dr. Joseph Ojo, ECE
Dr. Andy Pardue, MNE
Dr. Darek Potter, STEM
Dr. Mohan Rao, MNE
Dr. Syed Ali Asad Rizvi, ECE
Dr. Rory Roberts, MNE
Dr. Jonathan (Robby) Sanders, ChE
Dr. Susmit Shannigrahi, CSc
Dr. Doug Talbert, CS
Dr. L. (Fred) Vondra, MET
Dr. Chris Wilson, GIE, MNE
Dr. Kumar Yelamarthi, COE
Dr. Peng Zhang, MNE
Dr. Jiahong (John) Zhu, MNE

* CMR Faculty Associates are TTU faculty members who work with the CMR by serving as principal investigators, co-principal investigators, or other senior personnel on externally-funded projects, as well as by submitting proposals to seek external funding.

EXECUTIVE SUMMARY

FY24-25 marked another milestone year for the Center for Manufacturing Research (CMR), with externally sponsored research funding reaching a record \$8.3M (excluding internal cost share). Since FY22-23, CMR has consistently doubled its historical average in external funding, surpassing \$4M and maintaining funding levels above \$8M for two consecutive years. This sustained growth reflects CMR's strong commitment to securing competitive external support and delivering a significant return on the State's investment and the public dollars entrusted to the Center.

The Center's success is a direct result of the dedication and hard work of the CMR Faculty Associates, who continue to lead cutting-edge research and train the next-generation workforce. Several new projects were activated in FY24-25:

- (1) *"Establishing the Metallurgical Engineering Trades Apprenticeship & Learning (METAL) Spoke,"* Dr. Ismail Fidan and Dr. Fred Vondra, \$200,000, sponsored by U.S. Department of Defense via Collaborative Composite Solutions Corporation.
- (2) *"Novel High-Temperature Coatings for Protecting Critical Components in Concentrating Solar-Thermal Power Systems,"* Dr. Ying Zhang and Dr. Jiahong Zhu, \$500,000, awarded by the U.S. Department of Energy (DOE).
- (3) *"Highly Efficient and Durable Low-Temperature Solid Oxide Electrolysis Cell Stack Based on Engineered Ceria Electrolyte,"* Dr. Jiahong Zhu and Dr. Ying Zhang, \$739,420, supported by the DOE via the University of North Dakota.

Moreover, Drs. Syed Rafay Hasan, Terry Guo, and Doug Talbert received a supplemental \$1.25M in funding from NEYA Systems (a division of Applied Research Associates, Inc.) for their work on hardware security for autonomous ground vehicles. Significant progress was also made in two major ongoing projects: Dr. Pinggen Chen's DOE project *"Second-life Battery in Mobile EV Charging Application for Rural Transportation (SMART),"* and Dr. Rory Roberts' NASA project titled *"CarbonLess Electric Aviation (CLEAN)."*

In FY24-25, CMR Faculty Associates submitted 23 research proposals totaling \$9.17M. They also contributed 70 journal articles, 96 conference papers, and 9 book chapters to the scholarly community. Their commitment to workforce development remained strong, with continued efforts in teaching and training the next generation of engineers and scientists. Through support from State Appropriations and external grants, CMR provided funding for 67 graduate students (including 24 M.S. and 43 Ph.D. students) and 51 undergraduate students. The Center's laboratories also supported students, faculty, and local industries through a wide range of analysis and testing services.

CMR continues to serve small and medium-sized manufacturers, expanding its impact across Tennessee and neighboring states. In FY24-25, Dr. Ethan Languri, Director of the Industrial Training and Assessment Center (ITAC) at Tech, led a team of graduate and undergraduate students in conducting energy assessments for 24 manufacturers. Since its inception in 2006, the ITAC has performed over 337 energy assessments, resulting in \$124.5M in persistent cost savings for industry and the reduction of 0.87 million metric tons of CO₂ emissions.

Center Research, Education and Outreach Areas

Smart Manufacturing, including (1) Additive Manufacturing, (2) Advanced Robotics and Smart Mobility, and (3) Cybersecurity in Manufacturing.

Sustainable Materials and Manufacturing, including (1) Materials Processing and Modeling and (2) Energy Conversion / Storage Materials and Systems.

Industry Support, including efforts to provide Tennessee manufacturers with technical expertise in problem-solving challenges faced in materials, design, testing, and processes.

Education and Outreach, including efforts to enhance the Tennessee workforce development and outreach in the CMR's research areas in addition to such other activities as energy efficiency, waste reduction, and productivity improvements.

Selected Highlights from FY 2024 – 2025

CMR Faculty Associates were funded for a total of \$8,286,025 from various funding agencies (e.g., National Science Foundation, U.S. Department of Energy, NASA, National Institute of Health).

CMR's new matching funds for the past FY were \$9,912,922. This amount excludes \$1,814,420 of indirect costs associated with this year's funded projects.

Twenty-three research proposals totaling \$9,170,577 were submitted by CMR faculty and faculty associates.

CMR supported 67 graduate students during the past FY. A total of 24 M.S. students and 43 Ph.D. students were funded through both State appropriations and external funding received by faculty. Specifically, external grants funded 19 of the M.S. students and 27 of the Ph.D. students. Thus, 69% of CMR graduate students supported was from external funding.

Five M.S. students and six Ph.D. students supported by CMR received their degrees during FY24-25.

CMR supported a total of 51 undergraduate research assistants during this past fiscal year through both State Appropriations and externally-funded projects.

CMR Faculty Associates and R&D engineers have published 70 journal papers, 96 conference papers, 9 book chapters, one report, and one patent during the past year.

Table 1. Summary of CMR Accomplishments

	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25
Total External Activations	\$2,411,429	\$2,185,133	\$2,085,716	\$4,141,124	\$8,219,594	\$8,286,025
Number of Graduate Students Supported by External Funding and State Appropriations	36	41	53	55	70	67
Percentage of Graduate Students Supported by External Funding	53%	59%	38%	53%	59%	69%
Number of Undergraduate Students Supported by External Funding and State Appropriations	35	50	41	18	22	51

Table 1 summarizes CMR accomplishments in the past six years. A brief description of some of these funded projects can be found in the “Research Highlights” on pages 10-15.

The Center’s annual external activations (FY14-15 to FY24-25) are presented in Figure 1. The proposals submitted by the CMR Faculty Associates (FY14-15 to FY24-25) are shown in Figure 2.

