California CTE

Transportation

Adopted 2013

Knowledge and Performance

1 Academics 1.0

2 Communications 2.0

1. Recognize the elements of communication using a sender–receiver model. 2.1
2. Identify barriers to accurate and appropriate communication. 2.2
3. Interpret verbal and nonverbal communications and respond appropriately. 2.3
4. Demonstrate elements of written and electronic communication such as accurate spelling, grammar, and format. 2.4
5. Communicate information and ideas effectively to multiple audiences using a variety of media and formats. 2.5
6. Advocate and practice safe, legal, and responsible use of digital media information and communications technologies. 2.6

3 Career Planning and Management 3.0

1. Identify personal interests, aptitudes, information, and skills necessary for informed career decision making. 3.1
2. Evaluate personal character traits such as trust, respect, and responsibility and understand the impact they can have on career success. 3.2
3. Explore how information and communication technologies are used in career planning and decision making. 3.3
4. Research the scope of career opportunities available and the requirements for education, training, certification, and licensure. 3.4
5. Integrate changing employment trends, societal needs, and economic conditions into career planning. 3.5
6. Recognize the role and function of professional organizations, industry associations, and organized labor in a productive society. 3.6
7. Recognize the importance of small business in the California and global economies. 3.7
8. Understand how digital media are used by potential employers and postsecondary agencies to evaluate candidates. 3.8
9. Develop a career plan that reflects career interests, pathways, and postsecondary options. 3.9

4 Technology 4.0

1. Use electronic reference materials to gather information and produce products and services. 4.1
2. Employ Web-based communications responsibly and effectively to explore complex systems and issues. 4.2
3. Use information and communication technologies to synthesize, summarize, compare, and contrast information from multiple sources. 4.3
4. Discern the quality and value of information collected using digital technologies, and recognize bias and intent of the associated sources. 4.4
5. Research past, present, and projected technological advances as they impact a particular pathway. 4.5
6. Assess the value of various information and communication technologies to interact with constituent populations as part of a search of the current literature or in relation to the information task. 4.6

5 Problem Solving and Critical Thinking 5.0

1. Identify and ask significant questions that clarify various points of view to solve problems. 5.1
2. Solve predictable and unpredictable work-related problems using various types of reasoning (inductive, deductive) as appropriate. 5.2
3. Use systems thinking to analyze how various components interact with each other to produce outcomes in a complex work environment. 5.3
4. Interpret information and draw conclusions, based on the best analysis, to make informed decisions. 5.4

6 Health and Safety 6.0

1. Locate, and adhere to, Material Safety Data Sheet (MSDS) instructions. 6.1
2. Interpret policies, procedures, and regulations for the workplace environment, including employer and employee responsibilities. 6.2
3. Use health and safety practices for storing, cleaning, and maintaining tools, equipment, and supplies. 6.3
4. Practice personal safety when lifting, bending, or moving equipment and supplies. 6.4
5. Demonstrate how to prevent and respond to work-related accidents or injuries; this includes demonstrating an understanding of ergonomics. 6.5
6. Maintain a safe and healthful working environment. 6.6
7. Be informed of laws/acts pertaining to the Occupational Safety and Health Administration (OSHA). 6.7

7 Responsibility and Flexibility 7.0

1. Recognize how financial management impacts the economy, workforce, and community. 7.1
2. Explain the importance of accountability and responsibility in fulfilling personal, community, and workplace roles. 7.2
3. Understand the need to adapt to changing and varied roles and responsibilities. 7.3
4. Practice time management and efficiency to fulfill responsibilities. 7.4
5. Apply high-quality techniques to product or presentation design and development. 7.5
6. Demonstrate knowledge and practice of responsible financial management. 7.6
7. Demonstrate the qualities and behaviors that constitute a positive and professional work demeanor, including appropriate attire for the profession. 7.7
8. Explore issues of global significance and document the impact on the Transportation sector. 7.8

