



# Improving the Pipeline for Tennessee's Workforce

Academic Supply for Occupational Demand Report **2022**

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## Executive Summary

This year's *Improving the Pipeline for Tennessee's Workforce: Academic Supply for Occupational Demand Report* is the first joint report between the Tennessee Higher Education Commission (THEC), Tennessee Department of Labor and Workforce Development (TDLWD), Tennessee Department of Economic and Community Development (TNECD), and Tennessee Department of Education (TDOE).

This partnership has led to several exciting report improvements. For the first time, in-demand occupations and aligned academic programs are presented in one report.<sup>1</sup> Also, for the first time, the information is organized by Career Cluster, grouping occupations and training programs in alignment with TDOE programs of study. These improvements allow readers to identify in-demand occupations and aligned training programs in one place.

Additionally, this report includes a section identifying how various stakeholders can utilize this report. For example, a college may use the report to stand-up new programs or concentrations to serve employer needs, while the workforce development community may use the report to identify workforce needs and associated resources to connect employers with employees. This report is designed to be helpful to an assortment of users.

While there are several improvements to the report this year, we've also maintained existing resources that are invaluable to readers seeking localized data and information for their community. These include TNECD's in-demand occupations dashboard and downloadable datasets, as well as TDLWD's academic supplier dashboard.

### This Report:

- Identifies in-demand occupations and aligned academic programs at the postsecondary and secondary levels and registered apprenticeships organized across 15 career clusters.
- Includes in-demand occupations tables identifying the region(s) where the occupation is in demand, indicators for jobs which are STEM fields, those which support TNECD's target industries, and the typical training level required for employment.
- Contains aligned academic programs tables with information about degree production and completers, matriculation into Tennessee's job market, and first-year wages for those identified in Tennessee employment data.
- Highlights how readers, ranging from high school professionals to industry advocates, can use this report to inform their work.

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<sup>1</sup> Formerly, this information was presented in two different annual reports: the *Labor and Education Alignment Program (LEAP) Report* released by TNECD and the *Academic Supply and Occupational Demand Report* by THEC and TDLWD.

- Provides important details about the COVID-19 pandemic and its impact on these analyses.
- Includes degree production across Tennessee public and private colleges over five years by classification of instructional program (CIP code) highlighting how degree production has changed over time.
- Offers a new section on data, methods, and sources highlighting how existing data is used and areas for further exploration.

## **In-Demand Occupations and Aligned Academic Program Highlights**

### **Agriculture, Food, and Natural Resources**

Environmental scientists and specialists are in-demand statewide. Tennessee colleges produced graduates in environmental studies and environmental science at the bachelor's and master's level. The highest placement rate is for those receiving a master's degree.

Veterinarians are in-demand in two regions in Tennessee. University of Tennessee, Knoxville is the sole provider of Doctor of Veterinary Medicine (DVM) degrees in the State. In 2019-20, 75 DVM's were produced and their estimated annual wages in their first year were nearly \$80,000, outpacing other graduates in the agriculture, food, and natural resources cluster. The only program with an employment rate greater than 70 percent was the associate degree program in veterinary/animal health technology/technician and veterinary assistant. This high school CTE program had an employment rate of nearly 60 percent.

### **Architecture and Construction**

Several occupations in this group are in-demand statewide, and skilled workers are needed in every region or nearly every region across the state. Demand is tied to 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.

Electricians are in-demand statewide and in all nine regions of the state. Training opportunities are available at the certificate and apprenticeship levels. In 2019-20, 167 certificates were produced, and 318 electrical apprenticeships were completed.

The highest employment rates for architecture and construction programs were for the architectural engineering technology/technician associate degree program (82 percent) and the one-to-two-year certificate programs for electrician (74 percent) and heating, ventilation, air conditioning, and refrigeration (HVAC) maintenance technology/technician (74 percent). The HVAC certificate programs of less than one year had 68 percent

employment. Architectural engineering technology was also offered at the high school level.

### **Manufacturing**

Inspectors, testers, sorters, samplers, and weighers assess raw materials and manufactured products for defects or deviations from specifications. The most common training level for this occupation is a high school diploma or equivalent. On-the-job training or a recognized apprenticeship can prepare individuals to be quality control technologists.

Welders, cutters, solderers, and brazers are in-demand statewide and across seven regions in Tennessee. Over 600 certificates were completed at Tennessee colleges along with nearly 300 high school CTE completers, preparing individuals along the pipeline to become welders.

Manufacturing programs with employment rates of more than 70 percent included the one-to-two-year certificate programs in machine tool technology/machinist, tool and die technology/technician, welding technology/welder, and industrial mechanics and maintenance technology. Operations management and supervision, a certificate program of less than one year, employed more than 82 percent of completers. Two associate degree programs, electromechanical technology and industrial mechanics and maintenance technology, had employment rates of 84 and 90 percent, respectively.

### **Transportation**

The transportation cluster contains several occupations that are in-demand statewide and in every region of the state, including automotive service technicians, bus and truck mechanics and diesel engine specialists, heavy and tractor-trailer truck drivers, and industrial truck and tractor operators. Several TCAT programs train individuals for these occupations, yielding a sizeable share of graduates who remain in Tennessee to work.

Several transportation programs awarding certificates at the one-to-two-year level had employment rates of 70 percent or above. These included autobody/collision and repair technology, automobile/automotive mechanics technology, diesel mechanics technology, and motorcycle maintenance and repair. The small aircraft powerplant technology associate degree program had an employment rate of 80 percent. The logistics, materials, and supply chain short-term certificate program also had an employment rate of more than 70 percent.

### **Business Management and Support Services**

Human resource (HR) specialists maintain knowledge of policies and procedures related to employment, hire and process new hires, prepare and maintain employment records, and address employee relation issues. Degree programs at the bachelor's and master's level

prepare individuals to become HR specialists; Tennessee colleges produced 67 degrees aligned with this occupation.

Some of the highest employment rates aligned with in-demand occupations include the 82 percent employment share for completers of the building/property maintenance certificate; the administrative assistant and secretarial science, general certificate program (72 percent) and associate degree program (69 percent); and the customer service management certificate program with an 83 percent employment rate and average salary of more than \$52,400.

In the more mathematically technical areas, the management science post bachelor's certificate completers experienced a placement rate of 689 percent and an average salary of \$74,130; the business statistics master's degree completers had an employment rate of 55 percent and average salary of \$75,851.

The lower placement rates in some of the managerial programs may be due to wage and employment data only being available for program completers who were employed in Tennessee; data on employment in other states were not available.

### **Finance**

Tennessee's finance and insurance sector has experienced some of the largest growth in the nation over the last few years. Tennessee's finance sector ranks 8<sup>th</sup> highest among all states by rate of job growth over the last five years (2016-2021). Accountants and auditors are in-demand across all of Tennessee's regions, typically requiring a bachelor's degree or higher with many online job postings seeking candidates with CPA certification.

Other occupations in-demand include financial managers, market research analysts, buyers and purchasing agents, and insurance sales agents. Programs are available primarily at the bachelor's degree level or higher, with the master's degree in accounting having a 68 percent employment rate. Secondary and postsecondary programs for accounting technicians are also available.

### **Sales and Marketing**

Retail trade employment was hit hard during the initial phase of the pandemic, as many consumers shifted to online shopping. Companies in this industry are beginning to grow their workforce again. First-line supervisors of retail sales workers and sales representatives of services are in-demand in every region of Tennessee, with job postings increasingly requiring skills in data analysis and customer management software.

The highest wages were earned by graduates of the master's degree program in electronic commerce (\$54,612).

## **Health Sciences**

Nationally, employment in healthcare occupations is projected to grow 16 percent from 2020 to 2030, primarily due to the need to care for an aging population. The aging population also puts new strains on the workforce in other sectors, as the Baby Boomer generation continues to retire and the slowdown in population growth will make it difficult to replace those retiring. The pandemic has added extra burdens to the healthcare system in Tennessee. Shortages of workers due to burnout and low pay have slowed recovery.

Occupations in demand in six or more regions include surgical technologists (6 regions), clinical laboratory technologists and technicians (7 regions), physical therapy assistants (10 regions), dental assistants (7 regions), medical assistants (8 regions), and phlebotomists (7 regions). Four regions have a need for more licensed practical nurses.

Due to increasing demand, program completers in the health sciences have some of the highest employment rates of any career cluster. Nineteen of the 46 program completer types had employment rates of 75 percent or more two quarters after graduation, including health information/medical records technicians, pharmacy techs, emergency medical technicians, surgical technologists, environmental health specialists, licensed practical nurses (LPNs), and phlebotomists.

The life sciences are a TNECD target industry sector; investment associated with this sector in our universities and world-class research facilities complement and enable the development of a capable workforce.

## **Human Services**

Human services occupations include those focused on societal and individual well-being. Nationally, employment in community and social occupations is projected to grow 12 percent from 2020 to 2030.

Substance abuse, behavioral disorder, and mental health counselors are in-demand in every region within Tennessee. Also, in demand in three regions of Tennessee are mental health and substance abuse social workers. The master's and bachelor's degrees in social work totaled 861 graduates. Six regions also had a need for social and human services assistants, requiring a high school degree.

Although graduates with one-to-two-year certificates in cosmetology had better than average rates of employment, wages earned were low. This could be related to reduced demand during the pandemic. Counselors with higher rates of employment included those with master's and educational specialist degrees. Both social workers with master's and bachelor's degrees had similar rates of employment (approximately 65 percent), but the master's degree graduates earned about \$11,000 more.

### **Education and Training**

The education and training career cluster includes educators, administrators, trainers, counselors, and other learning support services. Successful teacher recruitment and retention are essential for a high-quality education workforce; however, teacher shortages remain a challenge. The depth of the problem is not able to be measured due to a decentralized system of job postings. As a new pipeline for recruitment, Tennessee has begun the first of its kind apprenticeship program for teachers called Grow Your Own.

The shortage of childcare staff and providers has been exacerbated during the pandemic. Childcare teachers were in demand in 7 of 10 regions of the state. One out of five families in a national survey reported childcare disruptions during the pandemic; the survey also found one in five childcare providers were preparing to leave the field. Early childhood education programs had 155 bachelor's degree graduates in 2019-2020 and employment rates of almost 75 percent. Low wages impact staff recruitment and retention.

### **Protective Services and Law**

The protective services and law career cluster includes occupations focused on providing legal, public safety, and protective services. Two occupations in high demand in six regions of the state are paralegals and legal assistants and security guards, with security guards comprising nearly half of the total projected openings in this cluster. Several postsecondary programs in this career cluster had high placement rates, with five more than 75 percent: forensic science at the bachelor's degree level; and criminal justice/police science and fire science/firefighting at the certificate and associate degree levels. Paralegal programs had employment rates of more than 68 percent.

### **Arts and Communications**

Tennessee is a hub of creative innovation, technology, and performing arts. Tennessee is home to nine annual film festivals, a host of dance companies, and dozens of theatre troupes. The Arts & Economic Prosperity 5 Study indicates that the nonprofits arts and culture sector is a \$1.17 billion industry in Tennessee, supporting over 38,000 full-time equivalent jobs and generating \$135 million in local and state government revenue.

In-demand occupations identified in this study include graphic designers (in-demand in 8 regions), printing press operators (7 regions), editors (4 regions), and producers, directors, musicians, and singers (2 regions). Postsecondary programs related to these arts and communications areas are popular, with 2,311 receiving awards in these areas in 2019-2020.

### **Leisure and Recreation**

Tennessee is well known for its great outdoors, with 13 national parks, 56 state parks, and 84 natural areas. The pandemic negatively affected workers in leisure and recreation, with state tourism spending in 2020 declining by 32 percent from the previous year. The



promotion of outdoor travel opportunities helped Tennessee do better than the national decline of 42 percent. The leisure and hospitality sector is expected to have 10 percent growth in 2022 with rising wages in the industry and consumers shifting back to more in-person services.

Most of the in-demand occupations in the leisure and recreation career cluster require only a high school degree or the equivalent. Food service managers, supervisors of food preparation and serving workers, supervisors of housekeeping and janitorial workers, and supervisors of personal services and entertainment and recreation workers are all in-demand in nearly all regions of the state.

### **Information Technology**

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, largely driven by the expansion of cloud computing, big data, and information security. These occupations typically have high median wages in this state.

Tennessee's strong growth in the headquarters, finance, and tech industries, unique research and development facilities in St. Jude Children's Research Hospital, Vanderbilt University, Oak Ridge National Laboratory, Arnold Engineering Complex, and the University of Tennessee frequently employ computer and information technology occupations. Oracle expanding in the state is expected to add 8,500 jobs to the tech industry and will increase the demand for IT talent in the state.

The information technology occupations in demand in the most regions of the state include computer user support specialists (7 regions), computer programmers (5 regions), computer systems and information security analysts (4 regions), software developers (4 regions), and network and computer systems administrators (4 regions).

The information technology programs/award types with employment rates of seventy percent or more include the associate (70 percent) and master's degree (74 percent) programs in information technology, certificate programs in system, networking, and LAN/WAN management/manager (88 percent) and computer and information systems security/information assurance (85 percent), and the post bachelor's certificate program in medical informatics (92 percent). Average earnings for the master's degree program in information technology were nearly twice that of the associate degree program.

### **Engineering and Other STEM Programs**

Engineering and engineering-related occupations play an instrumental role for Tennessee businesses. Engineers and related positions are in-demand for several of 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.

The occupations that are in-demand in the most regions of Tennessee are civil engineers (6 regions), mechanical engineers (5 regions), electrical and electronic engineering technologists and technicians (8 regions), and calibration and all other technologists and technicians (6 regions). The engineers require a bachelor's degree, while technicians and technologists require associate degrees.

Of the 35 program award types related to these demand occupation areas, 11 had employment rates for completers of 70 percent or more. This included the bachelor's degree for general engineering, with an employment rate of 80 percent, the bachelor's degree in mechatronics, and nine other certificate or associate degree programs in a variety of engineering technology/technician programs. These technology/technician certificate and associate degree programs generally have entry-level wages significantly above the Tennessee average entry level wage for 2020 of \$22,715.

## **Introduction**

This report is prepared pursuant to Tennessee Code Annotated § 49-7-112(b) which directs the Tennessee Higher Education Commission (THEC), in partnership with the Tennessee Department of Labor and Workforce Development (TDLWD), Tennessee Department of Economic and Community Development (TNECD), and Tennessee Department of Education (TDOE), to “produce an annual report regarding state workforce need projections and credential production.”

This report includes information on in-demand occupations, aligned academic programs, including postsecondary degrees, high school career and technical education (CTE) completers, and apprenticeships. Accompanying dashboards and workbooks localize this information by local workforce development area (LWDA), referred to as regions, and provide information on the aligned academic programs.

This inaugural report is the culmination of two years of collaboration aligning methods for identifying in-demand occupations and creating an improved output for wide ranging stakeholders, serving as a roadmap to improving the talent pipeline of Tennessee’s workforce.

## **Data Use and Application**

This report is created to help stakeholders make informed decisions about education and training opportunities in their communities and regions. This section outlines some of the ways that readers can use this report.

### **Students, Job Seekers, and Workforce Counselors**

Students planning their careers, job seekers, and advisors can use this report to identify in-demand occupations and related programs. Community and faith-based organizations and pathways and re-entry coordinators can broaden their understanding of the variety of in-demand occupations across career clusters, the training options that are available to students and job seekers, and the outcomes of students completing training programs. This report is intended to assist individuals who may have limited access to or understanding of available supply and demand information.

### **K-12 Professionals**

Middle schools and high schools in Tennessee can use this report to identify opportunities such as work-based learning, dual enrollment, industry tours, and teacher externships. TDOE requires data on the in-demand occupations to be provided by applicants for the department's grant programs and other award-based initiatives. Examples include applications for TDOE's [Innovative High School Models](#) grant program, and the criteria for credentials included on the [Tennessee Promoted Student Industry Certification List](#).

### **Tennessee Colleges of Applied Technology (TCATs)**

TCATs can use this report to identify gaps in educational programming and opportunities to develop postsecondary programs aligned to established occupational needs. TCATs and their program advisory committees might use this report as a point of reference to create, expand, or downsize programs based upon latest trends. Data within the report can also be used for general reference, to write grants, and forecast. TCATs may also use information in this report to develop partnerships with area employers. This may include the establishment of pipelines for completer job placement or the identification of employers for general and program advisory committees.

### **Community Colleges**

Community colleges can use this report to establish new academic programs, modify existing programs, and introduce or remove concentrations. Specifically, this report can be used to collaborate with business, industry, government agencies, local agencies, and postsecondary institutions to efficiently implement workforce training programs, across occupation levels, that address the needs of Tennessee. This report can be used to connect degree completers to occupations, and employers, developing pipelines between colleges

and employers for job placement. This report could also be used more generally by community colleges offering critical data points for reporting and grant writing and determining instruction and industry needs in Tennessee.

The Motlow [State Automation & Robotics Training Center \(ARTC\)](#) and the [Aviation Technology Program](#) at Northeast State Community College represent examples of expanded programming in response to business demand. This report serves to demonstrate and encourage more opportunities like these.

## **Universities**

Universities can use this report to detect workforce need in the creation and update of academic programs, including certificates and other credentials, generally, and as part of [THEC's expedited academic programs approval process](#). This report could also be used as a supporting document for the creation of new concentrations or minors which align with in-demand job markets. Universities can use this report for evaluation or analyses of academic programs, to motivate student interest in in-demand occupations, or to increase application, retention, and completion rates for aligned programs, among other initiatives. Universities may also use this report to enhance partnerships with employers and industry, ensuring that programs are aligned with occupational needs and creating a pipeline of prospective employees for needed positions.

## **Industry Advocates and Economic Developers**

Business and industry professionals that advocate for business growth and economic vitality, can use this report and accompanying data to support initiatives that reduce workforce gaps present in their communities. This includes, economic developers, chambers of commerce, human resources groups, public policy advocacy groups, and industry advocacy groups. These stakeholders can use the report as a tool to build support and obtain resources for increasing the supply of workers in a given field. This report can identify occupations in demand with employers and determine how to alter Tennessee's education and training systems to meet those needs.

## **Workforce Development Professionals**

Local, regional, and state workforce development professionals can use this report to identify unique workforce needs in their communities, and in turn, develop workforce pipeline opportunities. Labor market information is essential for tracking and analyzing the condition of the economy across the state. Data analysis is vital in determining workforce training needs, identifying the availability of labor for employers, understanding wages, and exploring labor market trends. This report and its accompanying resources support a data-driven and collaborative research environment for Tennessee's workforce development

professionals. For example, data on in-demand occupations have been utilized in grant proposals, including the Governor’s Investment in Vocational Education (GIVE) grant.

### **Individuals Supporting Re-entry Services**

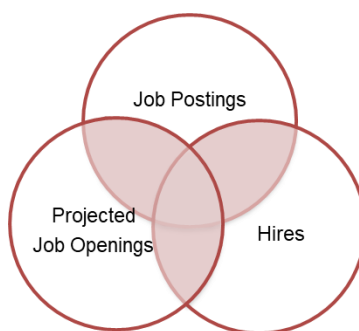
“Re-entry” is the transition from incarceration within prison, jail, or juvenile justice facilities and back to living in the community. Successful re-entry can have a direct impact on the state’s goals to (1) reduce recidivism rates, (2) improve social mobility, and (3) empower the economic sufficiency of communities and make them safer.

By using this report, justice involved individuals, their families, and supporting providers, like Tennessee Department of Correction or Tennessee Board of Regents, could identify in-demand occupations for which individuals may qualify, associated training programs, and the employment and wages that previous program completers have achieved in their first year. Stakeholders could use this report to assist those in re-entry to transition into the labor force by identifying pathways consistent with their skills and education—providing opportunities for advancement and reducing the risk of recidivism.

## In-Demand Occupations and Aligned Academic Supply

This section captures the 2022 in-demand occupations across Tennessee and the aligned secondary and postsecondary academic programs. An **in-demand occupation** is a job that Tennessee employers have a high demand to fill. An occupation is measured as in-demand when two of three measures of demand (job postings, projected job openings, or hires) are above the median relative to other occupations within the region.

### Measures for In-Demand Occupational Analysis



An **aligned academic program**<sup>2</sup> is a training program preparing students for careers in an in-demand occupation. The skills and knowledge developed through completion of an aligned academic program are matched with the skills and knowledge required for success in an occupation. These matches are made by using the Classification of Instructional Programs (CIP)<sup>3</sup> to Standard Occupational Classification (SOC)<sup>4</sup> crosswalk developed in partnership between the Bureau of Labor Statistics and National Center for Education Statistics.<sup>5</sup> This portion of the analysis captures data from Tennessee’s P20 Connect Data System for public and select private postsecondary completers<sup>6</sup>, secondary completers<sup>7</sup>, and employment outcomes.

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<sup>2</sup> This report includes registered apprenticeships, high school CTE completers, and postsecondary degree completers in data for aligned academic programs. There are other training initiatives, like industry certifications, that are not currently captured due to data availability.

<sup>3</sup> The [Classification of Instructional Programs \(CIP\)](#) is a taxonomic scheme that supports the accurate tracking and reporting of fields of study and program completions activity.

<sup>4</sup> The [Standard Occupational Classification \(SOC\)](#) is a federal statistical standard used by federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data.

<sup>5</sup> More information about BLS and NCES CIP to SOC Crosswalk can be found [here](#).

<sup>6</sup> Select Tennessee Independent Colleges and Universities Association (TICUA) institutions report to P20 Connect and those completers and their associated job market outcomes are included.

<sup>7</sup> For purposes of this report, high school CTE completers reflect a student completing three course credits within a CTE program of study or career cluster in alignment with the previous definition of CTE Concentrator. As part of the Strengthening Career and Technical Education for the 21st Century Act (Perkins V), this definition

For the first time, this year’s report captures in-demand occupations and aligned academic supply in the same section. This new approach can foster enhanced conversations about academic programming and how new and existing training programs can be leveraged to address workforce demands.

More information on the data sources and methodology for this analysis can be found on page 85. Details on in-demand occupations at the state and regional level can be found on [this dashboard](#) or in this [downloadable workbook](#).

