Course Outline

Transportation **REVISED: July/2021**

Job Title
Automotive Service Technician

Career Pathway:
Systems Diagnostics and Service

Industry Sector:
Transportation

O*NET-SOC CODE:
49-3023.00

CBEDS Title:
Automotive Service

CBEDS No.:
5668

79-90-85

Technology/2: Automotive Systems

Credits: 5 **Hours:** 90

Course Description:
This competency-based course is the second in a sequence of two designed to introduce automotive systems. It provides students with project-based experiences in automotive technologies including alternative and green vehicle technology. Instruction includes an introduction and safety, resource management review, tools and equipment review engine designs review: foreign, ignition systems, fuel systems, exhaust systems, emission controls, major engine operations, alternative fuels and energy, employability and entrepreneurial skills review. The competencies in this course are aligned with the California High School Academic Content Standards and the California Career Technical Education Model Curriculum Standards.

Prerequisites:
Enrollment requires successful completion of the Technology/1: Automotive Systems (79-90-83) course.

NOTE: For Perkins purposes this course has been designated as a **concentrator/capstone** course.

This course **cannot** be repeated once a student receives a Certificate of Completion.

Los Angeles Unified School District
Division of Adult and Career Education
Instructional and Couseling Services Unit
Adult Curriculum Office
www.wearedace.org

COURSE OUTLINE COMPETENCY-BASED COMPONENTS

A course outline reflects the essential intent and content of the course described. Acceptable course outlines have six components. (Education Code Section 52506). Course outlines for all apportionment classes, including those in jails, state hospitals, and convalescent hospitals, contain the six required elements:

(EC 52504; 5CCR 10508 [b]; Adult Education Handbook for California [1977], Section 100)

COURSE OUTLINE COMPONENTS	**LOCATION**
GOALS AND PURPOSES	Cover

The educational goals or purposes of every course are clearly stated and the class periods are devoted to instruction. The course should be broad enough in scope and should have sufficient educational worth to justify the expenditure of public funds.

The goals and purpose of a course are stated in the COURSE DESCRIPTION. Course descriptions state the major emphasis and content of a course, and are written to be understandable by a prospective student.

PERFORMANCE OBJECTIVES OR COMPETENCIES	pp. 7-14

Objectives should be delineated and described in terms of measurable results for the student and include the possible ways in which the objectives contribute to the student's acquisition of skills and competencies.

Performance Objectives are sequentially listed in the COMPETENCY-BASED COMPONENTS section of the course outline. Competency Areas are units of instruction based on related competencies. Competency Statements are competency area goals that together define the framework and purpose of a course. Competencies fall on a continuum between goals and performance objectives and denote the outcome of instruction.

Competency-based instruction tells a student before instruction what skills or knowledge they will demonstrate after instruction. Competency-based education provides instruction which enables each student to attain individual goals as measured against pre-stated standards.

Competency-based instruction provides immediate and continual repetition and In competency-based education the curriculum, instruction, and assessment share common characteristics based on clearly stated competencies. Curriculum, instruction and assessment in competency-based education are: explicit, known, agreed upon, integrated, performance oriented, and adaptive.

COURSE OUTLINE COMPETENCY-BASED COMPONENTS (continued)

COURSE OUTLINE COMPONENTS	LOCATION
INSTRUCTIONAL STRATEGIES	p. 16

Instructional techniques or methods could include laboratory techniques, lecture method, small-group discussion, grouping plans, and other strategies used in the classroom.

Instructional strategies for this course are listed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructional strategies and activities for a course should be selected so that the overall teaching approach takes into account the instructional standards of a particular program, i.e., English as a Second Language, Programs for Adults with Disabilities.

UNITS OF STUDY, WITH APPROXIMATE HOURS ALLOTTED FOR EACH UNIT	Cover
The approximate time devoted to each instructional unit within the course, as well as the total hours for the course, is indicated. The time in class is consistent with the needs of the student, and the length of the class should be that it ensures the student will learn at an optimum level.	pp. 7-14

Units of study, with approximate hours allotted for each unit are listed in the COMPETENCY AREA STATEMENT(S) of the course outline. The total hours of the course, including work-based learning hours (community classroom and cooperative vocational education) is listed on the cover of every CBE course outline. Each Competency Area listed within a CBE outline is assigned hours of instruction per unit.

EVALUATION PROCEDURES	pp. 16-17

The evaluation describes measurable evaluation criteria clearly within the reach of the student. The evaluation indicates anticipated improvement in performances as well as anticipated skills and competencies to be achieved.