8 Ethics and Legal Responsibilities 8.0

1. Access, analyze, and implement quality assurance standards of practice. 8.1
2. Identify local, district, state, and federal regulatory agencies, entities, laws, and regulations related to the Transportation industry sector. 8.2
3. Demonstrate ethical and legal practices consistent with Transportation sector workplace standards. 8.3
4. Explain the importance of personal integrity, confidentiality, and ethical behavior in the workplace. 8.4
5. Analyze organizational culture and practices within the workplace environment. 8.5
6. Adhere to copyright and intellectual property laws and regulations, and use and appropriately cite proprietary information. 8.6
7. Conform to rules and regulations regarding sharing of confidential information, as determined by Transportation sector laws and practices. 8.7

9 Leadership and Teamwork 9.0

1. Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders. 9.1
2. Identify the characteristics of successful teams, including leadership, cooperation, collaboration, and effective decision-making skills as applied in groups, teams, and career technical student organization activities. 9.2
3. Understand the characteristics and benefits of teamwork, leadership, and citizenship in the school, community, and workplace setting. 9.3
4. Explain how professional associations and organizations and associated leadership development and competitive career development activities enhance academic preparation, promote career choices, and contribute to employment opportunities. 9.4
5. Understand that the modern world is an international community and requires an expanded global view. 9.5
6. Respect individual and cultural differences and recognize the importance of diversity in the workplace. 9.6
7. Participate in interactive teamwork to solve real Transportation sector issues and problems. 9.7

10 Technical Knowledge and Skills 10.0

1. Interpret and explain terminology and practices specific to the Transportation sector. 10.1
2. Comply with the rules, regulations, and expectations of all aspects of the Transportation sector. 10.2
3. Construct projects and products specific to the Transportation sector requirements and expectations. 10.3
4. Collaborate with industry experts for specific technical knowledge and skills. 10.4

11 Demonstration and Application 11.0

1. Utilize work-based/workplace learning experiences to demonstrate and expand upon knowledge and skills gained during classroom instruction and laboratory practices specific to the Transportation sector program of study. 11.1
2. Demonstrate proficiency in a career technical pathway that leads to certification, licensure, and/or continued learning at the postsecondary level. 11.2
3. Demonstrate entrepreneurship skills and knowledge of self-employment options and innovative ventures. 11.3
4. Employ entrepreneurial practices and behaviors as appropriate to the Transportation sector opportunities. 11.4
5. Create a portfolio, or similar collection of work, that offers evidence through assessment and evaluation of skills and knowledge competency as contained in the anchor standards, pathway standards, and performance indicators. 11.5

Pathway Standards

A. Operations

1. Evaluate and assess all aspects of facilities and facility planning for efficient and effective processing/handling of people, goods, and services in the transportation industry (housing, storage, maintenance, parts). A1.0
    1. Recognize the importance of space and location of equipment. A1.1
    2. Define and understand highway, rail, harbor, port, and airport controls. A1.2
    3. Identify where to place equipment for effective and efficient processing. A1.3
    4. Explain the difference between office area and processing areas. A1.4
    5. Design a/an processing center/office/shop. A1.5
2. Describe and identify tools, techniques, and systems used to plan, staff, lead, and organize human resources as it relates to the transportation sector. A2.0
    1. Define the role of management and the responsibility and importance that are required to hold or maintain a position. A2.1
    2. Describe the production and use of industry-generated documents, records, and forms as well as related management skills used in the transportation industries. A2.2
    3. Understand work-related systems of the transportation industries. A2.3
    4. Maintain accurate records as applicable. A2.4
    5. Understand how guidelines, rules, regulations, and laws control transportation-industry practices and how they are overseen by local, state, federal, and international agencies. A2.5
    6. Explore career paths and opportunities within the transportation industry. A2.6
    7. Analyze asset acquisition and procurement needs. A2.7
    8. Research the various types of communication systems needed. A2.8
3. Demonstrate an understanding of the concepts and processes needed to move, store/house, locate, and/or transfer people, goods, and services. A3.0
    1. Identify and understand transportation options such as rail, air, road, and sea. A3.1
    2. Define the different types of process controls available. A3.2
    3. Describe hazardous and nonhazardous materials handling. A3.3
    4. Understand process controls, from planning to completion. A3.4
    5. Determine the uses of information systems in the order fulfillment process. A3.5
    6. Determine the effects of government regulations on stock handling techniques and warehousing. A3.6
    7. Explore the functions of the shipping and receiving process in the success of the distribution function. A3.7
    8. Evaluate types of inventory controls. A3.8