### **How to Read Tables in this Section**

Occupations have been grouped throughout this report based on their career clusters, which are groupings of occupations and their connected training programs. The nationally recognized career clusters framework<sup>8</sup> is used in alignment with TDOE’s high school Career and Technical Education (CTE) planning<sup>9</sup> and the TDLWD’s aligned career clusters and programs of study which serves as a framework to organize occupations and training programs providing common pathways for prospective students to occupations (and vice versa).

Each career cluster has a section in the report which provides a table of the in-demand occupations within that career cluster<sup>10</sup> and tables with the aligned academic program supply. For most career clusters, there are multiple tables showing academic program supply. The first table highlights postsecondary degree completers, a second table highlights high school CTE Completers, and, for some clusters, a third table provides the number of students completing registered apprenticeships.<sup>11</sup>

### ***Clusters of In-Demand Occupations and Aligned Academic Programs***

<a href="#">Agriculture, Food, and Natural Resources</a>
<a href="#">Architecture and Construction</a>
<a href="#">Manufacturing</a>
<a href="#">Transportation</a>
<a href="#">Business Management and Support Services</a>
<a href="#">Finance</a>
<a href="#">Sales and Marketing</a>
<a href="#">Health Sciences</a>

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changed, lessening the required course credit requirements from three to two. More detail about the changes to this definition can be found [here](#).

<sup>8</sup> For more information see Advance CTE’s website explaining the 16 National Career Clusters Framework [here](#).

<sup>9</sup> Tennessee Department of Education’s Career Cluster Framework can be found [here](#).

<sup>10</sup> For purposes of this report, each occupation is categorized into only one cluster. In practice an occupation may be relevant to additional career clusters.

<sup>11</sup> Apprenticeship data is limited to the Agriculture, Food and Natural Resources, Architecture and Construction, Manufacturing, Transportation, and Engineering and Other STEM clusters.



**Clusters of In-Demand Occupations and Aligned Academic Programs, continued**

<a href="#">Human Services</a>
<a href="#">Education and Training</a>
<a href="#">Protective Services and Law</a>
<a href="#">Arts and Communication</a>
<a href="#">Leisure and Recreation</a>
<a href="#">Information Technology</a>
<a href="#">Engineering and Other STEM</a>

In addition to aligning with a career cluster framework, the report also highlights positions which comprise the workforce for TNECD’s target industry sectors.<sup>12</sup> TNECD has nine sectors which it prioritizes for business expansion and recruitment initiatives. 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 significant economic impact and high-quality job opportunities.

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.

<sup>12</sup> More information on each target industry sector is available at <https://tneecd.com/>.

- In the column named “Total # Regions”, a number from one to ten indicates the number of regions in which the occupation was found to be in-demand. The regions include the state’s nine Local Workforce Development Areas (LWDA), as well as a tenth region representing the state as a whole.<sup>13</sup>
- A “\*” denotes the occupation is important to one or more of TNECD’s target industry sectors.
- A “#” denotes the occupation is a STEM occupation.<sup>14</sup>
- 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.<sup>15</sup>

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.

***Academic Supply Table legends:***

For Postsecondary Completers:

- The six-digit code denotes the Classification of Instructional Program (CIP Code) for the academic program.<sup>16</sup>
- 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).<sup>17</sup>
- The Number of Graduates from 2019-20 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 Tennessee’s Unemployment Insurance (UI) records two quarters after graduation. This excludes individuals who remain enrolled in education.

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<sup>13</sup> Statewide is one region with the in-demand methodology applied at the state level. There are an additional nine LWDAs, or regions, composed of groups of counties within Tennessee. An occupation with a “10” indicates that the occupation was found to be in-demand in the statewide analysis and the analysis for each of the nine LWDAs, or regions, within the state.

<sup>14</sup> 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 2020 (XLS), <https://www.bls.gov/oes/additional.htm>

<sup>15</sup> More information about education training levels in BLS data can be found [here](#).

<sup>16</sup> More information about CIP codes can be found [here](#).

<sup>17</sup> TCAT diplomas are captured within the certificate degree level.

- Estimated First year Annual Wages of Graduates Employed in Tennessee denotes the estimated first year average annual wages of graduates found in UI data. Wages are pulled two quarters after graduation and are calculated by multiplying the quarterly wages by four.

For High School CTE Completers:

- The six-digit code denotes the Classification of Instructional Program (CIP Code) for the High School CTE Program.
- Program Title is the name of the academic program.
- The number of high school CTE completers, which are high school graduates who completed three course credits in a CTE program of study in a career cluster. This data reflects completers from 2018-19.
- Share of graduates employed in Tennessee represents the percentage of graduates found in Tennessee's Unemployment Insurance (UI) records two quarters after graduation. This excludes individuals who remain enrolled in education.
- Estimated First year Annual Wages of Graduates Employed in Tennessee denotes the estimated first year average annual wages of graduates found in UI data. Wages are pulled two quarters after graduation and are calculated by multiplying the quarterly wages by four.

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 2019-20.

## Agriculture, Food, and Natural Resources Occupations

In 2020, farming operations occupied around 40 percent of the state’s nearly 27.0 million acres of land area according to the Boyd Center for Business and Economic Research. Farming generated \$3.6 billion in cash receipts during 2020, “with about 65.5 percent of this value coming from crops and 34.5 percent from animals and animal products.” Tennessee is home to approximately 69,500 farming operations, which ranks 9<sup>th</sup> highest among all states.<sup>18</sup>

Veterinarians and veterinary technologists and technicians provide essential services for the health and safety of Tennessee’s animals and animal products.

Biological technicians support scientists by operating and maintaining instruments and other equipment, and by working with samples and experimental data.<sup>19</sup> Biological technicians in Tennessee are employed primarily in research and development, hospitals, pharmaceuticals, and other healthcare and life sciences fields.

Environmental scientists and specialists in Tennessee are employed in a range of industries including consulting, engineering, and research and development services. Environmental scientists research and communicate information on risks to the environment caused by pollutants or other hazards.<sup>20</sup>

Tennessee has an estimated 8.4 billion live trees<sup>21</sup> and 13.9 million acres in forest.<sup>22</sup> Logging equipment operators supply raw materials to companies needing wood and forest products for manufacture.

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
19-2041	Environmental Scientists and Specialists, Including Health	X	2	*	#	Bachelor's degree
19-4021	Biological Technicians		1	*	#	Bachelor's degree
29-1131	Veterinarians		2			Doctoral or professional degree
29-2056	Veterinary Technologists and Technicians		2			Associate degree
37-1012	First-Line Supervisors of Landscaping, Lawn Service, and Groundskeeping Workers	X	8			HS diploma or equivalent

<sup>18</sup> An [Economic Report to the Governor of Tennessee](#), 2022

<sup>19</sup> [O\\*NET OnLine](#), SOC Code [19-4021](#)

<sup>20</sup> [O\\*NET OnLine](#), SOC Code [19-2041](#)

<sup>21</sup> The University of Tennessee, Department of Agriculture and Resource Economics, [Economic Contributions of Agriculture and Forestry in Tennessee 2021](#)

<sup>22</sup> An [Economic Report to the Governor of Tennessee](#), 2022

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
37-3011	Landscaping and Groundskeeping Workers		4			No formal educ. credential
45-2091	Agricultural Equipment Operators		2			No formal educ. credential
45-2099	Agricultural Workers, All Other		1			No formal educ. credential
45-4022	Logging Equipment Operators		2			HS diploma or equivalent
51-8031	Water and Wastewater Treatment Plant and System Operators		1			HS diploma or equivalent
53-7081	Refuse and Recyclable Material Collectors		5			No formal educ. credential

The University of Tennessee system offers many academic programs to equip students for in-demand agriculture occupations.<sup>23</sup> Offerings include environmental science and information, food and agriculture business, natural resources, forestry, and veterinary medicine. Some of Tennessee’s community colleges, like Volunteer State Community College, provide specialized offerings, including a certificate preparing completers to work as a veterinary assistant.

In 2019-20, 365 students across the state completed postsecondary programs aligned with in-demand occupations in agriculture. Skills learned in these programs range from management and operation of the agricultural industry to various environmental and agricultural sciences, in addition to healthcare and cosmetic services for animals. Program completers may receive instruction in basic or advanced sciences, mathematics, diagnostics and testing, animal healthcare, law, policy, economics, and other social sciences, as well as training in administration and management.

### ***Postsecondary Agriculture, Food, & Natural Resources Degrees, 2019-20***

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
01.0101	Agricultural Business and Management, General	BA	13	46%	\$35,842
01.0102	Agribusiness/Agricultural Business Operations	BA	86	55%	\$37,594
51.2401	Veterinary Medicine	P	75	47%	\$79,428
01.0504	Dog/Pet/Animal Grooming	C<1YR	13	54%	\$16,565

<sup>23</sup> More information about the academic programs offered at all Tennessee public institutions can be found on [THEC's Academic Program Inventory](#).

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
51.0808	Veterinary/Animal Health Technology/Technician and Veterinary Assistant	AA	39	74%	\$25,945
03.0103	Environmental Studies	BA	14	57%	\$30,857
03.0104	Environmental Science	BA	53	53%	\$21,804
03.0201	Natural Resources Management and Policy	BA	25	44%	\$27,007
03.0501	Forestry, General	BA	16	31%	\$16,567
03.0104	Environmental Science	MA	19	63%	\$28,591
03.0299	Natural Resources Management and Policy, Other	MA	12	42%	\$25,160

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### ***High School CTE Agriculture, Food, & Natural Resources Completers, 2018-19***

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
01.0102	Agribusiness/Agricultural Business Operations	CTE HS	26	58%	\$16,148
01.1002	Food Technology and Processing	CTE HS	26	65%	\$16,734
26.1201	Biotechnology	CTE HS	5	20%	\$28,510
51.0808	Veterinary/Animal Health Technology/Technician and Veterinary	CTE HS	329	60%	\$13,636

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

### ***Agriculture, Food, & Natural Resources Apprenticeship Completers, 2019-20***

CIP Code	Program Title	Number of Completers
01.0605	Landscaping and Groundskeeping	1
15.0506	Water Quality and Wastewater Treatment	1

Source: TDLWD Apprenticeship Completer Data, Oct. 2019-Sept. 2020.

The only program with an employment rate greater than 70 percent was the associate degree program in veterinary/animal health technology/technician and veterinary assistant. This high school career and technology program had an employment rate of nearly 60 percent.

## Architecture and Construction Occupations

Occupations in architecture and construction need skilled workers that design, plan, manage, build, and maintain structures. Construction workers are highly sought after, as construction of new homes and buildings seeks to keep up with demand from population growth in Tennessee. Future construction employment growth will also be driven by large construction projects. Tennessee's position as a top state to do business has generated economic development successes, which in turn create jobs in architecture and construction. Among Tennessee's recent successes are Ford Motor Company's plans to build an electric vehicle and battery manufacturing plant at the Memphis Regional Megasite in West Tennessee.<sup>24</sup>

Several occupations in this group are in-demand statewide, and skilled workers are needed in every region or nearly every region across the state. 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.

Many of the in-demand occupations in the construction trades are tied to residential and commercial construction. In 2021, despite 1.1 million single-family homes beginning construction, demand outpaced supply.<sup>25</sup> The increasing need to build new housing stock across the state requires skilled tradespeople to fill that workforce. This includes construction managers, carpenters, cement masons and concrete finishers, construction laborers, operating engineers and other construction equipment operators, painters, plumbers, roofers and heating, air conditioning, and refrigeration mechanics and installers.

Cost estimators are employed in a variety of construction industries. Every region in Tennessee has a lower concentration of cost estimators than the national average. Supply chain issues, increased demand for products, and inflation since the onset of the pandemic has increased the present need for cost estimators in the state.

Electricians represent 13 percent of the total annual projected job openings in the construction and extraction occupations. Electricians are in-demand in every region in Tennessee and are key to several TNECD industry sectors including the automotive and the electrical equipment and appliance sectors. Within the automotive sector, Tennessee is developing as a leader in the electric vehicle (EV) industry. Electricians will be a key component to the adoption of electric vehicles in our state.<sup>26</sup> In February 2021, the

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<sup>24</sup> Office of the Governor, [Press Release](#)

<sup>25</sup> An [Economic Report to the Governor of Tennessee](#), 2022

<sup>26</sup> According to the U.S. Bureau of Labor Statistics, "Electricians install charging stations and any other equipment needed for electric vehicles. They attach the charging stations to lines that have been installed by electrical power-line installers and ensure the chargers are working properly. When there is a problem with the

Tennessee Valley Authority (TVA) and the Tennessee Department of Environment and Conservation announced their partnership to develop a statewide electric vehicle fast charging network to power the growth of EVs across Tennessee and to reduce barriers to transportation electrification.<sup>27</sup>

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
11-9021	Construction Managers	X	9			Bachelor's degree
13-1051	Cost Estimators	X	9			Bachelor's degree
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	X	9			HS diploma or equivalent
47-2021	Brickmasons and Blockmasons	X	4			HS diploma or equivalent
47-2031	Carpenters	X	9			HS diploma or equivalent
47-2051	Cement Masons and Concrete Finishers	X	7			No formal educ. credential
47-2061	Construction Laborers	X	10			No formal educ. credential
47-2071	Paving, Surfacing, and Tamping Equipment Operators	X	5			HS diploma or equivalent
47-2073	Operating Engineers and Other Construction Equipment Operators	X	10			HS diploma or equivalent
47-2081	Drywall and Ceiling Tile Installers		1			No formal educ. credential
47-2111	Electricians	X	10	*		HS diploma or equivalent
47-2141	Painters, Construction and Maintenance	X	8			No formal educ. credential
47-2152	Plumbers, Pipefitters, and Steamfitters	X	9	*		HS diploma or equivalent
47-2181	Roofers	X	5			No formal educ. credential
47-2211	Sheet Metal Workers		5	*		HS diploma or equivalent
47-2221	Structural Iron and Steel Workers		1			HS diploma or equivalent
47-3013	Helpers--Electricians	X	4			HS diploma or equivalent
47-4011	Construction and Building Inspectors	X	3			HS diploma or equivalent
47-4051	Highway Maintenance Workers		1			HS diploma or equivalent
47-4090	Miscellaneous Construction and Related Workers	X	5			HS diploma or equivalent
47-5022	Excavating and Loading Machine and Dragline Operators, Surface Mining		2			HS diploma or equivalent
49-2098	Security and Fire Alarm Systems Installers	X	2			HS diploma or equivalent
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	X	10	*		Postsecondary nondegree award
49-9051	Electrical Power-Line Installers and Repairers		2			HS diploma or equivalent

charger, electricians are called to make necessary repairs." - Source: U.S. Bureau of Labor Statistics, Careers in Electric Vehicles ([https://www.bls.gov/green/electric\\_vehicles/](https://www.bls.gov/green/electric_vehicles/)).

<sup>27</sup> Tennessee Department of Environment and Conservation, [Press Release](#)



SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
49-9052	Telecommunications Line Installers and Repairers		3			HS diploma or equivalent
49-9098	Helpers--Installation, Maintenance, and Repair Workers	X	7			HS diploma or equivalent
53-7021	Crane and Tower Operators		1			HS diploma or equivalent

The Tennessee Colleges of Applied Technology, the state’s leading providers of training in the architecture and construction fields, offer programs in plumbing; welding; electrical, heating, ventilation, and air conditioning (HVAC); and engineering—all ranging in complexity and program length, but typically in one to two-year programs with increasing levels of experience within specialized fields. Additional education in this field can be pursued through bachelor’s degree offerings in construction management at University of Tennessee, Knoxville, and Middle Tennessee State University. These programs result in a range of expected average wages for completers, depending upon field and education level, although they tend to fall below Tennessee’s median wage.

These programs prepare individuals to apply principles and technical knowledge in their field to install, construct, maintain, repair, and operate relevant equipment. Instruction includes designing and implementing testing and safety procedures, engineering drawing, report writing, specialized systems (e.g., electrical, HVAR, HVAC, water, sewer), building, remodeling, codes, standards, in addition to specialized skills—at both basic and advanced levels (e.g., welding and pipefitting). Further, at the higher award levels, these programs may prepare individuals to manage, coordinate, and/or supervise the construction process.

Training opportunities at the apprenticeship level also supply individuals to work in the construction trades. In 2019-20, 318 apprenticeships were completed preparing students to become electricians. Tennessee colleges have several ongoing partnerships with employers in these industries, with 53 additional linework completers.

GIVE Grantee TCAT Knoxville partners with East Tennessee HVAC for their Refrigeration Maintenance Technology/Technician program (CIP 47.0201). East TN HVAC serves as an industry partner providing students with work-based learning opportunities including offering externships, serving as guest speakers for K-12 classes, providing information about skills training and certifications, participating in career days and career fairs, and, when able, donating equipment and supplies. In addition, Forcum Lannom, a design and build contractor, partners with TCAT Newbern, as part of their GIVE grant, in their Building Construction Technology program (CIP 46.0415). Forcum Lannom strengthens programs by incorporating work-based learning components into the grant and providing hands-on

opportunities for students participating in the consortium. They are also engaged in consultation, speaking engagements, recruiting other industry partners, and the utilization of One-Stop Workforce System ([Jobs4TN.gov](http://Jobs4TN.gov)) for recruitment activities. To continuously improve grant initiatives, they also participate in evaluation activities to measure progress and satisfaction, including surveys and testimonials, regarding partnership successes.

## Architecture and Construction Programs

### *Postsecondary Architecture and Construction Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
15.0101	Architectural Engineering Technology/Technician	AA	11	82%	\$31,996
46.0301	Electrical and Power Transmission Installation/Installer, General	C1-2YR	63	65%	\$34,182
46.0302	Electrician	C<1YR	41	63%	\$33,919
46.0302	Electrician	C1-2YR	126	74%	\$32,844
46.0415	Building Construction Technology	C1-2YR	55	53%	\$25,666
46.0502	Pipefitting/Pipefitter and Sprinkler Fitter	C1-2YR	12	67%	\$21,366
46.0503	Plumbing Technology/Plumber	C1-2YR	12	42%	\$17,596
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician	C<1YR	91	68%	\$28,037
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician	C1-2YR	231	74%	\$34,537
52.2001	Construction Management	BA	61	66%	\$51,698

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

The highest employment rates for architecture and construction programs were for the architectural engineering technology/technician associate degree program (82 percent) and the one-to-two-year certificate programs for electrician (74 percent) and heating, air conditioning, ventilation and refrigeration (HVAC) maintenance technology/technician (75 percent). The HVAC certificate programs of less than one year had 68 percent employment. Architecture engineering technology was also offered at the high school level.

### **High School CTE Architecture and Construction Completers, 2018-19**

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ. Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
15.0101	Architectural Engineering Technology/Technician	CTE HS	578	53%	\$18,405
46.0415	Building Construction Technology	CTE HS	247	54%	\$17,495
46.9999	Construction Trades, Other	CTE HS	116	57%	\$17,477

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

### **Architecture and Construction Apprenticeship Completers, 2019-20**

<b>CIP Code</b>	<b>Program Title</b>	<b>Number of Completers</b>
15.0501	Heating, Air Conditioning and Refrigeration Technology/Technician	3
46.0201	Carpentry/Carpenter	28
46.0301	Electrical and Power Transmission Installation/Installer, General	1
46.0302	Electrician	318
46.0303	Line Worker	53
46.0414	Insulator	2
46.0503	Plumbing Technology/Plumber	75
46.9999	Construction Trades, Other	38
48.0509	Ironworking/Ironworker	43

Source: TDLWD Apprenticeship Completer Data, Oct. 2019-Sept. 2020.

## **Manufacturing Occupations**

Manufacturing represents 15 percent of Tennessee’s gross domestic product, the largest of any sector.<sup>28</sup> From November 2020 through October 2021, Tennessee exported \$31.8 billion in manufactured goods.<sup>29</sup> The largest categories of exported manufactured goods in Tennessee over the last year includes computer and electronic products; chemicals; transportation equipment; machinery; and electrical equipment, appliances, and components.

<sup>28</sup> U.S. Bureau of Economic Analysis, Gross Domestic Product by State, 2021 Quarter 3

<sup>29</sup> U.S. Census Bureau, USA Trade Online, State Export Data, Commodities (31,32,33), November 2020 – October 2021

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.<sup>30</sup> The Boyd Center for Business and Economic Research reports: "Manufacturing employment in Tennessee is projected to recover to pre-pandemic levels by 2023, whereas national manufacturing employment will remain below pre-pandemic levels throughout the decade."<sup>31</sup>

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 215 manufacturing projects with over 31,900 new job commitments. These 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.<sup>32</sup>

Metal and plastics workers, like machine setters, machinists, tool & die, and welders 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 600 certificates were completed at Tennessee colleges along with nearly 300 high school CTE completers, 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, residential building construction, or machine shops.<sup>33</sup>

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, foundries, and medical equipment and supplies manufacturing. This occupation may use precision measuring instruments and complex test equipment to detect deviations from specifications in manufactured parts and products.

