Regional Occupational Program

NATEF Certification 2025-2026

Automotive Systems- Engine Performance and Electrical

COURSE DESCRIPTON

This course provides instruction and training in automotive repair and maintenance specializing in engine tune-up and repair. Hands-on training experiences will include understanding, diagnosing, and repairing engines, drive train systems, braking, steering/suspension, heating and air conditioning systems, electrical and fuel/emission systems, and other automotive system fundamentals. Experience will be provided in using hand tools, power tools, testing and troubleshooting equipment, as well as using service manuals. Students that achieve competency in this course will obtain entry-level skills necessary for employment as an automotive service person. These skills will provide students with a solid foundation for continued training in this field. For additional information go to www.ctc.ca.gov.

Course Information:

Course Length:	2 Years
Prerequisite:	None
Course Level:	Capstone
UC:	No
Articulated:	No
Industry Cert.:	Yes- NATEF
Industry Sector:	Transportation
Pathway:	Systems Diagnostics, Service and Repair
CALPADS:	8532

O*Net SOC Codes:

49-3023	Automotive Service Technicians and Mechanics
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists

Legend:

CTE - PS	CTE Pathway Standards
CRP	Career Ready Practices
CTE - AS	CTE Anchor Standards
CCSS	Common Core State Standards
ISTE	International Society for Technology in Education

Includes updates from 24/25 Transportation Advisory

Advisory Minutes

NATEF Certification

Course Orientation

a. Discuss objectives for this course, including competencies, teacher expectations, classroom policies, and procedures.
b. Identify and discuss the acquisition of transferable skills (communication, collaboration, creativity, and critical thinking) and their importance to being college and career ready and for future personal and professional success.
c. Review objectives, competencies, and course syllabus.
d. Discuss student and teacher expectations including behavior, class rules, appropriate dress, pre-course knowledge, and grading policies, including enrollment and attendance requirements and procedures, and classroom/school safety and disaster procedures.
e. Discuss next steps in course sequence related to the career pathway, the need for reinforcement of basic skills, transferrable skills, and post-secondary and career options.
f. Discuss the Big Six: Career Ready Essentials and the Standards for Career Ready Practice as they relate to this course, all aspects of the industry sector, and being college and career ready.

Big Six: Career Ready Essentials

1. Effective Communication	CTE - PS	CRP	CTE - AS	CCSS	ISTE
a. Demonstrate effective verbal communication and conflict resolution skills. **b. Use the writing process to develop written communication with the appropriate tone, organization, and format for the identified audience.** c. Explain the effect of interpersonal skills on one's ability to communicate effectively and develop relationships. d. Describe the impact of ineffective communication on business relationships. e. Analyze the impact of vocabulary, body language, and tone on verbal communication. f. Demonstrate active listening skills. g. Accurately interpret industry-specific written communication. h. Model responsible and effective use of various communication technologies. i. Identify valid and reliable digital reference and resource materials. j. Gather information from multiple digital sources to compare and contrast, synthesize, and summarize. k. Identify and use appropriate communication and collaboration technologies. l. Utilize technology to problem solve, accomplish tasks, and to produce or publish products.		2 4 11	2 5 10	**LS** 9-10 11-12.6 **SLS** 11-12.2 9-10 11-12.1 11-12.1d **WS** 11-12.7 11-12.6	1b,c 2c 3b,c 5c 6b,c,d

2. Collaboration, Creativity, and Critical Thinking	CTE - PS	CRP	CTE - AS	CCSS	ISTE
a. Demonstrate critical thinking skills for a variety of purposes and in different settings. **b. Collaborate to reach consensus on an identical objective through the sharing of knowledge, tasks, and learning.** c. Discuss the importance of the critical thinking process to real-world applications. d. Evaluate the impact of creative thinking on problem solving and innovation in real-world applications.		5 9 10	5	**LS** 9-10 11- 12.6 **SLS** 9-10	1c 3c,d 4a-d 5c,d 6c 7b,c,d