4. Demonstrate an understanding of business fundamentals, uses and application of technologies, communications, and basic management functions. A4.0
    1. Describe current business and marketing trends. A4.1
    2. Identify and analyze the risks associated with obtaining business credit. A4.2
    3. Identify considerations in planning and implementing marketing/business strategies. A4.3
    4. Identify target audience for specific marketing and sales needs. A4.4
    5. Identify the legal aspects of sales contracts and warranties. A4.5
    6. Explain the nature of sales forecasting and marketing needs. A4.6
    7. Understand the practices of acceptable customer relations services. A4.7
    8. Compare and contrast advantages and disadvantages of business ownership. A4.8
5. Analyze and evaluate the design advantages and disadvantages of transportation-industry systems and the effects of those systems on people and the environment. A5.0
    1. Identify environmental conditions that would impact various aspects of the transportation industry. A5.1
    2. Identify steps necessary to design a specific mode of transportation using aerodynamics. A5.2
    3. Research the effects of ergonomics on the health and safety of workers and customers. A5.3
    4. Create a model of a vehicle (train, airplane, railroad, car) incorporating ergonomics and aerodynamics in the design. A5.4
6. Demonstrate safety practices pertaining to the transportation industry, including requirements of the Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), Air Quality Management Districts (AQMDs), and other regulatory agencies. A6.0
    1. Extract information from Material Safety Data Sheets (MSDS) pertaining to chemicals used in the workplace. A6.1
    2. Locate regulatory information and manufacturer recalls. A6.2
    3. Conform to federal, state, and local regulations and manufacturers' specifications when handling, storing, and disposing of chemicals and equipment, including necessary certifications. A6.3
    4. Adhere to ergonomic and environmental safety regulations in the workplace. A6.4
    5. Participate in compliance training activities and exercises. A6.5
    6. Determine the safe and correct application and use for chemicals used in the transportation industry. A6.6
7. Describe and identify the infrastructures required and used in the transportation industry. A7.0

1. Identify the infrastructure needed to move people, goods, and equipment from one location to another (highways, bridges, waterways, railways). A7.1
2. Recognize the need for traffic signals, signs, and markings. A7.2
3. Define fueling infrastructure needed to move vehicles, equipment, goods, and services from one location to another. A7.3
4. Explain the importance of infrastructure in transporting vehicles, goods, and/or equipment in our everyday lives. A7.4
5. Evaluate the need to safely move fluids from one location to another. A7.5

B. Structural Repair and Refinishing

1. Students practice personal and occupational safety and understand the environmental effects of collision repair and refinishing practices. B1.0
    1. Describe industry environmental conservation practices and their applications. B1.1
    2. Practice the safe handling and storage of chemicals and hazardous wastes as required by the Occupational Safety and Health Administration (OSHA), Air Resources Board (ARB), Air Quality Management Districts (AQMDs), and other regulatory agencies. B1.2
    3. Understand the generation of waste products and other environmentally destructive substances. B1.3
    4. Use appropriate materials and repair technologies. B1.4
    5. Understand the environmental implications of using new and emerging materials, resources, and technologies. B1.5
    6. Demonstrate the safety practices applied when servicing vehicle-body electronics and other vehicle systems. B1.6
2. Practice the safe and appropriate use of tools, equipment, and work processes. B2.0
    1. Understand how certain tools and equipment are used to perform maintenance and repair operations. B2.1
    2. Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems). B2.2
3. Apply measurement systems and the mathematical functions necessary to perform required fabrication, maintenance, and operation procedures. B3.0
    1. Use industry-standard measurement scales, devices, and systems to perform design, fabrication, diagnostic, maintenance, and repair procedures. B3.1
    2. Use technical vocabulary, technical reports and manuals, electronic systems, and related technical data resources, as appropriate, to determine repairs and estimates. B3.2
    3. Demonstrate the different types of welding and heat processes used in repair processes and procedures. B3.3
    4. Understand the mathematical functions associated with collision repair and refinishing. B3.4
4. Apply scientific principles in relation to chemical, mechanical, and physical functions and in relation to industry and manufacturer standards. B4.0
    1. Identify and understand the physical and chemical characteristics of metals, plastics, and other materials. B4.1
    2. Describe the basic terms, characteristics, and concepts of physical and chemical processes. B4.2