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<sup>30</sup> U.S. Bureau of Labor Statistics, QCEW, Employment Location Quotient, June 2021

<sup>31</sup> An [Economic Report to the Governor of Tennessee](#), 2022

<sup>32</sup> TNECD [Press Release](#)

<sup>33</sup> Tennessee Department of Labor, [Jobs4TN.gov](#)

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping		3	*		HS diploma or equivalent
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	X	7	*		HS diploma or equivalent
49-2011	Computer, Automated Teller, and Office Machine Repairers	X	5	*		Some college, no degree
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers		3	*		Postsecondary nondegree award
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment		2	*		Postsecondary nondegree award
49-9041	Industrial Machinery Mechanics		2	*		HS diploma or equivalent
49-9043	Maintenance Workers, Machinery		4	*		HS diploma or equivalent
49-9044	Millwrights		2	*		HS diploma or equivalent
49-9062	Medical Equipment Repairers		1	*		Associate degree
49-9071	Maintenance and Repair Workers, General	X	7	*		HS diploma or equivalent
49-9099	Installation, Maintenance, and Repair Workers, All Other	X	8			HS diploma or equivalent
51-1011	First-Line Supervisors of Production and Operating Workers	X	9	*		HS diploma or equivalent
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers		4	*		HS diploma or equivalent
51-2041	Structural Metal Fabricators and Fitters		1	*		HS diploma or equivalent
51-3021	Butchers and Meat Cutters	X	6	*		No formal educ. credential
51-3022	Meat, Poultry, and Fish Cutters and Trimmers		3	*		No formal educ. credential
51-3092	Food Batchmakers	X	3	*		HS diploma or equivalent
51-3099	Food Processing Workers, All Other		1	*		No formal educ. credential
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic		1	*		HS diploma or equivalent
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic		1	*		HS diploma or equivalent
51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic		2	*		HS diploma or equivalent
51-4041	Machinists		6	*		HS diploma or equivalent
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic		3	*		HS diploma or equivalent
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic		2	*		HS diploma or equivalent
51-4111	Tool and Die Makers		1	*		Postsecondary nondegree award

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
51-4121	Welders, Cutters, Solderers, and Brazers	X	8	*		HS diploma or equivalent
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders		1	*		HS diploma or equivalent
51-4199	Metal Workers and Plastic Workers, All Other		3	*		HS diploma or equivalent
51-6063	Textile Knitting and Weaving Machine Setters, Operators, and Tenders		1			HS diploma or equivalent
51-6099	Textile, Apparel, and Furnishings Workers, All Other		1			HS diploma or equivalent
51-7041	Sawing Machine Setters, Operators, and Tenders, Wood		1			HS diploma or equivalent
51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing		2			HS diploma or equivalent
51-8013	Power Plant Operators		1			HS diploma or equivalent
51-9011	Chemical Equipment Operators and Tenders		1	*		HS diploma or equivalent
51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders		2	*		HS diploma or equivalent
51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	X	4	*		HS diploma or equivalent
51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	X	3	*		HS diploma or equivalent
51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders		1	*		HS diploma or equivalent
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	X	10	*		HS diploma or equivalent
51-9111	Packaging and Filling Machine Operators and Tenders	X	8	*		HS diploma or equivalent
51-9124	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	X	4	*		HS diploma or equivalent
51-9161	Computer Numerically Controlled Tool Operators		4	*		HS diploma or equivalent
51-9198	Helpers--Production Workers	X	7	*		HS diploma or equivalent
51-9199	Production Workers, All Other	X	6	*		HS diploma or equivalent
53-7063	Machine Feeders and Offbearers	X	5	*		No formal educ. credential

TCATs, the state's premier providers of technical training, offer programs in machine tool technology, industrial maintenance, mechatronics, and more to train individuals for employment in manufacturing roles. Completers of these short-term programs (typically two years or less) yield strong wages soon after graduation. Several programs captured on this list prepare individuals to apply basic engineering principles and technical skills in support of engineers engaged in developing and testing automated, servomechanical, and

other electromechanical systems. This includes instruction for various testing, reporting, analysis, and maintenance procedures. These programs may also prepare individuals to apply technical knowledge and skills to repair and maintain industrial machinery and equipment; to plan, manufacture, assemble, test, and repair parts, mechanisms, machines, and structures; and/or to apply technical knowledge and skills to operate machine tools. Additionally, these programs can prepare individuals to manage and direct the physical and/or technical functions of a firm or organization in related fields.

TCATs and community colleges have several partnerships with area employers to enhance the pipeline of degree completers for the manufacturing career cluster. GIVE Grantee TCAT Pulaski partners with Marelli, an automotive supplier, for their Welding Technology/Welder program (CIP 48.0508). GIVE Grantee Motlow State Community College partners with Franke, a Foodservice Systems company, for their Industrial Mechanics and Maintenance Technology program (CIP 47.0303). Both employers offer students opportunities for work-based learning, job-shadowing, and internships, and offers faculty and teachers externship opportunities. Employers also support programs as advisors communicating and collaborating on curriculum and instruction.

## Manufacturing Programs

### *Postsecondary Manufacturing Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
48.0501	Machine Tool Technology/Machinist	C<1YR	31	58%	\$19,755
48.0501	Machine Tool Technology/Machinist	C1-2YR	193	74%	\$34,206
48.0507	Tool and Die Technology/Technician	C1-2YR	11	100%	\$39,662
48.0508	Welding Technology/Welder	C<1YR	131	67%	\$30,000
48.0508	Welding Technology/Welder	C1-2YR	486	71%	\$30,770
15.0403	Electromechanical Technology/ Electromechanical Engineering Technology	C<1YR	75	63%	\$43,328
47.0303	Industrial Mechanics and Maintenance Technology	C<1YR	87	66%	\$30,118
52.0205	Operations Management and Supervision	C<1YR	34	82%	\$38,221
47.0303	Industrial Mechanics and Maintenance Technology	C1-2YR	414	81%	\$41,780
15.0403	Electromechanical Technology/ Electromechanical Engineering Technology	AA	118	84%	\$47,590
47.0303	Industrial Mechanics and Maintenance Technology	AA	10	90%	\$67,483

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### **High School CTE Manufacturing Completers, 2018-19**

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ. Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
14.4201	Mechatronics, Robotics, and Automation Engineering	CTE HS	63	65%	\$16,399
14.4201	Mechatronics, Robotics, and Automation Engineering	CTE HS	1	100%	\$7,880
15.0499	Electromechanical and Instrumentation and Maintenance Technology	CTE HS	8	75%	\$17,769
46.9999	Construction Trades, Other	CTE HS	116	57%	\$17,477
47.0105	Industrial Electronics Technology/Technician	CTE HS	24	54%	\$20,536
47.0303	Industrial Mechanics and Maintenance Technology	CTE HS	1	100%	\$7,365
48.0503	Machine Shop Technology/Assistant	CTE HS	117	56%	\$20,013
48.0508	Welding Technology/Welder	CTE HS	281	55%	\$20,479
48.0703	Cabinetmaking and Millwork/Millwright	CTE HS	35	54%	\$16,166

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

### **Manufacturing Apprenticeship Completers, 2019-20**

<b>CIP Code</b>	<b>Program Title</b>	<b>Number of Completers</b>
15.0403	Electromechanical Technology/ Electromechanical Engineering Technician	11
15.0404	Instrumentation Technology/Technician	1
41.0303	Chemical Process Technology	79
47.0101	Electrical/Electronics Equipment Installation and Repair, General	6
47.0303	Industrial Mechanics and Maintenance	28
48.0501	Machine Tool Technology/Machinist	4
48.0503	Machine Shop Technology/Assistant	2
48.0506	Sheet Metal Technology/Sheetworking	21
48.0507	Tool and Die Technology/Technician	12
48.0511	Metal Fabricator	2
48.0801	Boilermaking/Boilermaker	125

Source: TDLWD Apprenticeship Completer Data, Oct. 2019-Sept.2020.

Manufacturing programs with employment rates of more than 70 percent included the one-to-two-year certificate programs in machine tool technology/machinist, tool and die technology/technician, welding technology/welder, and industrial mechanics and maintenance technology. Operations management and supervision, a certificate program of less than one year, employed more than 82 percent of completers. Two associate degree



programs, electromechanical technology and industrial mechanics and maintenance technology, had employment rates of 84 and 90 percent, respectively.

Two high school CTE programs are also notable for high employment rates. The employment rate for the electromechanical and instrumentation and maintenance technology program was 75 percent; for the mechatronics program, it was 65 percent. Two apprenticeship programs with high numbers of completers included chemical process technology and boilermaking.

## **Transportation Occupations**

Tennessee is a leading state in transportation, distribution, and logistics. Tennessee's geographic location is central to a large consumer base in the Southeastern United States and offers immediate access to eight interstate highways reaching 60 percent of the U.S. population within an 11-hour drive. The state has six Class I railroads, four commercial airports and more than 1,000 miles of navigable waterways. Tennessee also boasts the busiest cargo airport in the Western hemisphere—the FedEx World Hub in Memphis, which covers over 880 acres and is the largest sorting facility in the world. These are among the characteristics of Tennessee that attract companies which rely on transportation positions.

The pandemic led to a large boom in e-commerce, which will likely continue in the future according to DHL's predictions for 2022.<sup>34</sup> E-commerce as a share of retail sales doubled from 2015 to 2020, reaching 16 percent in 2020 Q4.<sup>35</sup> Companies in the e-commerce, distribution, and logistics industries employ occupations in this cluster. This includes companies such as Amazon and FedEx, which have a large presence in the state, as well as distribution centers for retailers such as Academy Sports + Outdoors (Cookeville), The Gap (Gallatin), and Lowe's (Robertson County).

Production, planning, and expediting clerks are in-demand across the state. Most Tennesseans employed in this field work in the warehousing and storage industry. They coordinate and expedite the flow of work and materials within or between departments of an establishment according to a production schedule. Their skills include customer service, positive work ethic, interpersonal skills, time management, and attention to detail. Currently about ten percent of online job postings require an associate or bachelor's degree for this occupation, although 75 percent of the online job postings for this occupation do not specify any education level.<sup>36</sup>

According to the Tennessee Department of Transportation (TDOT)<sup>37</sup> Tennessee's industries relying on freight have been growing due to increased production and consumption of

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<sup>34</sup> DHL, [Delivery and Logistics Trends for 2022](#)

<sup>35</sup> An [Economic Report to the Governor of Tennessee](#), 2022

<sup>36</sup> [Jobs4TN.gov](#), Occupation Data, Occupation Summary

<sup>37</sup> Tennessee Department of Transportation, [Statewide Multimodal Freight Plan](#), amended 05-21-2021

commodities, however there is a decline in the number of truck drivers to move the increasing freight. TDOT's statewide freight plan identifies "a need for workforce development to recruit and train new drivers." Heavy and tractor-trailer truck drivers and industrial truck and tractor operators are in-demand in every region of the state and are both key to TNECD's target industry sectors.

The transportation cluster contains several other occupations that are in-demand statewide and in every region of the state, including automotive service technicians, bus and truck mechanics and diesel engine specialists, and industrial truck and tractor operators. Several TCAT programs train individuals for these occupations, yielding a sizeable share of graduates who remain in Tennessee to work.

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
13-1081	Logisticians		5	*		Bachelor's degree
43-5021	Couriers and Messengers	X	1	*		HS diploma or equivalent
43-5061	Production, Planning, and Expediting Clerks	X	9	*		HS diploma or equivalent
43-5071	Shipping, Receiving, and Inventory Clerks		6	*		HS diploma or equivalent
49-3011	Aircraft Mechanics and Service Technicians		1	*		Postsecondary nondegree award
49-3021	Automotive Body and Related Repairers	X	6			HS diploma or equivalent
49-3023	Automotive Service Technicians and Mechanics	X	10	*		Postsecondary nondegree award
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	X	10	*		HS diploma or equivalent
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	X	9	*		HS diploma or equivalent
49-3053	Outdoor Power Equipment and Other Small Engine Mechanics		1			HS diploma or equivalent
49-3093	Tire Repairers and Changers		1			HS diploma or equivalent
53-1047	First-Line Supervisors of Transportation and Material Moving Workers, Except Aircraft Cargo Handling Supervisors		4	*		HS diploma or equivalent
53-3031	Driver/Sales Workers		3	*		HS diploma or equivalent
53-3032	Heavy and Tractor-Trailer Truck Drivers	X	10	*		Postsecondary nondegree award
53-3033	Light Truck Drivers		5	*		HS diploma or equivalent
53-3052	Bus Drivers, Transit and Intercity	X	2			HS diploma or equivalent

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
53-3058	Passenger Vehicle Drivers, Except Bus Drivers, Transit and Intercity		1			No formal educ. credential
53-3099	Motor Vehicle Operators, All Other		1			No formal educ. credential
53-7051	Industrial Truck and Tractor Operators	X	10	*		No formal educ. credential
53-7061	Cleaners of Vehicles and Equipment		1	*		No formal educ. credential
53-7062	Laborers and Freight, Stock, and Material Movers, Hand	X	8	*		No formal educ. credential
53-7064	Packers and Packers, Hand		1	*		No formal educ. credential
53-7121	Tank Car, Truck, and Ship Loaders		1			No formal educ. credential

Tennessee’s colleges offer an array of degree programs designed to prepare Tennesseans for work in transportation. Tennessee’s Colleges of Applied Technology (TCATs) offer diplomas in automotive technology, collision repair, and diesel-powered equipment, among others. Tennessee’s public universities, including Middle Tennessee State University, University of Memphis, and University of Tennessee, Knoxville, offer bachelor’s degrees in supply chain management to support employer needs for skilled professionals in transportation occupations.

In 2019-20, over 1,200 students completed degrees in postsecondary programs aligned with these in-demand occupations. These academic programs teach individuals to apply technical knowledge and skills to repair, service, maintain, reconstruct, and/or finish automobiles, buses, ships, trucks, railroad locomotives, motorcycles, some aircraft components, construction equipment, electrical generators, and related equipment. These programs can also prepare individuals to instruct, manage, and/or coordinate all logistical functions in an enterprise, ranging from acquisitions to receiving and handling, through internal allocation of resources to operations units, to the handling and delivery of output.

## Transportation Programs

### *Postsecondary Transportation Degrees, 2019-20*

CIP Code	Program Title	Educ Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
47.0603	Autobody/Collision and Repair Technology/Technician	C<1YR	23	48%	\$20,165
47.0603	Autobody/Collision and Repair Technology/Technician	C1-2YR	89	70%	\$25,166

CIP Code	Program Title	Educ Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
47.0604	Automobile/Automotive Mechanics Technology/Technician	C<1YR	108	65%	\$26,454
47.0604	Automobile/Automotive Mechanics Technology/Technician	C1-2YR	183	75%	\$27,351
47.0605	Diesel Mechanics Technology/Technician	C<1YR	19	58%	\$15,324
47.0605	Diesel Mechanics Technology/Technician	C1-2YR	111	76%	\$35,987
47.0607	Airframe Mechanics and Aircraft Maintenance Technology/Technician	C1-2YR	50	60%	\$27,547
47.0608	Aircraft Powerplant Technology/Technician	C1-2YR	13	62%	\$12,567
47.0608	Aircraft Powerplant Technology/Technician	AA	10	80%	\$15,748
47.0611	Motorcycle Maintenance and Repair Technology/Technician	C<1YR	19	58%	\$23,440
47.0611	Motorcycle Maintenance and Repair Technology/Technician	C1-2YR	22	77%	\$23,662
49.0205	Truck and Bus Driver/Commercial Vehicle Operator and Instructor	C<1YR	244	62%	\$38,783
52.0203	Logistics, Materials, and Supply Chain Management	C<1YR	21	71%	\$35,916
52.0203	Logistics, Materials, and Supply Chain Management	BA	349	50%	\$47,830

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### **High School CTE Transportation Completers, 2018-19**

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
47.0603	Autobody/Collision and Repair Technology/Technician	CTE HS	109	62%	\$19,159
47.0604	Automobile/Automotive Mechanics Technology/Technician	CTE HS	490	59%	\$18,255
47.0605	Diesel Mechanics Technology/Technician	CTE HS	8	63%	\$23,895
51.0810	Emergency Care Attendant (EMT Ambulance)	CTE HS	138	59%	\$13,231
52.0203	Logistics and Materials Management	CTE HS	9	44%	\$22,380

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

### **Transportation Apprenticeship Completers, 2019-20**

<b>CIP Code</b>	<b>Program Title</b>	<b>Number of Completers</b>
47.0604	Automobile/Automotive Mechanics Technology	1

Source: TDLWD Apprenticeship Completer Data, Oct. 2019-Sept. 2020.

Several transportation programs awarding certificates at the one-to-two-year level had employment rates of 70 percent or above. These included autobody/collision and repair technology, automobile/automotive mechanics technology, diesel mechanics technology, and motorcycle maintenance and repair. The small aircraft powerplant technology associate degree program had an employment rate of 80 percent. The logistics, materials, and supply chain short-term certificate program also had an employment rate of more than 70 percent.

### **Business Management and Support Services Occupations**

Tennessee has seen growth in the recent years in headquarters and other business support services. The headquarters industry alone has grown by 7,080 net new jobs (16 percent) in Tennessee over the last five years, which ranks 9<sup>th</sup> highest in the nation.<sup>38</sup> Tennessee ranks among the top ten states in the nation for growth in other industries related to this career cluster, such as the Management, Scientific, and Technical Consulting Services industry which had 8,800 net new jobs or 32 percent growth over the last five years in Tennessee, and Business Support Services where Tennessee employment grew by 6 percent or 1,300 net new jobs during this time period.

The business management and support services occupations include managerial and professional occupations, which can be found in every sector of the economy but are especially present in headquarters and back-office operations. Tennessee is home to many global companies which require these in-demand jobs. This includes ten Fortune500 companies based in Tennessee.<sup>39</sup> Other businesses employing business management and support services occupations include Amazon's Operations Center of Excellence in downtown Nashville, The ICEE Company, Bridgestone Americas, Regal Entertainment Group, and Tractor Supply Company, to name a few.

Skills required for these occupations include organization, time management, customer service, and communication.

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<sup>38</sup> TNECD evaluation of employment data from EMSI (2021.4 QCEW Employees)

<sup>39</sup> [Fortune500](#), 2021

As human capital becomes increasingly important due to tight labor markets across the state, businesses have a heightened demand for human resource specialists that recruit, screen, and interview candidates.

Management analysts, who study and design efficient and effective procedures and operations, are another in-demand occupation that will be key to successful strategies for recruitment and retention of workers as well as other challenges businesses may be facing. Online job postings for management analysts seek candidates with SQL, MS Office, ATM, PowerPoint, and Tableau skills.<sup>40</sup>

Training and development specialists that design and conduct work-related training programs are key to strategies for growing a company’s workforce from within—this is important to Tennessee companies that have specialized workforce needs and companies that are increasing their use of new technologies.

Medical and health services managers plan, direct, or coordinate medical and health services in hospitals, clinics, and other organizations. Most Tennesseans employed in this occupation work for general medical and surgical hospitals or offices of physicians.

Bookkeeping, accounting, and auditing clerks typically require some college and skills with Microsoft Office products, like Word, Outlook, and Excel. Bookkeeping, accounting, and auditing clerks in Tennessee work in industries such as accounting, tax preparation, and payroll services, and in management of companies and enterprises.<sup>41</sup>

Other occupations in high demand include property, real estate, and community association managers (7 regions); payroll and timekeeping clerks (9 regions); customer service representatives (10 regions); executive secretaries and executive administrative assistants (10 regions); and secretaries and administrative assistants, except legal, medical, and executive (10 regions).

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
11-1021	General and Operations Managers		3	*		Bachelor's degree
11-3010	Administrative Services and Facilities Managers		3	*		Bachelor's degree
11-3051	Industrial Production Managers		1	*		Bachelor's degree
11-3061	Purchasing Managers	X	5	*		Bachelor's degree
11-3071	Transportation, Storage, and Distribution Managers		5	*		HS diploma or equivalent

<sup>40</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

<sup>41</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
11-3121	Human Resources Managers		3	*		Bachelor's degree
11-3131	Training and Development Managers		1	*		Bachelor's degree
11-9041	Architectural and Engineering Managers		2	*	#	Bachelor's degree
11-9111	Medical and Health Services Managers	X	9	*		Bachelor's degree
11-9141	Property, Real Estate, and Community Association Managers	X	7			HS diploma or equivalent
11-9198	Personal Service Managers, All Other; Entertainment and Recreation Managers, Except Gambling; and Managers, All Other	X	10	*		Bachelor's degree
13-1071	Human Resources Specialists	X	10	*		Bachelor's degree
13-1075	Labor Relations Specialists		1			Bachelor's degree
13-1111	Management Analysts	X	9	*		Bachelor's degree
13-1141	Compensation, Benefits, and Job Analysis Specialists	X	5	*		Bachelor's degree
13-1151	Training and Development Specialists	X	8	*		Bachelor's degree
13-1198	Project Management Specialists and Business Operations Specialists, All Other		5	*		Bachelor's degree
15-2031	Operations Research Analysts	X	2	*	#	Bachelor's degree
27-3031	Public Relations Specialists		3	*		Bachelor's degree
31-9094	Medical Transcriptionists		1			Postsecondary nondegree award
43-1011	First-Line Supervisors of Office and Administrative Support Workers		2	*		HS diploma or equivalent
43-3011	Bill and Account Collectors	X	6	*		HS diploma or equivalent
43-3021	Billing and Posting Clerks		5	*		HS diploma or equivalent
43-3031	Bookkeeping, Accounting, and Auditing Clerks	X	8	*		Some college, no degree
43-3051	Payroll and Timekeeping Clerks	X	9			HS diploma or equivalent
43-4031	Court, Municipal, and License Clerks		1			HS diploma or equivalent
43-4051	Customer Service Representatives	X	10	*		HS diploma or equivalent
43-4071	File Clerks	X	4			HS diploma or equivalent
43-4111	Interviewers, Except Eligibility and Loan	X	4			HS diploma or equivalent
43-4131	Loan Interviewers and Clerks	X	6			HS diploma or equivalent
43-4151	Order Clerks		4	*		Some college, no degree
43-4161	Human Resources Assistants, Except Payroll and Timekeeping	X	6			Associate degree
43-4199	Information and Record Clerks, All Other		3			HS diploma or equivalent
43-5011	Cargo and Freight Agents	X	2	*		HS diploma or equivalent
43-5032	Dispatchers, Except Police, Fire, and Ambulance	X	6	*		HS diploma or equivalent

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
43-6011	Executive Secretaries and Executive Administrative Assistants	X	10	*		HS diploma or equivalent
43-6012	Legal Secretaries and Administrative Assistants		1			HS diploma or equivalent
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	X	10	*		HS diploma or equivalent
43-9021	Data Entry Keyers	X	7	*		HS diploma or equivalent
43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	X	2			HS diploma or equivalent
43-9061	Office Clerks, General	X	10	*		HS diploma or equivalent
43-9071	Office Machine Operators, Except Computer		1			HS diploma or equivalent
43-9199	Office and Administrative Support Workers, All Other		4			HS diploma or equivalent

Many of Tennessee’s institutions offer academic programs aligned with in-demand business management and support services occupations. These include academic programs in business management, organizational leadership, human resources management, customer service, training, and development as well as specialized management and administrative programs, like medical and engineering industries. Completers can pursue short-term certificates through professional programs depending on the occupation of interest. For example, an individual could seek a Certificate in Office Technology, an Associate of Applied Science in Business Management, or a Bachelor of Business Administration in Management. The occupational opportunities and wage premium of these credentials will vary.

University of Tennessee, Chattanooga offers a Data Analytics, Master of Science program (CIP 52.1301) where students analyze data sets provided by industry partners like Electric Power Board (EPB), BlueCross BlueShield of Tennessee, and the Tennessee Valley Authority to help solve current problems faced by these employers.