Evaluation procedures are detailed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructors monitor students' progress on a continuing basis, assessing students on attainment of objectives identified in the course outline through a variety of formal and informal tests (applied performance procedures, observations, and simulations), paper and pencil exams, and standardized tests.

REPETITION POLICY THAT PREVENTS PERPETUATION OF STUDENT ENROLLMENT	Cover

After a student has completed all the objectives of the course, he or she should not be allowed to reenroll in the course. There is, therefore, a need for a statement about the conditions for possible repetition of a course to prevent perpetuation of students in a particular program for an indefinite period of time.

ACKNOWLEDGMENTS

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CALIFORNIA CAREER TECHNICAL EDUCATION MODEL CURRICULUM STANDARDS
Transportation Industry Sector
Knowledge and Performance Anchor Standards

1.0 Academics
Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Transportation academic alignment matrix for identification of standards.

2.0 Communications
Acquire and accurately use Transportation sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

3.0 Career Planning and Management
Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

4.0 Technology
Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Transportation sector workplace environment.

5.0 Problem Solving and Critical Thinking
Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the Transportation sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

6.0 Health and Safety
Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the Transportation sector workplace environment.

7.0 Responsibility and Flexibility
Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the Transportation sector workplace environment and community settings.

8.0 Ethics and Legal Responsibilities
Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

9.0 Leadership and Teamwork
Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution as practiced in the SkillsUSA career technical student organization

10.0 Technical Knowledge and Skills
Apply essential technical knowledge and skills common to all pathways in the Transportation sector, following procedures when carrying out experiments or performing technical tasks.

11.0 Demonstration and Application
Demonstrate and apply the knowledge and skills contained in the Transportation anchor standards, pathway standards, and performance indicators in classroom, laboratory, and workplace settings, and through the SkillsUSA career technical student organization.

C. Systems Diagnostics and Service Pathway

The Systems Diagnostics and Service pathway prepares students for postsecondary education and employment in the transportation industry, which includes but is not limited to motor vehicles, rail systems, marine applications, and small-engine and specialty equipment.

Sample occupations associated with this pathway:

- Service Technician/Maintenance Worker/Shop Foreman
- Technical Writer
- Dispatcher
- Engineer
- Investigator/Inspector

C1.0 Demonstrate the practice of personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.

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

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

C4.0 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.

C5.0 Apply and understand appropriate business practices.

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

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

C8.0 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.

CBE
Competency-Based Education

COMPETENCY-BASED COMPONENTS
for the Technology/2: Automotive Systems Course

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
A. INTRODUCTION AND SAFETY Review, apply, and evaluate classroom and workplace policies and procedures used in accordance with federal, state, and local safety and environmental regulations. (2 hours)	1. Review the scope and propose of the course. 2. Review the overall course content as a part of the Linked Learning Initiative. 3. Review classroom policies and procedures. 4. Review classroom and workplace first aid and emergency procedures. 5. Review the different occupations in the Transportation Industry Sector which have an impact on the role of the auto technicians. 6. Review the California Occupational Safety and Health Administration (Cal/OSHA) workplace requirements for auto technicians. 7. Review the opportunities available for promoting gender equity and the representation of non-traditional populations in automotive science. 8. Review the impact of Environmental Protection Agency (EPA) legislation on Transportation Industry Sector practices in protecting and p0reserving the environment. 9. Review the impact of California Air Resources Board (ARB) legislation on Transportation Industry Sector. 10. Review the Bureau of Automotive Repair (BAR) standards for consumer and environmental protection. 11. Review and demonstrate the use of the Safety Data Sheet (SDS) as it applies to the automotive industry. 12. Review the safety items required by the federal, state, and local regulations. 13. Review the role of the Automotive Service Excellence (ASE) Education Foundation in auto technician training. 14. Review and demonstrate the ASE standards regarding proper use of protective: a. clothing and gloves in an auto shop b. respiratory gear in an auto shop c. eye gear in an auto shop d. ventilation in an auto shop e. handling, storage, and disposal of chemicals and hazardous materials used in an auto shop 15. Pass the safety exam with 100%.	**Career Ready Practice:** 1, 2, 3, 7, 8, 9, 12 **CTE Anchor:** Communications: 2.1 Career Planning and Management: 3.3, 3.4, 3.6 Problem Solving and Critical Thinking Skills: 5.1 Health and Safety: 6.2, 6.4, 6.5, 6.6, 6.7 Ethics and Legal Responsibilities: 8.2, 8.3, 8.4, 8.5, 8.6 Leadership and Teamwork: 9.3, 9.5, 9.6, 9.7 Technical Knowledge and Skills: 10.1, 10.2, 10.4 **CTE Pathway:** C1.1, C1.2, C1.3, C1.4, C1.5, C4.2

