CHATTANOOGA STATE COMMUNITY COLLEGE

2024 Governor's Investment in Technical Education (GIVE 3.0):

Chattanooga State to Create a New Distributed Control Systems Security Technician Program and Certification

Chattanooga State Community College
(Lead Entity & Fiscal Agent)

IN PARTNERSHIP WITH:

1. Southeast Tennessee Development District
2. Chattanooga State Community College (ChSCC) & Tennessee College of Applied Technology at Chattanooga State (TCAT-CS)
3. Bledsoe, Grundy, Rhea, and Sequatchie County Schools
4. Card-Monroe Corporation, Colonial Chemical Company, and other employer partners as listed in the proposal

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Funding requested:

$2,000,000

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Chattanooga State Community College
(Lead Entity)

2024 GOVERNOR'S INVESTMENT IN VOCATIONAL EDUCATION (GIVE 3.0)

CHATTANOOGA STATE TO CREATE A NEW DISTRIBUTED CONTROL SYSTEMS SECURITY TECHNICIAN PROGRAM AND CERTIFICATION

CHATTANOOGA STATE COMMUNITY COLLEGE

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GIVE Grant Abstract: Chattanooga State to Create a New Distributed Control Systems Security Technician Program & Certification

Industry 4.0 brought advanced automation and data exchange to increase the efficiency of industrial control. Smart manufacturing integrated the Internet of Things (IoT) devices, artificial intelligence, and machine learning into industrial environments, collecting data to enable better decision making. While these technologies offer numerous benefits, they also increase the attack surface for ransomware threats. Cyber-physical security is a crucial aspect of smart manufacturing.

In collaboration with the Southeast Tennessee Development District and American Job Center; Bledsoe (Appalachian Regional Commission [ARC] *distressed* county), Rhea (ARC *at-risk*), Sequatchie (*at-risk*), and Grundy (*at risk*) County Schools, Card-Monroe Corporation, Colonial Chemical Company, and others, Chattanooga State Community College (ChSCC) and the Tennessee College of Applied Technology at Chatt State (TCAT-CS) proposes to create pathways to a career as a Distributed Control Systems Security Technician or, as we prefer to call it, an Industrial Control Systems Security Technician (ICSST). An ICSST ensures the confidentiality and integrity of data transmitted and stored within control systems, preventing unauthorized access, maintaining data integrity, protecting legacy systems, and mitigating supply chain risks. Providing personnel and equipment, this GIVE grant will integrate high school dual enrollment, work-based learning elements, access to/completion of industry recognized certifications, TCAT diplomas, and community college career and technical education, culminating in the new technical certificate and, if a student chooses, an associated degree.

A unique feature of this proposed project is the integration of two in-demand career clusters: Manufacturing Occupations and Information Technology. According to the 2023 *Improving the Pipeline for Tennessee's Workforce: Academic Supply for Occupational Demand Report,* manufacturing is 15% of the state's gross domestic product—the largest of any sector and manufacturing employment is 36% more concentrated than the national average. Since 2019, the Tennessee Department of Economic and Community Development has announced more than 270 manufacturing projects with more than 41,000 new job commitments, which is over half of the new commitments generated by the department's projects. Likewise, IT occupations are projected to grow 13% nationally from 2020 to 2030, faster than the average for all occupations.

Supporting IT and manufacturing industries in the region, this project aims to attract more students from the four rural counties to careers in Industrial Control Systems Security with multiple on-ramps, dual enrollment via TCAT-CS or ChSCC Engineering and Information Technology, pursuing a TCAT-CS technical diploma, and/or obtaining a ChSCC technical certificate or Associate of Applied Science degree. Additionally, students who complete their AAS can matriculate to the University of Tennessee, Chattanooga to complete a bachelor degree. This model provides students many pathways to expedite their entry to the workforce, while building a steady pipeline from elementary, middle, and high school to technical college matriculation. Additionally, the proposed project will develop a new Technical Certificate in Internal Control System Security. Through a combination of theory and hands-on learning, students will develop a strong foundation in electrical and digital fundamentals, programming, networking, and operating systems relevant to industry. Currently, there are 906 students across the 4 counties taking Career Technical Education in computer science, advanced manufacturing, and STEM/engineering. This program is expected to serve more than 3,600 by 2028.

Section 1. Demonstration of Need

In February 2024, the FBI issued a stark warning to Congress regarding the escalating threat posed by hackers targeting critical infrastructure systems in the United States. These targets included industrial control systems (ICS) vital to the nation's functioning, such as water treatment plants, the electrical grid, nuclear facilities, and transportation networks.[1]

Subsequently, 49 vulnerabilities have been discovered within ICS providers like Siemens, Hitachi, and Rockwell, spanning various industry sectors. These vulnerabilities exposed critical weaknesses, allowing malicious actors remote access to manipulate settings, bypass security protocols, escalate privileges, and steal sensitive data.[2] The devastating impact exploiting any of these vulnerabilities results in significant downtime for automated systems and staggering financial losses. These incidents point to the urgent need for robust safeguards for critical infrastructure and businesses against evolving threats.

Industry 4.0 brought advanced automation and data exchange to increase the efficiency of industrial control. Smart manufacturing integrated the Internet of Things (IoT) devices, artificial intelligence, and machine learning into industrial environments, collecting data to enable better decision making. While these technologies offer numerous benefits, they also increase the attack surface for ransomware threats.

Cyber-physical security is a crucial aspect of smart manufacturing. An Industrial Control Systems Security (ICSS) Technician ensures the confidentiality and integrity of data transmitted and stored within control systems preventing unauthorized access, maintaining data integrity,

[1] Williams, K. (2024, March 3). “Cyber-physical attacks fueled by AI are a growing threat, experts say” CNBC.

[2] Sharma, S. (2023, March 23). “New vulnerabilities found in industrial control systems of major vendors”. csoonline.com.

protecting legacy systems, and mitigating supply chain risks. Chattanooga State proposes a program to create pathways to a career as a Distributed Control Systems Security Technician or, as we prefer to call it, an Industrial Control Systems Security Technician (ICSST). The program will integrate high school dual enrollment, TCAT diplomas, and community college career and technical education, culminating in a technical certificate and, if a student chooses, an associated degree.

Rural residents of Appalachia, particularly those in Bledsoe, Sequatchie, Rhea, and Grundy Counties, face some of the greatest challenges in the nation with respect to intergenerational poverty and educational attainment, where more than half of the students are projected to give up and not complete any credentials or degree following their first year in college. That is where this proposed grant project can intervene by reaching elementary, middle, and high school students with vocational career exploration, so students will start their education and earn certifications before they graduate from high school. Early exposure to college level curriculum will acclimate high school students to college rigors, thereby easing the transition to additional certificate and degree completion at the Tennessee College of Applied Technology at Chattanooga State (TCAT-CS) and Chattanooga State Community College (ChSCC).

A unique feature of this proposed project is the integration of two in-demand career clusters: Manufacturing Occupations and Information Technology. According to the 2023 *Improving the Pipeline for Tennessee's Workforce: Academic Supply for Occupational Demand Report (ASODR),* manufacturing is 15% of the state's gross domestic product—the largest of any sector and manufacturing employment is 36% more concentrated than the national average. Since 2019, the Tennessee Department of Economic and Community Development (TNECD) has announced more than 270 manufacturing projects with more than 41,000 new job commitments, which is

over half of the new commitments generated by the department's projects. Likewise, IT occupations are projected to grow 13% nationally from 2020 to 2030, faster than the average for all occupations.

According to the most recent Census estimates (see chart in appendices), on average, 19% of residents in these counties live in poverty (compared to 13% of Tennesseans overall). At 23%, Bledsoe faces the highest poverty rate in the area, which puts it among Tennessee's distressed counties by the Appalachian Regional Commission (ARC) for fiscal year 2024. Educational attainment in the four counties is low, with an average of only 22% holding a Bachelor's degree compared to the state's 29%. In fact, 16% of these county's populations did not graduate from high school (20% for Sequatchie) compared to only 11% of residents statewide. This project will not only improve these statistics by increasing those individuals holding a certification or degree, but it will also improve the socioeconomic outcomes of participants and their families, meeting or beating the MIT Living Wage benchmark.

For example, according to the 2023 ASODR, Industrial Mechanics and Maintenance Technician two-year degree holders make about $47,870 in their first year on the job, while certificate holders in Computer and Information Systems Security/Auditing/ Information Assurance make approximately $46,154 in their first year on the job. A certification and potential degree that spans both occupations, will not only ensure a graduate of an in-demand position, but increase job stability, and potentially yield even higher earnings. This trajectory aligns with the goal of improving graduates' salaries toward the median household income for their respective counties and well above the poverty level. An April 8, 2024 search on jobs4tn.gov showed more than 70 openings within 50 miles of Chattanooga for the

aforementioned occupations. Such robust demand signals the relevance of pursuing pathways that lead to these certifications for individuals and their families.

The TNECD County Profile Tool mentions automotive is the top employment cluster in Grundy and Rhea Counties and the area has 13 manufacturers in Grundy, as well as 36 in Rhea who may have interest in this new ICSST career. The top cluster in Sequatchie County is appliances and electrical, with 18 manufacturers of all types in the county. The top cluster in Bledsoe is healthcare and medical devices, with 7 manufacturers of varying types. These companies could potentially utilize graduates of this new program.

Supporting IT and manufacturing industries in the region, the GIVE grant will provide additional dual enrollment opportunities across the four counties. This initiative aims to attract more students to careers in Industrial Control Systems Security with multiple on-ramps, dual enrollment via TCAT-CS or ChSCC Engineering and Information Technology, earning a TCAT-CS technical diploma, and/or obtaining a ChSCC technical certificate or Associate of Applied Science (AAS) degree. Additionally, students who complete their AAS can matriculate to the University of Tennessee at Chattanooga to complete a bachelor degree. This model provides students numerous pathways to expedite their entry to the workforce, while building a steady pipeline from elementary, middle, and high school to technical college matriculation. (See Educational & Career Pathways in the appendices.)

Section 2. Program Plan (including Goals, Objectives, & Deliverables)

The proposed project will develop a new Technical Certificate in Industrial Control Systems Security. The technical certificate will include one math course, four industrial control system classes, and four ransomware security courses. The Industrial Control Systems Security Technical Certificate is a comprehensive program designed to equip students with the essential

knowledge and skills required to excel in the field of industrial automation and control systems. Through a combination of theoretical learning and hands-on experience, students will develop a strong foundation in electrical and digital fundamentals, programming, networking, and operating systems relevant to industrial environments.

High school students will have the opportunity to complete courses toward this certificate via dual credit or dual enrollment (TCAT-CS/ChSCC). Following high school graduation, participants will be able to complete the certificate in one semester. Upon completion of the ICSST Certificate program, graduates will be well equipped to pursue careers as industrial automation technicians, control systems engineers, PLC programmers, and network specialists in a variety of industries.

With this initiative's new structure, students use specific curriculum and lab equipment to make advancements tied directly to the TCAT-CS clock hours. Students and instructors benefit from the use of the National Coalition of Certification Center's (NC3) certification, their Learning Management System (LMS) and supporting materials for implementing NC3 industry-driven certifications.

Goal 1: Introduce elementary, middle and high school students to high-demand, high wage careers in advanced manufacturing, emphasizing Industry 4.0 concepts of mechatronics, smart manufacturing, networking, and IT security. (Implementation time: 3-6 months) *Objective*: Develop and implement hands-on activities for multiple learning levels, highlighting skills utilized by industrial control systems technicians within the framework of Industry 4.0. *Deliverable*: Create six hands-on activities demonstrating key skills/concepts in mechatronics, smart manufacturing, networking, and IT security. *Objective*: Facilitate career exploration activities through various platforms such as classroom visits, career fairs, and workshops.

(WBL—Industry & Career Awareness) *Deliverables*: Organize classroom visits to expose students to real-world applications of ICSS; Participate in career fairs to highlight advanced manufacturing careers and companies; Conduct workshops for students, teachers, and parents focusing on career pathways, skill requirements, and opportunities within the industry; Solicit feedback to assess the effectiveness of activities and events in increasing students interest in ICSS. >Measurable Outcomes: 1. Increased student engagement in advanced manufacturing-related activities. (Number of students participating in activities); 2. Higher awareness among students about career opportunities in advanced manufacturing, particularly in Industrial Control Systems Security. (Activity effectiveness survey); 3. Enhanced understanding of the skills and knowledge required for careers in mechatronics, smart manufacturing, networking, and IT security. (Workshop Pre- and Post-test assessments)

Goal 2: To design and implement a new 28-credit-hour Technical Certificate (TC) program focused on Industrial Control Systems Security (ICSS), providing students with fundamental skills and pathways for education and career advancement. (Implement. time: 6 months-1 year) *Objective:* Develop a cross-disciplinary curriculum for the ICSS Technical Certificate program, emphasizing fundamental skills in industrial control systems and networking security measures. *Deliverables:* Identify courses containing key competencies and knowledge areas for industrial control systems security; Design courses and integrative learning modules to cover competencies effectively. *Objective:* Establish multiple pathways for students to earn credits toward the ICSS Technical Certificate, including dual credit programs, industry certifications, as well as TCAT and College dual enrollment. (WBL–Career Preparation and Training Experiences) *Deliverables:* Collaborate with high schools to offer dual credit courses related to ICSS; Identify industry certifications related to industrial control systems security for credit transfer; Create Agreements

and partnerships with high schools, TCAT, and industry organizations to support credit pathways and recognition of certifications; Develop articulation agreements with TCAT and ChSCC to facilitate seamless credit transfer for students; Develop Marketing materials and outreach efforts to promote the ICSS-TC program and its pathways to students and stakeholders. *Objective:* Provide opportunities for ICSS-TC completers to pursue three different Associate of Applied Science (AAS) degrees, allowing for further specialization and career advancement. (WBL–Career Preparation and Training Experiences) *Deliverable:* Develop clear pathways from the ICSS Technical Certificate program to AAS degrees in Computer Information Technology, Mechatronics, and Engineering Systems Tech. >Measurable Outcomes: 1. Number of students earning credits through dual credit programs, industry certifications, and dual enrollment options. 2. Enrollment and completion rates for the ICSS Technical Certificate program. 3. Percentage of ICSS-TC completers who continue their education and pursue one of the three identified AAS degrees. 4. Feedback from students, faculty, and industry partners on the relevance and effectiveness of the program and pathways.

Goal 3: To provide Early Postsecondary Opportunities (EPSOs) for high school students, enabling them to earn industry-recognized credentials, dual credit, TCAT clock hours, and college credit. (Implement. time: 6-12 months) *Objective*: Develop and implement a comprehensive EPSO program that offers a range of opportunities for high school students to earn various credentials and credits. (WBL–Career Preparation and Training Experiences) *Deliverables:* Identify industry-recognized credentials relevant to local workforce needs; Perform a gap analysis on high school CTE curriculum to identify dual credit opportunities; Identify industry-recognized certifications that qualify for Timewise TN credit (prior learning assessment credit) for courses in the ICSS-TC. Establish partnerships with Technical Colleges

(TCAT), colleges, and industry organizations to offer dual credit courses and credentialing programs. *Objective:* Design flexible pathways that allow students to tailor their EPSO experience based on their learning style, career interests and goals. (WBL–Career Preparation and Training Experiences) *Deliverables:* Offer a variety of ways to earn credits aligned with the ICSS-TC; Dual credit–high school instructors teach course content. Students take a dual credit assessment to earn credit for the course; TCAT clock hours–students participate in TCAT dual enrollment focused on the student learning outcomes identified in the articulation agreement; ChSCC credit hours–students take courses included in the ICSS-TC through dual enrollment, earning college credit. *Objective:* Ensure all students have the equal access to EPSO opportunities through high-quality CTE courses. *Deliverables:* Implement outreach and recruitment efforts to engage students from all backgrounds; Create outreach materials to raise awareness among high school students, parents, educators, and community stakeholders about EPSO opportunities; Provide support services to facilitate participation and success. >Measureable Outcomes: 1. Increased high school student participation rates in EPSO programs. 2. Number of industry-recognized credentials earned by students while in high school. 3. Percentage of high school graduates with college credits or TCAT clock hours. 4. Feedback from students, educators, and industry partners on the effectiveness and relevance of EPSO offerings

Goal 4: To prepare a skilled workforce capable of safeguarding industrial control systems (ICS) from ransomware attacks. (Implement. time: 6-12 months) *Objective:* Develop key concept modules focusing on ICS security to integrate into current high school CTE programs. (WBL–Career Exploration Experiences) *Deliverables:* Identify crucial knowledge and skills required to protect industrial control systems from computer attacks; Design modular curriculum materials that align with existing CTE frameworks and standards, allowing for seamless integration into

programs; Solicit feedback on the curriculum's effectiveness and impact. *Objective:* Create accessible and equitable active learning activities utilizing Augmented or Virtual Reality technology to enhance student engagement and understanding. (WBL–Career Exploration Experiences) *Deliverables:* Explore AR/VR platforms and tools suitable for delivering immersive learning experiences; Develop interactive simulations and scenarios that match real-world challenges related to ICS security; Solicit feedback on the AR/VR activities effectiveness and impact. *Objective:* Establish a steering committee comprised of stakeholders from industry, education, and workforce development board to provide guidance and oversight for grant activities. *Deliverables:* Recruit representatives from industry partners; Collaborate with the steering committee to assess program effectiveness and provide strategic direction for grant activities. >Measurable Outcomes: 1. Number of high school CTE programs that integrate ICSS modules in their curriculum. 2. Engagement levels and feedback from students participating in AR/VR learning activities. 3. Number of students pursuing careers or furthering education in Computer Information Technology, Mechatronics, or Engineering Systems Technology.

As of this academic year, there are 906 students across the 4 counties taking Career Technical Education (CTE) courses in STEM/engineering, computer science, and advanced manufacturing. This program is expected to serve more than 3,600 by 2028. According to ChSCC's Institutional Effectiveness, Research, and Planning Office, first time freshmen from CTE Dual Enrollment programs are almost three times more likely to graduate from Chattanooga State than those who do not take dual enrollment. It is for this reason that, through this project, Chattanooga State is working to embed dual enrollment into the Advanced Manufacturing, Information Technology, and most of the STEM CTE programs of study (POS). (POS specifics in appendices.)