Generally, these programs prepare individuals to perform managerial duties, technical support, and applied research functions related to the operation of commercial and non-profit enterprises as well as the buying and selling of goods and services. More specifically, these programs could prepare individuals to practice as licensed professionals/assistants in health care professions and related fields, or to be in administrative and support services; to organize and manage music organizations; to work in operations/personnel management; or to apply technical knowledge and skills in the building, inspecting, and maintaining of structures and related properties.



## Business Management and Administrative and Support Services Programs

### *Postsecondary Management and Support Services Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
09.0902	Public Relations/Image Management	BA	128	59%	\$27,075
15.1501	Engineering/Industrial Management	BA	101	58%	\$55,342
15.1501	Engineering/Industrial Management	MA	32	41%	\$97,598
46.0401	Building/Property Maintenance	C1-2YR	11	82%	\$24,865
50.1003	Music Management	BA	179	63%	\$20,380
51.0701	Health/Health Care Administration/Management	AA	11	91%	\$39,968
51.0701	Health/Health Care Administration/Management	BA	145	52%	\$40,072
51.0701	Health/Health Care Administration/Management	MA	60	47%	\$60,819
51.0702	Hospital and Health Care Facilities Administration/Management	MA	15	40%	\$50,429
51.0706	Health Information/Medical Records Administration/Administrator	BA	13	62%	\$33,838
51.0706	Health Information/Medical Records Administration/Administrator	CPBA	13	77%	\$19,685
51.0706	Health Information/Medical Records Administration/Administrator	MA	30	57%	\$63,266
51.0710	Medical Office Assistant/Specialist	C1-2YR	18	78%	\$19,847
51.0713	Medical Insurance Coding Specialist/Coder	C<1YR	11	82%	\$37,736
51.3802	Nursing Administration	MA	15	60%	\$70,431
52.0101	Business/Commerce, General	BA	89	71%	\$47,278
52.0101	Business/Commerce, General	MA	107	56%	\$54,352
52.0201	Business Administration and Management, General	BA	2075	59%	\$36,227
52.0201	Business Administration and Management, General	MA	1425	56%	\$74,377
52.0201	Business Administration and Management, General	D	13	23%	\$42,333
52.0204	Office Management and Supervision	BA	19	37%	\$42,905
52.0207	Customer Service Management	C<1YR	18	83%	\$52,483
52.0213	Organizational Leadership	BA	262	56%	\$47,370
52.0213	Organizational Leadership	CPBA	29	62%	\$63,484
52.0213	Organizational Leadership	MA	100	29%	\$61,770
52.0213	Organizational Leadership	D	19	37%	\$57,164

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
52.0299	Business Administration, Management and Operations, Other	AA	20	70%	\$52,486
52.0299	Business Administration, Management and Operations, Other	MA	57	44%	\$63,782
52.0401	Administrative Assistant and Secretarial Science, General	C1-2YR	25	72%	\$26,716
52.0401	Administrative Assistant and Secretarial Science, General	AA	62	69%	\$28,391
52.0402	Executive Assistant/Executive Secretary	C<1YR	86	51%	\$18,979
52.0402	Executive Assistant/Executive Secretary	C1-2YR	200	66%	\$21,361
52.0407	Business/Office Automation/Technology/Data Entry	C<1YR	36	64%	\$30,225
52.0407	Business/Office Automation/Technology/Data Entry	C1-2YR	27	63%	\$21,149
52.0701	Entrepreneurship/Entrepreneurial Studies	C<1YR	17	59%	\$18,913
52.0701	Entrepreneurship/Entrepreneurial Studies	BA	24	63%	\$27,903
52.1001	Human Resources Management/Personnel Administration, General	BA	47	53%	\$39,409
52.1001	Human Resources Management/Personnel Administration, General	MA	20	55%	\$46,420
52.1005	Human Resources Development	CPBA	21	33%	\$33,888
52.1005	Human Resources Development	MA	32	59%	\$43,761
52.1101	International Business/Trade/Commerce	BA	43	56%	\$32,623
52.1101	International Business/Trade/Commerce	MA	10	70%	\$18,508
52.1301	Management Science	CPBA	32	69%	\$74,130
52.1302	Business Statistics	BA	106	51%	\$48,538
52.1302	Business Statistics	MA	40	55%	\$75,851

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### ***High School CTE Management and Support Services Completers, 2018-19***

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
51.2211	Health Services Administration	CTE HS	4	75%	\$16,422
52.0204	Office Management and Supervision	CTE HS	255	56%	\$14,861

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

Some of the highest employment rates aligned with demand occupations include the 82 percent employment share for completers of the building/property maintenance certificate; the administrative assistant and secretarial science, general certificate program (72 percent) and associate degree program (69percent); and the customer service management certificate program with an 83 percent employment rate and average salary of more than \$52,400.

Other programs with employment greater than 70 percent were the medical office assistant/specialist certificate program; medical insurance coding; and the health information/medical records administration post bachelor's certificate program. The medical records master's degree program had lower placement but an average salary of more than \$63,000.

In the more mathematically technical areas, the management science post bachelor's certificate completers experienced a placement rate of 69 percent and an average salary of \$74,130; the business statistics master's degree completers had an employment rate of 55 percent and average salary of \$75,851.

The lower placement rates in some of the managerial programs may be due to wage and employment data only being available for program completers who were employed in Tennessee; data on employment in other states were not available.

## **Finance Occupations**

Tennessee's finance and insurance sector<sup>42</sup> has experienced some of the largest growth in the nation in the last few years. The industry's employment grew by 11 percent or 11,400 net new jobs over the last five years (2016-2021). Tennessee's finance sector ranks 8th highest among all states by rate of job growth over this period.<sup>43</sup> The sector's growth is evidenced by companies such as Alliance Bernstein and Ernst & Young who have established major new operations in Tennessee within recent years.

Accountants and auditors are in-demand across all of Tennessee's regions. These positions typically require a bachelor's degree or higher. Nearly 500 of the online job postings for accountants include seeking a candidate with an American Institute of CPAs (AICPA) certification.<sup>44</sup>

Financial managers are in-demand in a majority of Tennessee's regions, and typically make over \$100,000 in Tennessee. Financial managers make up 8 percent of the total annual projected job openings in management occupations. Industries in which they typically work include accounting, tax preparation, bookkeeping and payroll services; headquarters

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<sup>42</sup> North American Industry Classification System (NAICS) - 52 Finance and Insurance

<sup>43</sup> TNECD evaluation of employment data from EMSI (2021.4 QCEW employees)

<sup>44</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

operations; or nondepository credit intermediation. Many of the online job postings are looking for candidates with an American Institute of CPAs (AICPA) certification.<sup>45</sup>

Market research analysts and marketing specialists primarily work in the following industries: management, scientific, and technical consulting services; headquarters operations; computer systems design and related services; agencies, brokerages, and other insurance related activities; and insurance carriers. Approximately 70 percent of the current online job postings for market research analysts and marketing specialists require a bachelor’s or master’s degree. Companies like FedEx, HCA Healthcare, and Eastman Chemical are all looking for market research analyst and marketing specialist candidates. Job skills that candidates need for this occupation include customer service, problem solving, attention to detail, organizational skills, and data analytics.<sup>46</sup>

Buyers and purchasing agents are responsible for buying merchandise or commodities and include wholesale and retail buyers as well as buyers of agricultural products. Dollar General and Volkswagen Group of America currently have online job postings for wholesale and retail buyers.<sup>47</sup> Farm product buyers and purchasing agents include tree farm contractors, grain buyers, and tobacco buyers. Tobacco products account for 20 percent of the values of food- and fiber-related manufacturing shipments in Tennessee.<sup>48</sup>

Insurance sales agents sell life, property, casualty, health, automotive, or other types of insurance. This occupation is typically employed by agencies, brokerages, and other insurance related activities or insurance carriers. Insurance sales agents are in-demand in nearly all regions of Tennessee.

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
11-3031	Financial Managers		6	*		Bachelor's degree
13-1020	Buyers and Purchasing Agents	X	9	*		Bachelor's degree
13-1031	Claims Adjusters, Examiners, and Investigators		5			HS diploma or equivalent
13-1161	Market Research Analysts and Marketing Specialists	X	9	*		Bachelor's degree
13-2011	Accountants and Auditors	X	9	*		Bachelor's degree
13-2052	Personal Financial Advisors	X	6			Bachelor's degree
13-2082	Tax Preparers	X	5	*		HS diploma or equivalent

<sup>45</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

<sup>46</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

<sup>47</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

<sup>48</sup> An [Economic Report to the Governor of Tennessee](#), 2022

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
13-2072	Loan Officers		3	*		Bachelor's degree
13-2098	Financial and Investment Analysts, Financial Risk Specialists, and Financial Specialists, All Other		4	*		Bachelor's degree
41-3021	Insurance Sales Agents	X	8			HS diploma or equivalent

The University of Tennessee System and Locally Governed Institutions provide programs in accounting, business, agricultural business, resources, finance, and general economics that feed into in-demand occupations in the banking and finance fields. Apart from accounting, these programs tend to be smaller than others, generating 195 postsecondary credentials in 2019-20, and these programs start at the bachelor's degree level. University of Tennessee, Knoxville offers the widest variety of programs in this field. These programs tend to focus on the systematic study and application of the production, conservation, and allocation of resources in conditions of scarcity, together with organizational frameworks related to these processes. These programs might include instruction in economic theory, micro- and macroeconomics, comparative economic systems, money and banking systems, agricultural economics, international economics, quantitative analytical methods, and applications to specific industries and public policy issues.

## Finance Programs

### *Postsecondary Finance Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
45.0601	Economics, General	BA	74	35%	\$35,308
52.0301	Accounting	BA	560	62%	\$38,345
52.0301	Accounting	MA	268	68%	\$57,103
52.0302	Accounting Technology/Technician and Bookkeeping	C<1YR	37	70%	\$38,643
52.0302	Accounting Technology/Technician and Bookkeeping	C1-2YR	24	63%	\$31,337
52.0302	Accounting Technology/Technician and Bookkeeping	AA	20	55%	\$39,134
52.0304	Accounting and Finance	BA	13	624%	\$32,601
52.0601	Business/Managerial Economics	BA	100	52%	\$27,983
52.0601	Business/Managerial Economics	D	11	18%	\$32,227
01.0103	Agricultural Economics	MA	10	40%	\$31,076

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### **High School CTE Finance Completers, 2018-19**

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ. Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
52.0302	Accounting Technology/Technician and Bookkeeping	CTE HS	36	50%	\$12,580

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

The highest placement rate was for the accounting technology/technician and bookkeeping certificate program (less than one year) at 70 percent, with average salary just over \$38,600. The associate degree program had a lower placement rate but slightly higher average salary. Of the high school/CTE program graduates, half were employed within two quarters of graduation.

Among the accounting program graduates, the highest placement rate was for those who achieved master’s degrees (68 percent), with average salaries of \$57,103.

### **Sales and Marketing Occupations**

The sales and marketing career cluster includes occupations that plan, manage, and perform marketing activities or are otherwise responsible for sales of goods and services to consumers.

Retail trade employment was hit hard during the initial phase of the pandemic, as many consumers shifted to online shopping. Tennessee’s retail trade industry employs 326,200 people, which reflects a loss of approximately 7,500 jobs (2 percent) since 2019.<sup>49</sup> Across other states, the industry experienced an even more significant decline, with a retail trade workforce that is 6 percent below pre-pandemic levels on average across the nation. Companies in this industry are beginning to grow their workforce again. This study reports on the jobs that were in-demand throughout the challenges of the pandemic.

First-line supervisors of retail sales workers and sales representatives of services are in-demand in every region of Tennessee. Job postings for these two occupations are increasingly requiring skills with data analysis software, database querying software, enterprise planning software, and customer relationship management software. After the onset of the pandemic, many retail operations in Tennessee began offering pick-up and delivery of products at unprecedented rates, and these two occupations likely needed to upskill quickly to adapt to the changing marketplace. Buy online, pick up in store (BOPIS),

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<sup>49</sup> TNECD analysis of employment data using EMSI (2021.4 QCEW employees)

also known as click-and-collect, is the process of a consumer ordering an item online and picking it up later that day or in the following days. Business Insider predicts that click-and-collect more than doubled in 2020 nationally and will sustain double-digit growth rates through 2024.<sup>50</sup> First-line supervisors of retail sales workers will likely continue to be on the forefront of managing the process and retail sales workers directly engage in click-and-collect retail sales in Tennessee.

This career cluster prepares students for marketing and sales positions which are prevalent in a vast array of other industries outside of retail sales. Marketing managers and sales managers, for example, often gain employment in headquarters operations or consulting firms. In Tennessee they earn median wages of \$99,800 and \$111,600, respectively.<sup>51</sup>

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
11-2021	Marketing Managers		3	*		Bachelor's degree
11-2022	Sales Managers		2	*		Bachelor's degree
27-1026	Merchandise Displayers and Window Trimmers		3	*		HS diploma or equivalent
41-1011	First-Line Supervisors of Retail Sales Workers	X	10			HS diploma or equivalent
41-1012	First-Line Supervisors of Non-Retail Sales Workers		4	*		HS diploma or equivalent
41-2021	Counter and Rental Clerks		1			No formal educ. credential
41-2022	Parts Salespersons	X	4	*		No formal educ. credential
41-3011	Advertising Sales Agents	X	4			HS diploma or equivalent
41-3031	Securities, Commodities, and Financial Services Sales Agents		1			Bachelor's degree
41-3091	Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	X	10	*		HS diploma or equivalent
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products		5	*	#	Bachelor's degree
41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products		6	*		HS diploma or equivalent
41-9011	Demonstrators and Product Promoters		1			No formal educ. credential
41-9022	Real Estate Sales Agents	X	6			HS diploma or equivalent

Academic programs within the sales and marketing cluster are offered at the certificate, bachelor's, and master's level by several institutions across the state. Programs in

<sup>50</sup> Business Insider, [Click-and-Collect 2021: Buy Online, Pick-up In Store \(BOPIS\) Industry Trends](#)

<sup>51</sup> TNECD analysis of employment data from EMSI (2021.4 QCEW Employees)

marketing rank as the 5<sup>th</sup> largest by number of graduates in relation to all other programs associated with in-demand occupations in Tennessee. Within this field, offerings include advertising, marketing, customer service, and professional selling. Completers can pursue careers in electric commerce, marketing management, and general pathways in advertising and customer service. These programs focus on preparing individuals to function as advertising or marketing assistants, technicians, and managers. They also train individuals to plan, manage, supervise, and market electronic business operations, products, and services provided online. Instruction might include consumer psychology, relevant research and analysis, public speaking, communications, organization and operations, professional standards and ethics, and management, as well as other applicable theory and technical skills.

## Sales and Marketing Programs

### *Postsecondary Sales and Marketing Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
09.0903	Advertising	BA	75	55%	\$26,569
52.1401	Marketing/Marketing Management, General	BA	700	63%	\$32,337
52.1804	Selling Skills and Sales Operations	C<1YR	20	65%	\$26,080
52.0208	E-Commerce/Electronic Commerce	MA	14	64%	\$54,612

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### *High School CTE Sales and Marketing Completers, 2018-19*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
52.0701	Entrepreneurship/Entrepreneurial Studies	CTE HS	123	58%	\$16,094
52.1401	Marketing/Marketing Management, General	CTE HS	270	60%	\$15,256

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

The number of sales and marketing programs are small compared to other program areas. However, marketing and sales programs from certificate to master's degree had placement rates above 60 percent. The highest wages were earned by graduates of the master's degree in electronic commerce (\$54,612).



## Health Sciences Occupations

Nationally, employment in healthcare occupations is projected to grow 16 percent from 2020 to 2030, primarily due to the need to care for an aging population.<sup>52,53</sup> Tennessee's, and the nation's, aging population will continue to generate demand for healthcare. The aging population also puts new strains on the workforce in other sectors, as the Baby Boomer generation continues to retire and the slowdown in population growth will make it difficult to replace those retiring.<sup>54</sup>

The pandemic has placed extra burden on Tennessee's healthcare systems and healthcare workers. Employment in education and health services in Tennessee is not expected to recover until 2023. "A shortage of healthcare workers due to burnout and poor pay among some healthcare occupations is impeding the jobs recovery in this sector."<sup>55</sup>

Most of Tennessee's in-demand health sciences occupations are in local healthcare services industries, such as hospitals, clinics, doctor's offices, nursing homes, and ambulatory services. These occupations will typically require a degree, certificate, and many a license to practice. Allied health is a growing need in Tennessee—these are healthcare professionals that do not autonomously practice medicine, nursing, pharmacy, or dentistry.

Physician assistants provide healthcare services typically performed by a physician, under the supervision of a physician, and must graduate from an accredited program for physician assistants. Physician assistants work primarily in office of physicians, outpatient care centers, and general medical and surgical hospitals.<sup>56</sup>

Surgical technologists, under the supervision of surgeons, registered nurses, or other surgical personnel, assist in operations including setting up an operating room, preparing and transporting patients for surgery, adjusting lights and equipment, and passing instruments and other supplies to surgeons. Covenant Health, HCA Healthcare, Vanderbilt University Medical Center, and Community Health Systems all currently have openings to fill for surgical technologists.<sup>57</sup>

Occupations in demand in six or more regions include surgical technologists, clinical laboratory technologists and technicians (7 regions), physical therapy assistants (10

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<sup>52</sup> U.S. Bureau of Labor Statistics, [Occupational Outlook Handbook, Healthcare Occupations](#)

<sup>53</sup> The 2020 decennial census showed that Tennessee's population increase over the last 10 years is smaller than gains seen in the previous two decades. "Over the past 30 years, other studies have shown that much of the state's population increase has been driven by net migration gains—more people moving into the state than moving out. While that general trend continues, a decline in birth rates that began in 2007 dampened Tennessee's overall growth between 2010 and 2020." -- Tennessee State Data Center, [Tennessee Population Tops 6.9 Million in First 2020 Census Result](#)

<sup>54</sup> An [Economic Report to the Governor of Tennessee](#), 2022

<sup>55</sup> An [Economic Report to the Governor of Tennessee](#), 2022

<sup>56</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

<sup>57</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

regions), dental assistants (7 regions), medical assistants (8 regions), and phlebotomists (7 regions). Four regions have a need for more licensed practical nurses.

Growing expertise in healthcare fields also supports research and development activity in physical, engineering and life sciences, which encompasses nearly all types of life sciences research except for nanotechnology and biotechnology. Life sciences research includes various branches of medical research, such as genetics, human biology, dental, bacteriological, and veterinary.

TNECD's life sciences target industry sector includes four key industry segments: biosciences logistics and distribution; medical devices and equipment; drugs and pharmaceuticals; and research, testing, and medical labs. Tennessee has a robust presence of healthcare companies in the manufacturing, distribution and logistics, headquarters, and business services industries. While the life sciences target sector excludes local healthcare services, which are prevalent in this career cluster, all the healthcare industries and associated workforce complement one another due to shared assets and expertise. The assets which lend to the strength of all life sciences industries in Tennessee include our universities, world-class research facilities, and capable workforce.

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
19-5011	Occupational Health and Safety Specialists		1	*		Bachelor's degree
29-1031	Dietitians and Nutritionists		1			Bachelor's degree
29-1071	Physician Assistants	X	5			Master's degree
29-1122	Occupational Therapists		2			Master's degree
29-1123	Physical Therapists		2			Doctoral or professional degree
29-1126	Respiratory Therapists		3			Associate degree
29-1127	Speech-Language Pathologists		3			Master's degree
29-1151	Nurse Anesthetists		1			Master's degree
29-1171	Nurse Practitioners		4			Master's degree
29-1215	Family Medicine Physicians		1			Doctoral or professional degree
29-1228	Physicians, All Other; and Ophthalmologists, Except Pediatric		1			Doctoral or professional degree
29-1292	Dental Hygienists		3			Associate degree
29-2010	Clinical Laboratory Technologists and Technicians		7			Bachelor's degree
29-2034	Radiologic Technologists and Technicians		1			Associate degree
29-2040	Emergency Medical Technicians and Paramedics		1			Postsecondary nondegree award
29-2052	Pharmacy Technicians		2			HS diploma or equivalent

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
29-2055	Surgical Technologists	X	6			Postsecondary nondegree award
29-2061	Licensed Practical and Licensed Vocational Nurses		4			Postsecondary nondegree award
29-2098	Medical Dosimetrists, Medical Records Specialists, and Health Technologists and Technicians, All Other		1			Postsecondary nondegree award
29-9098	Health Information Technologists, Medical Registrars, Surgical Assistants, and Healthcare Practitioners and Technical Workers, All Other		1			Postsecondary nondegree award
31-1131	Nursing Assistants		2			Postsecondary nondegree award
31-2011	Occupational Therapy Assistants		4			Associate degree
31-2021	Physical Therapist Assistants	X	10			Associate degree
31-9011	Massage Therapists	X	4			Postsecondary nondegree award
31-9091	Dental Assistants	X	7			Postsecondary nondegree award
31-9092	Medical Assistants	X	8			Postsecondary nondegree award
31-9093	Medical Equipment Preparers		2			HS diploma or equivalent
31-9097	Phlebotomists	X	7			Postsecondary nondegree award
31-9099	Healthcare Support Workers, All Other		4			HS diploma or equivalent

Institutions across Tennessee provide academic programs in the health sciences that provide completers with general and specialized training to fulfill in-demand occupations in the state. In these programs individuals are prepared under supervision, in person or remotely, by health information administrators, physicians, occupational therapists, pharmacists, physical therapists, surgical nurses, clinical laboratory scientists, medical technologists, registered nurses, dentists, and/or other health care professionals. One of the more competitive programs in the list, Nurse Anesthesia, places only 26 percent of completers in the Tennessee job market and is one of the most lucrative, at an expected average annual wage of \$184,000. Programs at the University of Tennessee Health Science Center and select private colleges prepared 174 Master's in Physician's Assistant completers in 2019-20 with approximately one-third of those graduates found in the Tennessee job market after two quarters.