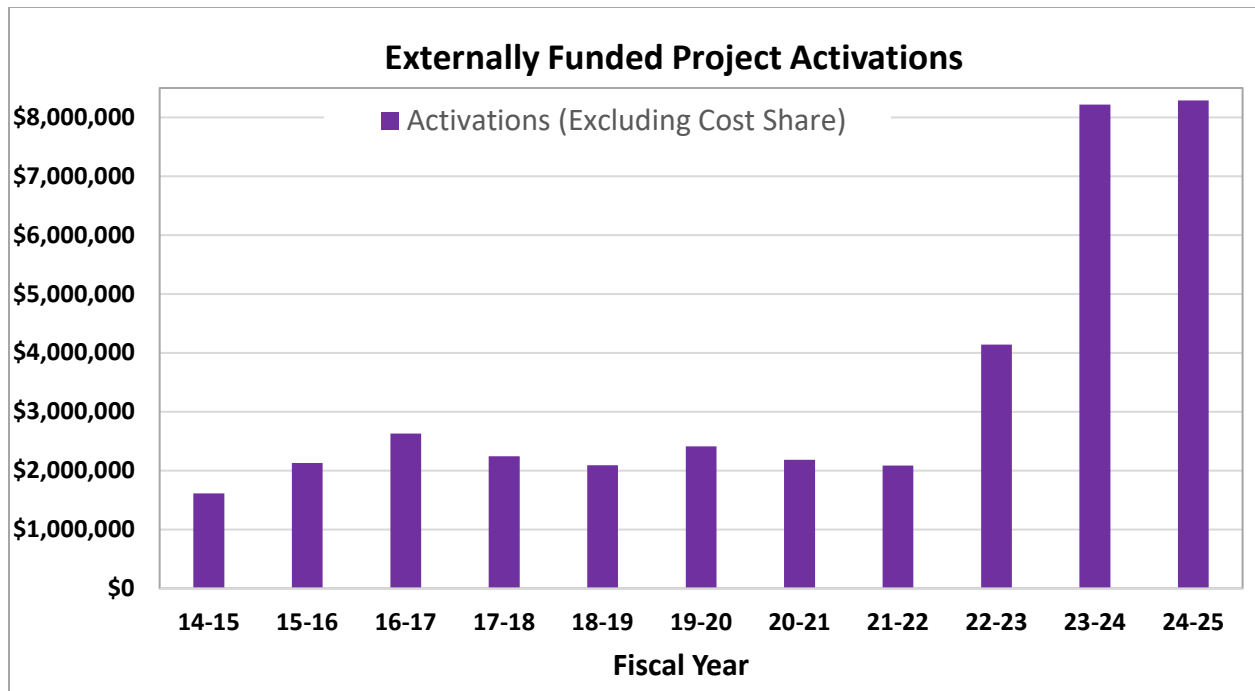


Figure 1 – Externally Funded Activations Since FY14-15

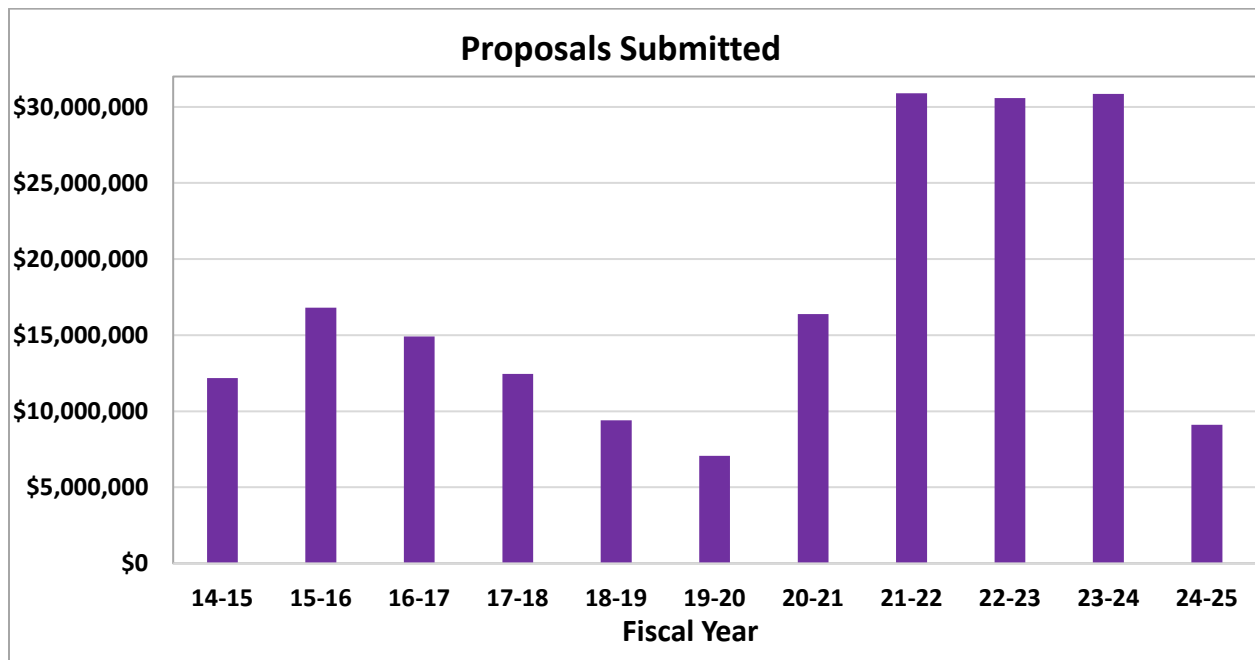


Figure 2 – Proposals Submitted Through CMR Since FY14-15

Table 2 shows various sources of external revenues for the past seven years that were used to “release” or “free up” State appropriations for other strategic investment areas.

Table 2. Salary and Supplies Released by External Funding

Performance Metrics	FY 18-19	FY 19-20	FY 20-21	FY 21-22	FY 22-23	FY 23-24	FY 24-25
CMR faculty and staff release time	\$86,717	\$129,844	\$155,410	\$80,066	\$107,517	\$172,383	\$158,052
Graduate student stipend and fees from external sponsors	\$287,144	\$157,179	\$294,022	\$431,500	\$494,940	\$946,181	\$944,710
Total of income resources (F&A return, testing income, GRA support, equipment usage, and release time)	\$412,454	\$304,220	\$472,841	\$542,281	\$618,667	\$1,124,394	\$1,141,739

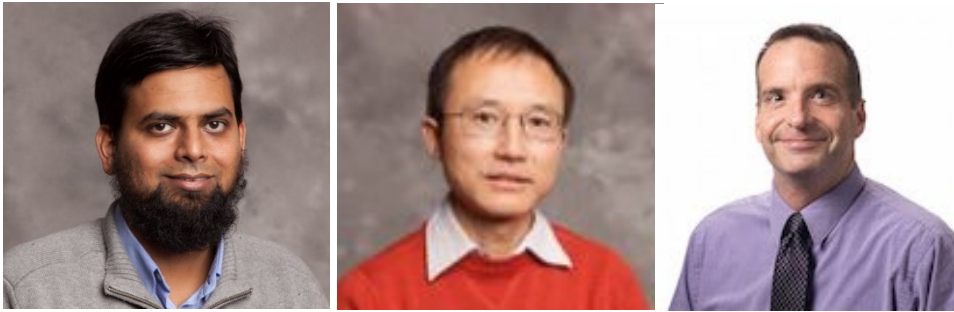
Research Highlights

Dr. Pinggen Chen (PI, Mechanical and Nuclear Engineering) and **Dr. Joseph Ojo** (co-PI, Electrical and Computer Engineering) received Year 2 funding of \$2,737,850 (\$9.2M Total: \$4,531,642 sponsor share + \$4,671,076 cost share) Year 1 Activation \$1,774,944) by the Department of Energy (DOE) for the project “Second-life Battery in Mobile EV Charging Application for Rural Transportation (SMART).” Mobile charging stations play a critical role in removing the charging deserts in rural areas and alleviating range anxiety, as they can be transported to desired locations for EV charging with fewer concerns about power infrastructure and locational constraints. While rural America will potentially need many mobile charging stations to eliminate charging deserts, the high investment cost due to large and new battery energy storage systems and low utilization rate are barriers to adoption at a large scale. This project aims to address the urgent need to develop affordable mobile charging stations that can be deployed in rural America at scale by utilizing second-life batteries retired from electric vehicles, which cost 70-75% less than new battery energy storage systems of the same size. Undergraduate and graduate students have the opportunity to work with industry partners such as Nissan North America, Envision AESC (the leading battery manufacturers in the U.S.), mobile charging station manufacturers, as well as battery testing and recycling companies to gain critical knowledge of lithium-ion batteries. The project creates and demonstrates the first-of-its-kind affordable, resilient, and sustainable rural EV infrastructure in a multi-state region (TN, OH, VA, KY, WV, KS, and TX).



Dr. Ismail Fidan and **Dr. Fred Vondra** (Manufacturing and Engineering Technology) received funding from the Institute for Advanced Composites Manufacturing Innovation (IACMI) in the amount of \$200,000 for “Establishing the Metallurgical Engineering Trades Apprenticeship & Learning (METAL) Spoke” to conduct metallurgy education and outreach for workforce development. Weeklong “bootcamps” are attended by Tennessee Tech students, community college students and local job-seekers who are taught high-demand skills such as metal casting, forging, and plate rolling. Tennessee Tech is a certified Foundry Educational Foundation university, one of only 20 such schools in North America.





