

# SECTION 4

## STATE-APPROVED CTE PROGRAMS

### DESCRIPTION OF STATE-APPROVED CTE PROGRAMS

The Michigan Department of Education's Office of Career and Technical Education (MDE-OCTE) provides technical assistance and support for the improvement of existing state-approved career and technical education (CTE) programs, and the development of new CTE programs for secondary students attending career centers, intermediate school districts (ISDs), and local school districts in Michigan. A current list of CTE programs eligible to receive funding can be found in the [Career Cluster and CIP Codes by Consultant](#) document on the [MDE-OCTE website](#).

Students enrolled in state-approved secondary CTE programs have an opportunity to acquire skills that prepare them for successful career entry, advancement, and/or continuing education. CTE program choices should relate to the career goals identified in the students' Educational Development Plan (EDP). These skills should be transferable, as well as career-specific and basic to students' education, providing them with a foundation for lifelong learning and career employability.

Each state-approved program is required to integrate [four key components of a successful CTE program](#):

1. Classroom Instruction: Integration of academic and technical skills to support core knowledge.
2. Laboratory Learning: Hands-on learning to develop technical skills.
3. Work-Based Learning (WBL): WBL opportunities to further develop and apply skills.
4. Student Leadership: Student leadership opportunities to support employability and career-ready practices.

The primary objectives for secondary CTE programs are:

- To provide students with the skills needed for employment now, and broad transferable academic, employability, and career skills, allowing students further employment and education flexibility.
- To acquire an awareness of the structure and future trends within high-skill, high-wage, and in-demand industries, to increase student options for occupational choice in the pursuit of a career, and to provide the requisite knowledge and skills for continued advanced education and training.
- To provide classroom, leadership, and WBL experiences to bridge the gap between education and the world of work.

State-approved CTE programs are aligned with the following 17 career clusters:

- Agriculture, Food and Natural Resources
- Architecture and Construction
- Arts, A/V Technology and Communications
- Business, Management and Administration
- Education and Training
- Energy
- Finance
- Government and Public Administration
- Health Science
- Hospitality and Tourism
- Human Services
- Information Technology
- Law, Public Safety, Corrections and Security
- Manufacturing
- Marketing
- Science, Technology, Engineering and Mathematics
- Transportation, Distribution and Logistics

These 17 career clusters provide a useful framework to aid both students and educators in making meaningful connections to the current and emerging world of work, leading to students being successful in a career of choice and lifelong learning.

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View a one-page, at-a-glance on the [Four Components of a CTE Program](#) or a two-page at-a-glance on [Career Clusters](#).

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## DEFINITION OF CTE PROGRAMS

To be approved and eligible for funding by the State of Michigan, a state-approved CTE program must be a program that prepares students to earn a wage (except for 19.0000 Family and Consumer Sciences). A CTE program must have a federal U. S. Department of Education Classification of Instructional Program (CIP) Code number and descriptor. All CTE programs include classroom, leadership, laboratory experiences, and work-based learning instruction. Instruction must be competency-based and aligned with state-level CIP-specific CTE program standards, as defined by the MDE-OCTE.

The [MDE CTE Portal](#) for Michigan's CTE community (state, local, and regional CTE administrators and instructors) provides real-time access to Michigan's state-approved monitoring process. This is necessary for educational decision-making, management, and, ultimately, student achievement. This comprehensive, statewide, web-based system is user-friendly, instructor-driven, and can be used for managing the components of CTE program delivery, including technical standards, career cluster content, competencies, resource content, and academic alignment results for all of Michigan's CTE program areas.

The MDE CTE Portal provides Michigan CTE programs with the capability of listing programs by Career Cluster and CIP Code. Teachers have the capability of adding resources that they would use to deliver the standards (images, documents, presentations, and lesson plans). For monitoring purposes, the CIP Self-Review must be completed for each state-approved program.

For information on developing new CTE programs, refer to [Section 5](#) of this manual.

## **CIP SELF-REVIEW PROGRAM CRITERIA**

A CTE [CIP Self-Review](#) must be completed annually for all state-approved CTE programs with any student enrollment. A regional CIP Self-Review Summary Report must be completed by June 30<sup>th</sup> of each year for the selected 20% of state-approved CTE programs in the region. A description of each area of the CIP Self-Review Criteria may be found in [Section 5](#) of this manual. Please note that FCS programs have different criteria.