e. Compile work that demonstrates the process used to (elaborate, refine, analyze) evaluate original ideas and maximize creative efforts. f. Apply divergent and convergent thinking to the development of an original idea or solution. g. Examine real-world limits to adopting ideas. h. Demonstrate creative thinking (preparation, insight, evaluation, elaboration, and communication) to create a new idea or concept. i. Assume shared responsibility for collaborative work, and value the individual contributions made by each team member. j. Evaluate evidence, arguments, claims, and beliefs to identify connections. k. Identify bias, prejudice, propaganda, self-deception, distortion, and misinformation. l. Produce intellectual, informational, or material products that serve an authentic purpose. m. Work effectively and respectfully with those from diverse backgrounds or cultures. n. Demonstrate respect, trust, commitment, and the ability to compromise in collaborative projects.				11-12.1 11-12.1d 11-12.2 **WS** 11-12.7 11-12.6	
3. Leaders and Teams: Roles and Responsibilities	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Determine the individual and team members' roles and responsibilities. **b. Demonstrate leadership skills and qualities (i.e., reliability, negotiation skills, initiative, positive reinforcement, recognition of others' efforts, problem-solving skills, conflict resolution, and delegation).** c. Explain the importance of technical, social, and communication skills to team success. d. Compare and contrast leadership styles and their effectiveness in various situations. e. Organize and delegate responsibilities in a team setting to encourage ideas, perspectives, and contributions from all team members. f. Develop a strong sense of team identity by brainstorming solutions, volunteering, assisting others, practicing respect and courtesy, and taking initiative. g. Examine situations in which a follower becomes the leader. h. Describe twenty-first-century skills required across all occupations. i. Identify and discuss the characteristics of a successful team (i.e., leadership, cooperation, and effective decision-making). j. Leverage social and cultural differences to increase innovation and quality of work.		7 9 10 12	5 7 9	**SLS** 11-12.2 9-10 11-12.1 11-12.1d **WS** 11-12.6	7a,c
4. Legal, Ethical, and Environmental Considerations	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Demonstrate industry specific ethical and legal practices. **b. Identify eco-friendly industry specific practices and resources.** c. Identify local, state, and federal regulatory agencies, entities, laws, and regulations. d. Identify discrimination based on race, nationality, religion, gender, age, disability, or sexual orientation.		7 8 9 12	4 8	**WS** 11-12.6 11-12.7 **SLS**	2a,b 3a,b 5c 6c

e. Summarize the ethical and legal implications of workplace discrimination and harassment. f. Explain the concept of corporate citizenship. g. Examine an employer's role in protecting the health and welfare of employees, the community, and the environment. h. Analyze current environmental laws and regulations and their impact on industry. i. Compare and contrast both society's and industry's impact on the environment.				9-10 11-12.1 11-12.1d 11-12.2	
5. Personal Growth and Career Planning	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Demonstrate continued personal development and growth. **b. Develop and manage a personal growth and career plan.** c. Explain the relationship between sound financial habits and financial security. d. Create and manage a personal financial plan. e. Demonstrate initiative in achieving personal and professional goals. f. Apply time management strategies to meet deadlines. g. Demonstrate a growth mindset through flexibility and a positive attitude. h. Select and demonstrate appropriate job-search and retention techniques. i. Demonstrate strategies to prepare for employment. j. Demonstrate interpersonal skills appropriate for the workplace. k. Elaborate on the importance of perseverance to personal and professional success. l. Discover personal career interests, aptitudes, and skills.		3	3	**LS** 9-10 11-12.6 **SLS** 9-10 11-12.1 11-12.1d 11-12.2 **WS** 11-12.6	1a 3a,c 4d 6a,d 7b
6. Workplace Safety and Personal Wellness	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Demonstrate proper industry specific safe work practices to prevent injury or illness. **b. Assess the potential impact of goal setting on personal and professional success.** c. Describe the role of security and emergency procedures in workplace safety. d. Describe the effect of preventative measures on emergencies in the workplace. e. Identify and describe the causes, prevention, and treatment of common accidents. f. Identify local, state, and federal agencies that regulate workplace safety. g. Explain the role of the California Occupational Safety and Health Administration (Cal-OSHA) and the Environmental Protection Agency (EPA). h. Discuss the basics of system operations. i. Demonstrate the proper use of personal protective equipment (PPE). j. Explain the purpose of and accurately interpret a Safety Data Sheet (SDS). k. Identify hazardous materials and chemicals. l. Demonstrate proper procedures to respond to work-related accidents and injuries. m. Describe how ergonomics, housekeeping, and maintenance are related to accidents and injuries. n. Demonstrate cyber ethics, cyber safety, and cybersecurity.		6 12	4 6 9	**LS** 9-10 11-12.6 **WS** 11-12.7 11-12.6 **SLS** 9-10 11-12.1 11-12.1d	1a,d 2a-d 5b