To meet employer demands, updated equipment provided by this grant will ensure each county high school is training students in the most recent learning methods and cutting-edge equipment. Specifically, the project will include a subscription to each program participant and faculty (in all participating counties) in the EON Academic Virtual Campus. Through AI headsets, as well as phone apps, the Virtual Campus platform employs AI, Augmented, and Virtual Reality to transform textual and visual content into immersive learning courses. Additionally, nearly half of the grant will be spent on Snap-on, and FESTO NC3 training equipment to teach the new ICSST and other industry recognized certifications. The equipment is detailed in the attached budget narrative.

A Steering Committee of representatives from each represented elementary, middle, and high school, Chattanooga State, Southeast Tennessee Development District, as well as industry partners will further plan and implement the program enhancements just mentioned. The Committee will meet monthly during the Planning Phase (the project's first ten months) and quarterly during the three-year Pilot phase. Decisions will be made by majority vote.

This grant project's timeline (see appendices) outlines the activities and action steps necessary for a successful effort. Particular College recruitment attention will be given to the economically disadvantaged students (all of the involved schools are under the Community Eligibility Provision for schools in low-income areas as identified by the US Department of Agriculture).

TCAT-CS Dual Enrollment Coordinator Carl Miller and Director of Early College, as well as K-12 Partnerships Lewis Jackson will serve as this grant's project directors. They will manage/oversee all of the project's details. The College will hire additional partnership directors/leads for this new program. The project directors will meet with all strategic partners at least quarterly during the grant term and twice annually following the grant to discuss progress,

address concerns, and obtain answers for project course direction, as well as provide professional development.

Section 3: Strength of Partnership.

Community support and partnership for the project is significant. Each partner will provide a representative to serve on the Steering Committee to help design and evaluate the WBL components. Following is a detailed description of each partner and their roles in this program's implementation (MOUs are in the grant appendices):

>Lead Entity, Fiscal Agent and Higher Education Partner: Chattanooga State Community College—*Authorizing Agent*: Rebecca Ashford, President— *Grant Role & Capabilities/ Qualifications*: Chattanooga State will serve as lead entity, fiscal agent and the postsecondary education provider for this project. For the educational and work-based learning grant components, three program leads will oversee the activities and reporting—One from Dual Enrollment/Early College, one from Industrial Automation at the TCAT at Chattanooga State, and one in ChSCC's Engineering and Information Technology Division-Computer Science. The College will obtain and install the necessary equipment for this project, as well as employ the faculty to teach the postsecondary courses, along with necessary high school elements. Also, the College will hire additional instructors for the new ICSST credential. The College will prepare the various reports for this grant. Chattanooga State has served in a similar role on several grants including National Science Foundation, Department of Labor, Department of Education (Strengthening Institutions-SIP), as well as GIVE 1.0 & 2.0, along with LEAP 2.0 projects.

>K-12 Partners: Bledsoe, Grundy, Rhea, and Sequatchie County Schools—*CTE Directors*: Steve Reel (Bledsoe), Gina Sons (Grundy), Lori Derlak (Rhea), Marsha Talley (Sequatchie) — *Grant Role & Capabilities/Qualifications*: The CTE Directors will market the CTE Advanced

Manufacturing courses with the Industrial Control Systems Security Technician enhancements to prospective students and parents. They will work with Chattanooga State on the enhancements planned for the various courses of study. They will explore dual enrollment offerings in the course areas and assist with needed statistics for grant reporting purposes. The CTE Directors and school districts of this project have regularly partnered with Chattanooga State on several grants and other projects, including most of them participating in the LEAP 1.0 and 2.0 grant initiatives, as well as GIVE 1.0 and 2.0.

>Industry Partners [and Primary Contact]: Card-Monroe Corporation [Allen Neely, Senior Vice-president], Colonial Chemical, Inc. [Doug Wynn, Executive Vice-President], La-Z-Boy [Janet Earnhardt, Human Resources Director]—*Grant Role & Capabilities/Qualifications:* The grant's industry partners will provide a variety of work-based learning opportunities including industry-recognized certification training, internships, job shadowing opportunities, in-the-field career exploration days for the high school students, and classroom visits for career exploration at elementary and middle schools in the counties participating in this grant project. These industry partners have closely worked with Chattanooga State's Industrial Automation and Robotics programs on existing WBL programs and previous grant projects, such as National Science Foundation grants to develop new curriculum. These employers are very supportive of this proposed project, as a steady supply of professionals is needed in the region.

>Local Workforce/Economic Development Agency Partner: Southeast Tennessee Development District—*Project Liaison*: Michele Holt, SETWORKS/Management, Director of Workforce Development—*Grant Role & Capabilities/Qualifications*: SETD will serve as the liaison to employers to help obtain/maintain this project's WBL elements. SETD will assist with needed statistics for grant reporting purposes. Providing economic and workforce development

programs in ten Southeast Tennessee counties, SETD has served as Lead Entity or key participant in a variety of grants including Labor and Education Alignment Program Grant-LEAP 1.0 and 2.0, GIVE 1.0 & 2.0, as well as WIOA funding.

Section 4: Budget Plan

There is a clear alignment between the funds requested and the grant activities. The equipment funds are necessary to engage, train and subsequently expand the regional advanced manufacturing and information technology workforce pipeline. The equipment purchases align with the goal of closing skills/training gaps in the region and better preparing students entering postsecondary institutions and ultimately professional positions. The equipment and supply figures are based on quotes from the following vendors: EON, Reletech, FESTO, and Snap-On. The salary and benefits line items will provide the needed personnel, especially the project directors, three outreach specialists, Early College and K-12 Partnership Director, and Program Leads, to plan and implement the on-going college-ready modules, digital literacy components, job shadowing coordination, arranging career exploration opportunities, outreach and recruitment, as well as enhanced instruction and employer relations. Additionally, the two project directors overseeing the activities will coordinate the reporting elements necessary for this grant. The personnel mentioned will aid with curriculum development, teaching support, as well as WBL coordination. The travel budget is necessary for reimbursement of expenses associated with program activities in this project's four counties, including elementary, middle, and high schools in the region, along with professional development.

Section 5: Sustainability

This project's partners are committed to sustaining this initiative, including all work-based learning components, long after the grant concludes. The roles and resources that each partner

brings to this project will continue following the grant's initial 48 months. Post-grant, each partner will continue to work collaboratively as part of the Steering Committee to share resources, outcomes, and other relevant programmatic information, meeting twice annually to discuss program direction, address concerns, and make plans to further build the program that this grant helped to launch. For personnel and benefits, Chattanooga State will budget for all teaching, project coordination, and administrative staff in its ordinary, annual budgeting process. This project's industry partner donations, scholarships, WBL experiences, Tennessee Promise and Reconnect, Dual Enrollment Grants, as well as other scholarship programs will further provide foundational support for sustainability, especially along with the new equipment (which will be maintained and functional until no longer relevant for training). Chattanooga State's Marion County location in Kimball, Rhea County's locations in Dayton, and the main campus in Hamilton County will provide commuting flexibility to students from each county, which will eliminate students' costly and time-consuming commute, and will positively impact each satellite's annual enrollments due to accessibility. Educator partners will ensure continuation of instruction and all partners will continue to make workforce development decisions that are both industry- and data-driven, introducing state-of-the-art technologies within curricula as needed. Another important sustainability component is the on-going commitment by all parties involved with this grant to maintain and grow the strong partnerships and long-term relationships between employers, primary and secondary education, community colleges and TCATs in order to increase the skilled workforce pipeline for Industrial Control Systems Security Technician career pathways.

Section 6: Optional Criteria

>>*High Demand Programs:* Cluster 3: Manufacturing—This project directly involves SOC Code 49-2094-Electrical and Electronics Repairers, Commercial and Industrial Equipment, which is in demand in Tennessee, including 5 regions; and 49-9099-Installation, Maintenance, and Repair Workers, All Other, which is in demand in 9 regions. Cluster 13: Information Technology—This project involves 15-1241-Computer Network Architects, which is in demand in Tennessee, especially in 4 regions; 15-1244-Network and Computer Systems Administrators, which is in demand in 5 regions of the state; 15-1212-Information Security Analysts, which is in demand in Tennessee, as well as 5 regions of the state; 15-1231-Computer Network Support Specialists, which is in demand in a region of the state.

>>*County Economic Status Acknowledgement:* In order to help Tennessee meet the objective of attaining no distressed counties, this grant project will substantively serve Bledsoe County, which has currently been designated by the Appalachian Regional Commission as *distressed*. Additionally, Grundy, Rhea, and Sequatchie are *at-risk* counties.

Appendix B: Budget & Budget Line-Item Detail

GRANT BUDGET				
GIVE Program Competitive Grant				
The grant budget line-item amounts below shall be applicable only to expenses incurred during the following **Applicable Period:** **BEGIN: 08/15/24** **END: 08/14/28**				
POLICY 03 Object Line-item Reference	**EXPENSE OBJECT LINE-ITEM CATEGORY [1]**	**GRANT CONTRACT**	**GRANTEE PARTICIPATION**	**TOTAL PROJECT**
1, 2	Salaries, Benefits & Taxes	475,425.00	0.00	475,425.00
4, 15	Professional Fee, Grant & Award [2]	207.00	0.00	207.00
5, 6, 7, 8, 9, 10	Supplies, Telephone, Postage & Shipping, Occupancy, Equipment Rental & Maintenance, Printing &Publications	397,826.00	0.00	397,826.00
11, 12	Travel, Conferences & Meetings	35,650.00	0.00	35,650.00
13	Interest [2]	0.00	0.00	0.00
14	Insurance	0.00	0.00	0.00
16	Specific Assistance to Individuals	0.00	0.00	0.00
17	Depreciation [2]	0.00	0.00	0.00
18	Other Non-Personnel [2]	0.00	0.00	0.00
20	Capital Purchase [2]	942,744.00	0.00	942,744.00
22	Indirect Cost	148,148.00	0.00	148,148.00
24	In-Kind Expense	0.00	0.00	0.00
25	**GRAND TOTAL**	**2,000,000.00**	**0.00**	**2,000,000.00**

[1] Each expense object line-item shall be defined by the Department of Finance and Administration Policy 03, *Uniform Reporting Requirements and Cost Allocation Plans for Sub recipients of Federal and State Grant Monies, Appendix A.* (posted on the Internet at: www.state.tn.us/finance/act/documents/policy3.pdf).

[2] Applicable detail follows this page if line-item is funded

GRANT BUDGET LINE-ITEM DETAIL:

Salaries, Benefits & Taxes

3 Outreach Specialists (12-month temporary staff)	
(27 hours @ $25/hour x 48 weeks for 3.5 years)	$340,200
Fringe benefits and payroll taxes (7.65% of wages)	$26,025
Co-Project Director-TCAT	
(Stipend of $500.00/month for 48 months)	$24,000
Fringe benefits and payroll taxes (30% of wages)	$7,200
Co-Project Director-College	
(Stipend of $500.00/month for 48 months)	$24,000
Fringe benefits and payroll taxes (30% of wages)	$7,200
Early College & K-12 Partnership Director	
(Stipend of $250.00/month for 48 months)	$12,000
Fringe benefits and payroll taxes (30% of wages)	$3,600
Program Lead-Computer Science	
(Faculty stipend of $250.00/month for 48 months)	$12,000
Fringe benefits and payroll taxes (30% of wages)	$3,600
Program Lead-Industrial Automation Robotics	
(Faculty stipend of $250.00/month for 48 months)	$12,000
Fringe benefits and payroll taxes (30% of wages)	$3,600
	$475,425

Professional Fee, Grant & Award

Professional Fee-background checks for 3 Outreach Specialists	**$207**

Supplies, Telephone, Postage & Shipping, Occupancy, Equipment Rental & Maintenance, Printing & Publications

(Includes supplies with a life over 1 year but under $5,000 capital equipment threshold)

DESCRIPTION	UNIT PRICE	QTY	TOTAL
Year 2: EON-XR ACADEMIC (Student 100, teacher 3) Instructional Subscription [AR/VR component]	$39,882	1	$39,882
Year 3 & 4: EON-XR ACADEMIC (Student 250, teacher 6) Instructional Subscription [AR/VR Component]	$78,372	2	$156,744
Cisco catalyst 9200L 24 port switch [AR/VR Component]	$3,940	40	$157,600
Cisco ISR 1101 Router [AR/VR Component]	$950	40	$38,000
Tripp lite 7ft Cat 6 snag less patch cable [AR/VR component]	$7	800	$5,600
			$397,826

Travel, Conference & Meetings

Outreach Specialists-Travel & Professional Development	$25,000
Project Directors & Program Leads-Travel & Professional Development	$10,650
	$35,650

Capital Purchase

DESCRIPTION	UNIT PRICE	QTY	TOTAL
Snap-On Certification Cart Precision Measuring Instruments	$41,162	4	$164,648
FESTO NC3 Certification-Exploring Electricity	$5,147	8	$41,176
FESTO NC3 Certification-Electricity-AC/DC	$9,995	8	$79,960
NC3 Certification-Introduction to Mechatronics MEC lab with FluidSim 6	$15,000	8	$120,000
850-ABS-Sim PLC Trainer with Simulators, Mechatronics Connections, Festo EasyPort Interface [NC3 Certification Component]	$10,000	8	$80,000
Snap-On Certification Cart Mechanical Torque & Electrical Torque	$55,300	4	$221,200
Snap-On Certification Cart Multi-Meter	$9,130	4	$36,520
Snap-On Certification Cart Hand Tool Identification & Safety	$11,615	4	$46,460
FESTO NC3 Certification-Mechanical Systems Level 1 and 2	$38,195	4	$152,780
			$942,744

Indirect Cost

Chattanooga State Community College (8% of Total Direct Costs) Costs include use allowances, operations and maintenance expenses, general and administrative expenses, departmental administration expenses, sponsored projects administration, library expenses, and student services administration. Our federally negotiated rate with the Department of Health and Human Services is 50% (On-Campus) and 17.4% (Off-Campus) of Direct Salaries and Wages excluding all fringe benefits. Attached is our current rate agreement for your reference.	**$148,148**
GRAND TOTAL	**$2,000,000**

COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN: 62-0725362
ORGANIZATION:
Chattanooga State Community College
4501 Amnicola Highway
Chattanooga, TN 37406-

Date: 02/15/2024
FILING REF.: The preceding agreement was dated 04/06/2020

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

SECTION I: Facilities And Administrative Cost Rates

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

	EFFECTIVE PERIOD				
TYPE	FROM	TO	RATE(%)	LOCATION	APPLICABLE TO
PRED.	07/01/2023	06/30/2027	50.00	On-Campus	All Programs
PRED.	07/01/2023	06/30/2027	17.40	Off-Campus	All Programs
PROV.	07/01/2027	Until Amended			Use same rates and conditions as those cited for fiscal year ending June 30, 2027.

*BASE

Direct salaries and wages excluding all fringe benefits.

SECTION II: SPECIAL REMARKS

TREATMENT OF FRINGE BENEFITS:
The fringe benefits are specifically identified to each employee and are charged individually as direct costs. The directly claimed fringe benefits are listed below.

TREATMENT OF PAID ABSENCES:
Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims are not made for the cost of these paid absences.

OFF-CAMPUS DEFINITION: The off-campus rate will apply for all activities: a) Performed in facilities not owned by the institution and where these facility costs are not included in the F&A pools; or b) Where rent is directly allocated/charged to the project(s). Grants or contracts will not be subject to more than one F&A cost rate. If more than 50% of a project is performed off-campus, the off-campus rate will apply to the entire project.

Fringe Benefits include: FICA, Workers' Compensation, Retirement and Health Insurance.

Equipment means an article of nonexpendable tangible personal property having a useful life of more than one year, and an acquisition cost of $5,000 or more.

Your next proposal based on actual costs for the fiscal year ending 06/30/26 is due in our office by 12/31/26.

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted: such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Title 2 of the Code of Federal Regulations, Part 200 (2 CFR 200), and should be applied to grants, contracts and other agreements covered by 2 CFR 200, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to these programs.

BY THE INSTITUTION:

Chattanooga State Community College
(INSTITUTION)

Susan Joseph
(SIGNATURE)

Susan Joseph
(NAME)

VP for Business & Finance
(TITLE)

3/4/24
(DATE)

ON BEHALF OF THE GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES
(AGENCY)

Darryl W. Mayes -S
Digitally signed by Darryl W. Mayes -S
Date: 2024.03.01 08:47:13 -05'00'
(SIGNATURE)

Darryl W. Mayes
(NAME)

Deputy Director, Cost Allocation Services
(TITLE)

02/15/2024
(DATE)

HHS REPRESENTATIVE: Wheatford Ashby
TELEPHONE: (301) 492-4855

ATTACHMENT ONE: DATA LIST

County Demographics

	Grundy County	Rhea County	Sequatchie County	Bledsoe County	Tennessee
High school graduate or higher, percent of persons age 25 years+, 2018-2022	84%	83%	80%	91%	89%
Bachelor's degree or higher, percent of persons age 25 years+, 2018-2022	19%	17%	14%	36%	29%
Persons in poverty, percent	21%	14%	18%	23%	13%

Source: US Census Quick Facts, https://www.census.gov/quickfacts/table/PST045216/47,00

IMPROVING THE PIPELINE FOR TENNESSEE'S WORKFORCE: ACADEMIC SUPPLY FOR OCCUPATIONAL DEMAND REPORT 2023

TN Department of Economic & Community Development

TN Department of Education

TN Department of Labor & Workforce Development

THEC TSAC

IN-DEMAND OCCUPATIONS AND ALIGNED ACADEMIC PROGRAM HIGHLIGHTS

In this section, unmet need is determined in cases where there is high regional demand but few or no aligned training programs; and in cases where employment rates in aligned programs are 60 percent or higher and confer wages higher than the state median wage of $37,700 in 2021, signaling greater labor force needs.