Dr. Syed Rafay Hasan (Electrical and Computer Engineering), **Dr. Terry Guo** (Center for Manufacturing Research), and **Dr. Doug Talbert** (Computer Science) received continued funding of \$1,250,000 from NEYA Systems (a division of Applied Research Associates, Inc.) to tackle security in autonomous vehicle infrastructure. Physical-layer-level attacks on sensors pose a serious challenge to autonomous vehicle infrastructure. These attacks affect the overall navigational control system, AI, and communication of connected vehicles, which will be investigated in the project. Eight graduate students, one postdoc, and several undergraduate students will be engaged in this research to address critical issues related to potential sensor attacks to enhance infrastructure safety for autonomous vehicles. The team is also developing an Autonomous Vehicle Security Research Lab for sustained research in this area.



Dr. Duckbong Kim (Manufacturing and Engineering Technology) received \$121,930 in Year 4 activation for his NSF-CAREER Award (total \$526,186) to continue research in the additive manufacturing of high-temperature alloys capable of withstanding harsh environments such as rocket engines, high-temperature furnaces, and electronic components. Dr. Kim and his graduate students are developing a methodology to successfully fabricate titanium-zirconium-molybdenum (TZM) alloys using wire+arc additive manufacturing. The project also enables him to equip Tennessee Tech's students with cutting-edge skills in emerging, technology-intensive additive manufacturing and data science and facilitates undergraduate and graduate internships at national laboratories.

Dr. Ethan Languri (Mechanical and Nuclear Engineering) received continued funding from the Department of Energy totaling \$428,753 (\$2.3M total 5 year award = \$1,750,000 sponsor share + \$560,026 cost share) for the project “Public-Private Partnership to Promote Efficient, Resilient and Secure Manufacturing and Workforce Development”. This award continues the Industrial Training and Assessment Center (ITAC), established in 2006. The goals of the ITAC are: 1) assisting small and medium-sized manufacturers to become more energy efficient and reduce carbon emissions, and 2) training the next generation of energy engineers. Tennessee Tech, together with its Satellite Center at the University of Memphis, has the only ITAC in the state of Tennessee.

In FY 2024-2025, the ITAC conducted energy assessments for 24 manufacturers in Tennessee, Arkansas, Mississippi, and Georgia. One of these clients was S.R. Smith in Portland, TN, a manufacturer of slides, ladders, lifts, and other swimming pool accessories. The assessment team (pictured above), comprised of engineering faculty and students, identified projects that will save the plant over 14% of their total annual energy costs and approximately 273,289 lbs. of carbon dioxide from being released in the atmosphere (the equivalent of 29 gasoline-powered passenger vehicles driven for 1 year).

Since its inception, the ITAC has conducted 337 assessments and saved industry \$124.5 million in implemented persistent cost savings. This represents a savings of 0.87 million metric tons of CO₂ greenhouse gases.





Dr. Mohamed Mahmoud and Dr. Syed Rafay Hasan, (Electrical and Computer Engineering) received second-year funding of \$152,896 for an NSF grant “REU Site: Secure and Privacy-Preserving Cyber-Physical Systems: Software and Hardware Approaches.” (total award \$359,993). The site focuses on Cyber-Physical Systems (CPSs), a class of engineering systems where computation and communication networks are used to monitor and control physical components. CPSs play a major role in the design and development of modern systems and initiatives, such as smart and safe cities, self-driving cars, industrial Internet of Things (IIoT), and the smart power grid. Security breaches in CPSs can occur through software or hardware, either of which can halt critical infrastructure and reveal citizens' locations and activities, making the security of CPSs crucial for U.S. national security. Students are exposed to different toolsets in domains such as cryptography, graph-based anomaly detection, and convolutional neural networks.



The team led by **Dr. Rory Roberts** (Mechanical and Nuclear Engineering) received \$2,025,881 in activations from NASA for the “CarbonLess Electric Aviation (CLEAN)” project (total award \$8,670,014 = \$7,999,982 sponsor share + \$670,032 cost share). Team members include Tennessee State University, The Ohio State University, University of Dayton, University of Washington – Bothell, Boeing Research & Technology, Raytheon Technologies Research Center, and Special Power Sources. This project seeks to help solve one of aviation’s key challenges for the future of commercial air travel: zero-

emission aircraft by 2050. The team will explore a preliminary design for an electrified, 150-passenger aircraft that uses an ammonia-based integrated propulsion, power, and thermal management system. The research focuses on investigating, designing, and testing several components and subsystems required for a zero-emissions commercial passenger aircraft. The research team has unique testing capabilities for solid oxide fuel cell combustor (SOFC) with a turbogenerator (TG) power generation technology under flight conditions including pressurized operation with rapid changes in load for emulated in-flight operation. SOFC-TG technology is a unique and transformative concept addressing many of the challenges faced in all-electric propulsion-based aviation. The power generation system has high part-load efficiency during cruise, high specific power density, load following capability, high-power capacity at high altitudes adapting to low temperatures and pressures, rapid startup time, and efficient thermal management.

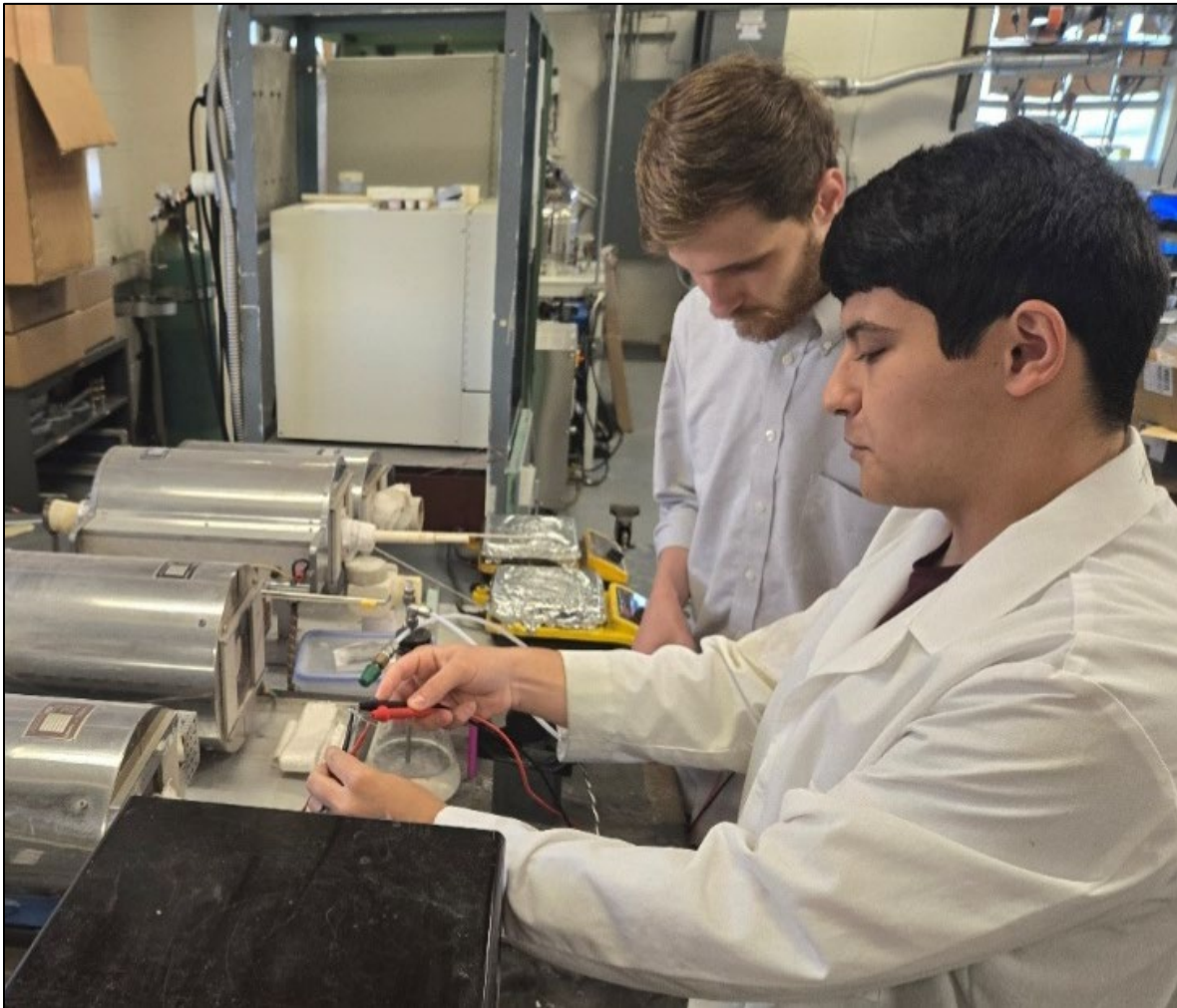
In addition, Dr. Roberts secured \$343,053 for three additional projects to continue research in solid oxide fuel cells (SOFCs) for generating carbon-neutral electrical power for aircraft and space applications.