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
B. RESOURCE MANAGEMENT REVIEW Review, apply, and evaluate the resource management principles and techniques in the auto repair and maintenance business. (1 hour)	1. Define the following: a. resources b. management c. sustainability 2. Describe and list specific examples of effective management of the following resources in the auto repair and maintenance business: a. time b. materials c. personnel 3. Describe the benefits of effective resource management in the auto repair and maintenance business: a. profitability b. sustainability c. company growth 4. Describe the economic benefits and liabilities of managing resources in an environmentally responsible way.	**Career Ready Practice:** 1, 2, 12 **CTE Anchor:** Communications: 2.1 Career Planning and Management: 3.7 Responsibility and Flexibility: 7.1, 7.2, 7.4, 7.6 Technical Knowledge and Skills: 10.1 Demonstration and Application: 11.1 **CTE Pathway:** C1.1, C5.2, C5.3, C5.4
C. MEASUREMENTS REVIEW Review, apply, and evaluate the principles of precision measurement and the use of precision measuring instruments. (5 hours)	1. Review and describe the features and functions of the following automotive measuring tools: a. steel ruler b. Vernier calipers c. inside calipers d. outside calipers e. micrometer gauges f. telescoping gauges g. hole gauges h. plastic gauges i. dial indicator gauge 2. Review and demonstrate proper use of a conversion chart 3. Compare measurement pre-test scores with post-test scores.	**Career Ready Practice:** 1, 2, 5 **CTE Anchor:** Communications: 2.1 Problem Solving and Critical Thinking: 5.1 Technical Knowledge and Skills: 10.1 Demonstration and Application: 11.1 **CTE Pathway:** C2.3, C2.4, C2.5, C2.7

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
D. TOOLS AND EQUIPMENT Understand, apply, and evaluate the use, maintenance, and storage techniques for automotive tools and equipment. (2 hours)	1. Review and describe the features and functions of the most common: a. automotive hand tools b. power tools and equipment 2. Review and demonstrate the following: a. selection of the appropriate hand, power tools, and equipment for each job b. procedures for checking out hand, power tools, and equipment from the tool room c. safe use of the most common hand, power tools and equipment	**Career Ready Practice:** 1, 2, 4 **CTE Anchor:** Communications: 2.1 Problem Solving and Critical Thinking: 5.2, 5.3, 5.4 Health and Safety: 6.3, 6.4, 6.5, 6.6 Technical Knowledge and Skills: 10.1 **CTE Pathway:** C1.4, C2.2
E. ENGINE DESIGN REVIEW Understand, apply, and evaluate the principles of the internal combustion engine design. (10 hours)	1. Identify and discuss the features and functions of the following: a. major parts of an automobile engine b. different types of cylinder configurations c. valve arrangements i. overhead valve ii. overhead cam iii. double overhead cam iv. multiple valve heads 2. Define four-stroke cycle. 3. Explain advantages and disadvantages of the various cylinder configurations.	**Career Ready Practice:** 1, 2, 4, 5, 11 **CTE Anchor:** Communications: 2.1 Problem Solving and Critical Thinking: 5.1, 5.2, 5.3, 5.4 Technical Knowledge and Skills: 10.1 **CTE Pathway:** C1.5
F. IGNITION SYSTEMS Understand, apply, and evaluate the principles and procedures used for ignition systems.	1. Identify and discuss the features and functions of the following ignition systems: a. breaker point ignition system b. electronic ignition system i. primary ignition voltage ii. secondary ignition voltage c. distributorless and breakerless ignition system d. direct ignition	**Career Ready Practice:** 1, 2, 4, 5, 11 **CTE Anchor:** Communications: 2.1 Problem Solving and