Agriculture, Food, and Natural Resources

Veterinarians are **in demand** in three regions in Tennessee. The University of Tennessee, Knoxville (UTK) is the sole provider of Doctor of Veterinary Medicine (DVM) degrees in the state. In 2020-21, 86 DVMs were granted. The estimated annual wages of DVMs in the first year were $99,844, outpacing other graduates in the agriculture, food, and natural resources cluster. However, only 30 percent of DVM graduates were found in Tennessee's employment records, which may indicate that graduates are working out of state. Occupations in-demand in more than three regions include supervisors of landscaping workers, landscaping workers, and wastewater treatment operators. **Supply:** In this cluster, the highest employment rates of graduates found in the Tennessee records were associate degree programs in veterinary technician and assistant and biotechnology. The first-year wage outcomes for biotechnology graduates are the second highest in this cluster at $40,065. Certificate completers and high school CTE concentrators in veterinary technician/assistant and food technology and processing had higher than average employment rates. **Unmet needs**: Biotechnology will likely continue to expand; training programs for landscaping supervisors and workers were few.

Architecture and Construction

Demand: Several occupations in this group are in-demand statewide, including in residential, commercial, and industrial construction. Construction managers and cost estimators typically require four-year degrees, while most other occupations in this group acquire skills through a two-year degree, postsecondary certificate, apprenticeship, or on-the-job training. Construction workers in-demand in most areas of the state include: construction supervisors, electricians, carpenters, operating engineers, painters, plumbers, and heating, ventilation, and air conditioning (HVAC) personnel. **Supply:** The bachelor's program in construction management had the highest share of graduates (of programs with 10 or more completers) found in the Tennessee job market (63 percent), with first-year wages of $57,569. Less than one year certificate programs in plumbing place 60 percent of graduates in the Tennessee job market. Several high school CTE programs in this cluster have employment rates of 50 percent. In 2020-21, 32 electricians and 527 production machinery electricians completed apprenticeships. **Unmet Needs:** Due to high regional demand and few training options, programs in basic skills for carpenters, operating engineers, painters, plumbers, and cost estimators are needed.

Manufacturing

Demand: Tennessee has done an exceptional job of growing one of the strongest specialized manufacturing workforces in the country. As Tennessee expands its manufacturing investments, there are many occupations in-demand across the state, including first line supervisors of mechanics, installers, and repairers and production workers; general maintenance and repair workers; machinists; welders; inspectors, testers, sorters, samplers, and weighers; food batchmakers; and computer numerically controlled tool operators. **Supply:** Multiple certificate programs had employment rates of 60 percent or more among completers. High school CTE programs in the Manufacturing cluster including machine shop assistant, electromechanical technologies, mechatronics, and welding had employment rates of 56 percent or more, although salaries were low. Over 600 credentials in machine tool technology were awarded by TCATs and community colleges in 2020-21. Over 2,440 welding credentials were issued, including postsecondary certificates and CTE concentrators.

Transportation

Demand: Tennessee is a leading state in transportation, distribution, and logistics. The transportation cluster contains several occupations that are in-demand statewide and in every region of the state, including automotive service technicians and mechanics; bus and truck mechanics and diesel engine specialists; production, planning, and expediting clerks; heavy and tractor-trailer truck drivers; industrial truck and tractor operators; and mobile heavy equipment mechanics. **Supply:** Several TCAT programs train Tennesseans in this cluster who remain in Tennessee to work. The highest employment rates for certificate programs were logis-

had 227 bachelor's degree graduates with 55 percent of graduates found in Tennessee employment. **Unmet need:** Graphic design was in demand in seven regions of Tennessee, with one program offered at the bachelor's degree level.

Leisure and Recreation

Tennessee is well known for its great outdoors, with 13 national parks, 56 state parks, and 84 natural areas. In Tennessee, the leisure and hospitality sector is expected to have seven percent growth from 2021 to 2023[6] due to rising wages in the industry and consumers shifting back to more in-person services. **Demand:** Most of the in-demand occupations in the leisure and recreation cluster require only a high school degree or the equivalent. Food service managers, supervisors of housekeeping and janitorial workers, and pest control workers are in demand in all areas of the state; chefs and head cooks and exercise trainers were in demand in seven areas. **Supply:** Culinary arts/chef training and hotel/motel administration associate degree programs had the highest employment rates in Tennessee at 68 and 70 percent, respectively. Culinary arts completers from high school CTE programs had employment rates of 53 percent. Those earning bachelor's degrees in hotel/motel administration were employed at the rate of 51 percent. This cluster includes degrees in sports and exercise science. In 2020-21, more than 900 students completed bachelor's degrees in exercise science. **Unmet Needs:** Although employment rates were high for associate degrees in culinary arts and hotel administration, the wages were below state median wages. Increased pay in these fields may entice more students into these fields. Pest control workers were needed in all nine local workforce development areas but specific training was not available.

Information Technology

Demand: Information technology (IT) occupations are in-demand in both Tennessee and the nation. IT occupations are projected to grow 13 percent nationally from 2020 to 2030, faster than the average for all occupations. Tennessee's growth in the headquarters, finance, and tech industries and unique research and development facilities at St. Jude Children's Research Hospital, Oak Ridge National Laboratory, Arnold Engineering Complex, and universities are employers of computer and IT occupations. The IT occupations in demand in the most regions of the state include computer user support specialists, computer systems analysts, information security analysts, and network and computer systems administrators. **Supply:** The medical informatics associate degree program provided the highest share of its graduates (82 percent) the to the Tennessee workforce. The master's degree in medical informatics had an employment rate of 58 percent and paid a first-year median wage of $78,935. **Unmet needs:** While short term trends have shown some volatility, IT employment is expected to have strong growth long term. The computer and information systems security/auditing/information assurance certificate program of less-than-one-year had the highest employment rate (73 percent) and completers earned more than the state median wage. The associate degree in information technology also had high employment rates and pay above the median. Bachelor's and master's degree programs had high salaries but lower placement rates which could be due to individuals moving out of state.

Engineering and Other STEM Programs

Demand: Engineering and related occupations play an instrumental role in Tennessee businesses. TNECD has several target industries connected to engineering, including automotive, aerospace and defense, chemical products, and electrical equipment and appliances. Tennessee has a low concentration of employees in these high-wage fields, relative to the national average. In 2021, the number of engineers in Tennessee, about 26,000, was 23 percent below the national average concentration. The occupations that are in-demand in the most regions of Tennessee are electrical and electronic engineering technologists and technicians, civil engineers, electrical engineers, and mechanical engineers. **Supply:** Engineers require a bachelor's degree, while the technologists and technicians require associate degrees. Eight aligned academic programs had 70 percent or more of graduates found in Tennessee employment data, including the mechatronics, robotics, and automation engineering bachelor's program, associate degree programs in chemical engineering technology and industrial technology, and certificate programs of engineering technology, computer engineering technology, automation engineering technology, mechanical drafting, Computer Aided Design and Computer Aided Design and Drafting (CAD/CADD), and chemical technology. The master's degree in industrial engineering paid on average $93,896, while the doctorate paid $171,484. **Unmet needs:** The high rates of employment and wages signal the potential for supply gaps as Tennessee expands its manufacturing base and medical and other scientific research fields. Thirteen programs including many of those listed above had placement rates of 60 percent or more and paid more than the median wage. In addition, the associate and bachelor's degrees in engineering technologies and the associate degrees in welding technology met these criteria.

[6] Tennessee Department of Labor and Workforce Development, WIRED, Short Term Industry Projections 2021-2023

The report also highlights positions which comprise the workforce for TNECD's target industry sectors.[18] TNECD has nine prioritized sectors for business expansion and recruitment. Resources are focused on these industries due to the state's demonstrated strengths, concentration, and assets which allow the industries to thrive, as well as the significant economic impact and high-quality job opportunities these industries offer.

TNECD TARGET INDUSTRY SECTORS		
Aerospace & Defense	**Automotive**	**Chemicals**
Distribution & Logistics	**Electrical Equipment & Appliances**	**Food & Agriculture**
Healthcare & Life Sciences	**HQ, Finance & Tech**	**Rubber, Ceramics & Glass Products**

The tables for in-demand occupations include columns to help the reader quickly learn more about the occupation.

IN-DEMAND OCCUPATION TABLE LEGEND:

- The six-digit code denotes the Standard Occupational Classification (SOC) Code for the in-demand occupation.
- Occupation is the name of the in-demand job as provided by the SOC system.
- Two columns indicate the region(s) in which the position is in-demand:
    - In the column named "TN", an "X" denotes that an occupation was in-demand across the Tennessee statewide region.
    - In the column named "Total # Regions", a number from one to nine[19] indicates the number of regions in which the occupation was found to be in-demand. The regions include the state's nine Local Worforce Development Areas (LWDA).[20]
- The statewide entry-level wage is reported from the Occupational Employment and Wage Estimates from the Bureau of Labor Statistics.
- A "*" denotes the occupation is important to one or more of TNECD's target industry sectors.
- A "#" denotes the occupation is a STEM occupation.[21]
- The typical entry-level education requirement represents the typical education level most workers need to enter an occupation, as assigned by the U.S. Bureau of Labor Statistics.[22]

[18] More information on each target industry sector is available at https://tnecd.com/.

[19] In last year's report, the "Total # Regions" included both (1) the state's nine Local Workforce Development Areas (LWDA), as well as (2) a tenth region representing the state as a whole. In this year's report, "Total # Regions" does not include (2) a tenth region representing the state as a whole.

[20] There are nine LWDAs, or regions, composed of groups of counties within Tennessee. An occupation with a "9" indicates that the occupation was found to be in-demand for each of the nine LWDAs, or regions, within the state.

[21] TNECD and TDLWD use the U.S. BLS definition for Science, Technology, Engineering, and Math (STEM). More information about this definition can be found here: U.S. Bureau of Labor Statistics, Additional OEWS data sets, STEM data, May 2021 (XLS)

[22] More information about education training levels in BLS data can be found here.

ACADEMIC SUPPLY TABLE LEGENDS:

The tables for academic supply include columns to help the reader quickly learn more about completions and outcomes for academic programs within the career cluster.

For Postsecondary Completers:

- The six-digit code denotes the Classification of Instructional Program (CIP Code) for the academic program.[23]
- Program Title is the name of the academic program.
- Education Award Level represents the degree level completed. Degree levels include less than one-year certificates (C<1YR), one-to-two-year certificates (C1-2YR), associate (AA), bachelor's (BA), post-baccalaureate certificates (CPBA), master's (MA), education specialists (EDS), doctoral (D), and professional degrees (P).[24]
- The Number of Graduates from 2020-21 within that CIP code at that degree level are reported. Cells less than ten are suppressed.
- Share of Graduates Employed in Tennessee represents the percentage of graduates found in two quarters of Tennessee's Unemployment Insurance (UI) records two quarters after graduation. This excludes individuals who remain enrolled in education. ***This is an update from last year's methodology.***
- Estimated First Year Annual Wages of Graduates Employed in Tennessee denotes the estimated first year average annual wages of graduates found in UI data. Two quarters of wages are pulled two quarters after graduation and are calculated by multiplying the sum of quarterly wages by two then finding the median. ***This is an update from last year's methodology.***[25]

For High School CTE Concentrators:

- The six-digit code denotes the Classification of Instructional Program (CIP Code) assigned to the High School CTE Program.[26]
- Program Title is the name of the academic program.
- Number of Grads represents the number of high school graduates who completed two or more courses in a CTE program of study (HS CTE Concentrator). This data reflects completers from 2020-21.
- Share of Graduates Employed in Tennessee represents the percentage of graduates found in two quarters of Tennessee's Unemployment Insurance (UI) records two quarters after graduation. This excludes individuals who remain enrolled in education. ***This is an update from last year's methodology.***
- Estimated First Year Annual Wages of Graduates Employed in Tennessee denotes the estimated first year-average annual wages of graduates found in UI data. Two quarters of wages are pulled two quarters after graduation and are calculated by multiplying the sum of quarterly wages by two then finding the median. ***This is an update from last year's methodology.***

For Federal Registered Apprenticeship Completers:

- The six-digit code denotes the Classification of Instructional Program (CIP Code) linked to the Federally Registered Apprenticeship.
- Program Title is the name of the Registered Apprenticeship program.
- The number of Registered Apprenticeship completers in 2021.

[23] More information about CIP codes can be found here.
[24] TCAT diplomas are captured within the certificate degree level.
[25] The methodology for calculating the share of individuals found in the Tennessee workforce and their wages was updated from last year's report. More information about this methodological update can be found in the Data Sources and Methodology section on page 73.
[26] High School CTE pathways **do not** have CIP codes formally assigned. TDLWD uses information about the pathways to designate the CIP code. Formally assigning CIP codes to HS CTE pathways will improve alignment efforts.

CLUSTER THREE: MANUFACTURING OCCUPATIONS

QUICK TAKEAWAYS

Demand: Tennessee has done an exceptional job of growing one of the strongest specialized manufacturing workforces in the country. As Tennessee expands its manufacturing investments, there are many occupations in-demand across the state, including first line supervisors of mechanics, installers, and repairers and production workers; general maintenance and repair workers; machinists; welders; inspectors, testers, sorters, samplers, and weighers; food batchmakers; and computer numerically controlled tool operators. **Supply:** Multiple certificate programs had employment rates of 60 percent or more among completers. High school CTE programs in the Manufacturing cluster including machine shop assistant, electromechanical technologies, mechatronics, and welding had employment rates of 56 percent or more, although salaries were low. Over 600 credentials in machine tool technology were awarded by TCATs and community colleges in 2020-21. Over 2,440 welding credentials were issued, including postsecondary certificates and CTE concentrators.

Manufacturing represents 15 percent of Tennessee's gross domestic product, the largest of any sector.[39] From December 2021 through November 2022, Tennessee exported $38.9 billion in manufactured goods.[40] The largest categories of exported manufactured goods in Tennessee over the last year include chemicals; computer and electronic products; transportation equipment; miscellaneous manufactured commodities; machinery; and electrical equipment, appliances, and components.

Tennessee has excelled in growing one of the strongest specialized manufacturing workforces in the country. Tennessee's manufacturing employment is 36 percent more concentrated than the national average.[41]

Nearly every in-demand occupation in the manufacturing career cluster is key to the success of TNECD's target industry sectors. This is especially true for the Automotive; Rubber, Ceramics, & Glass; Electrical Equipment & Appliances; and Aerospace and Defense sectors.

Since 2019, TNECD has announced over 270 manufacturing projects with over 41,000 new job commitments. Manufacturing jobs represent over half the new job commitments generated through TNECD's projects since 2019. The largest manufacturing job announcement in the state's history occurred in 2021 with Ford Motor Company. Ford announced its once-in-a-generation investment to create a 3,600-acre mega campus called Blue Oval City on the Memphis Regional Megasite to produce all-electric F-Series trucks beginning in 2025.[42] In 2022, LG Chem announced its plan to invest approximately $3.2 billion to establish a new cathode manufacturing facility in Clarksville, Tennessee, which will support the electric vehicle battery value-chain in the U.S.[43]

Metal and plastics workers, like welders and machinists, are in-demand across different regions of the state, with each of the nine regions having a slightly different specialized need for these occupations. Welders are the most in-demand occupation of the metal and plastic workers across the state. Over 1,600 <1YR and 1-2YR certificates, and TCAT diplomas, were completed at TCATs and community colleges in 2020-21, preparing individuals along the pipeline to become welders.

Welders in Tennessee work in industries such as motor vehicle parts manufacturing, motor vehicle body and trailer manufacturing, or machine shops.[44]

Inspectors, testers, sorters, samplers, and weighers are in-demand across the state as well. This occupation works in a variety of manufacturing industries, including motor vehicle parts manufacturing, rubber product manufacturing, plastics product manufacturing, medical equipment and supplies manufacturing, electrical equipment manufacturing, and foundries. This occupation may use precision measuring instruments and complex test equipment to detect deviations from specifications in manufactured parts and products.