## **CTE CURRICULUM INTEGRATION**

CTE, integrated course sequences, and project-based learning are delivery models in which students may earn full or partial [Michigan Merit Curriculum](#) (MMC) credit by successfully demonstrating that they have met subject area content standards. The assignment of credit must be based, in part, on student performance on an assessment that measures student achievement of those standards. These programs give students the opportunity to apply academic content in real-world situations to demonstrate proficiency. Students must complete all the high school credit requirements at the same level of performance as required of all Michigan students. CTE students must also meet the technical standards and certification requirements of their chosen field of technical study. View the [Michigan Merit Curriculum High School Graduation Requirements Frequently Asked Questions](#).

## **PROGRAM CONCENTRATOR – PROGRAM COMPLETER DEFINITIONS**

The definitions of a program participant, program concentrator and program completer vary as programs transition from reporting by Perkins IV segments to Perkins V Perkins Course Competencies (PCCs). Definitions are outlined in the transitional [Participant](#), [Concentrator](#), and [Completer](#) memos, and Perkins V definitions [memo](#) on the [MDE-OCTE website](#).

## **Participant – Perkins IV to V Transition Definition**

### For programs reporting under Segments

For the purposes of Perkins reporting, a course is defined as 4 segments. Therefore, a Participant is a student who has successfully completed, with a grade of C (2.0) or better, courses totaling 4 to 7 segments of instruction – regardless of the number of local courses taken to reach 4 segments.

### For programs reporting under Perkins V Perkins Course Competencies (PCCs)

A Participant is a student served by an eligible recipient who has completed **one** PCC.

## **Concentrator – Perkins IV to V Transition Definition**

### For programs reporting under Segments

For the purposes of Perkins reporting, a course is defined as 4 segments and two courses require  $4 + 4 = 8$  segments. Therefore, a Concentrator is a student who has successfully completed, with a grade of C (2.0) or better, courses totaling 8 segments of instruction – regardless of the number of local courses taken to reach 8 segments.

### For programs reporting under Perkins V Perkins Course Competencies (PCCs)

A student served by an eligible recipient who has completed at least **two** PCCs in a single career and technical education program of study.

## **Completer – Perkins IV to V Transition Definition**

### For programs reporting under Segments

A Completer is a student who has successfully completed, with a grade of C (2.0) or better, courses totaling **all 12 segments** of instruction.

### For programs reporting under Perkins V Perkins Course Competencies (PCCs)

A Completer is a student who has completed **all state program competencies** with a grade of C (2.0) or better.

## **CAREER CLUSTERS**

The National Career Clusters Framework was originally designed and developed under a cooperative agreement with the Office of Vocational and Adult Education, by the U. S. Department of Education. The initiative is managed by Advance CTE.

A career cluster is a grouping of occupations and broad industries based on commonalities. The career clusters provide an organizing tool for schools. The cluster foundations represent the knowledge and skills, both academic and technical, that all students within the cluster should achieve regardless of the career specialty chosen. The 79 career pathways within the clusters represent the knowledge and skills necessary to pursue a full range of career opportunities,

ranging from entry-level to management, including technical and professional career specialties. The career specialties represent the full range of career opportunities within each cluster pathway.

There is no educational level to the clusters. Acceptance of these among secondary and postsecondary institutions can easily aid the seamless transition from secondary to postsecondary. All cluster foundations support the MMC Academic Content Standards for high school students.

The clusters are the first national approach to a set of standards in CTE with continuity between and among occupations. Each cluster utilizes the same format, using knowledge and skill statements, performance elements, and sample indicators, thus assuring some standardization in requirements among clusters.

Each cluster is divided into multiple career pathways (sections) to provide students with a clear focus in specialized occupational areas.