Programs in this field include both programs oriented toward training for healthcare research and for healthcare practice. While not an exhaustive list, completers may be prepared to work with various forms of data; conduct administrative services and clinical duties; administer medical care; prepare, provide, or manage operations; handle medical emergencies; employ specialized medicine/therapies; develop care plans; ensure medical standards/practice; conduct medical imaging, testing, trials, or research; own an individual practice; study factors affecting human health/safety; work in long-term care facilities; and work in specialized medical fields/functions. These programs may include instruction in a range of scientific arenas as well as research, analysis, mathematics, differing fields of medicine, laboratory procedures, data management, medical law and ethics, communications, office procedures, examination, measurement/testing, therapies, patient education, management skills, record keeping, psychology, pharmaceuticals, public policy analysis, professional standards, health care systems, and working with specialized populations.

## Health Sciences Programs

### *Postsecondary Health Sciences Degrees, 2019-20*

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
19.0501	Foods, Nutrition, and Wellness Studies, General	BA	48	50%	\$21,143
30.1901	Nutrition Sciences	BA	24	42%	\$18,433
51.0202	Audiology/Audiologist	D	41	20%	\$48,416
51.0203	Speech-Language Pathology/Pathologist	MA	41	56%	\$46,894
51.0204	Audiology/Audiologist and Speech-Language Pathology/Pathologist	MA	93	58%	\$52,182
51.0601	Dental Assisting/Assistant	AA	16	69%	\$22,054
51.0602	Dental Hygiene/Hygienist	AA	47	87%	\$36,347
51.0602	Dental Hygiene/Hygienist	BA	76	65%	\$50,770
51.0707	Health Information/Medical Records Technology/Technician	C<1YR	23	83%	\$29,543
51.0707	Health Information/Medical Records Technology/Technician	C1-2YR	68	79%	\$26,818
51.0707	Health Information/Medical Records Technology/Technician	AA	37	84%	\$33,164
51.0805	Pharmacy Technician/Assistant	C1-2YR	83	77%	\$20,296
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	C<1YR	549	85%	\$38,729
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	C1-2YR	110	95%	\$55,366

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	AA	27	82%	\$56,114
51.0905	Nuclear Medical Technology/Technologist	C1-2YR	14	57%	\$38,934
51.0908	Respiratory Care Therapy/Therapist	AA	65	89%	\$53,573
51.0908	Respiratory Care Therapy/Therapist	BA	50	52%	\$45,609
51.0909	Surgical Technology/Technologist	C1-2YR	105	88%	\$33,704
51.0909	Surgical Technology/Technologist	AA	42	91%	\$39,450
51.0911	Radiologic Technology Science- Radiographer	BA	83	65%	\$46,628
51.0912	Physician Assistant	MA	174	31%	\$66,988
51.1004	Medical Laboratory Technician	AA	68	87%	\$42,322
51.1005	Clinical Laboratory Science, Medical Technology	BA	70	54%	\$56,338
51.1201	Medicine*	P	228	36%	\$54,646
51.2202	Environmental Health**	AA	15	93%	\$42,549
51.2306	Occupational Therapy/Therapist	MA	99	46%	\$41,249
51.2306	Occupational Therapy/Therapist	D	24	46%	\$52,572
51.2308	Physical Therapy/Therapist	D	170	58%	\$58,971
51.3101	Dietetics/Dietitian	BA	15	33%	\$28,301
51.3101	Dietetics/Dietitian	CPBA	20	30%	\$22,461
51.3102	Clinical Nutrition/Nutritionist	MA	30	63%	\$33,891
51.3501	Massage Therapy/Therapeutic Massage	C1-2YR	11	82%	\$30,529
51.3804	Nurse Anesthetist	D	27	26%	\$183,528
51.3818	Nursing Practice	D	22	50%	\$104,843
51.3901	Licensed Practical/Vocational Nurse Training	C<1YR	71	72%	\$23,986
51.3901	Licensed Practical/Vocational Nurse Training	C1-2YR	1107	81%	\$35,098
51.0601	Dental Assisting/Assistant	C1-2YR	132	86%	\$20,636
51.0801	Medical/Clinical Assistant	C1-2YR	98	75%	\$22,259
51.0801	Medical/Clinical Assistant	AA	13	100%	\$26,783
51.0803	Occupational Therapist Assistant	AA	70	67%	\$26,403
51.0806	Physical Therapy Technician/Assistant	AA	123	69%	\$27,501
51.1009	Phlebotomy Technician/Phlebotomist	C<1YR	44	80%	\$20,534
51.1012	Sterile Processing Technology/Technician***	C<1YR	11	73%	\$26,858
51.3501	Massage Therapy/Therapeutic Massage	C<1YR	27	67%	\$18,584
51.3902	Nursing Assistant/Aide and Patient Care Assistant/Aide	C<1YR	71	79%	\$13,608

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

Notes:

- \* Information is not available on completers of internship/residency programs.
- \*\*The Environmental Health (51.2202) associate degree aligns with 19-5011 occupational health and safety specialists.
- \*\*\* Aligns with 31-9093 medical equipment preparers.

### **High School CTE Health Sciences Completers, 2018-19**

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ. Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
51.3902	Nursing Assistant/Aide and Patient Care Assistant/Aide	CTE HS	247	61%	\$14,848

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

Programs to build the health care pipeline are found at every level of the educational system, from certificates less than one year in length to doctoral and professional degrees. Due to increasing demand, program completers in the health sciences have some of the highest employment rates of any career cluster. Eighteen of the 46 program completer types had employment rates of 75 percent or more two quarters after graduation.

These programs ranged from health information/medical records technology/technician at the certificate and associate degree levels to pharmacy technicians with certificates to emergency medical technology/technician programs of various lengths. Associate degree recipients in dental hygiene had an 87 percent employment rate; graduates of associate degrees in surgical technology were employed at the rate of 91 percent; and those with associate degrees in environmental health at 93 percent. Licensed practical nurses with one-to-two-year certificates had nearly 81 percent employment; dental assistants, phlebotomists, and patient care assistants had high employment rates as well.

### **Human Services Occupations**

Human services occupations include those focused on societal and individual well-being. Nationally, employment in community and social occupations is projected to grow 12 percent from 2020 to 2030.<sup>58</sup> As our society grows and changes, demand for occupations focusing on nutritional, behavioral, and mental health will likely increase.

The pandemic shed new light on behavior and mental health services, needs, and access in Tennessee. According to the Sycamore Institute, “A majority of Tennessee adults experienced symptoms of depression and anxiety at some point in the last 18 months. Meanwhile, drug overdose deaths have surged, and it appears more people consumed

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<sup>58</sup> U.S. Bureau of Labor Statistics, [Occupational Outlook Handbook, Community and Social Service Occupations](#)

more alcohol often than perhaps ever before. At the same time, the necessities and strains of the pandemic have often limited access to behavioral health care.”<sup>59</sup>

Substance abuse, behavioral disorder, and mental health counselors are in-demand in every region within Tennessee. These counselors advise individuals, families, or groups with alcohol, tobacco, drug, stress management, self-esteem, or other problems. Many counsel others with emphasis on prevention to promote optimum mental and emotional health.

Mental health and substance abuse social workers are also in-demand in Tennessee. These social workers typically work in outpatient care centers; psychiatric and substance abuse hospitals; and residential intellectual and developmental disability, mental health, and substance abuse facilities. Many online job postings are searching for candidates with social worker or nursing credentials and certifications.<sup>60</sup> Social and human services assistants, requiring only a high school education, also were in demand in six regions of the state.

In 2021, Governor Bill Lee renewed the proposal for the Mental Health Trust Fund to assist K-12 families facing significant mental health issues in the wake of COVID-19.<sup>61</sup> The Mental Health Trust Fund received an investment of \$250 million.<sup>62</sup> Several in-demand occupations attend to the mental health of Tennessee children, including clinical, counseling, and school psychologists; educational, guidance, and career counselors and advisors; child, family, and school social workers; and community and social service specialists (all other).

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
11-9151	Social and Community Service Managers	X	4			Bachelor's degree
19-3031	Clinical, Counseling, and School Psychologists	X	5			Doctoral or professional degree
21-1012	Educational, Guidance, and Career Counselors and Advisors		5			Master's degree
21-1013	Marriage and Family Therapists		1			Master's degree
21-1015	Rehabilitation Counselors		1			Master's degree
21-1018	Substance Abuse, Behavioral Disorder, and Mental Health Counselors	X	10			Bachelor's degree
21-1019	Counselors, All Other		3			Master's degree

<sup>59</sup> Sycamore Institute, [Mental Health, Substance Abuse, and COVID-19 in Tennessee](#)

<sup>60</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

<sup>61</sup> Office of the Governor, [Press Release](#)

<sup>62</sup> Office of the Governor, [Press Release](#)

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
21-1021	Child, Family, and School Social Workers		3			Bachelor's degree
21-1022	Healthcare Social Workers		1			Master's degree
21-1023	Mental Health and Substance Abuse Social Workers	X	3			Master's degree
21-1093	Social and Human Service Assistants	X	6			HS diploma or equivalent
21-1099	Community and Social Service Specialists, All Other		3			Bachelor's degree
39-5012	Hairdressers, Hairstylists, and Cosmetologists		3			Postsecondary nondegree award
39-5094	Skincare Specialists		1			Postsecondary nondegree award

Tennessee's Colleges of Applied Technology and universities offer a diverse selection of awards and programs that feed into in-demand occupations in human services. Programs vary significantly in content, where some institutions offer cosmetology, barbering, and aesthetics—preparing completers to provide professional services related to cosmetology, funeral services, entertainment, and food preparation and service. Other programs include counseling, academic advising, psychology, research, human services, and social work. The most prolific among the human services programs are the Master's and Bachelor's degrees in Social Work, with 525 and 336 completers in 2019-20, respectively. Programs in human services might prepare completers to practice as licensed professionals and assistants in the health care professions and related clinical sciences and administrative and support services; to analyze, manage, and deliver public programs and services; to study of the behavior of individuals, independently or collectively, and the physical and environmental bases of mental, emotional, and neurological activity, or the theory and practice of learning and teaching and related research; or to provide administrative and support services.

## Human Services Programs

### *Postsecondary Human Services Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
12.0401	Cosmetology/Cosmetologist, General	C<1YR	36	56%	\$14,329
12.0401	Cosmetology/Cosmetologist, General	C1-2YR	270	62%	\$15,246
12.0402	Barbering/Barber	C1-2YR	18	39%	\$22,092



CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
12.0409	Aesthetics/Esthetician and Skin Care Specialist	C<1YR	54	57%	\$21,635
12.0499	Cosmetology and Related Personal Grooming Arts, Other	C1-2YR	15	67%	\$17,880
13.1101	Counselor Education/School Counseling and Guidance Services	MA	165	68%	\$41,392
13.1101	Counselor Education/School Counseling and Guidance Services	EDS	18	72%	\$35,846
13.1102	College Student Counseling and Personnel Services	MA	18	39%	\$47,352
42.0101	Psychology, General	MA	76	62%	\$39,729
42.0101	Psychology, General	D	28	18%	\$57,048
42.2703	Developmental and Child Psychology	BA	14	57%	\$26,445
42.2803	Counseling Psychology	MA	35	54%	\$36,401
42.2804	Industrial and Organizational Psychology	BA	25	88%	\$31,675
42.2806	Educational Psychology	MA	40	50%	\$38,563
42.2806	Educational Psychology	D	11	64%	\$62,925
42.2813	Applied Psychology	BA	20	75%	\$42,065
42.2899	Clinical, Counseling and Applied Psychology, Other	MA	34	41%	\$34,439
42.2899	Clinical, Counseling and Applied Psychology, Other	D	10	70%	\$59,090
44.0000	Human Services, General	BA	56	59%	\$20,678
44.0000	Human Services, General	MA	15	67%	\$42,579
44.0701	Social Work	BA	336	65%	\$27,934
44.0701	Social Work	MA	525	66%	\$39,250
44.0701	Social Work	D	24	17%	\$45,018
44.0799	Social Work, Other	BA	20	35%	\$29,412
44.0799	Social Work, Other	CPBA	44	59%	\$40,739
51.1505	Marriage and Family Therapy/Counseling	MA	66	26%	\$21,132
51.1508	Mental Health Counseling/Counselor	MA	50	52%	\$35,789

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### **High School CTE Human Services Completers, 2018-19**

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
12.0401	Cosmetology/Cosmetologist, General	CTE HS	407	62%	\$12,110
12.0402	Barbering/Barber	CTE HS	7	57%	\$3,154

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
13.1210	Early Childhood Education and Teaching	CTE HS	35	54%	\$12,110
19.0799	Human Development, Family Studies, and Related Services, Other	CTE HS	264	62%	\$12,563

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

Although graduates with one-to-two-year certificates in cosmetology had better than average rates of employment, wages earned were low. This could be related to reduced demand during the pandemic. Counselors with higher rates of employment included those with master’s and educational specialist degrees. Both social workers with master’s and bachelor’s degrees had similar rates of employment (about 65 percent), but the master’s degree graduates earned about \$11,000 more on average.

### Education and Training Occupations

The education and training career cluster includes educators, administrators, trainers, counselors, and other learning support services. Recruitment and retention are critical for a high-quality and consistent teaching workforce. Across the nation and in Tennessee, teacher shortages and retention are a topic of concern. According to the Tennessee Department of Education, even before the pandemic, “after five years, only six out of ten teachers were teaching in the same school.”<sup>63</sup> The pandemic put additional strain on the teacher workforce and on school districts across the state due to a rapidly changing environment, as normal rhythms of the school year were disrupted, and new ways of virtual learning were introduced. While the sector has relatively average growth projections,<sup>64</sup> there has been tremendous churn in the education workforce that has generated employer demand.

Preschool teachers are in demand in seven of the 10 regions in Tennessee. The usual training for this occupation is an associate degree. In the RAPID (Rapid Assessment of Pandemic Impact on Development) survey, which is a national survey with a large sample of parents with young children, about one-fifth of families had their childcare disrupted. Childcare providers in the survey had significant difficulty with staffing shortages (60 percent had difficulty during the pandemic compared to about one-third before); one of five providers were considering leaving the childcare business altogether.<sup>65</sup>

<sup>63</sup> Tennessee Department of Education, [Teacher Retention in Tennessee](#)

<sup>64</sup> Nationally, employment in education, training, and library occupations is projected to grow about as fast as the average for all occupations. -- U.S. Bureau of Labor Statistics, [Occupational Outlook Handbook, Education, Training and Library Occupations](#)

<sup>65</sup> RAPID-EC, [Childcare Shortages Weigh Heavily on Parents and Providers](#), November 2021

In 2020, the Tennessee Department of Education (TDOE) announced the award of \$2 million in grant funding to seven Educator Preparation Programs (EPPs) for the purpose of forming or expanding state recognized Grow Your Own partnerships to increase access and remove barriers to the teaching profession.<sup>66</sup> Tennessee also recently increased the teacher salary component of the Basic Education Program (BEP) by 4 percent.<sup>67</sup>

As noted in our Data Sources and Methodology section on page 85, there are some potential data limitations related to demand for occupations in the education and training career cluster. Job postings for teachers are decentralized in Tennessee, hindering our ability to comprehensively assess job postings for this occupation. Alternative methods to collect this data are under consideration for future iterations of this report.

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
11-9033	Education Administrators, Postsecondary		4			Master's degree
25-2011	Preschool Teachers, Except Special Education	X	7			Associate degree
25-3021	Self-Enrichment Teachers	X	5			HS diploma or equivalent
25-9031	Instructional Coordinators		2			Master's degree

Tennessee’s universities provide bachelor’s, master’s, and doctoral degrees for in-demand education and training occupations. The share of completers that are employed after graduating is over 61 percent across all academic programs in this cluster. These types of instructional programs focus on the theory and practice of learning and teaching, and related research, as well as administrative and support services. These programs include lessons in curriculum, instruction, leadership, and administration in early childhood, K-12, and higher education specializations. Completers might receive instruction in different levels and approaches to theory; curriculum planning, evaluation, principles, and techniques; supervising; management; administrative duties; law; and ethics, research, and pedagogy.

<sup>66</sup> Tennessee Department of Education, [Grow Your Own](#)

<sup>67</sup> Office of the Governor, [Press Release](#)

## Education and Training Programs

### *Postsecondary Education Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
13.0301	Curriculum and Instruction	MA	356	82%	\$48,446
13.0301	Curriculum and Instruction	EDS	37	95%	\$62,710
CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
13.0301	Curriculum and Instruction	D	26	62%	\$68,200
13.0401	Educational Leadership and Administration, General	CPBA	10	90%	\$69,144
13.0401	Educational Leadership and Administration, General	MA	339	881%	\$56,376
13.0401	Educational Leadership and Administration, General	EDS	60	87%	\$64,721
13.0401	Educational Leadership and Administration, General	D	147	76%	\$77,631
13.0404	Educational, Instructional, and Curriculum Supervision	EDS	23	74%	\$67,117
13.0404	Educational, Instructional, and Curriculum Supervision	D	54	93%	\$76,604
13.0406	Higher Education/Higher Education Administration	D	18	67%	\$72,651
13.0499	Educational Administration and Supervision, Other	D	123	42%	\$81,176
13.1210	Early Childhood Education and Teaching	BA	155	74%	\$32,710
13.1210	Early Childhood Education and Teaching	MA	29	69%	\$40,828

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

Most of the above education and training programs had high placement rates. Completers of early childhood education programs at the bachelor's degree level had placement rates of nearly 75 percent and earned an average of \$32,710. The smaller number of completers of master's degree programs in this field had average wages nearly \$8,000 higher.

## Protective Services and Law Occupations

The protective services and law career cluster includes occupations focused on providing legal, public safety, and protective services.

Paralegals and legal assistants, which are in-demand in six regions of the state, support lawyers through activities such as preparation of legal documents and researching legal precedent. Most paralegals and legal assistants work in legal services but are employed in other industries as well, such as headquarters or business support services industries. Paralegals and legal assistants represent 41 percent of the total annual projected job openings within legal occupations. Online job postings in Tennessee seek candidates with skills in Microsoft Office, including Word or PowerPoint, and skills in maintaining calendars.<sup>68</sup>

Security guards represent 46 percent of the total annual projected job openings within protective service occupations and are in demand in six regions. Security guards typically work in the investigation and security services industry, but can also work directly for colleges and universities, museums, historical sites, and other public institutions.<sup>69</sup> Security guards are represented in the workforce of TNECD’s aerospace & defense industry sector. This sector contains companies specializing in the production of everything from aerospace parts and helicopters to handguns and uranium for nuclear weapons, necessitating personnel for onsite security and protection.

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
23-1011	Lawyers		1	*		Doctoral or professional degree
23-2011	Paralegals and Legal Assistants	X	6	*		Associate degree
33-1021	First-Line Supervisors of Firefighting and Prevention Workers		1			Postsecondary nondegree award
33-1090	Miscellaneous First-Line Supervisors, Protective Service Workers		1			HS diploma or equivalent
33-3051	Police and Sheriff's Patrol Officers		1			HS diploma or equivalent
33-9032	Security Guards		6	*		HS diploma or equivalent
33-9091	Crossing Guards and Flaggers	X	4			No formal educ. credential
33-9098	School Bus Monitors and Protective Service Workers, All Other	X	3			HS diploma or equivalent

Tennessee’s community colleges and universities offer programs in paralegal studies, criminal justice, corrections, law enforcement, and fire science that can lead to in-demand careers in protective services and law. Students in these programs may be prepared to perform research, record-keeping, and related administrative functions for a law office; to apply theories and practices of organization management and criminal justice to the administration of public law enforcement agencies and operations; to perform the duties of police and public security officers; or to apply the theory and practice of fires and

<sup>68</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

<sup>69</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

firefighting to ensure public safety. These programs may include instruction in legal research, drafting legal documents, courthouse procedures, law enforcement history and theory, incident response strategies, legal and regulatory responsibilities, budgeting, public relations, fire chemistry and physics, combustible materials, building construction, fire codes and related laws, fire prevention/inspection, or fire/arson investigation. Graduates from these programs at the certificate and associate degree level experience high rates of employment in Tennessee.

## Protective Services and Law Programs

### *Postsecondary Protective Services and Law Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
22.0000	Legal Studies, General	BA	14	43%	\$27,603
22.0101	Law	P	205	55%	\$51,819
22.0302	Legal Assistant/Paralegal	AA	70	69%	\$31,510
43.0103	Criminal Justice/Law Enforcement Administration	BA	595	68%	\$28,489
43.0103	Criminal Justice/Law Enforcement Administration	MA	47	62%	\$47,764
43.0104	Criminal Justice/Safety Studies	AA	73	73%	\$33,544
43.0104	Criminal Justice/Safety Studies	BA	172	54.%	\$45,717
43.0104	Criminal Justice/Safety Studies	MA	49	51%	\$56,237
43.0106	Forensic Science and Technology	BA	13	77%	\$40,184
43.0107	Criminal Justice/Police Science	C<1YR	314	91%	\$36,458
43.0107	Criminal Justice/Police Science	AA	27	93%	\$40,557
43.0203	Fire Science/Fire-fighting	C1-2YR	17	88%	\$62,510
43.0203	Fire Science/Fire-fighting	AA	28	86%	\$70,468

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### *High School CTE Protective Services and Law Completers, 2018-19*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
43.0202	Fire Services Administration	CTE HS	1	NA	NA

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

Several postsecondary programs in this career cluster had high placement rates, with five programs exceeding 75 percent: forensic science at the bachelor's degree level and

criminal justice/police science and fire science/firefighting at the certificate and associate degree levels. Individuals earning associate degrees in fire science had average earnings of \$70,468. Legal assistant/paralegal programs had employment rates of more than 68 percent, with criminal justice/law enforcement graduates near that employment level as well.

## **Arts and Communication Occupations**

Tennessee's music and arts pedigree is unlike any other. Our state is the birthplace of country and rock 'n' roll music, the home of the blues, and the starting point of soul. Tennessee is a hub of creative innovation, technology and performing arts—a playground for big names and bigger ideas.

Tennessee is home to nine annual film festivals, a host of dance companies, and dozens of theatre troupes. Our museums showcase stunning works in every medium and from many cultures. World-renowned attractions in Tennessee include Elvis Presley's Graceland, Sun Studio, Memphis Rock 'n' Soul Museum, Stax Museum of American Soul Music, Grand Ole Opry, Ryman Auditorium, Country Music Hall of Fame and Museum, Schermerhorn Symphony Center, Brooks Museum of Art, Cheekwood Botanical Gardens and Museum of Art, Frist Center for the Visual Arts, The Parthenon, Hunter Museum of Art, Knoxville Museum of Art, and International Storytelling Center.