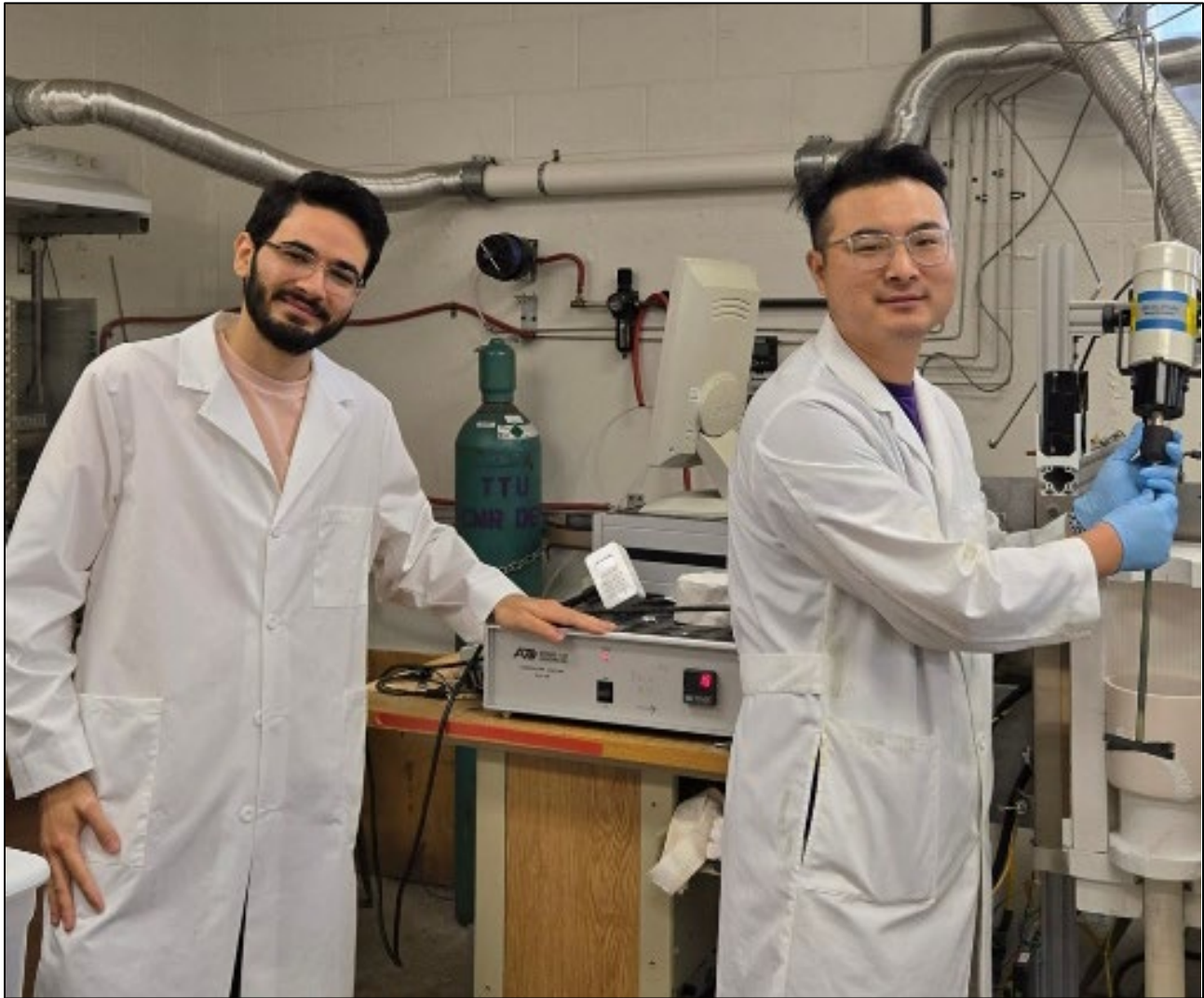
Dr. John Zhu (Mechanical and Nuclear Engineering) and **Dr. Ying Zhang** (Center for Manufacturing Research) received Year 2 funding of \$614,742 (total \$1.25M grant (\$1,000,000 sponsor share + \$255,743 cost share) from the DOE to work on “Spray Deposition of Coal-Derived Graphene-Copper Nanocomposites for Advanced Conductors.” The project aims to achieve Cu-Gr nanocomposites with properties that surpass those of copper wires and cables currently used in clean energy applications. The team will incorporate coal-derived graphene into copper-based metal matrix composites via a cost-effective spray deposition process and optimize key processing parameters and alloy compositions to improve electrical conductivity and interfacial bonding between copper and graphene particulates.

Dr. Zhu and Dr. Zhang were also awarded \$377,047 (total award \$600,430) from the University of North Dakota via U.S. Department of Energy for the “Highly Efficient and Durable Low-Temperature Solid Oxide Electrolysis Cell Stack Based on Engineering Ceria Electrolyte” project.

The project aims to develop materials to support and perform advanced oxygen-ion-conducting solid oxide electrolysis cell (SOEC) testing for hydrogen production. Proposed activities at Tennessee Tech University in Cookeville, TN would include development of materials and coating processes and screening of domestically available, low-cost metallic interconnects.



Additionally, Dr. Zhang and Dr. Zhu received funding of \$306,845 (total award \$500,000) from the U.S. Department of Energy to work on “Novel High-Temperature Coatings for Protecting Critical Components in Concentrating Solar-Thermal Power Systems”. The project focuses on developing and evaluating new oxidation- and erosion-resistant Tribaloy-based coatings fabricated via a low-cost and scalable electro-codeposition process for protecting critical concentrating solar-thermal power (CSP) components (e.g., tubular enclosed receivers, particle heat exchangers, etc.).



Center Activities

Materials Science Laboratory

The Materials Science Laboratory (MSL) performs microstructural, topographical imaging, and characterization for practically any solid material. A focal point of the MSL is the ultra-high resolution Field Emission Scanning Electron Microscope (FE_SEM) which is used to take nano-scale images and perform compositional analysis.

In FY 24-25, the MSL tracked approximately 1500 hours of equipment usage time, assisting over 40 different graduate and undergraduate researchers from 6 different departments.

These research projects include work on carbon nano-tube composites, high temperature conductive ceramics, high temperature wear resistant coatings, concrete microstructure, 3-D printed metal composites, battery materials, nanoparticle evaluation, tubular fuel cells, graphene-copper composites, and even leaf biology.

Additionally, the MSL was able to provide tours to classes and students groups as well as for local industries to demonstrate the principles and uses of materials science and microstructural evaluation.



Advanced Manufacturing Workforce Development

Virtual Reality (VR) technology is growing in applications in diverse fields such as entertainment, education, healthcare, and manufacturing. However, this region has a shortage in the skilled technicians needed to meet the resulting workforce demands. Also, manufacturers and potential workers in rural and underserved areas in this region might benefit from increased awareness or the advantages that VR can provide. Tennessee Tech and Somerset Community College (Kentucky) work together to educate a new generation of qualified employees for the region's manufacturing workforce. Dr. Ismail Fidan (Manufacturing & Engineering Technology) instructs Tennessee and Kentucky high school and community college STEM teachers in the pedagogy of VR to prepare their students for the modern manufacturing workforce.