[39] U.S. Bureau of Economic Analysis, Gross Domestic Product by State, 2022 Quarter 3
[40] U.S. Census Bureau, USA Trade Online, State Export Data, Commodities (31,32,33), December 2021 – November 2022
[41] U.S. Bureau of Labor Statistics, QCEW, Employment Location Quotient, June 2022
[42] TNECD Press Release
[43] TNECD Press Release
[44] Tennessee Department of Labor, Jobs4TN.gov

SOC Code	Occupation	In-Demand		Statewide Entry-Level Wage	Typical Entry-Level Education	Key to TNECD Industry Sectors	STEM
		TN	Total # Regions				
43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping		1	$28,870	HS diploma or equivalent	*	
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	X	8	$43,117	HS diploma or equivalent	*	
49-2011	Computer, Automated Teller, and Office Machine Repairers	X	2	$25,417	Some college, no degree	*	
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers		5	$38,512	Postsecondary nondegree award	*	
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	X	5	$40,184	Postsecondary nondegree award	*	
49-9041	Industrial Machinery Mechanics		4	$39,553	HS diploma or equivalent	*	
49-9043	Maintenance Workers, Machinery		1	$36,132	HS diploma or equivalent	*	
49-9044	Millwrights		2	$34,042	HS diploma or equivalent	*	
49-9071	Maintenance and Repair Workers, General		8	$28,314	HS diploma or equivalent	*	
49-9099	Installation, Maintenance, and Repair Workers, All Other		9	$27,932	HS diploma or equivalent		
51-1011	First-Line Supervisors of Production and Operating Workers		9	$40,666	HS diploma or equivalent	*	
51-2041	Structural Metal Fabricators and Fitters		1	$34,876	HS diploma or equivalent	*	
51-2051	Fiberglass Laminators and Fabricators		1	$32,194	HS diploma or equivalent	*	
51-3021	Butchers and Meat Cutters		4	$27,207	No formal educ. credential	*	
51-3022	Meat, Poultry, and Fish Cutters and Trimmers		1	$21,368	No formal educ. credential	*	
51-3092	Food Batchmakers		6	$29,584	HS diploma or equivalent	*	
51-3099	Food Processing Workers, All Other		2	$26,469	No formal educ. credential	*	
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic		2	$27,934	HS diploma or equivalent	*	
51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic		1	$33,153	HS diploma or equivalent	*	
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic		3	$28,512	HS diploma or equivalent	*	
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic		3	$27,720	HS diploma or equivalent	*	
51-4041	Machinists		8	$31,686	HS diploma or equivalent	*	
51-4071	Foundry Mold and Coremakers		1	$30,062	HS diploma or equivalent	*	
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic		3	$26,651	HS diploma or equivalent	*	
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic		4	$31,013	HS diploma or equivalent	*	

SOC Code	Occupation	In-Demand		Statewide Entry-Level Wage	Typical Entry-Level Education	Key to TNECD Industry Sectors	STEM
		TN	Total # Regions				
51-4111	Tool and Die Makers		1	$36,719	Postsecondary nondegree award	*	
51-4121	Welders, Cutters, Solderers, and Brazers	X	9	$34,693	HS diploma or equivalent	*	
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders		3	$29,343	HS diploma or equivalent	*	
51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic		2	$32,562	HS diploma or equivalent	*	
51-4199	Metal Workers and Plastic Workers, All Other		4	$27,439	HS diploma or equivalent	*	
51-6031	Sewing Machine Operators		1	$19,198	No formal educ. credential	*	
51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers		1	$33,326	HS diploma or equivalent	*	
51-6093	Upholsterers		1	$25,470	HS diploma or equivalent	*	
51-7011	Cabinetmakers and Bench Carpenters		2	$26,378	HS diploma or equivalent		
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood		6	$26,570	HS diploma or equivalent		
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing		1	$22,261	HS diploma or equivalent		
51-7099	Woodworkers, All Other		1	$22,969	HS diploma or equivalent		
51-8013	Power Plant Operators		3	$64,867	HS diploma or equivalent		
51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders		1	$28,887	HS diploma or equivalent	*	
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders		4	$28,762	HS diploma or equivalent	*	
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	X	4	$28,231	HS diploma or equivalent	*	
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders		1	$27,047	HS diploma or equivalent	*	
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	X	9	$27,573	HS diploma or equivalent	*	
51-9111	Packaging and Filling Machine Operators and Tenders	X	4	$25,060	HS diploma or equivalent	*	
51-9124	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	X	6	$29,217	HS diploma or equivalent	*	
51-9161	Computer Numerically Controlled Tool Operators	X	6	$31,859	HS diploma or equivalent	*	
51-9198	Helpers--Production Workers		4	$23,066	HS diploma or equivalent	*	
51-9199	Production Workers, All Other	X	8	$24,234	HS diploma or equivalent	*	
53-7011	Conveyor Operators and Tenders		1	$28,220	No formal educ. credential	*	
53-7063	Machine Feeders and Offbearers	X	3	$30,376	No formal educ. credential	*	

TCATs offer programs in welding, machine tool technology, industrial maintenance, mechatronics, and more to train individuals for employment in manufacturing roles. Over 600 credentials in Machine Tool Technology were granted by TCATs and community colleges in 2020-21. Programs in Machine Tool Technology prepare students to apply technical knowledge and skills in the planning, creating, assembling, and repairing of materials which are manufactured in various forms.[45] Completers of the 1-2YR certificate for tool and die technician were found at high rates in TN's job market (88%) and earned wages exceeding $50,000. Graduates of the electromechanical engineering technician associate and bachelor's degree programs had high employment rates (60% or more) and earnings exceeding the state median wage.

With funding from GIVE 2.0, Walters State Community College (WSCC) launched the Training Industrial Manufacturing Excellence (TIME) Program in six high schools and implemented a new pre-apprenticeship program in collaboration with a local manufacturing company and Greene County Schools. WSCC has also extended the program to the Claiborne County Detention Center offering opportunities for students enrolled in the detention center with plans to expand in June 2023.

MANUFACTURING ALIGNED ACADEMIC PROGRAMS

Postsecondary Manufacturing Degrees, 2020-21

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Estimated First Year Annual Wages
48.0501	Machine Tool Technology/Machinist.	C < 1 YR	94	38%	$32,797
48.0501	Machine Tool Technology/Machinist.	C 1-2 YR	504	51%	$37,953
48.0503	Machine Shop Technology/Assistant.	C < 1 YR	*	*	*
48.0503	Machine Shop Technology/Assistant.	C 1-2 YR	16	75%	$27,745
48.0507	Tool and Die Technology/Technician.	C < 1 YR	*	*	*
48.0507	Tool and Die Technology/Technician.	C 1-2 YR	32	88%	$51,626
48.0510	Computer Numerically Controlled (CNC) Machinist Technology/CNC Machinist.	C < 1 YR	*	*	*
48.0510	Computer Numerically Controlled (CNC) Machinist Technology/CNC Machinist.	C 1-2 YR	*	*	*
15.0403	Electromechanical/Electromechanical Engineering Technology/Technician.	C < 1 YR	194	54%	$53,105
15.0403	Electromechanical/Electromechanical Engineering Technology/Technician.	C 1-2 YR	*	*	*
15.0403	Electromechanical/Electromechanical Engineering Technology/Technician.	AA	112	72%	$49,614
15.0403	Electromechanical/Electromechanical Engineering Technology/Technician.	BA	10	60%	$68,067
15.0702	Quality Control Technology/Technician.	C < 1 YR	*	*	*
41.0303	Chemical Process Technology.	C < 1 YR	*	*	*
41.0303	Chemical Process Technology.	C 1-2 YR	12	33%	*
47.0303	Industrial Mechanics and Maintenance Technology/ Technician.	C < 1 YR	266	51%	$35,951
47.0303	Industrial Mechanics and Maintenance Technology/ Technician.	C 1-2 YR	874	51%	$47,870
47.0303	Industrial Mechanics and Maintenance Technology/ Technician.	AA	*	*	*
47.9999	Mechanic and Repair Technologies/Technicians, Other.	C < 1 YR	*	*	*
52.0205	Operations Management and Supervision.	C < 1 YR	54	56%	$27,255

[45] NCES, Classification of Instructional Programs, 48.0501

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Estimated First Year Annual Wages
47.0101	Electrical/Electronics Equipment Installation and Repair Technology/Technician, General.	AA	*	*	*
47.0105	Industrial Electronics Technology/Technician.	C 1-2 YR	28	64%	$36,888
48.0508	Welding Technology/Welder.	C < 1 YR	492	44%	$34,222
48.0508	Welding Technology/Welder.	C 1-2 YR	1172	34%	$35,521

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2020-21 and TDLWD Unemployment Insurance (UI) employment and wage records.

High School CTE Manufacturing Completers, 2020-21

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
48.0503	Machine Shop Technology/Assistant.	CTE HS	254	57%	$23,702
48.0703	Cabinetmaking and Millwork.	CTE HS	11	45%	$13,263
15.0499	Electromechanical Technologies/ Technicians, Other.	CTE HS	99	64%	$23,907
15.0407	Mechatronics, Robotics, and Automation Engineering Technology/Technician.	CTE HS	210	58%	$22,104
47.0105	Industrial Electronics Technology/ Technician.	CTE HS	*	*	*
48.0508	Welding Technology/Welder.	CTE HS	798	56%	$24,325

Source: P20 Connect, TDOE high school CTE completers, 2020-21 and TDLWD Unemployment Insurance (UI) employment and wage records.

Manufacturing Apprenticeship Completers, 2020-21

CIP Code	Apprenticeship Title	Number of Completers 2021
48.0801	Boilermaker 1	48
48.0507	Tool and Die Maker	5
47.0303	Industrial Maintenance Mechanic	2
48.9999	Industrial Sewing Machine Operator	61
47.0303	Maintenance Repairer, Industrial	1
47.0303	Millwright	4

Source: TDLWD Apprenticeship Data

Manufacturing programs with employment rates of more than 70 percent include the tool and die technology/ technician certificate programs and associate degree in electromechanical technology. Several high school CTE programs also have large shares of completers found in Tennessee employment data.

CLUSTER THIRTEEN: INFORMATION TECHNOLOGY

QUICK TAKEAWAYS

Demand: Information technology (IT) occupations are in-demand in both Tennessee and the nation. IT occupations are projected to grow 13 percent nationally from 2020 to 2030, faster than the average for all occupations. Tennessee's growth in the headquarters, finance, and tech industries and unique research and development facilities at St. Jude Children's Research Hospital, Oak Ridge National Laboratory, Arnold Engineering Complex, and universities are employers of computer and IT occupations. The IT occupations in demand in the most regions of the state include computer user support specialists, computer systems analysts, information security analysts, and network and computer systems administrators. **Supply:** The medical informatics associate degree program provided the highest share of its graduates (82 percent) the to the Tennessee workforce. The master's degree in medical informatics had an employment rate of 58 percent and paid a first-year median wage of $78,935. **Unmet needs:** While short term trends have shown some volatility, IT employment is expected to have strong growth long term. The computer and information systems security/auditing/information assurance certificate program of less-than-one-year had the highest employment rate (73 percent) and completers earned more than the state median wage. The associate degree in information technology also had high employment rates and pay above the median. Bachelor's and master's degree programs had high salaries but lower placement rates which could be due to individuals moving out of state.

Computer and information technology occupations typically have high median wages in Tennessee. Computer network architects, software developers and database administrators typically make above 2.5 times the median wage of all occupations. Information security analysts and computer programmers typically make more than 2.1 times the median wage of all occupations.

Many workers now prefer remote work and are searching for work-from-home opportunities. The availability of broadband, especially in rural areas of the state, is key to connecting workers to remote work job opportunities. The need for IT infrastructure, support, and security will continue. Occupations like information security analysts and computer user support specialists are key to the success of companies worldwide that have increased their technology needs in recent years, and there is a great opportunity for Tennesseans to fulfill that workforce need.

Information security analysts ensure appropriate security controls are in place to safeguard files and infrastructure from accidental or unauthorized modification, destruction, or disclosure. Online job postings for information security analysts are seeking candidates with skills using Python, SQL, PowerShell, UNIX, and VMWare. Information security analysts in Tennessee work in industries such as technical consulting services or headquarters operations.

Computer user support specialists provide technical assistance to computer users about software or hardware operation to resolve problems. Job skills necessary include customer service, problem solving, and conflict management.

Tennessee has a strong and growing industry sector of Headquarters, Finance & Tech[107] that frequently employ information technology occupations. Tennessee also has unique research and development (R&D) assets and facilities, like St. Jude Children's Research Hospital, Vanderbilt University, Oak Ridge National Laboratory (ORNL), U.S. Airforce Arnold Engineering Development Complex, and the University of Tennessee, that provide world-changing technologies to businesses. These assets and facilities also frequently employ information technology occupations. This clustering of industry, R&D, and education drives the need for IT specialization in our state. While short term trends have shown some volatility, IT employment is expected to have strong growth long term.

SOC Code	Occupation	In-Demand		Statewide Entry-Level Wage	Typical Entry-Level Education	Key to TNECD Industry Sectors	STEM
		TN	Total # Regions				
11-3021	Computer and Information Systems Managers		3	$79,611	Bachelor's degree	*	#
15-1211	Computer Systems Analysts		7	$54,294	Bachelor's degree	*	#
15-1212	Information Security Analysts	X	5	$60,043	Bachelor's degree	*	#
15-1231	Computer Network Support Specialists		1	$38,629	Associate degree	*	#
15-1232	Computer User Support Specialists	X	9	$33,492	Some college, no degree	*	#
15-1241	Computer Network Architects	X	4	$63,787	Bachelor's degree	*	#
15-1242	Database Administrators	X	3	$51,828	Bachelor's degree	*	#
15-1244	Network and Computer Systems Administrators		5	$53,101	Bachelor's degree	*	#
15-1251	Computer Programmers	X	3	$53,336	Bachelor's degree	*	#
15-1252	Software Developers	X	4	$63,152	Bachelor's degree	*	#
15-1253	Software Quality Assurance Analysts and Testers		2	$53,346	Bachelor's degree	*	#
15-1254	Web Developers	X	0	$32,278	Bachelor's degree	*	#
15-1299	Computer Occupations, All Other		1	$33,900	Bachelor's degree	*	#

TCATs, community colleges, and universities offer a variety of programs ranging from short-term certificates to graduate degrees that prepare students for careers in information systems and information technology.

107 TNECD, HQ, Finance and Tech

Some of the most popular certificate and associate programs at TCATs and community colleges include computer support specialist, computer systems networking, and information technology. Medical Informatics programs at several TBR community colleges, including Cleveland State, Columbia State, and Roane State offer a flexible curriculum that includes critical topics, such as Medical Terminology and Computer Applications, but also breadth across courses in Accounting, Coding and Computer Programming, and Psychology.

Universities offer undergraduate and graduate programs aligned to occupations in the Information Technology cluster. The Information Assurance and Security Executive Certificate program at Austin Peay State University (APSU) provides hands-on and applicable experiences with "security of organizational structure design and management, policy and governance, risk management, legal and compliance issues, incident response and forensic team formation, training, financial management, and outsourcing." Designed for working professionals with a degree seeking advanced training and continuing education, the 18-hour certificate complements an undergraduate Computer Information Systems bachelor's degree with a concentration in Information Assurance and Security.[108] Two University of Tennessee System schools recently created new degree programs in Cybersecurity. UTM's Cybersecurity was approved by THEC in July of 2021, while University of Tennessee, Chattanooga's (UTC) Information Technology in Cybersecurity was approved in November of 2022. The UTM program was the first accredited program at a public university in Tennessee. The UTC program was built to serve transfer and adult students and offers an accelerated curriculum with hands-learning through internships with local partners. Lower shares of bachelor and master's degree completers employed in TN may be indicative of individuals with these credentials moving out of state.

INFORMATION TECHNOLOGY ALIGNED ACADEMIC PROGRAMS

Postsecondary Information Technology Degrees, 2020-21

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Estimated First Year Annual Wages
11.0901	Computer Systems Networking and Telecommunications.	C < 1 YR	76	37%	$27,920
11.0901	Computer Systems Networking and Telecommunications.	C 1-2 YR	56	36%	$25,603
11.1002	System, Networking, and LAN/WAN Management/ Manager.	C < 1 YR	34	41%	$37,244
11.1002	System, Networking, and LAN/WAN Management/ Manager.	C 1-2 YR	84	64%	$33,937
11.1003	Computer and Information Systems Security/Auditing/ Information Assurance.	C < 1 YR	30	73%	$46,154
11.1003	Computer and Information Systems Security/Auditing/ Information Assurance.	C 1-2 YR	12	67%	$34,912
11.1003	Computer and Information Systems Security/Auditing/ Information Assurance.	BA	*	*	*
11.0103	Information Technology.	C < 1 YR	110	60%	$32,732
11.0103	Information Technology.	C 1-2 YR	*	*	*
11.0202	Computer Programming, Specific Applications.	C 1-2 YR	*	*	*
11.1006	Computer Support Specialist.	C < 1 YR	280	41%	$20,910
11.1006	Computer Support Specialist.	C 1-2 YR	244	47%	$32,280
11.0101	Computer and Information Sciences, General.	BA	86	55%	$44,000
11.0101	Computer and Information Sciences, General.	MA	45	18%	$63,952
11.0103	Information Technology.	AA	340	63%	$39,502
11.0103	Information Technology.	BA	93	35%	$39,016
11.0103	Information Technology.	MA	109	51%	$70,208
11.0104	Informatics.	MA	*	*	*
11.0401	Information Science/Studies.	BA	*	*	*

[108] APSU, Information Assurance and Security Executive Certificate

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Estimated First Year Annual Wages
11.0501	Computer Systems Analysis/Analyst.	BA	35	40%	$51,307
11.0701	Computer Science.	BA	409	55%	$60,153
11.0701	Computer Science.	CPBA	*	*	*
11.0701	Computer Science.	MA	83	31%	$76,246
11.0701	Computer Science.	D	13	8%	*
11.0802	Data Modeling/Warehousing and Database Administration.	CPBA	*	*	*
11.0802	Data Modeling/Warehousing and Database Administration.	MA	63	33%	$61,637
11.0804	Modeling, Virtual Environments and Simulation.	BA	*	*	*
11.1005	Information Technology Project Management.	CPBA	18	33%	$71,195
11.1099	Computer/Information Technology Services Administration and Management, Other.	MA	*	*	*
11.9999	Computer and Information Sciences and Support Services, Other.	MA	*	*	*
14.0903	Computer Software Engineering.	BA	*	*	*
14.0903	Computer Software Engineering.	MA	*	*	*
51.2706	Medical Informatics.	AA	11	82%	$29,648
51.2706	Medical Informatics.	BA	*	*	*
51.2706	Medical Informatics.	CPBA	20	35%	$71,241
51.2706	Medical Informatics.	MA	12	58%	$78,935
52.1201	Management Information Systems, General.	BA	135	54%	$42,080

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2020-21 and TDLWD Unemployment Insurance (UI) employment and wage records.

High School CTE Information Technology Completers, 2020-21

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
11.1002	System, Networking, and LAN/WAN Management/ Manager.	CTE HS	192	52%	$21,098
11.1003	Computer and Information Systems Security/Auditing/ Information Assurance.	CTE HS	101	52%	$19,422
11.0201	Computer Programming/Programmer, General.	CTE HS	327	51%	$18,767

Source: P20 Connect, TDOE high school CTE completers, 2020-21 and TDLWD Unemployment Insurance (UI) employment and wage records.