Michigan utilizes 17 career clusters. There are many benefits to Michigan students using the cluster framework. Some of these benefits are outlined below:

- Clusters were produced by nationally represented advisory committees using state and national standards that already existed. These committees were composed of experts and leaders in their fields nationally.
- Clusters have all been cross-walked with national resources and federal CIP codes.
- Once developed, they were validated electronically nationwide and are revalidated approximately every three years.
- Solid postsecondary, secondary, and business and industry representation ensured all parties had input in the development of the program of study (POS).
- Career clusters are being embraced all over the country in state-to-state standards alignment.
- Clusters are the first national approach to a teachable set of standards with continuity.
- Portability of credentials within the state and state-to-state are now possible in state-approved CTE programs.
- The Career Cluster Framework is used in some form by all 50 states and territories to organize CTE programs at the state and local levels.
- Several clusters are currently forming an assessment tool that may offer a national credential to students.

All secondary state-approved CTE programs in Michigan align their curriculum to the related CTE program standards and can be found on the [CTE Instructional Resources, by Career Cluster](#) page. More information on the National Career Clusters Framework can be found on the [Advance CTE](#) website.

## **AGRICULTURE, FOOD AND NATURAL RESOURCES**

The production, processing, marketing, distribution, financing, and development of agricultural commodities and resources including food, fiber, wood products, natural resources, horticulture, and other plant and animal products and resources.

Programs in this cluster should provide an extend program for the teaching staff. This will allow for the enhancement of student learning outside of the traditional school day and year.

### **01.0000 Agriculture, Agriculture Operations and Related Sciences**

This program focuses on the general principles and practice of agricultural research and production to prepare individuals to apply this knowledge to the solution of practical agricultural problems. Instruction includes basic animal, plant, and soil science, animal husbandry and plant cultivation, soil conservation, natural resources, and agricultural operations such as farming, ranching, and agricultural business.

### **01.0601 Applied Horticulture and Horticulture Operations**

This program focusing on the general production and processing of domesticated plants, shrubs, flowers, foliage, trees, ground covers, and related plant materials, the management of technical and business operations connected with horticultural services, and the basic scientific principles needed to understand plants and their management and care.

### **01.0903 Animal Health and Veterinary Science**

This program focuses on the application of biological and chemical principles to the study, prevention, and control of diseases in agricultural and companion animal populations. Instruction includes environmental science, pharmacology, animal population studies, genetics, animal physiology and diet, disease prevention, treatment methodologies, and laboratory and testing procedures.

### **03.0000 Natural Resources and Conservation**

This program focuses on the studies and activities relating to the natural environment and its conservation, use, and improvement. Instruction includes subjects such as climate, air, soil, water, land, fish and wildlife, and plant resources, basic principles of environmental science and natural resources management, and the recreational and economic uses of renewable and nonrenewable natural resources.

## **26.1201 Biotechnology**

This laboratory-based program preparing students for work in the science, technology, and business of the biotechnology industry related to plants, animals, and renewable fuels. Instruction includes an overview of the biotechnology industry, standard laboratory practices, and organisms used in research, deoxyribonucleic acid (DNA) and protein manipulation, assays, genetic engineering, product development and marketing, and industrial applications.

## **ARCHITECTURE AND CONSTRUCTION**

Careers in designing, planning, managing, building, and maintaining the build environment.

### **15.1301 Drafting and Design Technology/Architectural**

This program prepares individuals to generally apply technical skills to create working drawings and computer simulations for a variety of applications. Instruction includes specification interpretation, dimensioning techniques, drafting calculations, material estimation, technical communications, computer applications, and interpersonal communications.

### **19.0605 Home Furnishings Equipment Installers and Consultants**

This program prepares individuals to assist in home furnishings and decorations. Instruction includes spatial reimaging/redesign, selecting, purchasing, and designing home furnishings, decorations, and equipment, floral design, accessory construction, textiles, and upholstery.

### **46.0000 Construction Trades**

This program generally prepares individuals to apply technical knowledge and skills in the building, inspecting, and maintaining of structures and related properties. The program may include instruction in masonry, carpentry, electrical and power transmission installation, building/construction finishing, management, inspection, and applicable codes and standards.

### **46.0301 Electrical and Power Transmission Installation**

This program generally prepares individuals to apply technical knowledge and skills to install indoor and outdoor residential, commercial, and industrial electrical systems, and associated power transmission lines. Instruction includes electricity, safety, safety procedures, wiring, insulation and grounding, schematic blueprint interpretation, equipment operation and maintenance and applicable codes and standards.