CMR Staff Recognition

Giovanni Mainardi Neto, CMR R&D Engineer, was honored with the 2024-2025 College of Engineering Outstanding Staff Award. Giovanni came from Brazil to Cookeville and Tennessee Tech in 2013, graduating with a BS in Mechanical Engineering in 2017, followed by a MS in 2019. Since then, he has been working as a Research & Development Engineer for CMR, where he manages the Mechanical Properties Testing Lab. Giovanni assists researchers with materials testing, equipment maintenance and upgrades, and safety training. He is also involved in the testing services that CMR offers to external industry partners.



Faculty and Student Accomplishments and Awards



CMR Faculty Associate, **Dr. Jiahong Zhu** (Mechanical and Nuclear Engineering) was awarded the 2024 Leighton E. Sissom Innovation and Creativity Award. The Sissom Award was established to recognize innovation and creativity in scholarship, methodology, invention, technique, processes, or other unique contributions demonstrating creativity and innovation.

CMR-supported M.S. student **Kaydn Brady** (Electrical & Computer Engineering) won the Best Paper Award for his work “Add on Navigation & Control System for Outdoor Autonomous Wheelchairs for Physically and Mentally Challenged People”, presented during the 2024 IARIA Annual Congress on Frontiers in Science, Technology, Services, and Applications, held in Portugal.





CMR-supported students **Sahera Abumariam** (Chemical Engineering), **Mohammad Javad Seyed Sabour** (Chemical Engineering), **Mohsen Pourfallah** (Mechanical and Nuclear Engineering), and **Vivekanand Naikwadi** (Mechanical and Nuclear Engineering) won COE Eminence Awards for Doctor of Philosophy Best Paper. Sabour's paper was titled "A Comprehensive Review of Major Water Desalination Techniques and Mineral Extraction from Saline Water". Pourfallah's paper, titled "Optimization of Heat Transfer in Parabolic Trough Collectors Using Advanced Turbulator Designs and Nanofluids", was published in the Journal of Energy and Power Technology.

CMR-supported students **Vivekanand Naikwadi** (Mechanical and Nuclear Engineering) and **Mushfig Mahmudov** (Mechanical and Nuclear Engineering) won travel awards from the National Science Foundation to attend the 2025 American Society for Engineering Education (ASEE) Maker Program in Montreal, Canada.

The following CMR-supported students won awards during the Tennessee Tech Research and Creative Inquiry Day:

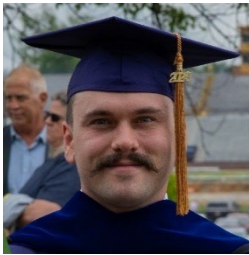
- **Sahera Abumariam** won the Chemical Engineering PhD division for her paper "Quantitative and Qualitative Analysis of Microplastics in Cookeville Wastewater Treatment Plant".
- **Md Ebrahim Khallil** won the Electrical and Computer Engineering MS division for his paper "Performance Evaluation of LSTM and PINN for Internal Resistance Estimation in Lithium-Ion Batteries".
- **Musayyibii Shuaibu** won the Electrical and Computer Engineering PhD division for his paper "Design of a Robust Observer for Sensorless Speed Control of Multi Three-Phase Synchronous Reluctance Motor Drives".
- **Anson Fry** won the Manufacturing and Engineering Technology Undergraduate division for his paper "Advancing Foundry Training through Virtual Reality: A Low-Cost, Immersive Learning Environment".

- **Mushfig Mahmudov** won the Manufacturing and Engineering Technology MS division for his paper “Development of Epoxy-Infused Composite Materials for Enhanced Isotropy and Watertightness in 3D-printed Structures”.
- **Vivekanand Naikwadi** won the Manufacturing and Engineering Technology PhD division for his paper “Enhanced Performance of Nanoparticle-Infused Polymers: Characterization, Post-Processing, and Vibration Analysis in Material Extrusion”.
- **Md Azizul Islam** won the Mechanical Engineering MS division for his paper “Developing and Implementing a Camber Morphing Mechanism for UAVs”.
- **Rajendra Tadakhe** won the Mechanical Engineering PhD division for his paper “Characterization of the Functionalized Nano Diamonds Enhanced Phase Change Materials for Li-ion Battery Thermal Management”.
- **Spencer Jones** and **Neal Patel** won the Mechanical Engineering PhD division for their paper “A Radiative Cooling Review for Engineering Applications”.

Select 2024 - 2025 CMR Supported Alumni



Wesam Al Amiri, PhD, Electrical and Computer Engineering, 2024
Assistant Professor
Department of Electrical, Computer, and Cybersecurity Engineering
Florida Polytechnic University
Lakeland, Florida



Cody Innis, PhD, Mechanical Engineering, 2025
Postdoctoral Research Associate
Tennessee Tech University
Cookeville, Tennessee



Sainand Jadhav, PhD, Mechanical Engineering, 2024
Assistant Professor
Southern Polytechnic College of Engineering and Engineering Technology
Kennesaw State University
Marietta, Georgia

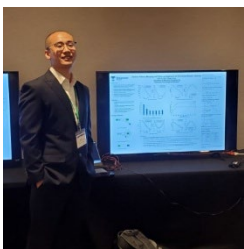
Select 2024 - 2025 CMR Supported Alumni (continued)



Trevor Kramer, PhD, Mechanical Engineering, 2024
Principal Engineer
Minco Technologies
Dayton, Ohio



Maxavier Lamantia, PhD, Mechanical Engineering, 2025
Postdoctoral Research Associate
Tennessee Tech University
Cookeville, Tennessee



Zifei Su, PhD, Mechanical Engineering, 2024
Postdoctoral Research Associate
Tennessee Tech University
Cookeville, Tennessee

Publications of CMR Faculty Associates & Staff (January 2024 – December 2024)

Journal Publications

1. Adeyemo, Adewale, Parth Patel, Syed Rafay Hasan, Mohammad Ashiqur Rahaman, and Soamar Homsy. "Securing pseudo-model parallelism-based collaborative DNN inference for edge devices." *IEEE Access* (2024).
2. Ahsan, Md RU, Nadim S. Hmeidat, Saiful Islam, Xuesong Fan, Jonathan D. Poplawsky, Peter K. Liaw, Yousub Lee, Brett G. Compton, Yongho Jeon, and Duck Bong Kim. "Strength-ductility synergy through microstructural and compositional heterogeneity in directed energy deposition additive manufacturing of face-centered cubic materials." *Journal of Materials Research and Technology* 33 (2024): 6444-6460.
3. Alkunte, S., Fidan, I., Naikwadi, V., Gudavasov, S. (2024). *Tensile And Fatigue Analysis of Functionally Graded Materials with Varying Concentrations Manufactured Using Material Extrusion* (vol. Proceedings of the 35th Annual International SOLID FREEFORM FABRICATION SYMPOSIUM 2023 – An Additive Manufacturing Conference, pp. 1820-1829). Austin, Texas: The Minerals, Metals & Materials Society (TMS).
4. Alshaikh Ali, M., Fidan, I., Gudavasov, S., Naikwadi, V., Mahmudov, M., Hudson, E. (2024). *Thermal and Mechanical Characterization of Lightweight PLA Filaments for Material Extrusion* (vol. Proceedings of the 35th Annual International SOLID FREEFORM FABRICATION SYMPOSIUM 2023 – An Additive Manufacturing Conference, pp. 1166-1176). Austin, Texas: The Minerals, Metals & Materials Society (TMS).
5. Ameer, Safwa, Lopamudra Praharaj, Ravi Sandhu, Smriti Bhatt, and Maanak Gupta. "ZTA-IoT: A novel architecture for zero-trust in IoT systems and an ensuing usage control model." *ACM Transactions on Privacy and Security* 27, no. 3 (2024): 1-36.
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Reports

1. Bangalore, P., Zhu, J., Huddleston, D., Skjellum, A., Welsh, D., Bedford, K., Wang, R., Sadayappan, P. "Parallelization of a Coupled Hydraulics and Sediment Transport Model." Major Shared Resource Center through Programming Environment and Training (PET)

Patents

1. Rory Andrew Roberts, "FUEL CELL TURBOELECTRIC FAN FOR AN AIRCRAFT." (Submitted: August 8, 2023, Application: July 19, 2024).