Tennessee Broadband Accessibility

The availability of broadband reduces workforce gaps by providing opportunities for student learning and training and by connecting jobseekers with potential employers. TNECD's Broadband grant programs are a critical part of Tennessee's plan to address broadband gaps. The goal of the programs is to facilitate broadband access to all Tennesseans while promoting practices that increase deployment and encourage adoption. The broadband accessibility grant program is designed to offset the capital expenses in the deployment of broadband in unserved areas. Funds are targeted to areas that are unlikely to receive broadband service without grant funding. TNECD has also been able to utilize federal stimulus funding allocated by the Fiscal Stimulus Accountability Group to further close the digital divide with the Tennessee Emergency Broadband Fund (TEBF). To date, the infrastructure programs have awarded grants to serve over 283,000 Tennesseans. The TEBF programming will continue with $50M of digital opportunity funding to encourage adoption, digital skills training, workforce development programs, and outreach to underserved populations. Additional federal funding through the Infrastructure Investment and Jobs Act will provide further funding for infrastructure and digital opportunity programs over the next 5-10 years.

CLUSTER FOURTEEN: ENGINEERING AND OTHER STEM

QUICK TAKEAWAYS

Demand: Engineering and related occupations play an instrumental role in Tennessee businesses. TNECD has several target industries connected to engineering, including automotive, aerospace and defense, chemical products, and electrical equipment and appliances. Tennessee has a low concentration of employees in these high-wage fields, relative to the national average. In 2021, the number of engineers in Tennessee, about 26,000, was 23 percent below the national average concentration. The occupations that are in-demand in the most regions of Tennessee are electrical and electronic engineering technologists and technicians, civil engineers, electrical engineers, and mechanical engineers. **Supply:** Engineers require a bachelor's degree, while the technologists and technicians require associate degrees. Eight aligned academic programs had 70 percent or more of graduates found in Tennessee employment data, including the mechatronics, robotics, and automation engineering bachelor's program, associate degree programs in chemical engineering technology and industrial technology, and certificate programs of engineering technology, computer engineering technology, automation engineering technology, mechanical drafting, Computer Aided Design and Computer Aided Design and Drafting (CAD/CADD), and chemical technology. The master's degree in industrial engineering paid on average $93,896, while the doctorate paid $171,484. **Unmet needs:** The high rates of employment and wages signal the potential for supply gaps as Tennessee expands its manufacturing base and medical and other scientific research fields. Thirteen programs including many of those listed above had placement rates of 60 percent or more and paid more than the median wage. In addition, the associate and bachelor's degrees in engineering technologies and the associate degrees in welding technology met these criteria.

Engineering and engineering-related occupations play an instrumental role for Tennessee businesses. These positions provide critical functions in the design, building, and testing of products. Engineers and related positions are in high demand for several TNECD's target industries, including automotive, aerospace and defense, chemical products, and electrical equipment and appliances.

Tennessee has a low concentration of employees in these high-wage fields, relative to the national average. In 2021, approximately 26,000 engineers were employed in Tennessee, which is 23 percent below the national average concentration. Median wages for engineers in Tennessee range from $36.85 (2.0 times the median wage for all occupations) to $60.71 (3.3 times the median wage for all occupations) an hour, depending on the type of engineer.[109]

Governor Bill Lee, in the 2023 State of the State said, "No other state in the country comes close to Tennessee's legacy, resources and potential to be a leader in nuclear energy." He is proposing $50 million in a Nuclear Fast Track fund to recruit companies to our state that will establish a nuclear development and manufacturing ecosystem. This report does not currently identify nuclear engineering as in-demand. Tennessee's concentration of nuclear engineers is 3.12x the national average concentration, the 5th highest in the nation.[110] Tennessee has the 3rd most nuclear engineering jobs in the nation at 840.[111] Tennessee's strong nuclear engineering foundation will support further growth in nuclear energy in Tennessee.

Tennessee also has a major engineering asset in the Arnold Engineering Development Complex (AEDC), an Air Force military facility in Tullahoma, that operates more than 68 aerodynamic and propulsion wind tunnels, rocket and turbine engine test cells, environmental chambers, arc heaters, ballistic ranges, sled tracks, centrifuges, and other specialized units.

The occupations that are in-demand in the most regions of Tennessee are electrical and electronic engineering technologists and technicians (7 regions), civil engineers (5 regions), electrical engineers (5 regions), and mechanical engineers (5 regions). The engineers require a bachelor's degree, while the technologists and technicians require associate degrees.

Tennessee is seeking to grow its pipeline of STEM workforce through its Future Workforce Initiative, which seeks to increase STEM training in K-12 schools.[112] There are currently 88 STEM and STE(A)M Designated Schools in Tennessee.[113] The Tennessee STEM Innovation Network, in partnership with Vanderbilt, is currently studying the impact of STEM school designation, and they will release a final impact report in March of 2023.[114] Their initial key findings suggest that the requirements within the designation rubric support schools in establishing their STEM culture and community.

SOC Code	Occupation	In-Demand		Statewide Entry-Level Wage	Typical Entry-Level Education	Key to TNECD Industry Sectors	STEM
		TN	Total # Regions				
17-2051	Civil Engineers	X	5	$60,963	Bachelor's degree	*	#
17-2071	Electrical Engineers	X	5	$69,449	Bachelor's degree	*	#
17-2112	Industrial Engineers		4	$61,295	Bachelor's degree	*	#
17-2141	Mechanical Engineers		5	$63,144	Bachelor's degree	*	#
17-2199	Engineers, All Other	X	3	$61,948	Bachelor's degree	*	#
17-3011	Architectural and Civil Drafters		3	$38,356	Associate degree	*	#
17-3023	Electrical and Electronic Engineering Technologists and Technicians	X	7	$41,105	Associate degree	*	#
17-3026	Industrial Engineering Technologists and Technicians		2	$32,421	Associate degree	*	#

[109] TNECD analysis of employment data from U.S. Bureau of Labor Statistics, OEWS.
[110] TNECD analysis of employment data from U.S. Bureau of Labor Statistics, OEWS.
[111] TNECD analysis of employment data from U.S. Bureau of Labor Statistics, OEWS.
[112] Office of the Governor, Press Release
[113] Tennessee STEM Innovation Network, STEM and STE(A)M Designated Schools
[114] Tennessee STEM Innovation Network, Vanderbilt and TSIN STEM School Designation Impact Report

SOC Code	Occupation	In-Demand		Statewide Entry-Level Wage	Typical Entry-Level Education	Key to TNECD Industry Sectors	STEM
		TN	Total # Regions				
17-3029	Engineering Technologists and Technicians, Except Drafters, All Other	X	3	$34,173	Associate degree	*	#
17-3031	Surveying and Mapping Technicians		1	$29,849	HS diploma or equivalent		#
19-2031	Chemists	X	2	$44,006	Bachelor's degree	*	#
19-4031	Chemical Technicians		1	$35,528	Associate degree	*	#
19-4099	Life, Physical, and Social Science Technicians, All Other		2	$31,152	Associate degree	*	#

This field is of special interest to the growth and development of Tennessee's workforce. As such, nearly all award levels are accessible, and all postsecondary institutions in Tennessee offer at least one academic program related to in-demand occupations within the engineering and other STEM cluster.

Tennessee Tech University's (TTU) Computer Science Department will participate in an international National Science Foundation and National Institute of Information and Communications Technology of Japan grant to address blockages in 6G mobile networks. Assistant Professor Muhammad Ismail, working with PhD and undergraduate students, will use machine learning and artificial intelligence to predict and avoid common blockages offering students valuable experience to apply in future careers.

MTSU offers a Bachelor of Science in Mechatronics Engineering that provides training in cutting edge robotics and automated systems used in today's advanced manufacturing environment. Similarly, UTC offers a Bachelor of Applied Science in Mechatronics Engineering Technology preparing students for systems integration, project management, technical communication, device networking, and industrial safety aspects of the automated manufacturing ecosystem. This program is a 2+2 program, designed with local college partners to support transfer into UTC's bachelor's program.[115]

UTK established a Geographic Information Science and Technology, BS in May 2021, complementing the GIS AAS and certificate at Roane State Community College (RSCC). Graduate certificates in GIS are also offered at TSU and the UoM. Graduates from these programs learn skills with a wide range of application areas, including transportation logistics, network analysis, emergency management, urban planning, public health, resource and environmental management, location intelligence, and energy analytics.

The high rates of employment and wages for graduates in this cluster signal the potential for supply gaps as Tennessee expands its manufacturing base and medical and other scientific research fields. Thirteen programs have placement rates of 60 percent or more and paid more than the median wage.

ENGINEERING AND OTHER STEM ALIGNED ACADEMIC PROGRAMS

Postsecondary Engineering and Other STEM Degrees, 2020-21

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Estimated First Year Annual Wages
14.0801	Civil Engineering, General.	BA	204	57%	$55,281
14.0801	Civil Engineering, General.	MA	43	49%	$67,608
14.0801	Civil Engineering, General.	D	10	10%	*
14.0901	Computer Engineering, General.	BA	51	37%	$58,440
14.0901	Computer Engineering, General.	MA	12	42%	$92,198
14.0901	Computer Engineering, General.	D	*	*	*
14.1001	Electrical and Electronics Engineering.	BA	162	39%	$65,000
14.1001	Electrical and Electronics Engineering.	MA	20	20%	*
14.1001	Electrical and Electronics Engineering.	D	10	10%	*
14.4201	Mechatronics, Robotics, and Automation Engineering.	BA	56	70%	$59,791

[115] UTC, Bachelor of Applied Science, Mechatronics

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Estimated First Year Annual Wages
14.1901	Mechanical Engineering.	BA	448	53%	$59,088
14.1901	Mechanical Engineering.	MA	33	30%	$81,652
14.1901	Mechanical Engineering.	D	14	43%	$58,022
14.3501	Industrial Engineering.	BA	38	42%	$63,256
14.3501	Industrial Engineering.	MA	36	50%	$93,896
14.3501	Industrial Engineering.	D	*	*	*
14.0101	Engineering, General.	BA	34	47%	$55,748
14.0101	Engineering, General.	MA	26	19%	$64,826
14.0101	Engineering, General.	D	26	19%	$171,484
14.0401	Architectural Engineering.	BA	*	*	*
14.1201	Engineering Physics/Applied Physics.	BA	*	*	*
14.1301	Engineering Science.	MA	*	*	*
14.9999	Engineering, Other.	CPBA	*	*	*
14.9999	Engineering, Other.	MA	*	*	*
14.9999	Engineering, Other.	D	17	12%	*
15.0000	Engineering Technologies/Technicians, General.	C < 1 YR	124	84%	$56,634
15.0000	Engineering Technologies/Technicians, General.	AA	128	66%	$52,761
15.0000	Engineering Technologies/Technicians, General.	BA	217	62%	$50,969
15.0000	Engineering Technologies/Technicians, General.	CPBA	*	*	*
15.0000	Engineering Technologies/Technicians, General.	MA	*	*	*
15.0303	Electrical, Electronic, and Communications Engineering Technology/Technician.	C < 1 YR	32	50%	$34,067
15.0303	Electrical, Electronic, and Communications Engineering Technology/Technician.	AA	95	64%	$39,701
15.0303	Electrical, Electronic, and Communications Engineering Technology/Technician.	BA	*	*	*
15.0305	Telecommunications Technology/Technician.	C 1-2 YR	*	*	*
15.0406	Automation Engineer Technology/Technician.	C < 1 YR	28	50%	$53,566
15.0406	Automation Engineer Technology/Technician.	C 1-2 YR	18	78%	$43,885
15.0612	Industrial Technology/Technician.	C < 1 YR	26	85%	$51,918
15.0612	Industrial Technology/Technician.	AA	43	84%	$33,123
15.0612	Industrial Technology/Technician.	MA	*	*	*
15.0613	Manufacturing Engineering Technology/Technician.	C < 1 YR	20	60%	$28,963
15.0613	Manufacturing Engineering Technology/Technician.	C 1-2 YR	52	31%	$28,963
15.0613	Manufacturing Engineering Technology/Technician.	AA	*	*	*
15.0614	Welding Engineering Technology/Technician.	C < 1 YR	10	60%	$43,114
15.0614	Welding Engineering Technology/Technician.	AA	11	73%	$38,762
15.0615	Chemical Engineering Technology/Technician.	C < 1 YR	20	100%	$72,984
15.0615	Chemical Engineering Technology/Technician.	C 1-2 YR	*	*	*
15.0615	Chemical Engineering Technology/Technician.	AA	17	71%	$68,462
15.0801	Aeronautical/Aerospace Engineering Technology/ Technician.	BA	*	*	*
15.1201	Computer Engineering Technology/Technician.	C < 1 YR	12	83%	$30,891
15.1201	Computer Engineering Technology/Technician.	AA	11	45%	$34,764
15.1102	Surveying Technology/Surveying.	BA	*	*	*
45.0702	Geographic Information Science and Cartography.	C < 1 YR	10	40%	*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Estimated First Year Annual Wages
45.0702	Geographic Information Science and Cartography.	AA	*	*	*
45.0702	Geographic Information Science and Cartography.	CPBA	*	*	*
45.0702	Geographic Information Science and Cartography.	MA	*	*	*
15.1301	Drafting and Design Technology/Technician, General.	C < 1 YR	60	40%	$29,375
15.1301	Drafting and Design Technology/Technician, General.	C 1-2 YR	106	58%	$36,589
15.1303	Architectural Drafting and Architectural CAD/CADD.	C < 1 YR	20	60%	$31,806
15.1306	Mechanical Drafting and Mechanical Drafting CAD/ CADD.	C < 1 YR	14	57%	$32,648
15.1306	Mechanical Drafting and Mechanical Drafting CAD/ CADD.	C 1-2 YR	22	100%	$39,385
41.0301	Chemical Technology/Technician.	C 1-2 YR	16	88%	$49,179
26.0101	Biology/Biological Sciences, General.	MA	63	30%	$34,466
26.0101	Biology/Biological Sciences, General.	D	19	42%	$41,688
26.0102	Biomedical Sciences, General.	BA	10	40%	*
26.0102	Biomedical Sciences, General.	MA	*	*	*
26.0102	Biomedical Sciences, General.	D	19	53%	$55,377
26.0202	Biochemistry.	CPBA	*	*	*
26.0202	Biochemistry.	D	*	*	*
26.0204	Molecular Biology.	MA	36	31%	$34,539
26.0204	Molecular Biology.	D	*	*	*
26.0503	Medical Microbiology and Bacteriology.	MA	*	*	*
26.0503	Medical Microbiology and Bacteriology.	D	*	*	*
26.1001	Pharmacology.	MA	*	*	*
26.1101	Biometry/Biometrics.	CPBA	*	*	*
26.1102	Biostatistics.	MA	*	*	*
26.1102	Biostatistics.	D	*	*	*
26.1199	Biomathematics, Bioinformatics, and Computational Biology, Other.	CPBA	*	*	*
26.1199	Biomathematics, Bioinformatics, and Computational Biology, Other.	MA	*	*	*
26.1301	Ecology.	MA	*	*	*
26.1301	Ecology.	D	11	9%	*
26.1309	Epidemiology.	CPBA	*	*	*
26.1309	Epidemiology.	MA	*	*	*
26.1309	Epidemiology.	D	*	*	*
26.9999	Biological and Biomedical Sciences, Other.	MA	45	36%	$49,585
26.9999	Biological and Biomedical Sciences, Other.	D	*	*	*
30.0101	Biological and Physical Sciences.	BA	35	57%	$34,882
30.0601	Systems Science and Theory.	D	*	*	*
30.1501	Science, Technology and Society.	MA	*	*	*
30.1701	Behavioral Sciences.	BA	16	31%	$35,960
30.2501	Cognitive Science, General.	CPBA	*	*	*
40.0501	Chemistry, General.	BA	198	46%	$34,936
40.0501	Chemistry, General.	MA	36	11%	*
40.0501	Chemistry, General.	D	16	25%	*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Estimated First Year Annual Wages
40.0599	Chemistry, Other.	BA	*	*	*

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2020-21 and TDLWD Unemployment Insurance (UI) employment and wage records.

High School CTE Engineering and Other STEM Completers, 2020-21

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
15.9999	Engineering/Engineering-Related Technologies/ Technicians, Other.	CTE HS	291	43%	$20,898
16.0612	Industrial Technology/Technician	CTE HS	137	48%	$20,556
15.0303	Electrical, Electronic, and Communications Engineering Technology/Technician.	CTE HS	197	45%	$20,080
15.1301	Drafting and Design Technology/Technician, General.	CTE HS	103	39%	$26,937
15.0507	Environmental/Environmental Engineering Technology/Technician.	CTE HS	*	*	*

Source: P20 Connect, TDOE high school CTE completers, 2020-21 and TDLWD Unemployment Insurance (UI) employment and wage records.