o. Assess the potential impact of preventative physical and mental health measures on workplace safety.					
NATEF Certification Units of Instruction					
7. Introduction to the Automotive Electrical System	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Recognize what constitutes an automotive electrical system. **b. Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.** c. Define voltage, current, voltage drop resistance and conductance. d. Using Ohm's law describes the cause-and-effect relationship among voltage, current, voltage drop, and resistance. e. Utilize Ohm's Law formulas to determine the mathematical values associated with voltage, current, voltage drop, and resistance. f. Identify and describe series, parallel and series parallel circuit structure. g. Compare atomic theory in relationship to battery operation that uses like and unlike charges. h. Describe the two theories of current flow and identify which is prevalent in the automotive industry. i. Measure current flow and perform voltage drop tests in electrical and electronic circuits using a voltmeter. j. Measure source voltage and perform voltage drop tests in electrical and electronic circuits using an ammeter. k. Check continuity and measure resistance in electrical and electronic circuits using an ohmmeter. l. Demonstrate the proper use of a Digital Multimeter to diagnose an electrical circuit problem.	C2.3 C2.4 C2.5 C3.0 C3.5 C7.0 C7.1	1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	
8. Magnetism and Electromagnetism	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Discuss and apply magnetism, electromagnetism, and electromagnetic induction, and magnetomotive force related to automotive systems. **b. Compare and contrast magnetism to electricity.** c. Compare and contrast magnetic force to current. d. Compare and contrast field density to voltage. e. Compare and contrast reluctance to resistance. f. Describe the operation of automotive circuit components that use electromagnetic induction and magnetism.		1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	
9. Automotive Electrical and Electronic Systems	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Develop a diagnostic strategy after reading automotive electrical schematics.	C2.3	1	1	**LS**	

b. Practice maintenance, diagnosis, and repair of electrical systems. c. Research applicable vehicle and service information on electrical and electronic system operation. d. View wiring diagrams during diagnosis of electrical circuit problems. e. Check electrical circuits using fused jumper wires. f. Locate shorts, grounds, opens, and resistance problems in electrical and electronic systems. g. Inspect fusible links and circuit breakers. h. Inspect and test switches, connectors, relays, and solid-state devices. i. Identify automotive symbols used on electrical and electronic system schematics. j. Diagnose and perform corrections in automotive functions controlled by electrical and electronic systems.	C7.0 C7.1 C7.7	2 5 6 11	2 5 6 11	9-10 11-12.6 **WS** 11-12.7 **RSTS** 9-10 11-12.1	
10. Automotive Batteries	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Detail how batteries are used and diagnose battery problems in automotive systems. **b. Maintain, diagnose, repair, and service batteries.** **c.** Describe the purpose and operation of the battery. d. Discuss battery ratings such as Cold Cranking, Amps and Reserve Capacity ratings. e. Identify battery safety procedures. f. Inspect, clean, fill, and replace battery. g. Inspect and clean battery cables, connectors, clamps, and hold downs. h. Start a vehicle using jumper cables or auxiliary power supply. i. Perform a state-of-charge test and a capacity test on a battery. j. Measure and diagnose excessive key-off battery drain.	C1.4 C2.3 C7.2	1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	
11. Automotive Charging Systems	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Demonstrate maintenance, diagnosis, service, and repair of starting and charging systems. b. Identify and describe charging system principles. c. Summarize the charging system function. d. Identify alternator components. e. Perform charging system analysis. f. Diagnose and correct undercharge, no-charge, and overcharge in a charging system. g. Perform voltage drop tests. h. Inspect and adjust or replace alternator drive belts, pulleys, tensioners, and their alignment. i. Remove and install an alternator.	C2.0 C2.2 C7.3	1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	
12. Automotive Starting Systems	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Diagnose and service or repair an automotive starting control system.	C2.0	1	1	**LS**	