External Activations

PIs	Title	Funding Agency	Amount Activated
Pingen Chen Joseph Ojo	Second-life Battery in Mobile EV Charging Application for Rural Transportation (SMART)	U.S. Department of Energy	\$2,737,850
Pingen Chen	On-board Diagnostic Algorithm Research and Development for Selective Catalytic Reduction System	Cummins Advanced Engineering	\$64,734
Ismail Fidan Fred Vondra	Tennessee Tech METAL Hub	Collaborative Composite Solutions Corporation	\$200,000
Syed Hasan Terry Guo Tarek Elfouly	Defense Against Hardware Intrinsic Attacks in COTS based Internet of Things and Futuristic Artificial	Qatar University (via Qatar National Research Foundation funds)	\$35,310
Syed Hasan Terry Guo	Cybersecurity for Autonomous Ground Vehicle: Towards Hardware in the Loop Simulation for Autonomous Vehicles' Cybersecurity	Applied Research Associates, Inc. (ARA)	\$1,250,000
Bruce Jo	JetX-Contract Bruce Jo	US Army SBIT - JetX LLC	\$54,000
Duckbong Kim	Development of Human-in-the-Loop Industrial Metaverse Technology for Intelligent Advanced Manufacturing	Institute for Information & Communication Technology Planning & Evaluation	\$36,500
Duckbong Kim	Machine Learning Based Metalk 3D Printing Defect Removal for the Functionally Graded Materials	Ajou University Industry-Academic Cooperative Foundation	\$38,481
Duckbong Kim	Machine Learning Based Metalk 3D Printing Defect Removal for the Functionally Graded Materials	Ajou University Industry-Academic Cooperative Foundation	-\$2,443 (Due to currency conversion)
Duckbong Kim	CAREER: Wire Arc Additive Manufacturing of Molybdenum Alloy Structures for High-temperature Applications: Residual Stresses and	National Science Foundation	\$121,930
Ethan Languri	South Carolina Clean Energy and Manufacturing Workforce Training and Technical Assistance	DEW HVAC Training Services Center	\$57,000

PIs	Title	Funding Agency	Amount Activated
Ethan Languri	Public-Private Partnership to Promote Efficient, Resilient and Secure Manufacturing and Workforce Development	U.S. Department of Energy	\$428,753
Ethan Languri	Tennessee Manufacturing Engagement in Onsite Energy through DOE Southeast Onsite Energy TAP	Department of Energy via NC State University	\$16,500
Mohamed Mahmoud Syed Hasan	REU Site: CyberAI: Cybersecurity Solutions Leveraging Artificial Intelligence for Smart Systems	National Science Foundation	\$152,896
Joseph Ojo	ESRDC: Electric Ship Research and Development Consortium 2021 - 2025	Office of Naval Research via Florida State University	\$16,234
Rory Roberts Bruce Jo	CarbonLess Electric Aviation (CLEAN)	NASA ULI	\$551,569
Rory Roberts Bruce Jo	CarbonLess Electric Aviation (CLEAN)	NASA ULI	\$700,000
Rory Roberts Bruce Jo	CarbonLess Electric Aviation (CLEAN)	NASA ULI	\$774,312
Rory Roberts	High Efficiency Solid Oxide Fuel Cell/ Turbogenerator Hybrid Electric Propulsion System	Brayton Energy (via NASA funds)	\$27,270
Rory Roberts	Logistics Fuels Compacted Desulfurization Demo for High-Efficiency SO	Brayton Energy LLC via Northrop Grumman Corp.	\$90,045
Rory Roberts	Brayton Energy NGC Conceptual 700kW Power Systems	Brayton Energy (via NASA funds)	\$29,600
Rory Roberts	Minco Army HEPPS	Minco Technologies	\$43,000
Rory Roberts	High Efficiency Solid Oxide Fuel Cell/Turbogenerator Hybrid Electric	Brayton Energy (via NASA funds)	\$153,138
Doug Talbert	Making Computerized Trauma Triage Decision Support Accurate, Fair, and Trustworthy	National Institutes of Health	\$123,654
Ying Zhang Jiahong Zhu	Novel High-Temperature Coatings for Protecting Critical Components in Concentrating Solar-Thermal Power Systems	U.S. Department of Energy	\$306,845

PIs	Title	Funding Agency	Amount Activated
Jiahong Zhu Ying Zhang	Spray Deposition of Coal-Derived Graphene-Copper Nanocomposites for Advanced Conductors	U.S. Department of Energy	\$614,742
Jiahong Zhu Ying Zhang	Highly Efficient and Durable Low-Temperature Solid Oxide Electrolysis Cell Stack Based on Engineered Ceria Electrolyte	U.S. Department of Energy via University of North Dakota	\$377,047

Total External Activations in FY 2024-2025 (including internal cost-share) \$8,998,967

Schedule 7

CENTERS OF EXCELLENCE ACTUAL, PROPOSED, AND REQUESTED BUDGET

Institution	Tennessee Technological University					Center	Center for Manufacturing Research		
	FY 2024-25 Actual			FY 2025-26 Proposed			FY 2026-27 Requested		
	Matching	Appopr.	Total	Matching	Appopr.	Total	Matching	Appopr.	Total
Expenditures									
Salaries									
Faculty	775,113	226,898	1,002,011	570,000	513,996	1,083,996	925,000	330,000	1,255,000
Other Professional	232,556	503,121	735,678	225,000	879,442	1,104,442	345,000	525,000	870,000
Clerical/ Supporting	102,045	28,148	130,193	65,000	25,207	90,207	75,000	29,000	104,000
Assistantships	740,077	309,752	1,049,828	550,000	385,282	935,282	783,000	355,000	1,138,000
Hourly Students	343,925	2,755	346,679	200,000	51,013	251,013	275,000	75,000	350,000
Total Salaries	2,193,715	1,070,674	3,264,389	1,610,000	1,854,940	3,464,940	2,403,000	1,314,000	3,717,000
Fringe Benefits	758,727	312,069	1,070,796	563,500	811,771	1,375,271	875,000	466,900	1,341,900
Total Personnel	2,952,442	1,382,743	4,335,185	2,173,500	2,666,712	4,840,212	3,278,000	1,780,900	5,058,900
Non-Personnel	NOTE: Appropriation Expenditures in Fringe Benefits include \$164,556 for Graduate Student Fees in FY 2024-25.								
Travel	199,680	15,011	214,691	175,000	44,850	219,850	275,000	30,000	305,000
Computer Maint./Software	0	1,371	1,371	500	0	500	7,500	0	7,500
Books & Journals	0	0	0	0	0	0	0	0	0
Other Supplies	547,149	72,582	619,731	300,000	232,311	532,311	560,000	90,185	650,185
Equipment	710,545	18,225	728,770	350,000	337,368	687,368	650,000	95,910	745,910
Lab. Upgrades/Mainten.	0	20,538	20,538	5,000	(597)	4,403	0	0	0
Scholarships for Service	392,120	0	392,120	0	0	0	0	0	0
Subcontracts/Subawards	2,637,849	0	2,637,849	2,750,000	0	2,750,000	2,850,000	0	2,850,000
Renovation	0	0	0	0	0	0	0	0	0
Seminars/Workshops/Con	0	0	0	0	0	0	15,000	0	15,000
Total Non-Personnel	4,487,344	127,726	4,615,070	3,580,500	613,933	4,194,433	4,357,500	216,095	4,573,595
GRAND TOTAL	7,439,786	1,510,469	8,950,255	5,754,000	3,280,644	9,034,644	7,635,500	1,996,995	9,632,495
Revenue	NOTE: Actual Matching Funds do not include Indirect Costs of \$1,814,420 for FY 2024-25.								
New State Appropriation	0	1,848,200	1,848,200	0	1,901,900	1,901,900	0	1,996,995	1,996,995
Carryover State Appropriation	0	1,041,015	1,041,015	0	1,378,746	1,378,746	0	0	0
New Matching Funds	7,439,786	0	7,439,786	5,754,000	0	5,754,000	7,635,500	0	7,635,500
Carryover from Previous Matching Funds	0	0	0	0	0	0	0	0	0
Total Revenue	7,439,786	2,889,215	10,329,001	5,754,000	3,280,646	9,034,646	7,635,500	1,996,995	9,632,495