County Profile Tool Data

Tennessee Department of Economic & Community Development

MASTERED IN TENNESSEE

BLEDSOE COUNTY

Population & Demographics

INDUSTRIES

INDUSTRY	EMPLOYMENT	ESTABLISHMENTS	AVG. ANNUAL WAGES
Crop and Animal Production	148	8	$41,053
Mining, Quarrying, and Oil and Gas Extraction	32	1	$56,906
Construction	143	21	$37,623
Manufacturing	49	7	$42,342
Wholesale Trade	22	7	$32,699
Retail Trade	139	19	$23,879
Information	86	4	$78,925
Finance and Insurance	57	10	$49,864
Professional, Scientific, and Technical Services	44	15	$57,375
Administrative, Support, Waste Management and Remediation	12	6	$41,825
Health Care and Social Assistance	98	21	$34,404
Accommodation and Food Services	152	16	$19,975
Other Services (except Public Administration)	22	6	$38,796
Government	1,156	20	$49,463

KEY CLUSTER	TOTAL EMPLOYMENT
Advanced Materials	0
Aerospace & Defense	0
Appliances & Electrical	0
Automotive	0
Business Services	11
Chemicals	0
Distribution & Logistics	21
Film, Music & Entertainment	0
Food & Beverage	0
Healthcare & Medical Devices	36

GRUNDY COUNTY

Population & Demographics ▾

INDUSTRIES

INDUSTRY	EMPLOYMENT	ESTABLISHMENTS	AVG. ANNUAL WAGES
Crop and Animal Production	38	3	$20,936
Mining, Quarrying, and Oil and Gas Extraction	26	1	$37,694
Construction	43	11	$43,216
Manufacturing	224	13	$41,916
Wholesale Trade	34	12	$85,413
Retail Trade	278	39	$24,286
Transportation and Warehousing	32	12	$38,891
Information	18	6	$53,475
Finance and Insurance	53	12	$36,639
Real Estate and Rental and Leasing	36	6	$40,698
Professional, Scientific, and Technical Services	28	11	$51,104

KEY CLUSTER	TOTAL EMPLOYMENT
Advanced Materials	0
Aerospace & Defense	0
Appliances & Electrical	0
Automotive	128
Business Services	22
Chemicals	0
Distribution & Logistics	45
Film, Music & Entertainment	15
Food & Beverage	0
Healthcare & Medical Devices	0

INDUSTRIES

INDUSTRY	EMPLOYMENT	ESTABLISHMENTS	AVG. ANNUAL WAGES
Crop and Animal Production	52	4	$29,828
Mining, Quarrying, and Oil and Gas Extraction	67	4	$64,472
Construction	422	37	$98,962
Manufacturing	3,661	36	$55,777
Wholesale Trade	36	13	$69,291
Retail Trade	1,269	100	$28,646
Transportation and Warehousing	369	20	$44,029
Information	68	10	$91,681
Finance and Insurance	173	37	$63,304
Real Estate and Rental and Leasing	49	21	$37,915
Professional, Scientific, and Technical Services	372	41	$88,690

KEY CLUSTER	TOTAL EMPLOYMENT
Advanced Materials	318
Aerospace & Defense	0
Appliances & Electrical	0
Automotive	1,098
Business Services	293
Chemicals	64
Distribution & Logistics	374
Film, Music & Entertainment	0
Food & Beverage	60
Healthcare & Medical Devices	0

SEQUATCHIE COUNTY

Population & Demographics ▾

INDUSTRIES

INDUSTRY	EMPLOYMENT	ESTABLISHMENTS	AVG. ANNUAL WAGES
Mining, Quarrying, and Oil and Gas Extraction	82	4	$74,984
Construction	75	14	$47,028
Manufacturing	521	18	$50,396
Wholesale Trade	110	20	$43,476
Retail Trade	444	40	$29,904
Transportation and Warehousing	28	9	$50,990
Finance and Insurance	224	18	$47,896
Real Estate and Rental and Leasing	30	8	$33,187
Professional, Scientific, and Technical Services	68	28	$75,791
Management of Companies and Enterprises	13	2	$34,270
Administrative, Support, Waste Management and Remediation	203	20	$39,041

KEY CLUSTER	TOTAL EMPLOYMENT
Advanced Materials	0
Aerospace & Defense	0
Appliances & Electrical	257
Automotive	0
Business Services	47
Chemicals	26
Distribution & Logistics	61
Film, Music & Entertainment	0
Food & Beverage	0
Healthcare & Medical Devices	0

TENNESSEE

2023-24 CTE Programs of Study

Tennessee's career and technical education (CTE) programs of study are meant to provide a relevant framework of industry-aligned, rigorous courses that progress a student in knowledge and skills year after year. They provide invaluable opportunities for students to experience a subject that they are passionate about and explore interests that lead to postsecondary learning and future career paths. These sequenced courses also reflect and support the three-credit elective focus requirement for graduation. Level 1 courses are encouraged to be taken by students in ninth grade; however, districts may make scheduling decisions that work best for their communities and students.

Advanced Manufacturing

Program of Study	Level 1	Level 2	Level 3	Level 4
Industrial Maintenance Technology	Principles of Manufacturing (C13H05)	Introduction to Industrial Maintenance (C13H28)	Advanced Industrial Maintenance (C13H29) -or- **Dual Enrollment** Industrial Maintenance Technology I (C13H30) -or- **Dual Enrollment** Industrial Maintenance Technology II (C13H31)	Manufacturing Practicum [2] (C13H08) -or- **Dual Enrollment** Industrial Maintenance Technology III (C13H32) -or- **Dual Enrollment** Industrial Maintenance Technology IV (C13H33) -or- **WBL** Industrial Maintenance Technology Career Practicum [1] (C13H40)
Machining Technology	Principles of Manufacturing (C13H05)	Principles of Machining I (C13H09)	Principles of Machining II (C13H06) -or- **Dual Enrollment** Machining Technology I (C13H01) -or- **Dual Enrollment** Machining Technology II (C13H20)	Manufacturing Practicum [2] (C13H08) -or- **Dual Enrollment** Machining Technology III (C13H34) -or- **Dual Enrollment** Machining Technology IV (C13H35) -or- **WBL** Machining Technology Career Practicum [1] (C13H41)
Mechatronics	Principles of Manufacturing (C13H05)	Digital Electronics (C13H07)	Mechatronics I (C13H16) -or- Robotics & Automated Systems (C13H15) -or- **Dual Enrollment** Mechatronics I (C13H04) -or- **Dual Enrollment** Mechatronics II (C13H21)	Mechatronics II (C13H17) -or- Manufacturing Practicum [2] (C13H08) -or- **Dual Enrollment** Mechatronics III (C13H36) -or- **Dual Enrollment** Mechatronics IV (C13H37) -or- **WBL** Mechatronics Career Practicum [1] (C13H42)

Program of Study	Level 1	Level 2	Level 3	Level 4
Welding	Principles of Manufacturing (C13H05)	Welding I (C13H12)	Welding II (C13H10) -or- **Dual Enrollment** Welding I (C13H03) -or- **Dual Enrollment** Welding II (C13H18)	Manufacturing Practicum [2] (C13H08) -or- **Dual Enrollment** Welding III (C13H38) -or- **Dual Enrollment** Welding IV (C13H39) -or- **WBL** Welding Career Practicum [1] (C13H43)

[1] May be taught for 1 or 2 credits.
[2] A student pursuing an Industry 4.0 diploma distinction may substitute their 4th credit of math with this work-based learning course.

Available courses for elective credit in this cluster:

- ***Jobs for Tennessee Graduates*** (C25H09) is a supplemental course that can be offered in addition to courses within the programs of study but does not count toward concentrator status.
- ***Preparing for the ACT, Postsecondary, and Career*** (C25H19) is a supplemental course that can be offered in addition to courses within the programs of study but does not count toward concentrator status.

Information Technology

Program of Study	Level 1	Level 2	Level 3	Level 4
Coding	Computer Science Foundations [1] (C10H11) -or- **IGCSE** Computer Science [1] (C10H07)	Coding I [1] (C10H14)	Coding II [1] (C10H15) -or- Mobile App Development [1] (C10H22) -or- **AP** Computer Science Principles [1] (G02H44) -or- **Dual Enrollment** Coding I [1] (C10H01) -or- **Dual Enrollment** Coding II [1] (C10H28)	Coding Practicum [1 & 4] (C10H08) -or- **AP** Computer Science A [1] (G02H45) -or- **Dual Enrollment** Coding III [1] (C10H32) -or- **Dual Enrollment** Coding IV [1] (C10H33) -or- **CIE** Computer Science 1 AS Level [1] (C10H25) -or- **WBL** Coding Career Practicum [2] (C10H40)
Cybersecurity	Computer Science Foundations [1] (C10H11)	Cybersecurity I [1] (C10H19)	Cybersecurity II [1] (C10H20) -or- **AP** Computer Science Principles [1] (G02H44) -or- **Dual Enrollment** Cybersecurity I [1] (C10H24) -or- **Dual Enrollment** Cybersecurity II [1] (C10H31)	Cybersecurity Practicum [1 & 4] (C10H21) -or- **Dual Enrollment** Cybersecurity III [1] (C10H34) -or- **Dual Enrollment** Cybersecurity IV [1] (C10H35) -or- **WBL** Cybersecurity Career Practicum [2] (C10H41)
Networking Systems	Computer Science Foundations [1] (C10H11)	Computer Systems (C10H10)	Networking (C10H13) -or **Dual Enrollment** Networking Systems I (C10H02) -or- **Dual Enrollment** Networking Systems II (C10H29)	Cabling & Internetworking (C10H09) -or- IT Clinical Internship [4] (C10H12) -or- **Dual Enrollment** Networking Systems III (C10H36) -or- **Dual Enrollment** Networking Systems IV (C10H37) -or- **WBL** Networking Systems Career Practicum [2] (C10H42)

Program of Study	Level 1	Level 2	Level 3	Level 4
Web Design	Computer Science Foundations (C10H11) [1] -or- **IGCSE** Information and Communication Technology (C10H26)	Web Design Foundations (C10H16) [3]	Web Site Development (C10H17) -or- **AP** Computer Science Principles [1] (G02H44) -or- **Dual Enrollment** Web Design I (C10H03) -or- **Dual Enrollment** Web Design II (C10H30)	Web Design Practicum [4] (C10H18) -or- **Dual Enrollment** Web Design III (C10H38) -or- **Dual Enrollment** Web Design IV (C10H39) -or- **WBL** Web Design Career Practicum [2] (C10H43)

[1] May count for the computer science graduation requirement.
[2] May be taught for 1 or 2 credits.
[3] Satisfies the one fine arts credit required for graduation.
[4] A student pursuing an Industry 4.0 diploma distinction may substitute their 4th credit of math with this work-based learning course.

Available courses for elective credit in this cluster:

- ***Introduction to Geographical Information Systems (GIS)*** (C18H39) is a supplemental course that can be offered in addition to courses within the Cybersecurity program of study but does not count toward concentrator status.
- ***Jobs for Tennessee Graduates*** (C25H09) is a supplemental course that can be offered in addition to courses within the programs of study but does not count toward concentrator status.
- ***Preparing for the ACT, Postsecondary, and Career*** (C25H19) is a supplemental course that can be offered in addition to courses within the programs of study but does not count toward concentrator status.

STEM

Program of Study	Level 1	Level 2	Level 3	Level 4
Advanced STEM Applications	STEM I: Foundation [1] (C21H15)	STEM II: Applications [1] (C21H16)	STEM III: STEM in Context [1] (C21H17) -or- **AP** Computer Science Principles [4 & 5] (G02H44) -or- **Dual Enrollment** Advanced STEM Applications I (C21H32) -or- **Dual Enrollment** Advanced STEM Applications II (C21H33)	STEM IV: STEM Practicum [3] (C21H18) -or- **AP** Calculus AB [5] (G02H24) -or- **AP** Calculus BC [5] (G02H25) -or- **AP** Computer Science A [4 & 5] (G02H45) -or- **AP** Biology (G03H10) -or- **AP** Chemistry (G03H16) -or- **AP** Physics I: Algebra-Based [5] (G03H27) -or- **AP** Physics II: Algebra-Based [5] (G03H28) -or- **AP** Physics C: Electricity & Magnetism [5] (G03H24) -or- **AP** Physics C: Mechanics [5] (G03H29) -or- **Dual Enrollment** Advanced STEM Applications III (C21H35) -or- **Dual Enrollment** Advanced STEM Applications IV (C21H36) -or- **IB** Biology II SL/HL (G03H69) -or- **IB** Physics II SL (G03H82) -or- **WBL** Advanced STEM Applications Career Practicum [2] (C21H45)

Program of Study	Level 1	Level 2	Level 3	Level 4
BioSTEM	BioSTEM I [1] (C21H07)	BioSTEM II [1] (C21H08)	BioSTEM III [1] (C21H09) -or- **Dual Enrollment** BioSTEM I (C21H37) -or- **Dual Enrollment** BioSTEM II (C21H38)	BioSTEM Practicum (C21H10) -or- **Dual Enrollment** BioSTEM III (C21H39) -or- **Dual Enrollment** BioSTEM IV (C21H40) -or- **WBL** BioSTEM Career Practicum [2] (C21H46)
Engineering	Principles of Engineering & Technology (C21H04)	Engineering Design I [1] (C21H05) -or- **IGCSE** Design & Technology (C21H03)	Engineering Design II [1] (C21H06) -or- **AP** Computer Science Principles [4 & 5] (G02H44) -or- **Dual Enrollment** Engineering I (C21H00) -or- **Dual Enrollment** Engineering II (C21H11)	Engineering Practicum [3] (C21H14) -or- **AP** Physics I: Algebra-Based [5] (G03H27) -or- **AP** Physics II: Algebra-Based [5] (G03H28) -or- **AP** Physics C: Electricity & Magnetism [5] (G03H24) -or- **AP** Physics C: Mechanics [5] (G03H29) -or- **AP** Computer Science A [4 & 5] (G02H45) -or- **Dual Enrollment** Engineering III (C21H41) -or- **Dual Enrollment** Engineering IV (C21H42) -or- **CIE** Design & Technology 1 AS Level (C10H05) -or- **IB** Physics II (SL) (G03H82) -or- **WBL** Engineering Career Practicum [2] (C21H47)

Program of Study	Level 1	Level 2	Level 3	Level 4
Technology	Principles of Engineering & Technology (C21H04)	Digital Electronics (C13H07)	Robotics & Automated Systems (C13H15) -or- **AP** Computer Science Principles [4 & 5] (G02H44) -or- **Dual Enrollment** Technology I (C21H01) -or- **Dual Enrollment** Technology II (C21H12)	Engineering Practicum [3] (C21H14) -or- **AP** Physics I: Algebra-Based [5] (G03H27) -or- **AP** Physics II: Algebra-Based [5] (G03H28) -or- **AP** Physics C: Electricity & Magnetism [5] (G03H24) -or- **AP** Physics C: Mechanics [5] (G03H29) -or- **AP** Computer Science A [4 & 5] (G02H45) -or- **Dual Enrollment** Technology III (C21H43) -or- **Dual Enrollment** Technology IV (C21H44) -or- **IB** Physics II SL (G03H82) -or- **WBL** Technology Career Practicum [2] (C21H48)

[1] Satisfies the third lab science credit required for graduation.
[2] May be taught for 1 or 2 credits.
[3] A student pursuing an Industry 4.0 diploma distinction may substitute their 4th credit of math with this work-based learning course.
[4] May count for the computer science graduation requirement.
[5] Satisfies the fourth math credit required for graduation.

Available courses for elective credit in this cluster:

- ***Introduction to Geographical Information Systems (GIS)*** (C18H39) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Foundations of Technology (EBD)*** (C21H27) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Technological Design (EBD)*** (C21H28) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Advanced Design Applications (EBD)*** (C21H29) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Advanced Technological Applications (EBD)*** (C21H30) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Engineering Design (EBD)*** (C21H31) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Introduction to Engineering Design (PLTW)*** (C21H19) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Principles of Engineering (PLTW)*** [1] (C21H20) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Aerospace Engineering (PLTW)*** (C21H21) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Civil Engineering & Architecture (PLTW)*** (C21H22) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.

- ***Biotechnical Engineering (PLTW)*** (C21H23) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Digital Electronics (PLTW)*** (C21H24) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Computer Integrated Manufacturing (PLTW)*** (C21H25) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Engineering Design & Development (PLTW)*** (C21H26) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Medical Detectives (PLTW)*** (C14801) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status.
- ***Energy & the Environment (PLTW)*** (C25802) is a supplemental course that can be offered in addition to courses within these programs of study but does not count toward concentrator status
- ***Jobs for Tennessee Graduates*** (C25H09) is a supplemental course that can be offered in addition to courses within the programs of study but does not count toward concentrator status.
- ***Preparing for the ACT, Postsecondary, and Career*** (C25H19) is a supplemental course that can be offered in addition to courses within the programs of study but does not count toward concentrator status.

Middle School

Career Cluster	6th Grade	7th Grade	8th Grade
Advanced Manufacturing	STEM Explorers (C25600) Career Awareness (C25X06)	STEM Innovators (C25701) Career Exploration (C25X07)	STEM Designers (C25801) Career Advising and Planning (C25X08)
Agriculture, Food, & Natural Resources	Career Awareness (C25X06)	Introduction to Agriculture Sciences (C18X00) Career Exploration (C25X07)	Introduction to Agriculture Sciences (C18X00) Career Advising and Planning (C25X08)
Architecture & Construction	STEM Explorers (C25600) Career Awareness (C25X06)	STEM Innovators (C25701) Career Exploration (C25X07)	STEM Designers (C25801) Career Advising and Planning (C25X08)
Arts, Audio/Visual Technology, & Communication	Keyboarding[1] (G10600) Career Awareness (C25X06)	Keyboarding[1] (G10700) Career Exploration (C25X07)	Computer Applications (C12X00) Keyboarding[1] (G10800) Career Advising and Planning (C25X08)
Business Management & Administration	Keyboarding[1] (G10600) Career Awareness (C25X06)	Keyboarding[1] (G10700) Career Exploration (C25X07)	Computer Applications (C12X00) Keyboarding[1] (G10800) Career Advising and Planning (C25X08)
Education & Training	Introduction to Social Health[2] (C19X00) Career Awareness (C25X06)	Introduction to Social Health[2] (C19X00) Career Exploration (C25X07)	Introduction to Social Health[2] (C19X00) Career Advising and Planning (C25X08)
Finance	Keyboarding[1] (G10600) Career Awareness (C25X06)	Keyboarding[1] (G10700) Career Exploration (C25X07)	Computer Applications (C12X00) Keyboarding[1] (G10800) Career Advising and Planning (C25X08)
Government & Public Administration	Career Awareness (C25X06)	Career Exploration (C25X07)	Career Advising and Planning (C25X08)
Health Science	Career Awareness (C25X06)	Introduction to Health Science (C14X00) Career Exploration (C25X07)	Introduction to Health Science (C14X00) Career Advising and Planning (C25X08)
Hospitality & Tourism	Career Awareness (C25X06)	Career Exploration (C25X07)	Career Advising and Planning (C25X08)
Human Services	Introduction to Social Health[2] (C19X00) Career Awareness (C25X06)	Introduction to Social Health[2] (C19X00) Career Exploration (C25X07)	Introduction to Social Health[2] (C19X00) Career Advising and Planning (C25X08)
Information Technology	Keyboarding[1] (G10600) STEM Explorers (C25600) Computer Science Discoveries (C25X04) Career Awareness (C25X06)	Keyboarding[1] (G10700) STEM Innovators (C25701) Computer Science (G25X40) Computer Science: Flexible Scheduling (G25X41) Computer Science Discoveries (C25X04) Career Exploration (C25X07)	Computer Applications (C12X00) Keyboarding[1] (G10800) STEM Designers (C25801) Career Advising and Planning (C25X08) Computer Science (G25X40) Computer Science: Flexible Scheduling (G25X41) Computer Science Discoveries (C25X04)
Law, Public Safety, Corrections, & Security	Career Awareness (C25X06)	Career Exploration (C25X07)	Career Advising and Planning (C25X08)

Career Cluster	6th Grade	7th Grade	8th Grade
Marketing, Distribution & Logistics	Keyboarding[1] (G10600) Career Awareness (C25X06)	Keyboarding[1] (G10700) Career Exploration (C25X07)	Computer Applications (C12X00) Keyboarding[1] (G10800) Career Advising and Planning (C25X08)
STEM	STEM Explorers (C25600) Computer Science Discoveries (C25X04) Career Awareness (C25X06)	STEM Innovators (C25701) Computer Science Discoveries (C25X04) Career Exploration (C25X07)	STEM Designers (C25801) Career Advising and Planning (C25X08) Computer Science Discoveries (C25X04)
Transportation	STEM Explorers (C25600) Career Awareness (C25X06)	STEM Innovators (C25701) Career Exploration (C25X07)	STEM Designers (C25801) Career Advising and Planning (C25X08)

[1] *Keyboarding* may also be used with 4th and 5th-grade students (G10400, G10500).