### **46.0503 Plumbing Technology**

This program prepares individuals to practice as licensed plumbers by applying technical knowledge and skills to lay out, assemble, install, and maintain piping fixtures and systems for steam, natural gas, oil, hot water, heating, cooling, drainage, lubricating, sprinkling, and industrial processing systems in home and commercial environments. Instruction includes source determination, water distribution, waste removal, pressure adjustment, basic physics, technical mathematics, blueprint reading, pipe installation, pumps, welding and soldering, plumbing inspection, and applicable codes and standards.

### **47.0201 Heating, Air Conditioning, Ventilation and Refrigeration**

This program prepares individuals to apply technical knowledge and skills to repair, install, service, and maintain the operating conditions of the heating, air conditioning, and refrigeration systems. Instruction includes diagnostic techniques, the use of testing equipment, and the principles of mechanics, electricity, and electronics as they relate to the repair of heating, air conditioning, and refrigeration systems.

## **ARTS, A/V TECHNOLOGY AND COMMUNICATIONS**

Designing, producing, exhibiting, performing, writing, and publishing multi-media, broadcast and social media content that includes visual and performing arts and design, journalism, and entertainment services.

### **19.0906 Fashion Design**

This program prepares individuals to assist in apparel and fashion selection with traditional training in the use of digital production equipment and technology, style coordination, sales, personal shopping and consulting, fabric selection, clothing, accessories, and buying activities. Instruction may also include home furnishing, interior design, and decorating. Specialized instruction in event planning.

### **10.0202 Radio and Television Broadcasting Technology**

This program prepares individuals to apply technical, broadcast journalism knowledge, and skills to the production of radio television broadcast media, social media, and related operations under the supervision of broadcast and studio managers, directors, editors, and producers. Instruction includes writing and reporting, sound, lighting, camera operations and maintenance, audio recording and production, digital media, control room and studio operations, pre-and post-production. The program also includes broadcast engineering, related computer applications, and specialized training in communication and networking, social media content production, news, entertainment, live talk, sports, commercials, and film.

### **10.0301 Graphics and Printing Technology and Communications**

This program prepares individuals to apply technical knowledge and skills in the manufacturing and distribution or transmission of graphic communications products. This program includes traditional and digital instruction in the pre-press, press, and post-press phases of production, operations, and processes such as offset lithography, flexography, gravure, letterpress, screen printing, photography, foil stamping, digital imaging, and other reproduction methods.

### **50.0101 Visual and Performing Arts**

This program of general theater, visual, and performing arts prepares individuals in any of the artistic media or performing disciplines. It may also include dance, choreography, stage production, talent agent, make-up artistry, directors, writers, composers, and costume design.

## **BUSINESS MANAGEMENT AND ADMINISTRATION**

Careers in planning, organizing, directing, and evaluating business functions essential to efficient and productive business operations.

### **52.0299 Business Administration Management and Operations**

This program prepares individuals to plan, manage, supervise, and market business operations, products, and services. Instruction includes business administration, information management, human resource management, business law, ethics, business communications utilizing application software, preparing and delivering presentations, planning and organizing projects, and decision making in a business environment.

## **EDUCATION AND TRAINING**

Planning, managing, and providing education and training services and related learning support services such as administration, teaching/training, administrative support, and professional support services.

### **13.0000 Education, General**

This program focuses on the general theory and practice of learning and teaching, the basic principles of educational psychology, the art of teaching, planning and administration of educational activities, school safety and health issues, and the social foundations of education.

## **ENERGY**

Prepares individuals for careers in the designing, planning, maintaining, generating, transmission, and distribution of traditional and alternative energy.

### **46.0303 Line Worker**

This program prepares individuals to apply technical knowledge and skills to install, operate, maintain, and repair local, long-distance, and rural electric power cables and communication lines, erect and construct pole and tower lines and install underground lines and cables. Instruction includes cable installation and repair, fiber-optic technology, trenching, mobile equipment and crane operation, high-voltage installations, maintenance and inspection, safety, remote communications, and applicable codes and standards.

## **FINANCE**

Careers in planning, services for financial and investment planning, banking, insurance, and business financial management.

### **52.0800 Finance and Financial Management Services**

This program generally prepares individuals to plan, manage, and analyze the financial and monetary aspects and performance of business enterprises, banking institutions, or other organizations. Instruction includes principles of accounting, financial instruments, capital planning, funds acquisition, asset and debt management, budgeting, financial analysis, and investments and portfolio management.