NOTE: Out of the \$1,378,744 Carryover State Appropriation in the "FY 2025-26 Proposed Appropri." column, \$23,780.84 was spent but was not posted in Banner by June 30, 2025. Another \$282,329 is the cost share contribution to DOE projects, \$273,675 supports new faculty, and \$467,256 provides bridge funding for faculty. **The actual carryover is \$364,353.58.**

FY 2025 – 2026 Budget Request and Justification

CMR is requesting a 5.0% increase in FY 2026–27 State Appropriations. The State’s continued support, together with the proposed increase, will enable the Center to deliver cutting-edge solutions, attract top talent, train the manufacturing workforce, and contribute to the State’s economic growth.

The additional appropriation will be used to support the following research and operational activities:

- **Technical Personnel Appointments:** Laboratory technicians, R&D engineers, and postdocs are essential to the successful execution of research, particularly for the large collaborative projects recently secured by CMR Faculty Associates. Hiring technical personnel with specialized expertise is also critical for expanding current research areas and enhancing competitiveness for future grants.
- **Cost-Sharing Commitments:** Many large proposals require 20–50% cost sharing from non-federal sources. Increased State appropriations will enable CMR to collaborate with industry partners and other institutions to meet these requirements and to launch new research initiatives.
- **Laboratory Equipment Upgrades:** New research directions place greater demands on laboratory equipment for both safety and technological capability. These needs cannot be met through external grants and cost recovery alone. Allocating a portion of State funding annually to upgrade or replace capital equipment is essential for maintaining state-of-the-art research capabilities.
- **Student Support:** The requested increase, combined with growth in external research funding, will allow CMR to offer competitive assistantships to attract top graduate students and to recruit undergraduates to engage in advanced manufacturing research. Through hands-on research opportunities, the Center prepares students to contribute to both the state and national manufacturing workforce.

SUPPORTING MATERIALS

CMR Supported Graduate Students Degrees Awarded in 2024-2025 Fiscal Year

Masters

Dunlap, Caleb

Fall 2024

Advisor: Dr. Pinggen Chen

Mechanical Engineering

Kramer, Trevor

Summer 2024

Advisor: Dr. Rory Roberts

Mechanical Engineering

Mahmudov, Mushfig

"Mechanical Characterization of Epoxy-Infused Material Extrusion Structures with Varying Lattice Infill Designs for Hybrid Manufacturing"

Spring 2025

Advisor: Dr. Ismail Fidan

Mechanical Engineering

Phillips, Katherine

"Machine Learning for Predicting Mood Using Multivariate Time-Series Smartwatch Movement Data"

Spring 2025

Advisor: Dr. Doug Talbert

Computer Science

Schafer, David

Fall 2024

Advisor: Dr. Rory Roberts

Mechanical Engineering

CMR Supported Graduate Student Degrees Awarded in 2024-2025 Fiscal Year

Ph.D.

Al Amiri, Wesam

“Sensing by Reusing Communication Waveforms in Integrated Sensing and Communication”

Summer 2024

Advisor: Dr. Allen MacKenzie

Electrical and Computer Engineering

Innis, Cody

“Development and Deployment of Advanced Charging Technologies and Operational Strategies for Battery Electric Vehicles”

Spring 2025

Advisor: Dr. Ping Chen

Mechanical Engineering

Jadhav, Sainand

“Wire + Arc Additive Manufacturing (WAAM) of Refractory Alloy-Based Bimetallic Structures”

Summer 2024

Advisor: Dr. Duckbong Kim

Mechanical Engineering

Kramer, Trevor

“Effects of SOFC Pressurization and Investigation of SOFC Gas Turbine Hybrids for Aerospace Applications”

Fall 2024

Advisor: Dr. Rory Roberts

Mechanical Engineering

Lamantia, Maxavier

“Electric Vehicle and Charging Technology Development and Experimental Validation for Rural Applications”

Spring 2025

Advisor: Dr. Ping Chen

Spring 2025

Su, Zifei

“Motion Control and Planning for Battery Electric Vehicles”

Summer 2024

Advisor: Dr. Ping Chen

Mechanical Engineering

CMR Graduate Students Supported from State Appropriations in 2024-2025 Fiscal Year

Masters

El-Shazly, Amr

Advisor: Dr. William Eberle
Computer Science

Khallil, Md Ebrahim

Advisor: Dr. Syed Rizvi
Electrical and Computer Engineering

Mahmudov, Mushfig

Advisor: Dr. Ismail Fidan
Mechanical and Nuclear Engineering

San Inocencio, Julian

Advisor: Dr. Jiahong Zhu
Mechanical and Nuclear Engineering

Shoummo, Md Mashiur Rahman

Advisor: Dr. Bruce Jo
Mechanical and Nuclear Engineering

Ph.D.

Adeleke, Abayomi Isaac

Advisor: Dr. Robby Sanders
Chemical Engineering

Arogunjo, Ezekiel

Advisor: Dr. Joseph Ojo
Electrical and Computer Engineering

Dunlap, Caleb

Advisor: Dr. Ping Chen
Mechanical and Nuclear Engineering

Elgarhy, Islam

Advisor: Dr. Mohamed Mahmoud
Electrical and Computer Engineering

Femi-Oyetero, James

Advisor: Dr. Bruce Jo
Mechanical and Nuclear Engineering

Foster, Jacob

Advisor: Dr. Steve Anton
Mechanical and Nuclear Engineering

Gothard, Andrew

Advisor: Dr. Steve Anton
Mechanical and Nuclear Engineering

Gudavasov, Shamil

Advisor: Dr. Ismail Fidan
Mechanical and Nuclear Engineering

Hines, Brandon

Advisor: Dr. Steve Anton
Mechanical and Nuclear Engineering

Innis, Cody

Advisor: Dr. Ping Chen
Mechanical and Nuclear Engineering

Jones, Spencer

Advisor: Dr. Ethan Languri
Mechanical and Nuclear Engineering

CMR Graduate Students Supported from State Appropriations in 2024-2025 Fiscal Year

(continued)

Ph.D.

Phillips, Katherine

Advisor: Dr. Doug Talbert
Computer Science

Pourfallah, Mohsen

Advisor: Dr. Ethan Languri
Mechanical and Nuclear Engineering

Raju, Md Abdul Goni

Advisor: Dr. Duckbong Kim
Mechanical and Nuclear Engineering

Rashid, Mamunur

Advisor: Dr. Syed Rizvi
Electrical and Computer Engineering

Swiecichowski, Patrick

Advisor: Dr. Ethan Languri
Mechanical and Nuclear Engineering

Upama, Samina

Advisor: Dr. Bruce Jo
Mechanical and Nuclear Engineering

CMR Graduate Students Supported from External Funds in 2024-2025 Fiscal Year

Masters

Bablu, Md Akter Hossain

Advisor: Dr. Ethan Languri
Mechanical and Nuclear Engineering

Brady, Carter

Advisor: Dr. Syed Hasan
Electrical and Computer Engineering

Chumney, Sam

Advisor: Dr. Rory Roberts
Mechanical and Nuclear Engineering

Edwards, Tyler

Advisor: Dr. Jiahong Zhu
Mechanical and Nuclear Engineering

Islam, Md Azizul

Advisor: Dr. Bruce Jo
Mechanical and Nuclear Engineering

Jones, James

Advisor: Dr. Syed Hasan
Electrical and Computer Engineering

Liang, Yangyang

Advisor: Dr. Ying Zhang
Mechanical and Nuclear Engineering

Mahmoud, Marim

Advisor: Dr. Syed Hasan
Electrical and Computer Engineering

Niec, Austin

Advisor: Dr. Rory Roberts
Mechanical and Nuclear Engineering

Odukoya, Oluwadara

Advisor: Dr. Bruce Jo
Mechanical and Nuclear Engineering

Patel, Neal

Advisor: Dr. Ethan Languri
Mechanical and Nuclear Engineering

Ph.D.