b. Identify and describe the principles of an automotive starting system. c. Describe the operation and function of a starting system switch. d. Identify starter components and describe their functions. e. Summarize the use and operation of automotive circuit components that use electromagnetic induction and magnetism in the operation of starters, relays, and solenoids. f. Perform starter current draw tests. g. Inspect, test, and repair as needed starter relays and solenoids. h. Inspect, test, and repair as needed switches, connectors, and wires of a starter control circuit. i. Remove and install a starter. j. Differentiate between an electrical and mechanical problem causing a slow crank or no-crank condition.	C2.2 C2.3 C6.4 C7.3	2 5 11	2 5 11	9-10 11-12.6 **WS** 11-12.7	
13. Automotive Wiring Systems	**CCTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Diagnose and service or repair an automotive wiring system. b. Inspect and test fusible links, circuit breakers, fuses, and replace as needed. c. Examine and test switches, connectors, relays, solid state devices and wires of electrical circuits, and perform corrective action. d. Perform a solder repair of electrical wiring. e. Repair or replace an automotive wiring harness.	C7.7	1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	
14. Automotive Lighting Systems	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Diagnose and service and repair an automotive lighting system. b. Describe the different types of headlight systems. c. Summarize the operation of daytime running lights. d. Explain how brake and turn signals operate. e. Generalize the operation of dome and reverse lights. f. Diagnose the cause and repair the problem of intermittent, dim, or no light operation. g. Inspect, replace, and align headlights. h. Diagnose and correct improper turn signal and hazard light operation.	C7.4	1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	
15. Motor Driven Accessories	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Diagnose incorrect operation of motor driven accessories. b. Diagnose incorrect heated glass operation and determine necessary action. c. Diagnose incorrect electric lock operation and determine necessary action. d. Diagnose radio static, weak reception or no reception and determine necessary action. e. Remove and reinstall door and instrument panels.	C3.7	1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS**	

f. Describe the operation of an anti-theft system. g. Diagnose the cause of an anti-theft system failure.				11-12.7	
16. AYES Work Journal	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Use AYES work journal and complete journal entries. **b. Recognize, analyze, and evaluate the need for maintenance of components and systems and the conditions under which service and maintenance are required.** c. Complete work journal entries. d. Employ strategy based diagnostic routines. e. Interpret and verify customer concerns. f. Interact with management, technicians, and customers. g. Utilize a diagnostic thought process with the OEM service manual. h. Reduce the possible causes of an electrical circuit problem with the electronic service information program. i. Recognize that a problem exists when there is a discrepancy between what is and what should or could be. j. Identify the reasons for the discrepancy. k. Implement a plan to correct the problem. l. Participate as an effective member of a dealership or business.	C4.3 C5.5 C5.6	1 2 5 7 8 9 10 11	1 2 5 7 8 9 11	**LS** 9-10 11-12.6 **SLS** 9-10 11-12.1 11-12.1d 11-12.1b **WS** 11-12.7	
17. Solid State Devices	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Analyze the operation of solid-state devices such as diodes, transistors, and microprocessors. b. Identify the basic types of solid-state devices used in automotive circuits and describe their operation. c. Define conductor, insulator, and semi-conductor and describe the function of each. d. Describe the function of a capacitor in an automotive electrical circuit. e. Identify and describe the types of symbols for diodes and transistors. f. Summarize the basic function of a microprocessor. g. Generalize the concept of an integrated circuit. h. Define impedance as it relates to microprocessor protection. i. Identify the types of automotive computer input signals. j. Compare digital and analog sensors.		1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	
18. Electronically Controlled Systems	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Identify and diagnose concerns in electronically controlled systems. b. Describe the operation of cruise control systems. c. Diagnose and repair incorrect operation of cruise control systems. d. Summarize the operation of supplemental restraint systems.	C7.7	1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6	