### **52.1701 Insurance**

This program prepares individuals to manage risk in organizational settings and provides insurance and risk-aversion services to businesses, individuals, and other organizations. Instruction includes casualty insurance and general liability, property insurance, employee benefits, social and health insurance, loss adjustment, underwriting, risk theory, and pension planning.

## **GOVERNMENT AND PUBLIC ADMINISTRATION**

Planning and executing government functions at the local, state, and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.

### **28.0301 Army (JROTC)**

This program introduces students to the theory and practice of military science and life in the U.S. Army and prepares them for cadet status (Junior ROTC or JROTC) or service as a commissioned reserve or active-duty officers (Senior AROTC or ROTC). Programs are offered as adjuncts to regular high school or college instructional programs.

## **HEALTH SCIENCE**

Planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.

### **26.0102 Biomedical Sciences, General**

This general program focuses on the integrative scientific study of biological issues related to health and medicine, or a program in one or more of the biomedical sciences that is undifferentiated as to title. Instruction includes any of the basic medical sciences at the research level, biological science research in biomedical faculties, and general studies encompassing a variety of biomedical disciplines.

### **51.0000 Health Services/Allied Health/Health Sciences, General**

This general, introductory, undifferentiated, or joint program in health services occupations prepares individuals for either entry into specialized training programs or a variety of concentrations in the allied health area. Instruction includes basic sciences, research and clinical procedures, and aspects of the subject matter related to various health occupations.

#### **51.1000 Clinical/Medical Laboratory Science/Research and Allied Professions**

This program prepares students to test biological specimens to gather information about patient conditions, analyze for abnormalities or other problems using special mechanical or electrical devices, understand and interpret requests for procedures, and plan for the implementation of services and procedures. Instruction includes healthcare safety and maintenance practices, ethical and legal responsibilities, problem-solving and critical thinking, technology applications, biology, and chemistry.

## **HOSPITALITY AND TOURISM**

Preparing individuals for employment in career pathways related to families and human needs, such as restaurant and food/beverage services, lodging, travel and tourism, recreation, amusement, and attractions.

### **12.0500 Cooking and Related Culinary Arts, General**

This program focuses on the general study of cooking and related culinary arts and may prepare individuals for a variety of jobs within the food service industry. Instruction includes food preparation, cooking techniques, equipment operation and maintenance, sanitation and safety, communication skills, applicable regulations, and principles of food service management.

### **52.0901 Hospitality and Tourism Management, General**

This program prepares 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. Instruction includes 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.

## **HUMAN SERVICES**

This diverse career cluster prepares individuals for employment in career pathways related to families and human needs.

### **12.0401 Cosmetology**

This program generally prepares individuals to cut, trim, and style scalp, facial, and body hair, apply cosmetic preparations, perform manicures and pedicures, massage the head and extremities, and prepare for practice as licensed cosmetologists in specialized or full-service salons. Instruction includes hair cutting and styling, manicures, pedicures, facial treatments, shampooing, chemical applications, esthetics, shop management, sanitation and safety, customer service, and applicable professional and labor laws and regulations.

## **INFORMATION TECHNOLOGY**

Building linkages in information technology (IT) occupations for entry-level, technical, and professional careers related to the design, development, support, and management of hardware, software, multimedia, and systems integration services.

### **11.0201 Computer Programming/Programmer**

This program focuses on the general writing and implementation of generic and customized programs to drive operating systems and generally prepares individuals to apply the methods and procedures of software design and programming to software installation and maintenance. Instruction includes software design, low- and high-level languages and program writing, program customization and linking, prototype testing, troubleshooting, and related aspects of operating systems and networks.

### **11.0801 Digital/Multimedia and Information Resources Design**

This program prepares individuals to apply HTML, XML, JavaScript, graphics applications, and other authoring tools to the design, editing, and publishing (launching) of documents, images, graphics, sound, and multimedia products on the World Wide Web. Instruction includes Internet theory, web page standards and policies, elements of web page design, user interfaces, vector tools, special effects, interactive and multimedia components, search engines, navigation, morphing, e-commerce tools, and emerging web technologies.