[2] *Introduction to Social Health* may also be used with 5th-grade students (C19X00).

Middle School *Engineering by Design (EBD)* and *Project Lead the Way (PLTW)* curriculum package courses. Note, these courses may require additional costs and training to implement.

C25700 – Inventions & Innovators (EBD)
C25800 – Technological Systems (EBD)
C25802 – Energy & the Environment (PLTW)
C25803 – Flight & Space (PLTW)
C25804 – Green Architecture (PLTW)
C25805 – Magic of Electrons (PLTW)
C25806 – Science & Technology (PLTW)
C25X01 – Exploring Technology (EBD)
C25X02 – Design & Modeling (PLTW)
C25X03 – Automation & Robotics (PLTW)

ATTACHMENT TWO: PROJECT TIMELINE

DD

GIVE 3.0 Project Timeline

Start Date: 7/1/2024

	Year 1				Year 2				Year 3				Year 4			
Project Element	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Steering Committee Planning Meeting (Monthly)	X	X	X	X												
Steering Committee Planning Meeting (Quarterly)					X	X	X	X	X	X	X	X	X	X	X	X
ID Industry-recognized Credentials; Perform gap analysis on high school CTE curriculum	X	X														
Establish Partnerships with TCATs, colleges, and industry organizations	X	X	X	X												

Develop New ICSST Certificate; Create Hands-on & Career Exploration Activities; Develop Key Concept Modules and Materials to integrate into High School CTE Programs; Create AR/VR Active Learning Activities	X	X	X	X												
Solicit Work-based Learning Components and Classroom Visits			X	X	X	X	X	X	X	X	X	X	X	X	X	X

Implement New ICSST Certificate; Implement Hands-on & Career Exploration Activities; Run Work-based Learning Components & Conduct Classroom Visits; Implement Key Concept Modules & Materials in High School CTE Programs; Conduct AR/VR Active Learning Activities					X	X	X	X	X	X	X	X	X	X	X	X
Offer/Teach Dual Credit and Dual Enrollment Classes/ Implement EPSOs					X	X	X	X	X	X	X	X	X	X	X	X
Pursue Articulation Agreements between TCAT, ChSCC, and 4-year degree programs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Develop Marketing Materials & Outreach Efforts			X	X											
Implement Outreach & Recruiting Efforts				X	X	X	X	X	X	X	X	X	X	X	X
Develop EPSOs for High School Students, design flexible pathways for tailored EPSO experiences	X	X	X	X											
Research/ Produce Participant Surveys for Students, Educators, and Industry Partners				X											
Conduct Participant Surveys					X	X	X	X	X	X	X	X	X	X	X
Tabulate Participant Surveys/ Collect Data					X	X	X	X	X	X	X	X	X	X	X
Order/Install Equipment		X	X	X	X										
Family Night Information Sessions				X	X		X		X		X		X		X

Hire Outreach Specialists			X	X												
Contract Teachers (paid outside of this grant)				X	X		X		X		X		X		X	
Assess Program Progress				X				X				X				X
Solicit/ Engage Additional Partners	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Renew MOUs for Program Continuation Beyond Grant																X
Prepare Reports		X		X		X		X		X		X		X		X
Prepare Final Report																X

ATTACHMENT THREE: MEMORANDUMS OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING (MOU) *between*

Chattanooga State Community College

Tennessee College of Applied Technology at Chattanooga State

and

Bledsoe, Grundy, Rhea, and Sequatchie County Schools

Southeast Tennessee Development District (SETD)

Colonial Chemical, Inc.

Card-Monroe Corporation

All Other Corporate Partners involved with this

Governor's Investment in Vocational Education (GIVE 3.0) Grant Project

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I. PURPOSE & SCOPE

The purpose of this MOU is to clearly identify the roles and responsibilities of Chattanooga State Community College and the Tennessee College of Applied Technology at Chattanooga State as it relates to the work of the GIVE Grant project.

II. BACKGROUND

Chattanooga State has served as fiscal agent and lead on a number of grants, including Labor and Education Alignment Program (LEAP 2.0) and the first, as well as second Governor's Investment in Vocational Education Grant (GIVE 1.0 & 2.0). Additionally, the College has extensive grants management experience, which will be applied to the implementation of GIVE 3.0 grant-funded efforts. Examples of grants successfully implemented by the institution include:

- US Department of Agriculture—Rural Utility Services' Distance Learning and Telemedicine initiative [2 separate project grants under this program]
- Health Resources and Services Administration—Nursing Workforce Diversity Program Grant
- Department of Education—Strengthening Institutions Program (SIP) [2 separate project grants under this program]
- Nuclear Regulatory Commission—Nuclear Engineering Technology (NPET) and Radiation Protection

Chattanooga State Community College's Procurement and Equipment Inventory/Property Control

Regarding the purchasing of equipment as described in this proposal, Chattanooga State Community College strictly adheres to the Tennessee Board of Regents (TBR) System's Purchasing Policy (Policy 4:02:10:00), which ensures that all procurements are in full compliance with state and federal laws, regulations and applicable TBR policies and guidelines. To ensure optimal pricing, the institution takes advantage of state contract pricing whenever possible. Formal policies also guide inventory and property control, thus ensuring that equipment obtained through GIVE grant funds is appropriately managed.

Chattanooga State Community College's Financial Management

Chattanooga State complies with the Tennessee Board of Regents guidance regarding fiscal management; state auditors employed by the State of Tennessee conduct on-site audits every 2 years. To supplement this process, an Internal Audit Department is employed by the College and reports administratively to the College President and functionally to the TBR Audit Committee through TBR's Chief Audit Executive.

III. CHATTANOOGA STATE COMMUNITY COLLEGE'S RESPONSIBILITIES UNDER THIS MOU

Chattanooga State Community College shall serve as Lead Entity, Fiscal Agent, and Higher Education Partner for this grant, including:

- Obtaining and installing necessary equipment for this initiative.
- Hiring needed personnel to accomplish the work of this project.
- Employing faculty program leads and instructors to teach the postsecondary courses, along with necessary high school, dual enrollment elements and other learning components in and support of computer science, advanced manufacturing, and appropriate STEM training at Chattanooga State's Marion, Rhea, and Hamilton County sites, as well as in Bledsoe, Grundy, Rhea, and Sequatchie County Schools.
- Working with Bledsoe, Grundy, Rhea, and Sequatchie County school systems and corporate partners to develop enhanced education classes that will include additional career exploration components, hands-on learning opportunities including local corporate partners teaching toward obtaining industry-recognized certification, as well as developing critical thinking skills through case scenarios, plus career exploration visits with computer science, advanced manufacturing, and STEM professionals, as well as job shadowing opportunities. The College will also work to provide such in-class activities for CTE courses as college ready workshops/modules and training for the new Industrial Control Systems Security Technician certificate. Chattanooga State will assist in arranging/hosting Family Night information sessions, coordinating job shadowing and hands-on training opportunities, coordinating/providing instruction for industry-recognized certifications, and, where possible/applicable coordinating summer internships.

- Serving as liaison to the corporate partners to obtain and maintain the project's work-based learning elements.
- Providing all necessary accounting and fund reporting functions of this grant.
- Generating necessary student data reporting regarding the computer science, advanced manufacturing, and STEM programs at all of the College's sites.
- Preparing the various reports for this grant.
- Accomplishing all other elements involving the College, as outlined in the grant proposal.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with all possible data necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of ChSCC's authorized official. It shall be in force from August 1, 2024 to July 31, 2028.

Chattanooga State Community College indicates agreement with this MOU by the following signature.

SIGNATURE & DATE

Dr. Rebecca Ashford, President

Signature

04/26/2024 Date

MEMORANDUM OF UNDERSTANDING (MOU) *between*

Bledsoe County Schools

and

Chattanooga State Community College

The Tennessee College of Applied Technology at Chattanooga State

Southeast Tennessee Development District

Grundy, Sequatchie, and Marion County Schools

Komatsu Chattanooga

Lodge Cast Iron

Valmont Industries

All Other Corporate Partners involved with this

Governor's Investment in Vocational Education (GIVE) Grant Project

I. PURPOSE & SCOPE

The purpose of this MOU is to clearly identify the roles and responsibilities of Bledsoe County Schools' Career and Technical Education program as it relates to the work of the GIVE Grant project.

II. BACKGROUND

Bledsoe County Schools served as a significant Career & Technical Education partner on the first round of the Governor's Investment in Vocational Education Grant Project—GIVE 1.0 & 2.0, as well as the Labor and Education Alignment Program grant-LEAP 2.0.

III. BLEDSOE COUNTY SCHOOLS' RESPONSIBILITIES UNDER THIS MOU

Bledsoe County Schools' Career & Technical Education division shall serve as one of the K-12 Partners for this grant, including:

- Participating in planning and development meetings as the new Distributed Control Systems Security Technician program and credential is created.
- Marketing the new initiative, as well as the Family Night Workshops, to prospective students and their parents.
- Providing the new course modules/training, where possible, to students, along with other applicable Industry Recognized Certification training.

- Working with Chattanooga State Community College to schedule the courses, related testing, and associated field trips/job shadowing opportunities and career exploration visits.
- Where possible, pursuing dual enrollment offerings with Chattanooga State.
- Assisting with needed participant statistics for grant reporting purposes.
- Coordinating with Chattanooga State to engage the corporate partners on this project to obtain and maintain the initiative's work-based learning components.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with all possible data necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of Bledsoe County School's authorized officials. It shall be in force from August 1, 2024 to July 31, 2028.

Bledsoe County Schools indicates agreement with this MOU by the following signatures.

SIGNATURES & DATES

Steve Reel, CTE Director

Steve Reel

4-10-24 Date

Selina Sparkman, Director of Schools

Selina Sparkman

4-10-24 Date

MEMORANDUM OF UNDERSTANDING (MOU) *between*

Grundy County Schools

and

Chattanooga State Community College

The Tennessee College of Applied Technology at Chattanooga State

Southeast Tennessee Development District

Bledsoe, Sequatchie, and Marion County Schools

Komatsu Chattanooga

Lodge Cast Iron

Valmont Industries

All Other Corporate Partners involved with this

Governor's Investment in Vocational Education (GIVE) Grant Project

I. PURPOSE & SCOPE

The purpose of this MOU is to clearly identify the roles and responsibilities of Grundy County Schools' Career and Technical Education program as it relates to the work of the GIVE Grant project.

II. BACKGROUND

Grundy County Schools has been a significant Career & Technical Education partner of Chattanooga State for many years.

III. GRUNDY COUNTY SCHOOLS' RESPONSIBILITIES UNDER THIS MOU

Grundy County Schools' Career & Technical Education division shall serve as one of the K-12 Partners for this grant, including:

- Participating in planning and development meetings as the new Distributed Control Systems Security Technician program and credential is created.
- Marketing the new initiative, as well as the Family Night Workshops, to prospective students and their parents.
- Providing the new course modules/training, where possible, to students, along with other applicable Industry Recognized Certification training.

- Working with Chattanooga State Community College to schedule the courses, related testing, and associated field trips/job shadowing opportunities and career exploration visits.
- Where possible, pursuing dual enrollment offerings with Chattanooga State.
- Assisting with needed participant statistics for grant reporting purposes.
- Coordinating with Chattanooga State to engage the corporate partners on this project to obtain and maintain the initiative's work-based learning components.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with all possible data necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of Grundy County School's authorized officials. It shall be in force from August 1, 2024 to July 31, 2028.

Grundy County Schools indicates agreement with this MOU by the following signatures.

SIGNATURES & DATES

Gina Sons, CTE Director

_____

_____ Date

Dr. Donald Durley, Director of Schools

4.24.24 Date

- Working with Chattanooga State Community College to schedule the courses, related testing, and associated field trips/job shadowing opportunities and career exploration visits.
- Where possible, pursuing dual enrollment offerings with Chattanooga State.
- Assisting with needed participant statistics for grant reporting purposes.
- Coordinating with Chattanooga State to engage the corporate partners on this project to obtain and maintain the initiative's work-based learning components.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with all possible data necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of Grundy County School's authorized officials. It shall be in force from August 1, 2024 to July 31, 2028.

Grundy County Schools indicates agreement with this MOU by the following signatures.

SIGNATURES & DATES

Gina Sons, CTE Director

Gina Sons
4/24/24 Date

Dr. Donald Durley, Director of Schools

_____
_____ Date

MEMORANDUM OF UNDERSTANDING (MOU) *between*

Rhea County Schools

and

Chattanooga State Community College

The Tennessee College of Applied Technology at Chattanooga State

Southeast Tennessee Development District

Bledsoe, Grundy, and Sequatchie County Schools

Komatsu Chattanooga

Lodge Cast Iron

Valmont Industries

All Other Corporate Partners involved with this

Governor's Investment in Vocational Education (GIVE) Grant Project

I. PURPOSE & SCOPE

The purpose of this MOU is to clearly identify the roles and responsibilities of Rhea County Schools' Career and Technical Education program as it relates to the work of the GIVE Grant project.

II. BACKGROUND

Rhea County Schools served as a significant Career & Technical Education partner on the second round of the Governor's Investment in Vocational Education Grant Project—GIVE 2.0.

III. RHEA COUNTY SCHOOLS' RESPONSIBILITIES UNDER THIS MOU

Rhea County Schools' Career & Technical Education division shall serve as one of the K-12 Partners for this grant, including:

- Participating in planning and development meetings as the new Industrial Control Systems Security Technician program and credential is created.
- Marketing the new initiative, as well as the Family Night Workshops, to prospective students and their parents.

- Providing the new course modules/training, where possible, to students, along with other applicable Industry Recognized Certification training.
- Working with Chattanooga State Community College to schedule the courses, related testing, and associated field trips/job shadowing opportunities and career exploration visits.
- Where possible, pursuing dual enrollment offerings with Chattanooga State.
- Assisting with needed participant statistics for grant reporting purposes.
- Coordinating with Chattanooga State to engage the corporate partners on this project to obtain and maintain the initiative's work-based learning components.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with all possible data necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of Rhea County School's authorized officials. It shall be in force from August 1, 2024 to July 31, 2028.

Rhea County Schools indicates agreement with this MOU by the following signatures.

SIGNATURES & DATES

Lori Derlak, CTE Director

Lori Derlak

4-18-24 Date

Jesse Messimer, Director of Schools

4/18/24 Date

MEMORANDUM OF UNDERSTANDING (MOU) *between*

Sequatchie County Schools

and

Chattanooga State Community College

The Tennessee College of Applied Technology at Chattanooga State

Southeast Tennessee Development District

Bledsoe, Grundy, and Marion County Schools

Komatsu Chattanooga

Lodge Cast Iron

Valmont Industries

All Other Corporate Partners involved with this

Governor's Investment in Vocational Education (GIVE) Grant Project

I. PURPOSE & SCOPE

The purpose of this MOU is to clearly identify the roles and responsibilities of Sequatchie County Schools' Career and Technical Education program as it relates to the work of the GIVE Grant project.

II. BACKGROUND

Sequatchie County Schools served as a significant Career & Technical Education partner on previous rounds of the Governor's Investment in Vocational Education Grant Project—GIVE 1.0 & 2.0.

III. SEQUATCHIE COUNTY SCHOOLS' RESPONSIBILITIES UNDER THIS MOU

Sequatchie County Schools' Career & Technical Education division shall serve as one of the K-12 Partners for this grant, including:

- Participating in planning and development meetings as the new Distributed Control Systems Security Technician program and credential is created.
- Marketing the new initiative, as well as the Family Night Workshops, to prospective students and their parents.
- Providing the new course modules/training, where possible, to students, along with other applicable Industry Recognized Certification training.

- Working with Chattanooga State Community College to schedule the courses, related testing, and associated field trips/job shadowing opportunities and career exploration visits.
- Where possible, pursuing dual enrollment offerings with Chattanooga State.
- Assisting with needed participant statistics for grant reporting purposes.
- Coordinating with Chattanooga State to engage the corporate partners on this project to obtain and maintain the initiative's work-based learning components.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with all possible data necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of Sequatchie County School's authorized officials. It shall be in force from August 1, 2024 to July 31, 2028.

Sequatchie County Schools indicates agreement with this MOU by the following signatures.