e. Diagnose and repair incorrect operation of supplemental restraint systems. f. Follow manufacturers' safety procedures to prevent accidental deployment of supplemental restraint systems. g. Disarm and enable an airbag system for vehicle service. h. Identify and describe entertainment system components.				WS 11-12.7	
19. Personal Computers and Interrelated Automotive Systems	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Utilize hardware, software, and on-line systems to access, organize and maintain information. b. Discuss the operation and use of scanning tools in communicating with automotive and personal computers. c. Download files from a remote computer using a communications program to reprogram an automotive computer. d. Describe the operation of an automotive cellular phone system. e. Diagnose an electronic system circuit problem using a scan tool to determine necessary action. f. Check modular communication errors using a scan tool.	C2.3 C2.6	1 2 4 5 11	1 2 4 5 11	LS 9-10 11-12.6 WS 11-12.6 11-12.7	
20. Process of Diagnoses	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Develop diagnostic strategies and scientific processes of elimination. **b. Practice maintenance, diagnosis, and repair of electrical systems.** c. Inspect, test and repair connectors, wires, and printed circuit boards of gauge circuits. d. Determine the reasons for incorrect operation of warning devices and driver information systems and repair as needed. e. Test for and repair the integrity of series and parallel-series circuits using the principle of electricity. f. Demonstrate the proper use of a Digital Multimeter (DMM) during a diagnosis of an electrical circuit problem. g. Check and repair as needed electrical circuits with a test light. h. Check electrical circuits using fused jumper wires and determine any necessary actions. i. Describe the operation of an oscilloscope and demonstrate its use to diagnose automotive electronic circuits concerns.	C2.0 C2.3 C2.4 C2.5 C7.1	1 2 4 5 11	1 2 4 5 11	LS 9-10 11-12.6 WS 11-12.6 11-12.7	
21. Engine Operating Principles	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Recognize physical and chemical operating principles in automotive gasoline engines. **b. Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems.** c. Recognize and identify physical and chemical operating principles of automotive gasoline engines.	C3.0 C3.1 C6.0 C6.4	1 2 5 11	1 2 5 11	LS 9-10 11-12.6 WS	

d. Explain atmospheric pressure as it relates to the term vacuum. e. Describe how energy, heat, and temperature relate to spark ignition in automotive gasoline engines. f. Summarize the combustion of hydrocarbons. g. Explain thermal expansion of fluids and solids. h. Compare bore, stroke, and displacement. i. Differentiate volumetric and mass efficiency. j. Calculate engine compression ratios. k. Describe performance factors such as speed, torque, and horsepower. l. Interpret Boyle's law of constant temperature. m. Interpret Charles's law of constant volume. n. Describe the four-stroke cycle of operation. o. Explain the operation of primary fuel system components, such as fuel tanks, pumps, filters, fittings, and fuel lines. p. Analyze the operation of a fuel injection system and its components. q. Check fuel for contaminants and determine any necessary action. r. Inspect and test mechanical fuel pumps. s. Check fuel pump control systems for pressure, regulation, and volume. t. Check and replace fuel filters. u. Inspect and check a cold enrichment system and its components. v. Examine air induction systems for vacuum leaks and unmetered air. w. Test and inspect fuel injectors. x. Check idle speeds and fuel mixtures.				11-12.7	
22. Strategy-based Diagnostic Process	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Utilize strategy-based diagnostic procedures to interpret customer concerns and determine needed repairs. b. Identify and interpret engine performance concerns. c. Inspect engine assembly for fuel, oil, coolant, and other fluid leaks. d. Diagnose engine noise and vibrations and determine any necessary actions. e. Check exhaust for color and odor and diagnose abnormalities. f. Perform absolute manifold pressure tests. g. Perform a cylinder balance and compression test and determine any necessary actions. h. Complete a cylinder leakage test and determine any necessary actions. i. Use an oscilloscope or other diagnostic equipment to determine mechanical, electrical, electronic, fuel, and ignition concerns. j. Prepare a gas analyzer for a vehicle exhaust inspection and interpret the readings to determine any necessary corrective actions. k. Describe the functions of a pyrometer and thermometer.	C2.3 C3.7 C5.5 C6.2	1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	