### **11.0901 Computer Systems Networking and Telecommunications**

This program focuses on the design, implementation, and management of linked systems of computers, peripherals, and associated software to maximize efficiency and productivity, and that prepares individuals to function as network specialists and managers at various levels. Instruction includes operating systems and applications, systems design and analysis, networking theory and solutions, types of networks, network management and control, network and flow optimization, security, configuring, and troubleshooting.

### **11.1001 Systems Administration/Administrator**

This program prepares individuals to manage the computer operations and control the system configurations emanating from a specific site or network hub. Instruction includes computer hardware and software and applications, local area networking (LAN) and wide area networking (WAN), principles of information systems security, disk space and traffic load monitoring, data backup, resource allocation, and setup and takedown procedures.

### **11.1003 Computer and Information Systems Security/Information Assurance**

This program prepares individuals to assess the security needs of computer and network systems, recommend safeguard solutions, and manage the implementation and maintenance of security devices, systems, and procedures. Instruction includes computer architecture, programming, and systems analysis, networking, telecommunications, cryptography, security system design, applicable law and regulations, risk assessment and policy analysis, contingency planning, user access issues, investigation techniques and troubleshooting.

## **LAW, PUBLIC SAFETY, CORRECTIONS AND SECURITY**

Planning, managing, and providing legal, public safety, protective services, and homeland security, including professional and technical support services.

### **43.0100 Public Safety/Protective Services**

This program prepares individuals to apply theories and practices of organization management and criminal justice to the administration of public law enforcement agencies and operations. Instruction includes law enforcement history and theory, operational command leadership, administration of public police organizations, labor relations, incident response strategies, legal and regulatory responsibilities, budgeting, public relations, and organizational leadership.

## **MANUFACTURING**

Planning, managing, and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance, and manufacturing/process engineering.

### **47.0101 Electrical/Electronics Equipment Installation and Repair, General**

This program generally prepares individuals to apply technical knowledge and skills to operate, maintain, and repair electrical and electronic equipment.

Instruction includes electrical circuitry, simple gearing, linkages and lubrication of machines and appliances, and the use of testing equipment.

### **48.0501 Machine Tool Technology/Machinist**

This program prepares individuals to apply technical knowledge and skills to plan, manufacture, assemble, test, and repair parts, mechanisms, machines, and structures in which materials are cast, formed, shaped, molded, heat treated, cut, twisted, pressed, fused, stamped, or worked.

### **48.0508 Welding, Brazing, and Soldering**

This program prepares individuals to apply technical knowledge and skills to join or cut metal surfaces. Instruction includes arc welding, resistance welding, brazing, and soldering, cutting, high-energy beam welding and cutting, solid state welding, ferrous and non-ferrous materials, oxidation-reduction reactions, welding metallurgy, welding processes and heat treating, structural design, safety and applicable codes and standards.

### **48.0701 Woodworking, General**

This program generally prepares individuals to apply technical knowledge and skills to lay out and shape stock, assemble wooden articles or subassemblies, mark, bind, saw, carve, and sand wooden products, repair wooden articles, and use a variety of hand and power tools.

## **MARKETING**

Planning, managing, and performing marketing activities to reach organizational objectives such as brand management, professional sales, merchandising, marketing communication, and market research.

### **52.1999 Specialized Merchandising, Sales, and Marketing Operations, Other**

This program focuses on planning, managing, and performing wholesaling and retailing services and related marketing and distribution support services including merchandise/product management and promotion. Various specialty areas are included. Skills acquired in this program include customer service, management, problem-solving, process/system thinking, project management, communication, decision-making, and entrepreneurship.

## **SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS**

Planning, managing, and providing scientific research and professional and technical services (e.g., physical science, social science, engineering) including laboratory and testing services and research and development services.

### **14.4201 Mechatronics**

This program prepares individuals to apply mathematical and scientific principles to the design, development, and operational evaluation of computer-controlled electromechanical systems and products with embedded electronics, sensors, and actuators, which includes automated robots and automation systems. Instruction includes mechanical engineering, electronic/electrical engineering, computer/software engineering, and control engineering.

### **15.0000 Engineering Technology**

This program generally prepares individuals to apply basic engineering principles and technical skills in support of engineers engaged in a wide variety of projects.