The Arts & Economic Prosperity 5 study indicates that the nonprofits arts and culture sector is a \$1.17 billion industry in Tennessee, supporting over 38,000 full-time equivalent jobs and generating \$135.9 million in local and state government revenue.<sup>70</sup>

Musicians and singers are identified as an in-demand occupation in two regions of the state. Musicians and singers are employed not only by musical groups and artists, but also by religious organizations, dance and theater companies, music publishers, the motion picture and video industry, and in education institutions of all levels. Demand for this occupation was primarily identified through hires and projected openings, rather than through job postings.

Nationally, it is expected that workers will be needed to meet demand for animation and visual effects in video games, movies, television, and on smartphones. In addition, arts and design workers are expected to create visually appealing and effective layouts of websites and other media platforms.<sup>71</sup>

Graphic designers are in-demand in Tennessee in eight regions. Employers seek candidates with skills in Adobe Create Suite, HTML, Microsoft Office, and Adobe Creative Cloud. Graphic designers are employed across many different industries, including printing and

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<sup>70</sup> Tennessee Arts Commission, [Arts & Prosperity 5](#)

<sup>71</sup> U.S. Bureau of Labor Statistics, [Occupational Outlook Handbook, Arts and Design Occupations](#)

related support activities; advertising, public relations, and related services; specialized design services; management, scientific, and technical consulting services; and management of companies and enterprises (commonly called headquarters). Over 30 percent of online job postings are seeking candidates with a bachelor’s degree, although 60 percent of online jobs posting for graphic designers do not list the educational requirements.<sup>72</sup>

Editors, in demand in four regions, plan, coordinate, or edit content of material for publication. Editors in Tennessee typically make about \$54,400 a year. Employers are seeking candidates with technology skills in Microsoft Office and Adobe InCopy.<sup>73</sup>

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
27-1024	Graphic Designers	X	8	*		Bachelor's degree
27-2012	Producers and Directors	X	2			Bachelor's degree
27-2042	Musicians and Singers	X	2			No formal educ. credential
27-3041	Editors	X	4			Bachelor's degree
27-4011	Audio and Video Technicians	X	2			Postsecondary nondegree award
51-5112	Printing Press Operators	X	7			HS diploma or equivalent
51-5113	Print Binding and Finishing Workers		1			HS diploma or equivalent

Many of the programs that prepare students for careers in arts and communication are offered at Tennessee’s colleges and universities. These include programs in communication, digital media design and production, journalism, media technologies, and fine and performing arts. Depending upon the program, students may learn theories of communication and media studies; communications regulation, law, and policy; media history; visual and media literacy; news writing and editing; reporting; photojournalism; graphic design; and general principles and techniques for effectively communicating ideas and information. In 2019-20, a total of 2,311 completers received degrees in the variety of fields that funnel to in-demand occupations in arts and communication.

## Arts and Communication Programs

### *Postsecondary Arts and Communications Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
09.0100	Communication, General	BA	208	65%	\$21,912
09.0101	Speech Communication and Rhetoric	BA	246	54%	\$30,817

<sup>72</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

<sup>73</sup> Jobs4TN.gov, Occupation Data, Occupation Summary



CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
09.0102	Mass Communication/Media Studies	BA	328	61%	\$22,121
09.0102	Mass Communication/Media Studies	MA	75	47%	\$30,605
09.0102	Mass Communication/Media Studies	D	13	15%	\$60,957
09.0401	Journalism	BA	235	64%	\$24,074
09.0702	Digital Communication and Media/Multimedia	BA	59	36%	\$20,357
09.9999	Communication, Journalism, and Related Programs, Other	BA	33	67%	\$20,808
10.0105	Communications Technology/Technician	AA	107	63%	\$23,736
13.0501	Educational/Instructional Technology	CPBA	16	56%	\$57,847
13.0501	Educational/Instructional Technology	MA	39	54%	\$51,671
23.1301	Writing, General	BA	18	44%	\$23,936
23.1302	Creative Writing	BA	20	30%	\$9,917
23.1304	Rhetoric and Composition	BA	15	73%	\$23,770
39.0501	Religious/Sacred Music	BA	15	77%	\$12,528
50.0101	Visual and Performing Arts, General	BA	30	57%	\$23,519
50.0102	Digital Arts	AA	10	70%	\$16,343
50.0102	Digital Arts	BA	10	30%	\$16,515
50.0401	Design and Visual Communications, General	BA	10	20%	\$16,312
50.0402	Commercial and Advertising Art	C<1YR	13	77%	\$16,570
50.0402	Commercial and Advertising Art	C1-2YR	31	65%	\$11,804
50.0402	Commercial and Advertising Art	AA	55	64%	\$27,175
50.0402	Commercial and Advertising Art	BA	13	54%	\$18,171
50.0409	Graphic Design	BA	43	58%	\$21,283
50.0501	Drama and Dramatics/Theatre Arts, General	BA	98	62%	\$17,910
50.0501	Drama and Dramatics/Theatre Arts, General	MA	13	23%	\$28,669
50.0506	Acting	C<1YR	10	70%	\$13,148
50.0599	Dramatic/Theatre Arts and Stagecraft, Other	BA	10	40%	\$20,042
50.0601	Film/Cinema/Video Studies	BA	32	41%	\$14,716
50.0602	Cinematography and Film/Video Production	BA	71	65%	\$25,440
50.0901	Music, General	BA	209	50%	\$25,268
50.0901	Music, General	MA	67	36%	\$37,401
50.0903	Music Performance, General	AA	37	62%	\$22,655
50.0905	Musicology and Ethnomusicology	BA	11	45%	\$12,842
50.0913	Music Technology	BA	76	54%	\$19,465
50.0999	Music, Other	BA	35	43%	\$23,647

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### **High School CTE Arts and Communications Completers, 2018-19**

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ. Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
09.0702	Digital Communication and Media/Multimedia	CTE HS	173	55%	\$14,447
10.0203	Recording Arts Technology/Technician	CTE HS	15	47%	\$8,812
10.0299	Audiovisual Communications Technologies/Technicians, Other	CTE HS	145	61%	\$13,449

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

Of the 39 programs aligned with in-demand arts and communication occupations, only four had employment rates of 70 percent or higher: rhetoric and composition, digital arts, commercial and advertising art, and acting. All were very small programs with 15 or fewer graduates. Larger programs that had employment rates of near 65 percent included communication, general (BA); communication, journalism and related programs, other (BA); commercial and advertising art (one-to-two-year certificate); and cinematography and film/video production (BA). Also notable are the low salaries for entry-level employees completing the programs. Only 17 of the 39 programs, or 43 percent, had average wages of more than the average entry level state salary for 2020 of \$22,715.<sup>74</sup>

### **Leisure and Recreation Occupations**

Tennessee is well-known for its great outdoors. There are 13 national parks, including the Great Smoky Mountains National Park, receiving over 9.6 million visitors in Tennessee.<sup>75</sup> The Great Smoky Mountains National Park is the number one most visited national park in the country.<sup>76</sup> There are also 56 state parks<sup>77</sup> and 84 natural areas<sup>78</sup> across Tennessee.

The pandemic negatively affected workers in leisure and recreation. "Tennessee tourism generated \$16.8 billion in domestic and international travel spending in 2020, a 31.6 percent decline from the previous year according to economic impact data from U.S. Travel Association and Tourism Economics. Travel in Tennessee generated nearly 150,000 jobs and \$1.4 billion in state and local tax revenue. Despite the impact of COVID-19, efforts to

<sup>74</sup> TN Dept. of Labor and Workforce Development, Occupational Employment and Wages Survey (OEWS) 2020. jobs4tn.gov

<sup>75</sup> [National Park Services, Tennessee](#)

<sup>76</sup> USA Today, [America's most-visited national parks](#)

<sup>77</sup> Tennessee State Parks, [Find a Park](#)

<sup>78</sup> Tennessee Department of Environment & Conservation, [List of Natural Areas](#)

promote outdoor travel opportunities helped Tennessee outperform the national average decline of 42 percent.”<sup>79</sup>

“Employment in the leisure and hospitality sector, which faced the brunt of pandemic-related job losses, will expand by 5.9 percent in 2021 and then accelerate to 10.2 percent growth in 2022, as consumers continue to shift back to in-person services and rising wage rates attract more workers. As a result, leisure and hospitality employment is projected to recover by the end of 2022.”<sup>80</sup> There are a few pandemic-related reasons for a shortage of Tennessee workers in leisure and hospitality including exposure risk from a high degree of public contact, workers being asked to do more due to the shortage of workers, workers being tasked with enforcing COVID-19 protocols, increased demand from a surge in consumer spending, and new job opportunities in other sectors.<sup>81</sup>

Most of the in-demand occupations in the leisure and recreation career cluster require only a high school diploma or equivalent. Food service managers, supervisors of food preparation and serving workers, supervisors of housekeeping and janitorial workers, and supervisors of personal service and entertainment and recreation workers are all in-demand in nearly all regions in the state.

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
11-9051	Food Service Managers	X	10			HS diploma or equivalent
11-9081	Lodging Managers		2			HS diploma or equivalent
13-1121	Meeting, Convention, and Event Planners	X	3			Bachelor's degree
35-1011	Chefs and Head Cooks	X	3			HS diploma or equivalent
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	X	7			HS diploma or equivalent
37-1011	First-Line Supervisors of Housekeeping and Janitorial Workers	X	9			HS diploma or equivalent
37-2021	Pest Control Workers	X	9			HS diploma or equivalent
39-1098	First-Line Supervisors of Personal Service and Entertainment and Recreation Workers, Except Gambling Services		6			HS diploma or equivalent
39-3091	Amusement and Recreation Attendants		1			No formal educ. credential
39-7010	Tour and Travel Guides		1			HS diploma or equivalent
39-9031	Exercise Trainers and Group Fitness Instructors	X	5			HS diploma or equivalent

<sup>79</sup> Tennessee Department of Tourist Development, [Tennessee Tourism Outperformed the Nation in 2020](#)

<sup>80</sup> An [Economic Report to the Governor of Tennessee](#), 2022

<sup>81</sup> An [Economic Report to the Governor of Tennessee](#), 2022

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
43-4181	Reservation and Transportation Ticket Agents and Travel Clerks	X	2			HS diploma or equivalent
51-3011	Bakers	X	3	*		No formal educ. credential
53-6031	Automotive and Watercraft Service Attendants		1			No formal educ. credential

Institutions across Tennessee offer programs in hospitality and tourism management—and have high percentages of completers employed in the Tennessee job market. Shorter term programs prepare individuals to manage operations and facilities that provide lodging services to the traveling public and include instruction in hospitality industry principles; supplies purchasing, storage, and control; hotel facilities design and planning; hospitality industry law; management; and marketing and sales promotion. Programs that lead to a bachelor’s degree prepare individuals to serve as general managers and directors of hospitality operations on a system-wide basis, including both travel arrangements and promotion and the provision of traveler facilities. They include instruction in principles of operations in the travel and tourism, hotel and lodging facilities, food services, and recreation facilities industries; hospitality marketing strategies; hospitality planning; management and coordination of franchise and unit operations; business management; accounting and financial management; hospitality transportation and logistics; and hospitality industry policies and regulations.

University of Memphis’ Kemmons Wilson School of Hospitality and Resort Management (CIP 52.0904) partners with Holiday Inn, allowing students the opportunity to manage an on-campus property as a part of their studies in the Hospitality and Resort Management Bachelor of Arts and Master of Science program offerings.

Several community colleges and TCATs across the state offer one-to-two-year programs in culinary arts, which prepare individuals to provide professional chef services in restaurants and other commercial food establishments. Instruction in these programs includes lessons on recipe and menu planning, supervising, and training kitchen assistance, management of food supplies and resources, and a wide variety of culinary techniques. Middle Tennessee State University offers a bachelor’s degree in leisure and sport management, preparing individuals to develop and manage park facilities and other indoor and outdoor recreation and leisure facilities. Universities across the state offer bachelor’s and master’s degrees in health and human performance, kinesiology, and recreation and sport management. These programs vary in the level of scientific skills and include instruction in biomechanics, motor behavior, motor development and coordination, motor neurophysiology, performance research, rehabilitative therapies, the development of diagnostic and rehabilitative

methods and equipment, and related analytical methods and procedures in applied exercise and therapeutic rehabilitation.

## Leisure and Recreation Programs

### ***Postsecondary Leisure and Recreation Degrees, 2019-20***

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ. Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
12.0503	Culinary Arts/Chef Training	C1-2YR	24	79%	\$21,622
31.0301	Parks, Recreation and Leisure Facilities Management, General	BA	32	75%	\$23,915
31.0501	Health and Physical Education/Fitness, General	BA	480	61%	\$24,351
31.0501	Health and Physical Education/Fitness, General	MA	57	56%	\$43,790
31.0504	Sport and Fitness Administration/Management	BA	253	47%	\$21,005
31.0504	Sport and Fitness Administration/Management	MA	97	49%	\$30,333
31.0505	Kinesiology and Exercise Science	BA	920	65%	\$23,735
52.0901	Hospitality Administration/Management, General	BA	34	65%	\$23,974
52.0904	Hotel/Motel Administration/Management	C<1YR	12	92%	\$16,155
52.0904	Hotel/Motel Administration/Management	AA	24	63%	\$21,722
52.0904	Hotel/Motel Administration/Management	BA	27	81%	\$25,145

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### ***High School CTE Leisure and Recreation Completers, 2018-19***

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ. Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
12.0503	Culinary Arts/Chef Training	CTE HS	358	55%	\$14,781
31.0507	Physical Fitness Technician	CTE HS	83	66%	\$13,579
52.0901	Hospitality Administration/Management, General	CTE HS	10	60%	\$11,762

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

Program completers with employment rates of 70 percent or greater included certificate programs in culinary arts/chef training and hotel/motel administration and management, and bachelor's degree programs in parks, recreation and leisure facilities management and hotel management. The high school CTE program for physical fitness technician had an employment rate of 66 percent.

## Information Technology Occupations

Information technology occupations are in high 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. Cloud computing, big data, and information security will drive demand nationally for these occupations.<sup>82</sup>

Computer and information technology occupations typically have high median wages in Tennessee. Software developers and software quality assurance analysts and testers typically make 2.4 times the median wage of all occupations. Computer programmers and information security analysts typically make 2.2 times the median wage of all occupations.

Tennessee has a strong and growing industry sector of Headquarters, Finance & Tech<sup>83</sup> 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.

In August 2021, TNECD landed its largest project to date—8,500 jobs and a \$1.2 billion investment from tech giant Oracle.<sup>84</sup> Oracle’s products include a global cloud infrastructure platform as well as cloud-based applications.

Capgemini, a global IT consulting company, announced 500 new job commitments in Nashville. Capgemini’s Nashville delivery center will focus on enterprise application modernization, artificial intelligence, machine learning, and IoT solutions.<sup>85</sup>

CGI announced 300 new job commitments over the next five years in Knox County for its eighth U.S. IT delivery center. CGI is partnering with the University of Tennessee, Knoxville on the launch of the IT delivery center and will be working with the university to engage students across interdisciplinary programs in the Haslam College of Business and the Tickle College of Engineering. CGI will partner with the university to build a talent pipeline focusing primarily on advanced analytics, cybersecurity, and digital transformation through emerging technologies.<sup>86</sup>

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<sup>82</sup> U.S. Bureau of Labor Statistics, [Occupational Outlook Handbook, Computer and Information Technology Occupations](#)

<sup>83</sup> TNECD, [HQ, Finance and Tech](#)

<sup>84</sup> TNECD, [2021 A Year for the Record Books](#)

<sup>85</sup> TNECD, [Press Release](#)

<sup>86</sup> TNECD, [Press Release](#)

The COVID-19 pandemic shifted many workers to a work-from-home or other hybrid telework model, increasing the needs for technological support for many businesses across Tennessee and the nation. Remote work has persisted, and the need for 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 the last two 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, HTML, UNIX, PowerShell, and SQL. 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. NTT Data<sup>87</sup> announced a new data center in Nashville in March 2021 focusing on developing and deploying digital industry skills within the IT sector, and are currently hiring computer user support specialists, with job titles like Field Tech Analyst, Field Services Technician, Field Technician, SCA Helpdesk, and Desktop Support Technician.<sup>88</sup>

The demand for IT and other STEM workers in Tennessee is rapidly growing, and both industry and educators are pursuing traditional and new pathways to grow its workforce in these areas. For example, Nashville-based tech care company Asurion and Nashville State Community College announced in 2020 the launch of Tennessee’s first in-house apprenticeship for software engineers, providing the company’s hourly employees with the opportunity to up-skill into one of the most sought-after professional roles.<sup>89</sup>

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
15-1211	Computer Systems Analysts		4	*	#	Bachelor's degree
15-1212	Information Security Analysts	X	4	*	#	Bachelor's degree
15-1231	Computer Network Support Specialists		3	*	#	Associate degree
15-1232	Computer User Support Specialists		7	*	#	Some college, no degree
15-1241	Computer Network Architects		3	*	#	Bachelor's degree

<sup>87</sup> TNECD, [Press Release](#)

<sup>88</sup> Jobs4TN.gov, Occupation Data, Occupation Summary

<sup>89</sup> Nashville State Community College, [Press Release](#)

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
15-1244	Network and Computer Systems Administrators		4	*	#	Bachelor's degree
15-1245	Database Administrators and Architects		1	*	#	Bachelor's degree
15-1251	Computer Programmers	X	5	*	#	Bachelor's degree
15-1256	Software Developers and Software Quality Assurance Analysts and Testers	X	4	*	#	Bachelor's degree
15-1257	Web Developers and Digital Interface Designers		1	*	#	Bachelor's degree
15-1299	Computer Occupations, All Other		2	*	#	Bachelor's degree

Tennessee’s 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. Certificate and associate programs at TCATs and community colleges include information technology and infrastructure management, cyber security, risk analysis, information technology technician, and computer information technology. Universities offer undergraduate and graduate programs in computer information systems, data science, and health data analytics. The most popular among them are information technology and computer science programs. These programs prepare individuals to oversee the computer system and performance requirements of an entire organization, including instruction in network management; system migration and upgrading; outage control; problem diagnosis and troubleshooting; and system maintenance, budgeting, and management. These programs may include instruction in the principles and theories of computer science, computer development, programming, or on the design of technological information systems as solutions to business and data needs. Additional training might include instruction in algorithms, databases, cryptography, risk assessment, auditing, telecommunications, and interface design, depending on the program. Wages for graduates of these programs are high at every level of credential, with wages increasing for students earning higher credentials.

GIVE Grantee Pellissippi State Community College is partnered with Discovery, Inc., a communications company, as part of their Information Technology program (CIP 11.0103). They work to align and map education and training program curriculum and credentialing requirements to industry standards and needs, identify in-demand industry recognized certifications or credentials for employment used for hiring and promotion, and assist with



the development and implementation of the GIVE work-based learning continuum in areas of career awareness, career exploration, career preparation, and career training.

East Tennessee State University is partnered with BlueCross BlueShield to provide the BlueSky Program (CIP 11.0101). The program is an ABET-accredited Bachelor of Science in Computing with a concentration in Information Systems. The program is offered in an accelerated format, leading to a potential job offer at BlueCross in just two years.

## Information Technology Programs

### *Postsecondary Information Technology Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
11.0101	Computer and Information Sciences, General	BA	94	55%	\$45,300
11.0101	Computer and Information Sciences, General	MA	45	33%	\$70,784
11.0103	Information Technology	C1-2YR	10	60%	\$36,192
11.0103	Information Technology	AA	352	70%	\$34,396
11.0103	Information Technology	BA	99	46%	\$41,645
11.0103	Information Technology	MA	103	74%	\$63,884
11.0104	Informatics	MA	17	41%	\$64,775
11.0501	Computer Systems Analysis/Analyst	BA	34	41%	\$38,731
11.0701	Computer Science	BA	457	52%	\$45,788
11.0701	Computer Science	MA	88	52%	\$59,879
11.0701	Computer Science	D	13	54%	\$96,487
11.0802	Data Modeling/Warehousing and Database Administration	MA	47	40%	\$52,962
11.0901	Computer Systems Networking and Telecommunications	C<1YR	52	52%	\$27,799
11.0901	Computer Systems Networking and Telecommunications	C1-2YR	25	72%	\$24,636
11.1002	System, Networking, and LAN/WAN Management/Manager	C<1YR	16	88%	\$28,009
11.1002	System, Networking, and LAN/WAN Management/Manager	C1-2YR	31	65%	\$32,559
11.1003	Computer and Information Systems Security/Information Assurance	C<1YR	20	85%	\$45,973
11.1005	Information Technology Project Management	CPBA	12	50%	\$55,943
11.1006	Computer Support Specialist	C<1YR	94	69%	\$21,645
11.1006	Computer Support Specialist	C1-2YR	68	57%	\$22,692

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
11.9999	Computer and Information Sciences and Support Services, Other	MA	15	67%	\$83,276
51.2706	Medical Informatics	CPBA	12	92%	\$52,365
51.2706	Medical Informatics	MA	10	40%	\$71,393

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### ***High School CTE Information Technology Completers, 2018-19***

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
11.0201	Computer Programming/Programmer, General	CTE HS	50	56%	\$14,447
11.1002	System, Networking, and LAN/WAN Management/Manager	CTE HS	92	63%	\$18,059
11.1003	Computer and Information Systems Security	CTE HS	8	63%	\$18,573

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

The information technology programs with employment rates of seventy percent or more include the associate (70 percent) and master's degree (74 percent) programs in information technology, certificate programs in system, networking, and LAN/WAN management/manager (88 percent) and computer and information systems security/information assurance (85 percent), and the post bachelor's certificate program in medical informatics (92 percent). Average earnings for the master's degree program in information technology were nearly twice that of the associate degree program.