3. Apply the principles of mechanical, electrical, hydraulic, and pneumatic power in relation to collision repair and refinishing. B4.3
4. Practice the principles of electricity and electronics. B4.4
5. Understand body and frame construction. B4.5
6. Know the importance of calibration processes, systems, and techniques in using various measurement and testing devices. B4.6

5. Perform and document repair procedures in accordance with manufacturer recommendations and industry standards. B5.0
    1. Explain and practice the recommended procedures and practices of various manufacturers. B5.1
    2. Use reference books and materials, technical service bulletins, and other related documents to determine repairs and rate of pay. B5.2
    3. Document repair procedures accurately as required by the Bureau of Automotive Repair and other regulatory agencies. B5.3
6. Demonstrate basic business practices. B6.0
    1. Know the laws and regulations applicable to the recordkeeping and handling of hazardous materials. B6.1
    2. Use and understand work-related systems. B6.2
    3. Practice and understand the importance of, and procedures for, maintaining accurate records. B6.3
    4. Discuss and apply the concept and application of accepted ethical business practices. B6.4
    5. Use and understand the concept and application of acceptable customer relations services. B6.5
7. Understand structural and nonstructural analysis and damage repair. B7.0
    1. Perform frame inspection and repair. B7.1
    2. Demonstrate applications, installations, and removal of fixed and moveable glass and hardware. B7.2
    3. Demonstrate the principles of metal welding and cutting. B7.3
    4. Prepare and analyze vehicles for repair. B7.4
    5. Perform outer body panel repairs, replacements, and adjustments. B7.5
    6. Prepare vehicles for metal finishing and body filling. B7.6
8. Demonstrate an understanding of mechanical and electrical components in relation to industry and manufacturer standards. B8.0
    1. Identify and communicate the operation of drivetrain, fuel, intake, and exhaust systems. B8.1
    2. Perform steering and suspension analysis and repairs. B8.2
    3. Perform electrical repairs. B8.3
    4. Perform brake analysis and repairs. B8.4

5 Perform heating, air-conditioning, and cooling system repairs. B8.5

6 Explain and demonstrate the operation of restraint systems. B8.6

9 Demonstrate the concepts, principles, and practices of painting and refinishing. B9.0

1 Identify, use, and repair plastics and adhesives. B9.1

2 Prepare surfaces for painting and finishing. B9.2

3 Practice operation of spray guns and related equipment. B9.3

4 Practice mixing, matching, and applying paint. B9.4

5 Prepare vehicles for final detail. B9.5

6 Analyze the causes and cures of paint defects. B9.6

C. Systems Diagnostics, Service, and Repair

1. Demonstrate the practice of personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards. C1.0
    1. Know and understand common environmental conservation practices and their applications. C1.1
    2. Practice the safe handling and storage of chemicals and hazardous wastes in accordance with Material Safety Data Sheets (MSDS) and the requirements of local, state, and federal regulatory agencies. C1.2
    3. Understand the way in which waste gasses, emissions, and other environmentally destructive substances are generated and the effects of these substances on the environment. C1.3
    4. Use appropriate personal protective equipment and safety practices. C1.4
    5. Evaluate the advantages and disadvantages of existing, new, and emerging systems and the effects of those systems on the environment. C1.5
2. Practice the safe and appropriate use of tools, equipment, and work processes. C2.0
    1. Recognize the importance of calibration processes, systems, and techniques using various measurement and testing devices. C2.1
    2. Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components. C2.2
    3. Use tools, equipment, and machines to safely measure, test, diagnose, and analyze components and systems (e.g., electrical and electronic circuits, alternating- and direct-current applications, fluid/hydraulic and air/pneumatic systems). C2.3
    4. Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures. C2.4
    5. Use measurement scales, devices, and systems, such as dial indicators and micrometers, to design, fabricate, diagnose, maintain, and repair vehicles and components following recommended industry standards. C2.5
    6. Demonstrate how to access technical reports, manuals, electronic retrieval systems, and related technical data resources. C2.6
    7. Test and analyze the elements of precision measuring using standard and metric systems. C2.7
3. Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems. C3.0
    1. Describe the operating principles of internal and/or external combustion engines. C3.1