l. Verify an engine operating temperature. m. Perform a cooling system pressure test. n. Adjust engine valves that have mechanical or hydraulic lifters. o. Verify and correct camshaft timing. p. Remove and replace a timing belt. q. Test and inspect mechanical and electrical fans, fan clutches, ducting, air dams, and fan control devices.					
23. Exhaust Emission Laws	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Articulate state and federal laws in regard to compliance with exhaust emission regulations. b. Describe OBD I and OBD II systems. c. Identify the types and operation of turbocharger and supercharger systems. d. Diagnose oil leaks, emission and drivability problems resulting from malfunctions of the positive crankcase ventilation (PCV) systems. e. Inspect and test positive crankcase ventilation system components such as filters, breather caps, valves, tubes, orifices, hoses, and perform any necessary corrective measures. f. Perform diagnostic testing to assess malfunctions in the exhaust gas recirculation system and determine any necessary repairs. g. Inspect, test, and replace components of the exhaust gas recirculation system such as tubing, exhaust passages, vacuum lines, pressure controls, filters, and hoses. h. Test and inspect electrical/electronic sensors, controls and wiring in exhaust gas recirculation systems. i. Diagnose emission and drivability problems resulting from malfunctions in the secondary air injection and catalytic converter systems. j. Inspect and test the performance of a catalytic converter. k. Test and repair mechanical and electrical components of air injection systems.	C1.1 C4.2	1 2 5 11 12	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	
24. Automotive Microprocessors	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Summarize the operation and function of an automotive microprocessor and describe the different types of automotive computer input and output signals. b. Explain the function and operation of an automotive microprocessor. c. Identify the different types of automotive computer input and output signals. d. Describe the terms; read only memory (ROM), programmable read only memory (PROM), keep alive memory (KAM) and random-access memory (RAM). e. Compare and contrast volatile and nonvolatile memory. f. Define adaptive strategy. g. Explain why an analog/digital (A/D) converter is necessary in an automotive fuel management computer.	C6.3	1 2 4 5 11	1 2 4 5 11	**LS** 9-10 11-12.6 **WS** 11-12.6 11-12.7	