### **Engineering and Other STEM Occupations**

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 2020, approximately 24,700 engineers were employed in Tennessee, which is 30 percent below the national average concentration. Median wages for engineers

in Tennessee range from \$37.11 (2.1 times the median wage for all occupations) to \$51.10 (2.8 times the median wage for all occupations) an hour, depending on the type of engineer.<sup>90</sup>

Tennessee's Arnold Engineering Development Complex (AEDC), an Air Force military facility in Tullahoma, will soon begin the Next Generation Turbine Engine Test Capability Project to enable testing next-generation, full-scale propulsion systems under simulated flight conditions that are as realistic as possible. "For the last 60 years, AEDC turbine engine ground test facilities have tested turbine engines for the majority of the Department of Defense's fighters, bombers, cruise missiles, and Intelligence, Surveillance, and Reconnaissance platforms," according to Rick Hutchins, technical lead for the AEDC Future Capabilities Branch.<sup>91</sup> Engineering summer internships are available at AEDC through the Department of Defense and its contractor for AEDC, National Aerospace Solutions, LLS (NAS). The engineering interns get to work in different engineering functions, like design, controls, and power or testing.<sup>92</sup>

Calibration technologists and technicians execute or adapt procedures and techniques for calibrating measurement devices. Engineering technologists and technicians (except drafters) include non-destructive testing specialists, which test the safety of structures, vehicles, or vessels. Photonics technicians build, install, or maintain optical or fiber optic equipment like lasers, lenses, or mirrors.<sup>93</sup> These occupations are employed primarily in manufacturing and professional, scientific, and technical services industries.

The occupations that are in-demand in the most regions of Tennessee are civil engineers (6 regions), mechanical engineers (5 regions), electrical and electronic engineering technologists and technicians (8 regions), and calibration and all other technologists and technicians (6 regions). The engineers require a bachelor's degree, while the technicians and technologists associate degrees.

Tennessee is seeking to grow its pipeline of STEM workforce through its Future Workforce Initiative,<sup>94</sup> which seeks to increase STEM training in K-12 schools. The Tennessee Department of Education and the Tennessee STEM Innovation Network (TSIN) released a report in November 2021 highlighting the significant impact career and technical education, computer science, and STEM has made on students and educators across the state.<sup>95</sup> Tennessee tripled the number of STEM-designated K-12 schools in 2020.

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<sup>90</sup>TNECD analysis of employment data from EMSI (2021.4 QCEW employees).

<sup>91</sup> Air Force Material Command, [Investment prepares AEDC to test next-gen engines](#)

<sup>92</sup> Tullahoma News, [DoD partners with summer interns at Arnold](#)

<sup>93</sup> These two occupations were combined in the May 2020 release of [the Occupational Employment and Wages Survey from the U.S. Bureau of Labor Statistics](#), based on a hybrid of two SOC classification systems.

<sup>94</sup> Office of the Governor, [Press Release](#)

<sup>95</sup> Tennessee Department of Education, [Press Release](#)

SOC Code	Occupation	In-Demand		Key to TNECD Industry Sectors	STEM	Typical Entry-Level Education
		TN	Total # Regions			
17-2051	Civil Engineers	X	6	*	#	Bachelor's degree
17-2071	Electrical Engineers		3	*	#	Bachelor's degree
17-2072	Electronics Engineers, Except Computer		1	*	#	Bachelor's degree
17-2112	Industrial Engineers		2	*	#	Bachelor's degree
17-2141	Mechanical Engineers		5	*	#	Bachelor's degree
17-2199	Engineers, All Other		5	*	#	Bachelor's degree
17-3011	Architectural and Civil Drafters		1	*	#	Associate degree
17-3023	Electrical and Electronic Engineering Technologists and Technicians	X	8	*	#	Associate degree
17-3026	Industrial Engineering Technologists and Technicians		1	*	#	Associate degree
17-3027	Mechanical Engineering Technologists and Technicians		2	*	#	Associate degree
17-3098	Calibration Technologists and Technicians and Engineering Technologists and Technicians, Except Drafters, All Other	X	6	*	#	Associate degree
19-2012	Physicists		1	*	#	Doctoral or professional degree
19-4031	Chemical Technicians		1	*	#	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. This group of academic programs boasts one of the highest expected average first-year wages at \$95,000 for completers with a doctorate in engineering, though average annual wages vary depending on the degree and degree level. These academic programs capture many of the general and specialized fields within engineering and science. These programs prepare individuals to apply mathematical and scientific principles to solve a wide variety of practical problems in industry, social organization, public works, and commerce. These may include basic and advanced instruction in undifferentiated and individualized programs that prepare completers to enter in-demand occupations within the engineering and STEM fields.

## Engineering and other STEM Programs

### *Postsecondary Engineering and Other STEM Degrees, 2019-20*

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
14.0101	Engineering, General	BA	41	80%	\$51,100

<b>CIP Code</b>	<b>Program Title</b>	<b>Educ. Award Level</b>	<b>Number of Grads</b>	<b>% Employed in TN</b>	<b>Est. First Year Annual Wages</b>
14.0101	Engineering, General	MA	25	36%	\$68,846
14.0101	Engineering, General	D	35	43%	\$76,355
14.0801	Civil Engineering, General	BA	222	60%	\$51,835
14.0801	Civil Engineering, General	MA	46	70%	\$62,207
14.0801	Civil Engineering, General	D	16	63%	\$58,463
14.0901	Computer Engineering, General	BA	55	53%	\$41,957
14.1001	Electrical and Electronics Engineering	BA	174	45%	\$56,479
14.1001	Electrical and Electronics Engineering	MA	29	55%	\$66,536
14.1001	Electrical and Electronics Engineering	D	16	31%	\$103,391
14.1901	Mechanical Engineering	BA	487	55%	\$49,259
14.1901	Mechanical Engineering	MA	42	55%	\$66,606
14.1901	Mechanical Engineering	D	11	45%	\$43,348
14.3501	Industrial Engineering	BA	44	41%	\$50,118
14.3501	Industrial Engineering	MA	36	61%	\$102,605
14.4201	Mechatronics, Robotics, and Automation Engineering	BA	55	75%	\$58,561
14.9999	Engineering, Other	D	19	42%	\$95,274
15.0000	Engineering Technology, General	C<1YR	53	89%	\$55,276
15.0000	Engineering Technology, General	AA	157	78%	\$48,348
15.0000	Engineering Technology, General	BA	219	661%	\$50,846
15.0000	Engineering Technology, General	MA	10	40%	\$57,656
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	C<1YR	26	62%	\$65,355
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	AA	86	73%	\$46,424
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	BA	12	58%	\$36,790
15.0406	Automation Engineer Technology/Technician	C<1YR	17	94%	\$67,752
15.0612	Industrial Technology/Technician	C<1YR	29	90%	\$41,311
15.0612	Industrial Technology/Technician	AA	54	76%	\$30,937
15.0613	Manufacturing Engineering Technology/Technician	C<1YR	11	100%	\$17,916
15.0614	Welding Engineering Technology/Technician	AA	12	83%	\$33,671
15.0801	Aeronautical/Aerospace Engineering Technology/Technician	BA	20	15%	\$41,220
15.0805	Mechanical Engineering/Mechanical Technology/Technician	C<1YR	12	67%	\$67,128

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
15.1301	Drafting and Design Technology/Technician, General	C<1YR	26	69%	\$24,213
15.1301	Drafting and Design Technology/Technician, General	C1-2YR	43	77%	\$30,294
40.0801	Physics, General	MA	19	11%	\$35,972
40.0801	Physics, General	D	16	31%	\$57,079

Source: P20 Connect, public postsecondary and select private postsecondary completers, 2019-20 and TDLWD Unemployment Insurance (UI) employment and wage records.

### ***High School CTE Engineering and Other STEM Completers, 2018-19***

CIP Code	Program Title	Educ. Award Level	Number of Grads	% Employed in TN	Est. First Year Annual Wages
15.0612	Industrial Technology/Technician	CTE HS	7	57%	\$10,188
15.1301	Drafting and Design Technology/Technician, General	CTE HS	77	52%	\$19,150
15.1302	CAD/CADD Drafting and/or Design Technology/Technician	CTE HS	10	40%	\$17,249

Source: P20 Connect, TDOE high school CTE completers, 2018-19 and TDLWD Unemployment Insurance (UI) employment and wage records.

### ***Engineering and Other STEM Apprenticeship Completers, 2019-20***

CIP Code	Program Title	Number of Completers
15.0305	Telecommunications Technology/Technician	1
15.0699	Industrial Production Technologies, Other	2
41.0301	Chemical Technology/Technician.	8

Source: TDLWD Apprenticeship Completer Data, Oct. 2019-Sept. 2020.

Several of the programs aligned with in-demand occupations had high employment rates in Tennessee. The master's degree program in civil engineering had a nearly 70 percent employment rate. The electrical, electronic and communications engineering technology/technician associate degree program had an employment rate of 73 percent with an average salary of \$46,423.

Other programs with employment rates of more than 70 percent include the mechatronics and automation engineering program (BA); the engineering technology certificate and associate degree programs; the automation engineer, industrial technology/technician, and manufacturing engineering technology certificate and industrial technology associate degree programs; and the welding engineering technology associate degree program. These technology/technician certificate programs generally have entry-level wages significantly above the Tennessee average entry level wage for 2020 of \$22,715.

## **Agency Initiatives**

This section identifies initiatives across partner agencies bringing programs and resources to Tennesseans to inform their decisions and assist in actualizing their pursuit of education and training for in-demand and well-paid occupations in Tennessee.

### **Tennessee Higher Education Commission**

The Tennessee Higher Education Commission (THEC) is relentlessly focused on increasing the number of Tennesseans with a postsecondary credential. Understanding that higher education prepares its graduates for in-demand jobs, through data-informed and collaborative work, THEC strives to ensure that postsecondary institutions are producing the credentials employers need while also driving new industry to the state.

### ***College For TN***

[CollegeForTN.org](https://CollegeForTN.org), an initiative led by the THEC's College Access and Success team, is a free, Tennessee-specific career and college exploration website. The goal of [CollegeforTN.org](https://CollegeforTN.org) is to provide students and their families with resources and information needed to make informed college and career decisions. Relaunched in Fall 2021, [CollegeforTN.org](https://CollegeforTN.org) addresses three areas of focus: (1) serve as the central hub in Tennessee for college access and success information and resources; (2) provide students and families a robust set of career, college, and financial aid tools, information, and resources; and (3) provide online college access and success resources for educators and others who help students develop and implement their college and career plans. The website, informed by data from the [U.S. Department of Labor](https://www.dhs.gov), includes information about typical education level, requisite skills, and salaries for over 900 careers—connecting these occupations to academic programs available in Tennessee.

### ***GIVE Community Grants***

The Governor's Investment in Vocational Education (GIVE) is designed to foster long-term regional partnerships between Tennessee Colleges of Applied Technology (TCATs), community colleges, industry, economic development/workforce agencies, and K-12 to identify and address skills gaps in local workforce needs. Through two competitive rounds, grants of up to \$1 million were made available to local collaboratives to facilitate the development and implementation of employer-driven career pathways that include K-12 local education agencies (LEAs), higher education institutions, and local employers.

As an example of the impact of GIVE Grants, TCAT Morristown's Five Rivers Partnership for Future Ready Pathways expands opportunities for high school and postsecondary students to take-up Advanced Manufacturing programs, like industrial electricity, industrial

maintenance, machine tool technology, and welding. This partnership provides students the opportunity to participate in TCAT coursework and earn industry certifications, like the [Festo Fundamentals of Electricity AC/DC](#) and [Snap-On and Starrett's Precision Measuring Instruments](#), which facilitate a student's transition with credit into a postsecondary TCAT program, the workforce, or both. Education and industry partners also collaborate to provide students with career awareness and exploration activities to enhance students' familiarity with the occupation, day-to-day activities, and skills needed. TCAT Morristown was awarded \$1 million to expand equipment in area high schools, provide instructors for new programs, instructor training, and teacher externships. In 2020-21, TCAT Morristown's grant yielded 46 dual enrollments, 541 industry certifications, 30 teacher externships, and over 1,800 participants in work-based learning activities.

### ***Tennessee Promise***

The [Tennessee Promise](#) is a last-dollar scholarship that provides recent high school graduates the opportunity to complete an associate degree or certificate program free of tuition and mandatory fees at a public community college, a TCAT, or a public or private university with an eligible associate degree program.

### ***Tennessee Reconnect***

The [Tennessee Reconnect grant](#) is a last-dollar grant that allows eligible adults to complete an associate degree or certificate program free of tuition and mandatory fees at a public community college or TCAT. The grant can also be used at eligible public and private universities towards an associate degree; in this case, it is not a last-dollar grant.

In addition to providing financial aid, Tennessee Reconnect students are provided with an individualized Reconnect Success Plan that matches Reconnectors with resources and information based on their specific needs. Included in the Reconnect Success Plan is information on how to connect to a Reconnect Navigator. Navigators provide potential adult students, as well as adults already enrolled, with institution-neutral college navigation services. They also connect Reconnectors to wraparound supports, such as affordable childcare and transportation.

## **Tennessee Department of Economic and Community Development**

The Tennessee Department of Economic and Community Development (TNECD)'s mission is to enhance Tennessee's competitiveness by driving job creation, generating economic growth, and facilitating community development. To achieve this mission, one of the department's strategies is to create innovative workforce partnerships with current and future employers to ensure Tennessee continues to develop a skilled workforce that can meet the needs of the labor market.



## ***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 Accessibility Grant Program is a critical part of Tennessee's plan to address broadband gaps. The program is designed to offset the capital expenses in the deployment of broadband in unserved areas. The goal is to facilitate broadband access to all Tennesseans while promoting practices that increase deployment and encourage adoption. Funds are targeted to areas that are unlikely to receive broadband service without grant funding. To date, the program has awarded grants to serve over 83,000 Tennesseans. TNECD has also been able to utilize federal stimulus funding to further close the digital divide with the Tennessee Emergency Broadband Fund (TEBF). The TEBF has served over 60,000 Tennesseans so far and will continue to do so with the \$400 million that has been designated for broadband infrastructure grants from the American Rescue Plan by the Fiscal Stimulus Accountability Group.

## **Tennessee Department of Labor and Workforce Development**

The Tennessee Department of Labor and Workforce Development (TDLWD) promotes workforce and economic development and improves safety and health throughout the state. It is a primary steward of economic and work force related data in Tennessee. TDLWD has developed several specialized Tennessee Work Ready programs to support Tennesseans in preparing for and securing work.

### ***Apprenticeship TN***

[Apprenticeship TN](#) is a statewide initiative powered by the Tennessee Workforce Development System (TWDS) and was developed to create a greater awareness of apprenticeship opportunities for employers and workers in every area of Tennessee. To help foster a better understanding of the benefits stemming from apprenticeships, Tennessee established an Office of Apprenticeships, with three regional directors to serve the state—where apprenticeship experts work directly with employers, communities, associations, and organizations to develop and implement new programs.

The TWDS is a consortium of seven state agencies working together to bolster the number of apprenticeships in Tennessee. The TDLWD, Tennessee College System, THEC, TDOE, TNECD, Department of Human Services, and Department of Correction each play a critical role in the Apprenticeship TN program.

With a clear direction set by Governor Bill Lee, TWDS creates a pathway to shared resources between agencies. The partnership allows Tennessee to increase the number of

apprenticeship programs and participants more efficiently, helping bridge the skilled labor gap in the state.

## **Tennessee Department of Education**

With the goal of setting all students on a path to success, the Tennessee Department of Education (TDOE) has developed programs that partner with educators, students, and their families to better prepare Tennesseans to enter the workforce and postsecondary education.

### ***Grow Your Own***

[Grow Your Own](#) is the first of its kind registered apprenticeship program for teaching where Tennessee will sponsor apprenticeships between local school districts and education preparation providers (EPPs) to extend the teacher pipeline and address teacher shortages. In October 2020, 65 partnerships began between 14 EPPs and 63 school districts innovating pathways for the teaching profession.

### ***Work-Based Learning Activities***

Work-based learning (WBL) is a proactive approach to bridging the gap between high school and high-demand, high-skill careers in Tennessee. Students build on classroom-based instruction to develop employability skills that prepare them for success in postsecondary education and future careers. Through experiences like internships, apprenticeships, and paid work experience, juniors and seniors (16 years or older) may earn high school credit for capstone WBL experiences. WBL coordinators are educators who are trained and certified by the department to coordinate these WBL experiences for students.

### ***Tennessee Pathways***

Tennessee Pathways is the K-12 initiative created to support regional and local led approaches to address gaps in job skills. The program is structured around high-quality college and career advisement throughout K-12, rigorous early postsecondary and work-based learning opportunities in high school, and seamless vertical alignment between secondary and postsecondary programs, as well as career opportunities as a result of effective partnerships among school districts, higher education institutions, employers, and community organizations. Students, with their certificate, degree, or credential, can transition seamlessly into the workforce and contribute to the success of Tennessee's economy.

## COVID-19 and Implications for Supply and Demand Analysis

This report and supplementary materials identify in-demand occupations in Tennessee and across Tennessee's nine Local Workforce Development Areas (LWDAs). The unprecedented impact of the COVID-19 pandemic on social behavior and the workforce is critical to acknowledge in these data and analyses.

In March 2020, the United States economy underwent substantial changes as the COVID-19 pandemic moved through the nation. Many employers pivoted to working remotely, businesses closed, and people lost jobs, were laid off, or had their hours reduced. In response, the U.S. Census Bureau and Bureau of Labor Statistics' [Current Population Survey](#) (CPS) added questions to better understand the impact of the COVID-19 pandemic on the labor market, including working from home, employer closures, and difficulty seeking new employment. As of December 2021, 12.2 percent of employed persons teleworked at some point over the previous four weeks. Approximately 2.7 million individuals reported not working or working fewer hours due to their employers' closing or lost business over the previous four weeks.<sup>96, 97</sup>

Nationally, as of December 2021, various measures of economic health have continued to improve—including unemployment rates, permanent job losses, and the number of long-term unemployed individuals. These measures show continuing progress in the labor market, though have not rebounded to February 2020 levels.<sup>98</sup>

As of December 2021, Tennessee's statewide preliminary unemployment rate was reported at 3.8 percent, returning to pre-pandemic levels (down from a peak of 15.8 percent in April 2020).<sup>99</sup> Employment continues to rebound but remains below pre-pandemic levels. Average employment growth is at its highest over the past four quarters, though still trails pre-pandemic employment growth in the first quarter of 2020.<sup>100</sup>

Industries and occupational groups have been differently impacted by the pandemic—with some industries rebounding from spring 2020 and others continuing to see higher unemployment claims. Goods-producing sectors, like administrative and support and waste management, have recovered to previous levels, while retail trade has experienced a

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<sup>96</sup> Bureau of Labor Statistics, Labor Force Statistics from the Current Population Survey, Table 1, Total, 25 years and over (01/24/2022), <https://www.bls.gov/cps/effects-of-the-coronavirus-covid-19-pandemic.htm>.

<sup>97</sup> As a comparison, in June 2020, 33.6 million individuals reported being unable to work or working reduced hours because their employer closed or lost business due to the COVID-19 pandemic. More information can be found [here](#).

<sup>98</sup> Bureau of Labor Statistics, Economic News Release, Employment Situation Summary (01/07/2022), <https://www.bls.gov/news.release/empsit.nr0.htm#>

<sup>99</sup> Bureau of Labor Statistics, Local Area Unemployment Statistics, <https://www.bls.gov/lau/>

<sup>100</sup> Tennessee Department of Labor and Workforce Development, [Industry Dashboard](#). Informed by Bureau of Labor Statistics Quarterly Census of Employment and Wages (QCEW).

smaller recovery. When observing total unemployment claims for the week ending June 26, 2021, low-skill occupations in the service and hospitality industries, like waiters, housekeepers, and retail salespersons, were among the top twenty occupations. This is consistent with unemployment claims throughout 2020. When looking at unemployment claims among in-demand occupations, heavy and tractor-trailer truck drivers are high on the list of total claims, though they represent a small share of the total workforce. Additional information is needed to assess how self-employment, remote work (and job growth outside of cities), and e-commerce and supply chain needs continue to transform the workforce. More detailed analyses from Tennessee's Department of Labor and Workforce Development can be found [here](#).

### **COVID-19 Impact on Occupational Demand**

Echoing data presented in this section, many businesses across the country closed permanently or had layoffs due to factors like supply chain interruptions, labor shortages, safety protocol responsibilities, unpredictable declines in consumer demand, and other changes to the costs of operation. These changes led some workers to reevaluate their attachment to the labor force—considering early retirements, going back to school, switching careers, childcare options, and better opportunities—leading to what experts have dubbed “The Great Resignation.” At the same time, demand for goods and services have gone up dramatically in 2021, and many businesses continue to struggle with finding and retaining employees.

This report incorporates three indicators of employer demand: projected job openings, recent job postings, and recent hiring patterns. These data represent demand during 2020 and beyond, corresponding with the COVID-19 pandemic and fluctuating trends in business, workforce, and consumer behaviors. The volatility in the labor market, changing needs and preferences, and transition in work, will all influence these data.

Shifts in patterns of unemployment, retirement, layoffs, quits, and hiring all happened at different rates by occupation since the onset of the pandemic. Employers have also had difficulty finding and retaining workers, and new types of jobs have been created. These trends will have impacted this study's results on in-demand occupations.

Business and individual needs and preferences over the past two years have changed. Companies likely needed to source either personal protective equipment (PPE) or other products within their supply chains. Companies may have needed to alter the type, style, size, or quantities offered of their products due to changes in consumer preferences since the onset of the pandemic. Consumer demand for various goods and services have also increased and decreased at volatile rates throughout the pandemic, altering employers' workforce needs in a variety of ways.

Many jobs during the pandemic that formerly were not remote jobs became remote jobs. The pivot to remote work alongside the expansion of broadband in the last two years could have altered previous patterns for employer job candidate searches. New recruitment tactics likely include expanded usage of online job postings for communicating employer demand and recruitment of workforce from regions beyond a company's traditional geographic footprint.

While the pandemic has shifted labor market trends, it remains unclear whether these shifts are permanent or temporary. In future reports, and as new data are released, the true impact of the pandemic is expected to become more transparent.

### **COVID-19 Impact on Academic Supply**

This report relies on high school graduates and postsecondary degree completers as sources of supply for in-demand occupations. Schools across the country, elementary, secondary, and postsecondary, shutdown in March 2020 and pivoted to emergency remote teaching. Since March 2020, the approach to schooling has varied from in-person to hybrid to virtual options, adjusting as local conditions required. Moreover, school districts have experienced critical shortages among teachers and support staff. A 2021 [Education Week Research Center survey](#) found that 40 percent of principals and district leaders reported severe or very severe staffing shortages in the 2021-22 school year. These shortages include substitute teachers, bus drivers, and instructional aides, and about half of respondent's report shortages in teachers. This shift in learning has had significant impacts on students, staff, and institutions.