SIGNATURES & DATES

Marsha Talley, CTE Director

Marsha Talley

4/11/24 Date

Sarai Pierce, Director of Schools

Sarai Pierce

4/11/24 Date

MEMORANDUM OF UNDERSTANDING (MOU) *between*

Southeast Tennessee Development District.

and

Chattanooga State Community College

Tennessee College of Applied Technology at Chattanooga State

Bledsoe, Grundy, Sequatchie, and Marion County Schools

Komatsu Chattanooga

Valmont Industries

Lodge Cast Iron

All Other Corporate Partners involved with this

Governor's Investment in Vocational Education (GIVE) Grant Project

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I. PURPOSE & SCOPE

The purpose of this MOU is to clearly identify the roles and responsibilities of the Southeast Tennessee Development District as it relates to the work of the GIVE Grant project.

II. BACKGROUND

SETD has served as lead entity for a variety of grants including Labor and Education Alignment grants—LEAP 1.0 and 2.0, the first Governor's Investment in Vocation Education (GIVE) Grant-GIVE 1.0, as well as Workforce Innovation and Opportunity Act (WIOA) funding.

III. SOUTHEAST TENNESSEE DEVELOPMENT DISTRICT'S RESPONSIBILITIES UNDER THIS MOU

Southeast Tennessee Development District shall assist with this grant by serving as:

- Liaison to the corporate partners to foster and maintain the project's work-based learning elements.
- Assist Chattanooga State's project directors with needed area employer statistics and trends for grant report preparation.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with the required data and grant-related activities necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of Southeast Tennessee Development District's authorized official. It shall be in force from August 1, 2024 to July 31, 2028.

SETD indicates agreement with this MOU by the following signature.

SIGNATURE & DATE

Michele Holt, SETD Director of Workforce Development & GIVE Project Liaison

_____

Date: 04.17.2023

MEMORANDUM OF UNDERSTANDING (MOU) *between*

Card-Monroe Corporation

and

Chattanooga State Community College

Tennessee College of Applied Technology at Chattanooga State

Bledsoe, Grundy, Sequatchie, and Rhea County Schools

Southeast Tennessee Development District

Colonial Chemical Company

Komatsu Chattanooga

Lodge Cast Iron

All Other Corporate Partners involved with this

Governor's Investment in Vocational Education (GIVE) Grant Project

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I. PURPOSE & SCOPE

The purpose of this MOU is to clearly identify the roles and responsibilities of Card-Monroe Corporation as it relates to the work of the GIVE Grant project.

II. BACKGROUND

Today, nearly 90% of carpet is produced by tufting. Founded in 1981, Card-Monroe Corporation is the preferred provider of tufting machines within the industry. Along with many of the other partners on this grant project, Card-Monroe has a strong relationship with Chattanooga State Community College. The company has employed many of the College's graduates from the Engineering and Information Technology Division. In 2019, the company provided funding to equip the Card-Monroe Corp. Lab, which is a state-of-the-art learning lab at Chattanooga State. The company also has a vibrant relationship with area secondary schools, offering many work-based learning experiences to students. Card-Monroe is pleased to support the proposed programs of this GIVE grant. Having a ready supply of graduates from Bledsoe, Rhea, Sequatchie, and Grundy Counties will be a great help in the company's recruiting efforts. Card-Monroe has partnered previously on several grant and special projects at Chattanooga State, especially GIVE 2.0.

III. CARD-MONROE CORPORATION'S RESPONSIBILITIES UNDER THIS MOU

Based on qualified candidates, Card-Monroe will be ready to employ at least 10 graduates from this GIVE Grant program in the next four years, as current openings allow. The company will provide up to twelve job shadowing opportunities annually for career exploration for high school CTE students from Sequatchie, Bledsoe, Grundy, and Rhea Counties. The company will provide employees to speak at career exploration opportunities at each county's elementary and middle schools, plus assist with instruction at each high school. Additionally, where possible, Card-Monroe Company will participate in field trips and job shadowing days at the company's location to provide students with an understanding of the day-to-day roles at Card-Monroe. Additionally, where possible, the company will offer 10 work-based internships for students to work and learn at the company's location, as well as a responsible employee to oversee the students and program while they are on-site.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with the required data and grant-related activities necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of Card-Monroe Company's authorized official. It shall be in force from August 1, 2024 to July 31, 2028.

Card-Monroe indicates agreement with this MOU by the following signature.

SIGNATURE & DATE

Allen Neely

Signature

Allen Neely SVP

Printed Name and Title

4/26/24 Date

MEMORANDUM OF UNDERSTANDING (MOU) *between*

Colonial Chemical, Inc.

and

Chattanooga State Community College

Tennessee College of Applied Technology at Chattanooga State

Bledsoe, Grundy, Sequatchie, and Marion County Schools

Southeast Tennessee Development District

Lodge Cast Iron

Valmont Industries, Inc.

Komatsu Chattanooga

All Other Corporate Partners involved with this

Governor's Investment in Vocational Education (GIVE) Grant Project

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I. PURPOSE & SCOPE

The purpose of this MOU is to clearly identify the roles and responsibilities of Colonial Chemical, Inc. as it relates to the work of the GIVE Grant project.

II. BACKGROUND

Colonial Chemical is a privately held manufacturer of specialty surfactants with more than 160 employees. Originally operating in Dalton, Georgia, the company expanded to Chattanooga in 1990, specializing in personal care, household and industrial chemicals, lubricants for industry, pet and vehicle care products, and much more. Along with many of the other partners on this grant project, Colonial has a strong relationship with Chattanooga State Community College. The company has employed the College's graduates from the Engineering and Information Technology Division, including those in advanced manufacturing, mechatronics, and robotics. Colonial is pleased to support the proposed programs of this GIVE grant. Having a ready supply of graduates from Bledsoe, Grundy, Sequatchie, and Marion Counties will be a great help in the company's recruiting efforts. Colonial has previously partnered on some grants and special projects at Chattanooga State.

III. COLONIAL CHEMICAL COMPANY'S RESPONSIBILITIES UNDER THIS MOU

Based on qualified candidates, Colonial will be ready to employ at least 10 graduates from this GIVE Grant program in the next four years, as current openings allow. The company will provide up to twelve job shadowing opportunities annually for career exploration for high school CTE students from Sequatchie, Bledsoe, Grundy, and Marion Counties. The company will provide employees to speak at career exploration opportunities at each county's elementary and middle schools, plus assist with instruction at each high school. Additionally, where possible, Colonial Chemical Company will participate in field trips and job shadowing days at the company's location to provide students with an understanding of the day-to-day roles at Colonial. Additionally, where possible, the company will offer 10 work-based internships for students to work and learn at the company's location, as well as a responsible employee to oversee the students and program while they are on-site.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with the required data and grant-related activities necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of Colonial Chemical Company's authorized official. It shall be in force from August 1, 2024 to July 31, 2028.

Colonial Chemical Company indicates agreement with this MOU by the following signature.

SIGNATURE & DATE

Signature

Don Wynn, Executive Vice-President

Printed Name and Title

4/22/24 Date

MEMORANDUM OF UNDERSTANDING (MOU) *between*

La-Z-Boy, Inc.

and

Chattanooga State Community College

Tennessee College of Applied Technology at Chattanooga State

Bledsoe, Grundy, Sequatchie, and Rhea County Schools

Southeast Tennessee Development District

Lodge Cast Iron

Valmont Industries, Inc.

Komatsu Chattanooga

All Other Corporate Partners involved with this

Governor's Investment in Vocational Education (GIVE) Grant Project

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I. PURPOSE & SCOPE

The purpose of this MOU is to clearly identify the roles and responsibilities of La-Z-Boy, Inc. as it relates to the work of the GIVE Grant project.

II. BACKGROUND

La-Z-Boy, Incorporated is one of the world's leading residential furniture producers, marketing furniture for every room of the home. Their wholesale segment includes England, La-Z-Boy, American Drew, Hammary, Kincaid, and the company's international wholesale and manufacturing businesses. The Company-owned Retail segment includes about half of the La-Z-Boy Furniture Galleries stores across North America. Joybird is an e-commerce retailer and manufacturer of upholstered furniture. There are 350 La-Z-Boy Furniture Galleries stores and about 530 independent Comfort Studio locations, in addition to in-store gallery programs for the company's Kincaid and England operating units. The company employs approximately 10,500 people worldwide. La-Z-Boy is pleased to support the proposed programs of this GIVE grant. Having a ready supply of graduates from Bledsoe, Grundy, Sequatchie, and Rhea Counties will be a great help in the company's recruiting efforts. La-Z-Boy has previously partnered on some grants and special projects at Chattanooga State.

III. LA-Z-BOY, INCORPORATED'S RESPONSIBILITIES UNDER THIS MOU

Based on qualified candidates, La-Z-Boy will be ready to employ at least 1 graduate from this GIVE Grant program in the next four years, as current openings allow. The company will provide up to six job shadowing opportunities annually for career exploration for high school CTE students from Sequatchie, Bledsoe, Grundy, and Rhea Counties. The company will provide employees to speak at career exploration opportunities at each county's elementary and middle schools, plus assist with instruction at each high school. Additionally, where possible, La-Z-Boy, Inc. will participate in field trips and job shadowing days at the company's location to provide students with an understanding of the day-to-day roles at La-Z-Boy. Additionally, where possible, the company will offer 2 work-based internships for students to work and learn at the company's location, as well as a responsible employee to oversee the students and program while they are on-site.

IV. OTHER PARTNERS RESPONSIBILITIES UNDER THIS MOU

The other partners' responsibilities in this GIVE grant project are outlined in their respective MOU's. Additionally, each partner agrees to provide Chattanooga State with the required data and grant-related activities necessary in the preparation of this grant's reports.

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

Any modification or termination of this MOU must be made in writing and responded to by Chattanooga State and all other grant partners within 30 days of notification.

VI. FUNDING

This MOU does not include the reimbursement of funds between any of the parties.

VII. EFFECTIVE DATE AND SIGNATURE

This MOU shall be effective upon the signature of La-Z-Boy, Incorporated's authorized official. It shall be in force from August 1, 2024 to July 31, 2028.

La-Z-Boy indicates agreement with this MOU by the following signature.

SIGNATURE & DATE

Signature

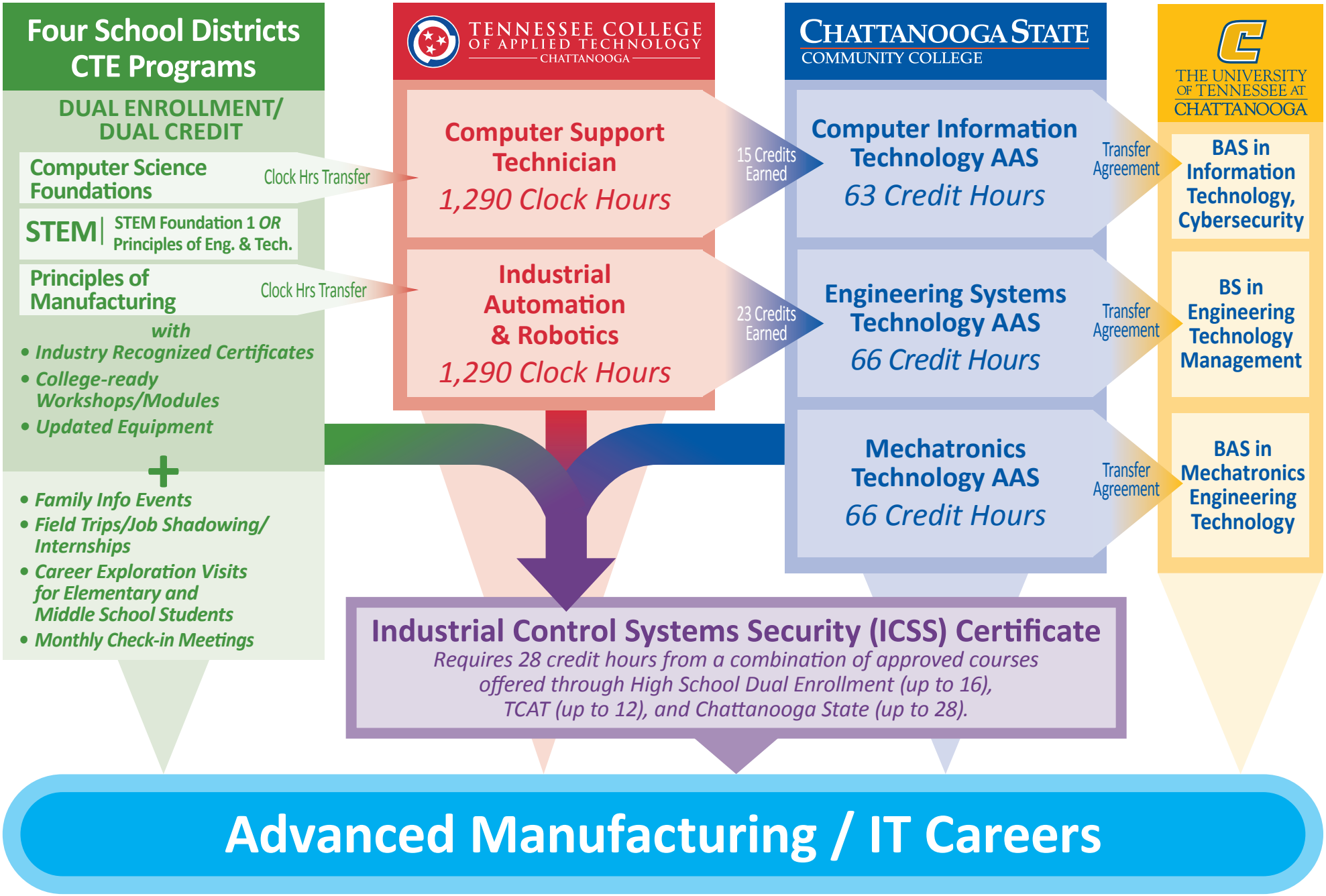
Janet Earnhardt, Director of Human Resources

Printed Name and Title

4/29/24 Date

ATTACHMENT FOUR: EDUCATIONAL & CAREER PATHWAYS

Advancing Advanced Manufacturing and Information Technologies in Southeast Tennessee Educational and Career Pathways



TENNESSEE COLLEGE OF APPLIED TECHNOLOGY
CHATTANOOGA

Credits Earned Toward A.A.S. Degrees at Chattanooga State

Medical Assisting	24 CREDITS
Massage Therapy	16 CREDITS
Practical Nursing	24 CREDITS
Automotive Technology	23 CREDITS
Collision Repair Technology	23 CREDITS
Computer Support Technician	23 CREDITS
Diesel Equipment Technology	23 CREDITS
HVAC/R Technician	23 CREDITS
Industrial Electricity	23 CREDITS
Industrial Maintenance Technician	23 CREDITS
Motorcycle & Marine Service Technician	23 CREDITS
Machine Tool Technology	23 CREDITS
Road Building Equipment Service Technician	23 CREDITS
Tool and Die Maintenance Technician	23 CREDITS
Welding Technology	23 CREDITS
HVAC/R Technician	23 CREDITS
Industrial Electricity	23 CREDITS
Landscape and Turf Management	23 CREDITS
Welding Technology	23 CREDITS
Welding Technology	19 CREDITS
Practical Nursing	18 CREDITS
Computer Support Technician	15 CREDITS

Completion of these TCAT programs results in credit toward an Associate of Applied Science (A.A.S.) at Chattanooga State.

- HEALTH SCIENCES A.A.S.
- INDUSTRIAL TECHNOLOGY A.A.S.
- CONSTRUCTION MANAGEMENT A.A.S.
- WELDING ENGINEERING TECHNOLOGY A.A.S.
- RN TRANSITION PROGRAM A.A.S.
- COMPUTER INFORMATION TECHNOLOGY A.A.S. (Networking Concentration)

CHATTANOOGA STATE
COMMUNITY COLLEGE

Chattanooga State Associate Degree Transfers to B.S. or B.A.S. Programs at UTC

CHATTANOOGA STATE COMMUNITY COLLEGE

These 2+2 programs allow students to complete their first two years at Chattanooga State, then transfer to UTC knowing course credits will be accepted toward a Bachelor of Science or Bachelor of Applied Science Degree.

CHATTANOOGA STATE DEGREE PROGRAMS		UTC DEGREE PROGRAMS
Associate of Applied Science (A.A.S.) General Engineering		
Chemical Emphasis		B.S. CHEMICAL ENGINEERING
Civil Emphasis		B.S. CIVIL ENGINEERING
Electrical Emphasis		B.S. ELECTRICAL ENGINEERING
Mechanical Emphasis		B.S. MECHANICAL ENGINEERING
A.A.S. Engineering Technology		
Civil Engineering Technology*		B.S. ENGINEERING TECHNOLOGY MANAGEMENT: CONSTRUCTION MANAGEMENT
Construction Engineering Technology*		
Chemical Engineering Technology*		B.A.S. MECHATRONICS ENGINEERING TECHNOLOGY
Mechanical Engineering Technology*		
Quality Assurance/Quality Control*		
Design Drafting Engineering Technology		B.S. ENGINEERING TECHNOLOGY MANAGEMENT: ENGINEERING MANAGEMENT
Non-Destructive Testing Technology		
Nuclear Power Engineering		
Radiation Protection		
A.A.S. Engineering Systems Technology		
Construction Systems*	*Must complete TCAT apprenticeship program prior to enrollment*	B.S. ENGINEERING TECHNOLOGY MANAGEMENT: ENGINEERING MANAGEMENT
Welding Engineering Technology		
Engineering Systems Management*		B.A.S. MECHATRONICS ENGINEERING TECHNOLOGY
Industrial Technology*	*Must complete TCAT apprenticeship program prior to enrollment*	
Mechatronic Systems*		
A.A.S. Electrical/Electronic Engineering Technology		
Automated Controls*		B.A.S. MECHATRONICS ENGINEERING TECHNOLOGY
Computer Systems*		
Solar Energy Technology		B.S. ENGINEERING TECHNOLOGY MANAGEMENT: ENGINEERING MANAGEMENT

**Also applies to B.S. Engineering Technology Management: Engineering Management*

THE UNIVERSITY OF TENNESSEE CHATTANOOGA