h. Identify and describe two types of voltage signals produced by engine load-sensing devices. i. Inspect and test power, ground circuits, connections, and service or replace as needed. j. Identify the different types of input sensors and circuits used in automotive computers. k. Explain the operation of input sensors and circuits used in automotive computers. l. Describe the difference between a digital and analog signal. m. Identify the different types of automotive computer output devices and explain how they operate. n. Diagnose emission problems resulting from malfunctions of an evaporative emission system. o. Inspect and test the components of an evaporative emission system. p. Interpret diagnostic evaporative emission systems trouble codes. q. Inspect and test a computerized engine control system including sensors, powertrain control module, actuators and circuits using a graphing multimeter, digital storage oscilloscope and perform any necessary repairs. r. Retrieve and record stored OBD I and OBD II diagnostic trouble codes. s. Check for module communication errors using a scan tool. t. Obtain and interpret scan tool data. u. Diagnose the causes of emission malfunctions with stored diagnostic trouble codes. v. Access and use service information to perform step-by-step diagnosis of assorted systems. w. Diagnose the causes of malfunctions of interrelated systems, such as cruise controls, security alarms, suspension controls, and traction controls. x. Identify the Clean Air Act Amendment and explain the OBD II provision. y. Locate vehicle and major component identification numbers. z. Practice recommended precautions when handling static sensitive devices. aa. Diagnose and repair non-starting problems, hard starting, incorrect idle speed, flooding, hesitation, surging, engine misfires, stalling dieseling, and emission problems on vehicles with fuel injection systems.					
25. Ignition Systems	**CTE - PS**	**CRP**	**CTE - AS**	**CCSS**	**ISTE**
a. Articulate how ignition systems generate time and ignition spark through primary and secondary circuits. b. Explain how ignition systems generate time and ignition spark through primary and secondary circuits. c. Describe the primary and secondary ignition circuits and the waveforms they generate. d. Discuss the operation of triggering devices, such as pick-up coils, hall-effect switches, PM generators, optical pick-ups, and magneto resistive. e. Diagnose ignition system related problems, such as no starting, hard starting, misfire spark knock, power loss, poor mileage, and emission concerns on vehicles with electronic ignition systems and determine necessary action to rectify any problems.	C6.4	1 2 5 11	1 2 5 11	**LS** 9-10 11-12.6 **WS** 11-12.7	

f. Diagnose ignition system related problems, such as no starting, hard starting, misfire spark knock, power loss, poor mileage, and emission concerns on vehicles with distributor ignition systems and determine necessary action to rectify any problems. g. Inspect and test an ignition pick-up system. h. Inspect and test an ignition system pick-up sensor or triggering device. i. Inspect and test secondary circuit wiring and its components in an ignition system. j. Inspect and test an ignition system coil. k. Check and adjust ignition system timing. l. Read and interpret engine oscilloscope patterns.					

Standards Alignment

The curricula have been aligned with the CTE Model Curriculum Standards released in 2013. Each industry sector was updated to meet the increased rigor and relevancy requirements of the Common Core State Standards. The curriculum also includes the new Standards for Career Ready Practices.

Standards for Career Ready Practice

1. *Apply appropriate technical skills and academic knowledge.*
2. *Communicate clearly, effectively, and with reason.*
3. *Develop an education and career plan aligned with personal goals.*
4. *Apply technology to enhance productivity.*
5. *Utilize critical thinking to make sense of problems and persevere in solving them.*
6. *Practice personal health and understand financial literacy.*
7. *Act as a responsible citizen in the workplace and the community.*
8. *Model integrity, ethical leadership, and effective management.*
9. *Work productively in teams while integrating cultural and global competence.*
10. *Demonstrate creativity and innovation.*
11. *Employ valid and reliable research strategies.*
12. *Understand the environmental, social, and economic impacts of decisions.*

CTE Anchor Standards—Common Core English Language Arts Alignment

Anchor Standard 2: Communications

Language Standard: Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the (career and college) readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression. LS 9-10, 11-12.6

Anchor Standard 3: Career Planning and Management

Speaking and Listening Standard: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data. SLS 11-12.2

Anchor Standard 4: Technology

Writing Standard: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments and information.

Anchor Standard 5: Problem Solving and Critical Thinking

Writing Standard: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow, or broaden the inquiry when appropriate, and synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. WS 11-12.7

Anchor Standard 6: Health and Safety

Reading Standards for Science and Technical Subjects: Determine the meaning of symbols, key words, and other domain-specific words and phrases as they are used in a specific scientific or technical context. RSTS 9-10, 11-12.4

Anchor Standard 7: Responsibility and Flexibility

Speaking and Listening Standard: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners, building on others' ideas and expressing their own clearly and persuasively. SLS 9-10, 11-12.1

Anchor Standard 8: Ethics and Legal Responsibilities

Speaking and Listening Standard: Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the work. SLS 11-2.1d

Anchor Standard 9: Leadership and Teamwork

Speaking and Listening Standard: Work with peers to promote civil, democratic discussions and decision making; set clear goals and deadlines; and establish individual roles as needed. SLS 11-12.1b

Anchor Standard 10: Technical Knowledge and Skills

Writing Standard: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. WS 11-12.6

Anchor Standard 11: Demonstration and Application

Demonstrate and apply the knowledge and skills contained in the industry-sector anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and the career technical student organization. Note: no alignment evident for this standard. WS 11-12.6

Transportation

C. Systems Diagnostics, Service, and Repair Pathway

C1.1 Know and understand common environmental conservation practices and their applications.