Fewer students are enrolling in higher education, including fewer direct enrollments from high school and adult learners who are not opting to return to earn a postsecondary credential. Nationwide, according to the [National Student Clearinghouse](#), undergraduate enrollment declined 7.8 percent from fall 2019 (representing enrollment prior to the COVID-19 pandemic) to fall 2021. Tennessee's public postsecondary enrollment trends are similar, with undergraduate headcount enrollment down 7.5 percent from fall 2019 to fall 2021. This decline has not impacted all sectors equally. In Tennessee, community college enrollment is down around 16 percent from fall 2019 to fall 2021, while enrollment at public universities decreased only 2 percent. This disparate impact across sectors of postsecondary education is mirrored at the national level.

In terms of high school graduates, the [Tennessee Department of Education Report Card](#) shows that graduation of the ninth-grade cohort within four years has remained steady through the pandemic, with the classes of 2020 and 2021 graduating at similar rates to previous cohorts. However, fewer students in the high school class of 2020 have seamlessly enrolled in postsecondary in the summer or fall following high school graduation, with a

college-going rate of 56.9 percent. Pre-pandemic college-going rates were higher, with 62.5 percent of the class of 2018 seamlessly enrolling in college. Despite similar rates of students graduating, fewer students enroll in postsecondary. Additionally, various policies around school closure and remote learning throughout 2020 and beyond may cause learning disruption, meaning that future cohorts of high school students may see varied impacts on high school graduation rates and college readiness.

Fortunately, in Tennessee, the impact of the COVID-19 pandemic is not as severe on retention and completion metrics. For first-time, full-time freshmen, retention of these students in their second fall semester is roughly flat between fall 2018 freshmen and fall 2019 freshmen. This early evidence suggests that these students are being retained at roughly the same rate as pre-pandemic. Additionally, award production at public institutions in Tennessee continues to increase year over year. For the 2019-20 academic year, public undergraduate awards increased about five percent over the number of awards earned in the previous year.<sup>101</sup> While this is only early evidence, steady retention and award production suggests that students who do enroll in postsecondary education are continuing to succeed, despite the impact of the COVID-19 pandemic. However, disruptions to the high school completer and college pipeline may have long-term impact on awards produced and an associated reduction in the supply of degree completers.

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<sup>101</sup> More information about degree completion statewide can be found in *Degree Production and Expected Degrees, 2016 to 2020*, a supplement to this report.

## Data Sources and Methodology

This section outlines the data sources and methods for identifying in-demand occupations and aligned academic programs. This is broken down into three parts: in-demand occupations, aligned academic supply, and limitations.

### In-Demand Occupations

The in-demand occupations methodology was created in collaboration with all partner agencies to align the state agencies' evaluations of employer demand.

To measure jobs with high employer demand, the Center for Economic Research in Tennessee (CERT) analyzed postings, openings, and hires for an occupation relative to total number of individuals employed in the occupation. Occupations which meet at least two of these three requirements are identified to have high employer demand:

- The ratio of job postings (2020) to the number of individuals employed in an occupation is greater than or equal to the median ratio for all occupations in the region.
- The ratio of hires (2020) to the number of individuals employed in an occupation is greater than or equal to the median ratio for all occupations in the region.
- The ratio of projected annual job openings from 2018 to 2028 to employment for an occupation is greater than or equal to the median ratio for all occupations in the region.

To encourage job creation and skill development in high-quality jobs, occupations must meet a minimum wage threshold. All occupations identified as in-demand have a median wage which is at least 80 percent of the median wage for the region. This analysis is completed at the statewide level and for each local workforce development area (LWDA) totaling 10 regions (statewide plus nine LWDAs). Additionally, to prevent reporting positions with very low employment levels as in-demand, occupations must meet a minimum employment threshold of 0.04 percent of the region's total employment.

### Data Definitions and Sources:

*Employment:* Employment and wage data for each occupation and region are sourced primarily from the Tennessee Department of Labor and Workforce Development's May 2020 release of the Occupational Employment and Wage Estimates (OEWS). OEWS publication standards required redaction for employment figures for some occupations. In cases where OEWS has redacted information, and a 2018 employment estimate from the Tennessee Department of Labor and Workforce Development Long-Term Occupational

Projections was available, the 2018 employment estimate was used in place of the redaction to fully analyze as many occupations as possible.

*Unique Job Postings*: Unique job postings denote the number of de-duplicated job advertisements listed by companies on online career sites or job boards. De-duplication is a process used to count a job posting only once even if there are listings of the same job on multiple career websites or online jobs boards. The source for this data is the Tennessee Department of Labor and Workforce Development.<sup>102</sup>

*Projected Annual Openings*: A projected annual opening is the average annual employment change over ten years from the Tennessee Department of Labor and Workforce Development's Long-Term Occupational Projections.<sup>103</sup>

*Hires*: A hire is reported by the Census Bureau's Quarterly Workforce Indicators (QWI) dataset when an individual's Social Security number appears on a company's payroll and was not there the quarter before. The QWI program produces a comprehensive tabulation of employment and wage information at the industry-level for workers covered by state unemployment insurance laws.

The hires data in this report is sourced from Economic Modeling Specialists, Intl. (EMSI). EMSI<sup>104</sup> uses the U.S. Census Bureau's QWI industry data in combination with occupation growth and occupation replacement needs from the U.S. Bureau of Labor Statistics to create a model hires figure for each occupation.

## Aligned Academic Programs

An **aligned academic program**<sup>105</sup> is a training program preparing students for careers in an in-demand occupation. The skills and knowledge developed through completion of an aligned academic program are matched with the skills and knowledge required for success in an occupation using the Classification of Instructional Programs (CIP) to

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<sup>102</sup> Advertised Job Data can be found at [www.Jobs4TN.gov](http://www.Jobs4TN.gov) by following the path: Labor Market Information > LMI Home > Menu (in the top left-hand corner of the webpage) > Data Trends > Advertised Job Data > Jobs Data by Occupations > Job Openings by Occupations

<sup>103</sup> The Tennessee Department of Labor & Workforce Development's 2018 – 2028 Long-Term Occupational Projections can be found at [www.Jobs4TN.gov](http://www.Jobs4TN.gov) by following the path: Labor Market Information > LMI Home > Menu (in the top left-hand corner of the webpage) > Data Trends > Employment and Wage Data > Occupation Data > Occupation Employment and Projections (Long-Term).

<sup>104</sup> More information about EMSI's methodology for hires can be found [here](#).

<sup>105</sup> This report includes registered apprenticeships, high school CTE Concentrators, and postsecondary degree completers in data for aligned academic programs. There are other training initiatives, like Industry Certifications, that are not currently captured due to data quality.



Standard Occupation Code (SOC) crosswalk developed in partnership between the Bureau of Labor Statistics and National Center for Education Statistics.<sup>106</sup>

This report uses Tennessee's P20 Connect statewide longitudinal data system. The P20 Connect system includes information on student outcomes at the secondary and postsecondary level and unemployment insurance (UI) employment records and wages.

Student outcome data at the *postsecondary level* include all public colleges: the Tennessee Colleges of Applied Technology (TCATs), TBR community colleges, six locally governed institutions, and three University of TN system colleges.<sup>107</sup> Twenty-three private institutions, members of the Tennessee Independent Colleges and Universities Association (TICUA), are also included. All degree levels, from less than one-year certificates through doctoral and professional degrees, are included and disaggregated by the six-digit CIP code.<sup>108</sup> Cells with less than 10 awards are suppressed.

Student outcome data at *secondary level* reflect 2019-20 high school career and technical education completers. For purposes of this report, completers reflect a student completing three course credits within a CTE program of study or career cluster in alignment with the previous definition of CTE Concentrator.<sup>109</sup>

Tennessee completers of registered apprenticeship in 2019-2020 are also included. As they are not currently in the P20 system, no wage or employment data are available. [Registered Apprenticeship programs](#) are those approved by the U.S. Department of Labor or a State Apprenticeship Agency with an employer that has an occupational objective and standards for implementation and completion of the apprenticeship.<sup>110</sup>

High school and postsecondary completers are matched to Tennessee's UI data within the P20 Connect data system to identify those graduates who are working in Tennessee and their wages in the two quarters following graduation. Quarterly wages are multiplied by four to estimate an annual average wage for completers. This annual wage represents a

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<sup>106</sup> More information about BLS and NCEC CIP to SOC Crosswalk can be found [here](#).

<sup>107</sup> Martin Methodist College, now UT Southern, is included in this dataset and will be re-classified as a public institution for reporting after spring 2021.

<sup>108</sup> TCAT sufficient credentials are also included among these degree completers and represent students who leave a program without a credential before graduation but have acquired sufficient competencies for employment in the field of instruction or related field. This type of credential will no longer be awarded effective the 2020-21 academic year.

<sup>109</sup> CTE Concentrators have been defined by the U.S. Department of Education. As part of the Strengthening Career and Technical Education for the 21st Century Act (Perkins V), this definition changed, lessening the required course credit requirements from three to two. More detail about the changes to this definition can be found [here](#).

<sup>110</sup> More information about Registered Apprenticeships in Tennessee can be found [here](#). This analysis is limited to Federal Registered Apprenticeships.

first-year wage for degree completers. Individuals who remain enrolled in an education program are excluded from these wage figures.

## Limitations

While this report illustrates the connection between in-demand occupations and academic supply, it does not include an explicit gap analysis.<sup>111,112</sup> Reporting agencies will continue to evaluate potential data sources to enhance the comprehensiveness of Tennessee's supply for in-demand occupations.

- The Bureau of Labor Statistics' Occupational Employment and Wage Statistics (OEWS) which is a semiannual survey collecting data on wage and salary workers in nonfarm establishments excludes self-employed individuals. The exclusion of self-employed individuals may disproportionately impact select occupational areas which tend to have a high number of self-employed workers.<sup>113</sup>
- Teachers are an occupational area that is under-represented in the data on job postings, which is one of the three indicators used in this report to identify demand.<sup>114</sup> Job postings data for teachers are decentralized at the local school district level. While there is a [TN Education Job Board](#), hosted by the Tennessee Department of Education, this is not a required space to post teacher jobs and is not a comprehensive listing of all teacher vacancies. As a result, teachers are under-represented among the in-demand occupations of this report. This is just one example of an occupation impacted by data limitations on the metrics for demand.
- Currently, academic supply is measured by degree completers, CTE Concentrators, and registered apprenticeships. As noted above, this measure does not include the current workforce. Additionally, this does not include other measures of occupational readiness, like industry certifications.<sup>115</sup> Tennessee does not have a centralized collection of all industry certification test takers or completers. Future

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<sup>111</sup> Several academic programs provide training for specific occupations, and in some cases, a single academic program can provide training for multiple occupations, resulting in many possible training opportunities for occupations.

<sup>112</sup> Occupations without any clear connected training remain in in-demand clusters.

<sup>113</sup> Bureau of Labor Statistics, Small-business options: Occupational outlook for self-employed workers (May 2018), [https://www.bls.gov/careeroutlook/2018/article/self-employment.htm?view\\_full](https://www.bls.gov/careeroutlook/2018/article/self-employment.htm?view_full)

<sup>114</sup> This occupation is used as an example and is not meant to be exhaustive. These occupations illustrate how the methodology and occupational conditions relate to the three metrics for demand, which impact whether occupations are on the in-demand occupation list.

<sup>115</sup> An industry certification is a credential recognized by business and industry at the local, state, or national level. It could be an assessment, an examination or a license that is administered and recognized by an industry third-party or governing board. Industry certificates measure competency in an occupation, and they validate the knowledge base and skills that show mastery in a particular industry or mastery of a particular competency needed in a certain industry.

reports will seek to improve the comprehensiveness of Tennessee's supply for in-demand occupations.

## Appendix: Supply and Demand Report – Degree Production and Expected Degrees, 2016 to 2020

Tennessee’s annual *Improving the Pipeline for Tennessee’s Workforce: Academic Supply for Occupational Demand Report*, released in March 2022, offers key insights into occupational demand across Tennessee and the academic programs and initiatives seeking to meet that demand. This supplementary brief addresses requirements under § TCA 49-7-112(b)(1) describing degree production and expected degrees produced by public and private institutions in Tennessee. Within this brief, this degree production and expected degrees table will be referred to as Table 1.

Table 1 highlights the latest five-year counts of undergraduate degrees produced by Title IV reporting institutions in the state of Tennessee.<sup>116</sup> These historical data include all Tennessee institutions reporting to the Integrated Postsecondary Education Data System (IPEDS). IPEDS is a federal dataset containing information about higher education institutions, including student demographics, program offerings, and completion data.<sup>117</sup>

Table 1 presents academic programs by their two-digit Classification of Instructional Programs (CIP) code.<sup>118</sup> There is a distinction made between STEM and non-STEM related fields, with STEM programs differentiated in Table 1 by an asterisk, as the state of Tennessee promotes an increase in STEM related awards. THEC’s division of Academic Affairs defines STEM using the two-digit 2020 CIP codes listed below:

- 01 - Agricultural/Animal/Plant/Veterinary Science and Related Fields
- 03 - Natural Resources and Conservation
- 11 - Computer and Information Sciences and Support Services
- 14 - Engineering
- 15 - Engineering/Engineering-related Technologies/Technicians
- 26 - Biological and Biomedical Sciences
- 27 - Mathematics and Statistics
- 40 - Physical Sciences
- 51 – Health Professions

This definition of STEM was adopted by the 2010-15 Performance Funding Taskforce in June 2010.<sup>119</sup> The Health Professions CIP code was later added. STEM is defined differently depending upon the institution, for example, the U.S. Department of Homeland Security has a broader definition that is meant to assist international students in obtaining a

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<sup>116</sup> For more information on the reporting requirements for IPEDS see [here](#).

<sup>117</sup> Data are available [here](#).

<sup>118</sup> For more information on CIP see [here](#).

<sup>119</sup> For more information on THEC’s definition of STEM see [here](#).

student visa. The Bureau of Labor Statistics (BLS) uses a different definition of STEM linking the STEM definition to occupational codes.<sup>120</sup>

Postsecondary credentials are projected through the next academic year, based on historical data from the previous five years. The institutions included in these projections are public, private, and proprietary institutions in Tennessee that award postsecondary certificates, associate degrees, or bachelor’s degrees.

**Table 1: Undergraduate Degrees Produced and Expected by Tennessee Institutions**

Program	2016	2017	2018	2019	2020	Compound Annual Growth Rate	2021 Estimated Awards
Architecture and Related Services	55	60	66	78	103	17.0%	120
Computer and Information Sciences and Support Services *	1,311	1,355	1,562	1,551	1,875	9.4%	2,050
Engineering *	1,573	1,714	1,839	1,769	1,876	4.5%	1,960
Parks, Recreation, Leisure, Fitness, and Kinesiology	1,887	2,001	2,052	2,032	2,217	4.1%	2,308
Biological and Biomedical Sciences *	1,535	1,696	1,626	1,652	1,793	4.0%	1,864
Visual and Performing Arts	2,373	2,436	2,495	2,575	2,624	2.5%	2,691
Liberal Arts and Sciences, General Studies and Humanities	9,449	9,803	10,380	9,728	10,440	2.5%	10,704
Precision Production	1,036	1,111	1,296	1,300	1,144	2.5%	1,173
Construction Trades	382	415	401	413	419	2.3%	429
Communications Technologies/Technicians and Support Services	355	351	405	415	387	2.2%	395
Engineering/Engineering-related Technologies/Technicians *	1,547	1,610	1,632	1,591	1,671	1.9%	1,704
Communication, Journalism, and Related Programs	1,466	1,578	1,553	1,609	1,563	1.6%	1,588
Agricultural/Animal/Plant/Veterinary Science and Related Fields *	732	715	713	711	756	0.8%	762
Physical Sciences *	536	590	578	508	531	-0.2%	530
Family and Consumer Sciences/Human Sciences	736	728	727	662	723	-0.4%	720
Psychology	1,894	1,870	1,835	1,789	1,831	-0.8%	1,816
Natural Resources and Conservation *	231	250	226	234	223	-0.9%	221

<sup>120</sup> More information about this definition can be found [here](#). The Bureau of Labor Statistic’s definition of STEM is used by Tennessee Department of Economic and Community Development and Tennessee Department of Labor and Workforce Development WIRED Division and is consistent with the STEM designation from pages 13-76 of the report.

Program	2016	2017	2018	2019	2020	Compound Annual Growth Rate	2021 Estimated Awards
Business, Management, Marketing, and Related Support Services	8,582	8,686	8,442	8,127	8,230	-1.0%	8,144
Social Sciences	1,894	1,881	1,870	1,950	1,793	-1.4%	1,769
History	532	471	477	484	492	-1.9%	482
Homeland Security, Law Enforcement, Firefighting and Related Protective Services	1,703	1,791	1,652	1,617	1,569	-2.0%	1,537
English Language and Literature/Letters	782	747	743	712	717	-2.1%	702
Mathematics and Statistics *	307	307	294	266	280	-2.3%	274
Legal Professions and Studies	167	140	139	140	152	-2.3%	148
Public Administration and Social Service Professions	709	662	751	742	644	-2.4%	629
Philosophy and Religious Studies	191	204	188	159	172	-2.6%	168
Multi/Interdisciplinary Studies	1,624	1,689	1,437	1,350	1,442	-2.9%	1,400
Health Professions and Related Programs *	14,333	14,490	13,718	12,680	12,696	-3.0%	12,317
Theology and Religious Vocations	530	469	476	418	444	-4.3%	425
Education	2,158	2,075	1,937	1,928	1,794	-4.5%	1,713
Area, Ethnic, Cultural, Gender, and Group Studies	70	65	82	72	56	-5.4%	53
Culinary, Entertainment, and Personal Services	2,738	2,655	2,256	2,074	2,181	-5.5%	2,060
Mechanic and Repair Technologies/Technicians	3,310	3,562	3,157	2,954	2,598	-5.9%	2,445
Foreign Languages, Literatures, and Linguistics	350	336	306	308	265	-6.7%	247
Transportation and Materials Moving	648	587	599	441	432	-9.6%	390
Science Technologies/Technicians	94	38	29	24	31	-24.2%	23
<b>Total</b>	<b>67,820</b>	<b>69,138</b>	<b>67,939</b>	<b>65,063</b>	<b>66,164</b>	<b>-1.0%</b>	<b>65,962</b>

### Table 1: Analysis

After two years of consecutive declines, overall award production increased by 1.7 percent in 2020, reaching just above 66,000 awards and above pre-pandemic 2019 levels. Overall award production at the baccalaureate and sub-baccalaureate level within the state has decreased 1.0 percent annually over the past five years, on average (down from the 0.8 percent increase estimated in previous year). Estimated level of awards in 2021 are expected to decrease slightly from 2020 to just below 66,000 awards.

Award production declines over this period may be better understood in the context of enrollment trends. Following the Great-Recession, from fall 2010 through fall 2016 there

were year-over-year declines in enrollments followed by small increases from fall 2017 through fall 2019.

Degree production over time is different between the public and private sectors. Since 2010, the public sector has experienced only three year-over-year declines in degree production (in 2013 down 3.6 percent, 2014 down 1.1 percent, and in 2019 down 3.2 percent). At the same time, the private sector experienced consistent year-over-year declines from 2013 through 2019 (ranging from 0.9-6.6 percent), and only a slight increase in degree production in 2020 (up 0.3 percent; compared to the public sector up by 2.3 percent). Within the private sector, non-institutions (e.g., cosmetology and IT schools) made up most of the declines from 2013 through 2019—where traditional postsecondary colleges and universities only experience declines in 2018, 2019, and 2020.

Some programs, Architecture and Related Services (17.0 percent), Parks, Recreation, Leisure, Fitness, and Kinesiology (4.1 percent), and Construction Trades (2.3 percent), are consistently growing. Other programs have been experiencing general declines in award production over time, such as Science Technologies/Technicians (-24.2 percent), Transportation and Materials Moving (-9.6 percent), and Foreign Languages, Literatures, and Linguistics (-6.7 percent).

Alternatively, most STEM fields like Computer and Information Sciences and Support Services (9.4 percent) and Engineering (4.5 percent), have grown steadily the past five years and are projected to continue. Other STEM programs like Health Professions and Related Programs (-3.0 percent), Mathematics and Statistics (-2.3 percent), Natural Resources and Conservation (-0.9 percent), and Physical Sciences (-0.2 percent) have all declined. Most programs experiencing declines during this period are non-STEM. Collectively, STEM programs have decreased by 0.5 percent while all other programs have decreased by 0.7 percent over the last five years.

## **Table 1: Technical Appendix**

### ***Replication of IPEDS Data***

Table 1 data can be replicated using [this website](#) with the following steps:

*IPEDS > Survey Data > Custom Data Files > By Groups > EZ Groups > (Select year data is associated with) > State or other jurisdiction > Tennessee > Search > Add New Variables > (Select associated year from the "Available Year(s)" box) > Completions > Completions/Awards/degrees conferred by program (CIP), award level, race/ethnicity, and gender: July 1, YYYY to June 20, YYYY > (Select First Major) > (Select all 2-digit CIP Code – 2010 Classification) > (Select Associate's degree, Bachelor's degree, and Certificates below the Baccalaureate total) > (Select Grand total) > Continue > (Download file for that year and then select start over to repeat for each additional year required).*

### ***Replication of Compound Annual Growth Rates and Estimated Awards***

In addition to the five-year count, Table 1 shows the Compound Annual Growth Rates (CAGR) over the given five-year period. A CAGR as seen in *Equation 1* can be utilized to forecast future values and is typically applied in the calculation of returns on an investment over time (e.g., an investor looking to compare two stocks in the same market index).

*Equation 1.*

$$CAGR = \left( \frac{EV}{BV} \right)^{\frac{1}{n}} - 1 * 100$$

*Where: EV = Ending Value, BV = Beginning value, and n = Number of years*

The benefit of applying a CAGR instead of a standard growth rate in this application is that a CAGR assumes the same growth every year, where a standard growth rate does not—this allows for smoothing of volatility that may be present in year-by-year growth rates across programs over time. The growth rates from *Equation 1* are then applied to the latest year's data to forecast the next year's Estimated Awards as seen in *Equation 2*:

*Equation 2.*

$$Estimated\ Awards = Previous\ Year\ Awards + (Previous\ Year\ Awards * CAGR)$$