Abdulmaged, Magdy

Advisor: Dr. Ping Chen
Mechanical and Nuclear Engineering

Al Amiri, Wesam

Advisor: Dr. Allen MacKenzie
Electrical and Computer Engineering

Alshaikh Ali, Mohammad

Advisor: Dr. Ismail Fidan
Mechanical and Nuclear Engineering

Arhin, Bernard

Advisor: Dr. Syed Rizvi
Electrical and Computer Engineering

Elke, Ocheme

Advisor: Dr. William Eberle
Computer Science

Hossain, Gazi Md Tanvir

Advisor: Dr. Duckbong Kim
Mechanical and Computer Engineering

Islam, Saiful

Advisor: Dr. Duckbong Kim
Mechanical and Nuclear Engineering

Jadhav, Sainand

Advisor: Dr. Duckbong Kim
Mechanical and Nuclear Engineering

Joshi, Sachin

Advisor: Dr. Ping Chen
Mechanical and Nuclear Engineering

Kamal, Moumita

Advisor: Dr. Doug Talbert
Computer Science

Karim, Md Abdul

Advisor: Dr. Duckbong Kim
Mechanical and Nuclear Engineering

CMR Graduate Students Supported from External Funds in 2024-2025 Fiscal Year

(continued)

Masters

Roberson, Christopher Joel

Advisor: Dr. Rory Roberts
Mechanical and Nuclear Engineering

Sakib, Tahmid Hasan

Advisor: Dr. Syed Hasan
Electrical and Computer Engineering

Solanki, Abhijeet

Advisor: Dr. Syed Hasan
Electrical and Computer Engineering

Tai, Chern Chao

Advisor: Dr. Doug Talbert
Computer Science

Travis, Andrew

Advisor: Dr. Pingen Chen
Mechanical and Nuclear Engineering

Tungar, Nikita

Advisor: Dr. Ethan Languri
Mechanical and Nuclear Engineering

Wang, Tianzhang

Advisor: Dr. Pingen Chen
Mechanical and Nuclear Engineering

Xu, Wenwen

Advisor: Dr. Pingen Chen
Mechanical and Nuclear Engineering

Ph.D.

Kramer, Trevor

Advisor: Dr. Rory Roberts
Mechanical and Nuclear Engineering

Lamantia, Maxavier

Advisor: Dr. Pingen Chen
Mechanical and Nuclear Engineering

Layhew, Griffin

Advisor: Dr. Rory Roberts
Mechanical and Nuclear Engineering

Le, Quy

Advisor: Dr. Syed Hasan
Electrical and Computer Engineering

Liu, Sheng

Advisor: Dr. Pingen Chen
Mechanical and Nuclear Engineering

Mahdi, Mohammad Mahruf

Advisor: Dr. Syed Hasan
Electrical and Computer Engineering

Mahmudov, Mushfig

Advisor: Dr. Ismail Fidan
Mechanical and Nuclear Engineering

Pesterfield, Ethan

Advisor: Dr. Rory Roberts
Mechanical and Nuclear Engineering

Rahman, Azizur

Advisor: Dr. Bruce Jo
Mechanical and Nuclear Engineering

Saha, Achintya

Advisor: Dr. Bruce Jo
Mechanical and Nuclear Engineering

CMR Graduate Students Supported from External Funds in 2024-2025 Fiscal Year

(continued)

Ph.D.

Schafer, David

Advisor: Dr. Rory Roberts
Mechanical and Nuclear Engineering

Shuaibu, Musayyibi

Advisor: Dr. Joseph Ojo
Electrical and Computer Engineering

Su, Zifei

Advisor: Dr. Pingen Chen
Mechanical and Nuclear Engineering

Tadakhe, Rajendra

Advisor: Dr. Ethan Languri
Mechanical and Nuclear Engineering

Tharpe, Alex

Advisor: Dr. Rory Roberts
Mechanical and Nuclear Engineering

External Funding – Proposals Submitted

PIs	Title	Funding Agency	Total Funding
Steven Anton Melissa Geist	Remote Patient Monitoring of Reactive Balance and Fall Risk from floor Vibrations	National Institutes of Health	\$415,605
Bruce Jo	JetX	US Army SBIT - JetX LLC	\$54,000
Bruce Jo Daniel Yoon	Small Business Technology Transfer (STTR); MetaFlex: Wearable Hand Grip Strengtheners for Aging Adults	National Institutes of Health	\$313,372
Bruce Jo	CRADA (Collaborative Research And Development Agreement)	ARL	\$500,000
Pingen Chen Zifei Su	Empowering Rural Communities with Smart Charge Management Solutions	U.S. Department of Energy	\$3,545,149
Pingen Chen	On-board Diagnostic Algorithm Research and Development for Selective Catalytic Reduction System Aging Detection	Cummins Filtration	\$73,515
Duckbong Kim	Machine Learning Based Metal 3D Printing Defect Removal for the Functionally Graded Materials (FGMs)	Ajou University	\$105,455
Tarek Elfouly	Designing Energy Efficient NEMS Based Devices for AI Applications	Ottonomi.AI	\$100,000
Ismail Fidan	Establishing an AI-Cybersecurity Integrated Advanced Manufacturing Workforce Development Consortia - ACAM	National Science Foundation	\$59,999
Ismail Fidan	Advancing National Additive Manufacturing: Multistate Workforce Development and Industry Integration Initiative	National Science Foundation	\$157,999
Ethan Languri Bahman Ghorashi	Tennessee Partnership for Smart Manufacturing (TPSM)	U.S. Department of Energy	\$1,535,000
Ethan Languri	South Carolina Clean Energy and Manufacturing Workforce Training and Technical Assistance	US DOE	\$57,000

PIs	Title	Funding Agency	Total Funding
Ethan Languri	Tennessee Manufacturing Engagement in Onsite Energy through DOE Southeast Onsite Energy TAP	U.S. Department of Energy	\$30,500
Zulkar Nine Ismail Fidan	ENACT: ENhancing Advanced CI Training in Smart Manufacturing for Rural Engineering Technology Workforce	National Science Foundation	\$299,999
Joseph Ojo Syed Rizvi	Collaborative Research : Mixed-Pole Multi-phase Synchronous Reluctance Motor Drives.	National Science Foundation	\$290,476
Joseph Ojo Syed Rizvi	Control of Modular Multi-Dual Active Bridge Converters for Integrated Ship-Board Power Systems	Office of Naval Research	\$50,000
Pingen Chen	Charging Tennessee: Advancing Public Vehicle Fleet Electrification	U.S. Department of Energy	\$999,976
Rory Roberts	Logistic Fuels Compact Desulfurization Demo for High-Efficiency SOFCC-TG Hybrid-Electric Propulsion System	Northrop Gruman	\$90,045
Rory Roberts	Minco Army HEPPS	MINCO	\$43,000
Rory Roberts	High Efficiency Solid Oxide Fuel Cell/Turbogenerator Hybrid Electric Propulsion System - Phase 2 with Additional funding	Brayton Energy	\$153,138
Rory Roberts	Brayton Energy – NGC Conceptual 700kW	Brayton Energy	\$29,600
Fred Vondra Ismail Fidan	Tennessee Tech METAL Hub	IACMI- The Composites Institute	\$199,999
Steve Anton	STTR, Phase 1: Mobile Object Vehicle Emulator (MOE)	DTRA	\$66,751

Total of 23 proposals submitted in FY 2024-2025 \$9,170,577