Instruction includes various engineering support functions for research, production, and operations and applications to specific engineering specialties.

### **15.1306 Mechanical Drafting**

This program prepares individuals to apply technical knowledge and skills to develop working drawings and electronic simulations in support of mechanical and industrial engineers and related professionals. Instruction includes manufacturing materials and processes, mechanical drafting, electrode-mechanical drafting, basic metallurgy, geometric dimensioning and tolerancing, blueprint reading, and technical communication.

## **TRANSPORTATION, DISTRIBUTION, AND LOGISTICS**

Planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional and technical support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.

### **47.0399 Heavy/Industrial Equipment Maintenance Technologies**

This program prepares individuals to apply technical knowledge and skills in the field of maintenance and repair of heavy equipment and in the general maintenance and overhaul of such equipment. Instruction includes inspection, maintenance, and repair of tracks, wheels, brakes, operating controls, pneumatic and hydraulic systems, electrical circuitry, and engines and techniques of welding and brazing.

### **47.0603 Collision Repair Technician (ASE Certified)**

This program prepares individuals to apply technical knowledge and skills to repair, reconstruct, and finish automobile bodies, fenders, and external features. Instruction includes structure analysis, damage repair, non-structural analysis, mechanical and electrical components, plastics and adhesives, painting and refinishing techniques, and damage analysis and estimating.

### **47.0604 Automobile Technician (ASE Certified)**

This program prepares individuals to apply technical knowledge and skills to repair, service, and maintain all types of automobiles. Instruction includes brake systems, electrical systems, engine performance, engine repair, suspension and steering, automatic and manual transmissions and drive trains, and heating and air conditioning systems.

### **47.0606 Small Engine and Related Equipment Repair**

This program prepares individuals to apply technical knowledge and skills to repair, service, and maintain small internal combustion engines used on portable power equipment such as lawnmowers, chain saws, rotary tillers, and snowmobiles.

### **47.0607 Airframe Technology**

This program prepares individuals to apply technical knowledge and skills to repair, service, and maintain all aircraft components other than engines, propellers, avionics, and instruments. Instruction includes layout and fabrication of sheet metal, fabric, wood, and other materials into structural members, parts, and fittings, and replacement of damaged or worn parts such as control cables and hydraulic units.

### **47.0608 Power Plant Technology (Aircraft)**

This program prepares individuals to apply technical knowledge and skills to repair, service, and maintain all types of aircraft power plant and related systems. Instruction includes engine inspection and maintenance, lubrication and cooling, electrical and ignition systems, carburetion, fuels and fuel systems, propeller, and fan assemblies.

### **47.0609 Avionics Maintenance Technology**

This program prepares individuals to apply technical knowledge and skills to repair, service, and maintain all types of aircraft operating, control, and electronic systems. Instruction includes flight instrumentation, aircraft communications and homing systems, radar and other sensory systems, navigation aids, and specialized systems for various types of civilian and military aircraft.

### **47.0613 Medium/Heavy Truck Technician**

This program prepares individuals to apply technical knowledge and skills to the specialized maintenance and repair of trucks, buses, and other commercial and industrial vehicles. Instruction includes diesel engine mechanics, suspension and steering, brake systems, electrical and electronic systems, preventive maintenance inspections, drive trains, gasoline engine mechanics, heating, ventilation, and air conditioning (HVAC) systems, and auxiliary equipment installation and repair.

### **49.0101 Aeronautics/Aviation/Aerospace Science and Technology**

(Commonly referred to as General Aviation/Drones)

This program focuses on the general study of aviation and the aviation industry, including in-flight and ground support operations. Instruction includes technical, business, and general aspects of air transportation systems.

### **49.0102 Airline/Commercial/Professional Pilot and Flight Crew**

(Commonly referred to as Private Pilot)

This program prepares individuals to apply technical knowledge and skills to the flying and/or navigation of commercial passenger and cargo, agricultural, public service, corporate, and rescue fixed-wing aircraft. Instruction includes principles of aircraft design and performance, aircraft flight systems and controls, flight crew operations and procedures, radio communications, navigation procedures and systems, airways safety and traffic regulations, and governmental rules and regulations pertaining to piloting aircraft. Programs may qualify individuals to sit for the Federal Aviation Administration (FAA) commercial and airline aircrew examinations.