2. Describe the function and principles of air-conditioning and heating systems. C3.2
3. Describe the basic principles of pneumatic and hydraulic power and their applications. C3.3
4. Describe the applications of alternative power sources. C3.4
5. Practice the basic principles of electricity, electronics and electrical power generation, and distribution systems. C3.5
6. Explain the principles of converting energy from one form to another. C3.6
7. Perform necessary procedures to maintain, diagnose, service, and repair vehicle systems and malfunctions. C3.7

4. Perform and document maintenance procedures in accordance with the recommendations of the manufacturer. C4.0
   1. Communicate the procedures and practices of various manufacturers regarding service, repair, and maintenance schedules. C4.1
   2. Demonstrate how to properly document maintenance and repair procedures in accordance with applicable rules, laws, and regulations (e.g., Bureau of Auto Repair [BAR], Occupational Safety and Health Administration [OSHA], and the California Air Resources Board [ARB]). C4.2
   3. Use reference books, technical service bulletins, and other documents and materials related to the service industry available in print and through electronic retrieval systems to accurately diagnose and repair systems, equipment, and vehicles. C4.3
   4. Complete a work order, including customer information, description of repairs, and billing information, in accordance with applicable rules, laws, and regulations. C4.4
5. Apply and understand appropriate business practices. C5.0
   1. Identify work-related systems common to the transportation service industry. C5.1
   2. Know the laws and regulations applicable to recordkeeping and the appropriate handling and disposal of hazardous materials. C5.2
   3. Explain the importance of and the procedures for maintaining accurate records (e.g., business licenses, repair orders, billing and tax records). C5.3
   4. Practice the concept and application of accepted ethical business practices. C5.4
   5. Practice the concept and application of acceptable customer relations practices. C5.5
   6. Recognize, analyze, and evaluate the need for maintenance of components and systems and the conditions under which service and maintenance are required. C5.6
6. Demonstrate the application, operation, maintenance, and diagnosis of engines, including but not limited to two- and four-stroke and supporting subsystems. C6.0

1. Perform general engine maintenance, diagnosis, service, and repair in accordance with portable national industry standards, such as the National Automotive Technicians Education Foundation and the Equipment and Engine Training Council. C6.1
2. Maintain, diagnose, service, and repair lubrication and cooling systems. C6.2
3. Practice how to maintain, diagnose, and repair computerized engine control systems and other engine-related systems. C6.3
4. Maintain, diagnose, service, and repair ignition, electronic, and computerized engine controls and fuel management systems. C6.4

7. Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards. C7.0
    1. Practice maintenance, diagnosis, and repair of electrical systems. C7.1
    2. Maintain, diagnose, repair, and service batteries. C7.2
    3. Demonstrate maintenance, diagnosis, service, and repair of starting and charging systems. C7.3
    4. Diagnose, service, and repair lighting systems. C7.4
    5. Diagnose, service, and repair heating and air-conditioning systems and components. C7.5
    6. Diagnose, service, and repair horns, wipers/washers, and other accessories. C7.6
    7. Perform necessary procedures to maintain, diagnose, service, and repair vehicle electrical and electronic systems and malfunctions. C7.7
8. Demonstrate the function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with national industry standards. C8.0
    1. Describe how to maintain, diagnose, service, and repair hydraulic and power assist systems. C8.1
    2. Describe the function and operation of automatic and manual transmissions and transaxles. C8.2
    3. Diagnose, service, and repair disc brakes, drum brakes, antilock brakes, and other brake systems as developed. C8.3
    4. Diagnose, service, and repair steering and suspension systems. C8.4
    5. Interpret tire and rim sizing to select appropriate wheels and tires for vehicles. C8.5
    6. Maintain, diagnose, service, and repair under-vehicle systems and malfunctions. C8.6