C1.4 Use appropriate personal protective equipment and safety practices.

C2.0 Practice the safe and appropriate use of tools, equipment, and work processes.

C2.2 Demonstrate and use appropriate tools and equipment—such as wrenches, sockets, and pliers—to diagnose, service, repair, and maintain systems and components.

C2.3 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).

C2.4 Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.

C2.5 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.

C2.6 Demonstrate how to access technical reports, manuals, electronic retrieval systems, and related technical data resources.

C3.0 Use scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems.

C3.1 Describe the operating principles of internal and/or external combustion engines.

C3.5 Practice the basic principles of electricity, electronics and electrical power generation, and distribution systems.

C3.7 Perform necessary procedures to maintain, diagnose, service, and repair vehicle systems and malfunctions.

C4.2 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]).

C4.3 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.

C5.5 Practice the concept and application of acceptable customer relations practices.

C5.6 Recognize, analyze, and evaluate the need for maintenance of components and systems and the conditions under which service and maintenance are required.

C6.0 Demonstrate the application, operation, maintenance, and diagnosis of engines, including but not limited to two- and four-stroke and supporting subsystems.

C6.2 Maintain, diagnose, service, and repair lubrication and cooling systems.

C6.3 Practice how to maintain, diagnose, and repair computerized engine control systems and other engine-related systems.

C6.4 Maintain, diagnose, service, and repair ignition, electronic, and computerized engine controls, and fuel management systems.

C7.0 Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.

C7.1 Practice maintenance, diagnosis, and repair of electrical systems.

C7.2 Maintain, diagnose, repair, and service batteries.

C7.3 Demonstrate maintenance, diagnosis, service, and repair of starting and charging systems.

C7.4 Diagnose, service, and repair lighting systems.

C7.7 Perform necessary procedures to maintain, diagnose, service, and repair vehicle electrical and electronic systems and malfunctions.

ISTE Standards for Students

1. Empowered Learner- Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences.

a) Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.

b) Students build networks and customize their learning environments in ways that support the learning process.

c) Students use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways

d) Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

2. Digital Citizen- Students recognize the rights, responsibilities, and opportunities of living, learning, and working in an interconnected digital world, and they act and model in ways that are safe, legal, and ethical.

a) Students cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world.

b) Students engage in positive, safe, legal, and ethical behavior when using technology, including social interactions online or when using networked devices.

c) Students demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.

d) Students manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online.

3.Knowledge Constructor- Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

a) Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.

b) Students evaluate the accuracy, perspective, credibility and relevance of information, media, data, or other resources.

c) Students curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.

d Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.

4. Innovative Designer- Students use a variety of technologies within a design process to identify and solve problems creating new, useful, or imaginative solutions.

a) Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems.

b) Students select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.

c) Students develop, test, and refine prototypes as part of a cyclical design process.

d) Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems.

5. Computational Thinker- Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

a) Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.

b) Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.

c) Students break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.

d) Students understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

6. Creative Communicator- Students communicate clearly and express themselves creatively for a variety of purposes using platforms, tools, styles, formats, and digital media appropriate for their goals.

a) Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.

b) Students create original works or responsibly repurpose or remix digital resources into new creations.

c) Students communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models, or simulations.

d) Students publish or present content that customizes the message and medium for their intended audiences.

7. Global Collaborator- Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.

a) Students use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.

b) Students use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints.

c) Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

d) Students explore local and global issues and use collaborative technologies to work with others to investigate solutions.