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(9 hours)	2. Identify and/or discuss the following: a. types of spark plugs according to shape and heat range b. purpose of ballast resistors c. operation of the coil d. methods of advancing the spark e. operation of computerized ignitions 3. Describe and demonstrate the following: a. performing industry recommended tests used to find ignition system trouble b. diagnosing symptoms produced by faulty ignition systems components c. replacing or repairing faulty ignition system parts d. adjusting ignition timing where applicable e. performing routine ignition system service	Critical Thinking: 5.1, 5.3, 5.4 Technical Knowledge and Skills: 10.1 Demonstration and Application: 11.1 **CTE Pathway:** C3.1, C3.6, C3.7, C5.6, C6.3, C6.4, C7.1
G. FUEL SYSTEMS Understand, apply, and evaluate the principles and procedures used for fuel systems. (9 hours)	1. Identify and discuss the features and functions of the following fuel systems: a. mechanical fuel injection systems b. electronic fuel injection systems c. diesel fuel injection systems 2. Identify and discuss the features and functions of the following fuel system components: a. fuel tank b. fuel pump i. mechanical ii. electrical c. fuel filter d. fuel injectors e. carburetors 3. Describe the following: a. properties and characteristics of gasoline b. carburetor circuits c. turbochargers d. superchargers 4. Describe and demonstrate the following: a. diagnosing fuel system malfunctions and their symptoms b. performing routine fuel system maintenance	**Career Ready Practice:** 1, 2, 4, 5, 11 **CTE Anchor:** Communications: 2.1 Problem Solving and Critical Thinking: 5.1, 5.4 Technical Knowledge and Skills: 10.1 **CTE Pathway:** C1.1, C1.2, C2.6, C3.1, C3.7, C5.6, C6.1, C6.4
H. EXHAUST SYSTEMS Understand, apply, and evaluate the principles and procedures used for exhaust systems.	1. Identify and discuss the features and functions of the following exhaust systems and components: a. exhaust manifold b. oxygen sensor c. catalytic converter d. resonator e. muffler f. exhaust pipe g. tail pipe 2. Describe catalytic converter systems.	**Career Ready Practice:** 1, 2, 4, 5, 11, 12 **CTE Anchor:** Communications: 2.1 Problem Solving and Critical Thinking: 5.3

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(9 hours)	3. Describe and demonstrate the following: a. diagnosing exhaust system malfunctions and their symptoms b. performing exhaust system repairs	Technical Knowledge and Skills: 10.1 Demonstration and Application: 11.1 **CTE Pathway:** C1.3, C3.1, C3.7, C5.6
I. EMISSION CONTROLS Understand, apply, and evaluate the principles and procedures used for emission controls. (9 hours)	1. Identify federal and state emission control rules and regulations. 2. Describe the following sources of auto emissions: a. evaporative emissions b. refueling losses c. exhaust emissions 3. Describe the following exhaust pollutants: a. hydrocarbons b. nitrogen oxides c. carbon monoxide d. carbon dioxide 4. Describe the importance of emission control devices on automobiles. 5. Identify and discuss the features and functions of emission control system components: a. crankcase controls b. exhaust control c. exhaust gas recirculation (EGR) controls d. evaporative loss controls e. secondary air injection f. OBD II 6. Describe and demonstrate the following: a. diagnosing emission control problems b. servicing PCV systems and controls c. servicing exhaust controls d. servicing EGR controls e. servicing evaporative loss controls f. servicing secondary air injection	**Career Ready Practice:** 1, 2, 4, 5, 11, 12 **CTE Anchor:** Communications: 2.1 Problem Solving and Critical Thinking: 5.1, 5.3, 5.4 Health and Safety: 6.7 Ethics and Legal Responsibilities: 8.2 Technical Knowledge and Skills: 10.1, 10.2 **CTE Pathway:** C1.3, C1.5, C3.7, C5.6, C8.6
J. MAJOR ENGINE OPERATIONS Understand, apply, and evaluate the principles and procedures used for major engine problems.	1. Identify and demonstrate common symptoms of engine mechanical problems. 2. Describe the following: a. diagnosing engine mechanical problems b. preparing for engine removal c. removing an engine d. disassembling the engine e. using micrometers to measure wear on engine parts	**Career Ready Practice:** 1, 2, 4, 5, 11 **CTE Anchor:** Communications: 2.1 Problem Solving and Critical Thinking:

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(15 hours)	f. assembling cylinder head(s) g. cleaning engine parts	5.1, 5.2, 5.3, 5.4 Health and Safety: 6.2, 6.3, 6.4, 6.5, 6.6, 6.7 Technical Knowledge and Skills: 10.1, 10.2, 10.3 **CTE Pathway:** C2.2, C2.4, C2.5, C3.7, C5.6, C6.1
K. ALTERNATIVE FUELS AND ENERGY Understand, apply, and evaluate the principles and procedures of alternative power.	1. Review the features and functions of the charging system in an internal combustion engine vehicle (ICEV). 2. Identify and describe the following: a. conductive charging b. flywheel energy/power storage c. inductive charging d. inverter/converter e. assist hybrid f. full hybrid g. mild hybrid h. regenerative braking i. parallel hybrid j. series hybrid k. electrolysis l. hydrogen m. ethanol/methanol 3. Identify and describe the following types of alternative power source vehicles: a. battery electric vehicle (BEV) b. hybrid electric vehicle (HEV) or hybrid c. fuel cell electric vehicle (FCEV) d. flexible-fuel vehicle (FFV) 4. Describe the differences between a BEV and an ICEV in terms of: a. major components b. power system c. operation of accessories d. advantage and disadvantages e. major considerations when servicing a BEV f. commonsense precautions when working around a BEV 5. Describe the differences between an HEV and an ICEV in terms of: a. major components b. power system c. operation of accessories d. advantages and disadvantages e. major considerations when servicing an HEV f. commonsense precautions when working around an HEV	**Career Ready Practice:** 1, 2, 4, 5, 11, 12 **CTE Anchor:** Communications: 2.1 Problem Solving and Critical Thinking: 5.1, 5.2, 5.3, 5.4 Health and Safety: 6.2, 6.4, 6.5, 6.6, 6.7 Technical Knowledge and Skills: 10.1 Demonstration and Application: 11.1 **CTE Pathway:** C1.4, C3.1, C3.4, C3.5, C3.6, C7.2, C7.3, C7.4, C7.5, C7.6, C7.7, C8.6

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(15 hours)	6. Describe the differences between an FCEV and an ICEV in terms of: a. major components b. power system c. operation of accessories d. advantage and disadvantages e. major considerations when servicing an FCEV f. commonsense precautions when working around an FCEV 7. Describe the differences between an FFV and an ICEV in terms of: a. major components b. power system c. operation of accessories d. advantage and disadvantages e. major considerations when servicing an FFV f. commonsense precautions when working around an FFV	
L. EMPLOYABILITY SKILLS REVIEW Review, apply, and evaluate the employability skills required in auto repair and maintenance.	1. Review employer requirements for the following: a. punctuality b. attendance c. proper attire d. attitude toward work e. quality of work f. teamwork g. timeliness h. responsibility i. communication skills j. computer skills and software applications 2. Review the importance of the continuous upgrading of job skills through lifelong learning. 3. Review pre-professional and professional industry organizations and discuss the employability benefits of belonging. 4. Review the need to adapt to varied roles and responsibilities in the workplace. 5. Review the importance of personal integrity and ethical behavior in the workplace. 6. Review customer service as a method of building permanent relationships between the organization and the client. 7. Review conflict resolution strategies for a variety of workplace situations. 8. Review ways to demonstrate respect for individual and cultural differences and for the attitudes and feelings of others. 9. Review potential employers through traditional and internet sources. 10. Review the role of electronic social networking in job search. 11. Review sample résumés and cover letters. 12. Review the importance of filling out a job application legibly, with accurate and complete information. 13. Review the common mistakes made on job applications. 14. Complete sample job application forms correctly.	**Career Ready Practice:** 1, 2, 3, 6, 7, 9 **CTE Anchor:** Career Planning and Management: 3.1, 3.2, 3.3, 3.4, 3.5, 3.7, 3.9 Problem Solving and Critical Thinking Skills: 5.1 Responsibility and Flexibility: 7.1, 7.2, 7.3, 7.6, 7.7 Ethics and Legal Responsibilities: 8.2, 8.3, 8.4 Technical Knowledge and Skills: 10.2, 10.4 Demonstration and Application: 11.2, 11.3, 11.4 **CTE Pathway:** C1.1, C1.5, C4.4, C5.2, C5.3, C5.4, C5.5

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(2 hours)	15. Review the importance of a. enthusiasm in the interview and on a job b. appropriate appearance on the job c. continuous upgrading of job skills d. clean driver's record e. background check 16. Review a career plan that builds on existing interests, skills, and abilities. 17. Review the informational materials, resources, and test knowledge needed to be successful in an interview. 18. Review and demonstrate appropriate interviewing techniques. .	
M. ENTREPRENEURIAL SKILLS Understand, apply, and evaluate the process involved in becoming an entrepreneur in the auto repair and maintenance industry. (2 hours)	1. Define entrepreneurship. 2. Identify the necessary characteristics of successful entrepreneurs. 3. Describe the contributions of entrepreneurs to the auto repair and maintenance industry. 4. Explain the purpose and components of a business plan. 5. Examine personal goals prior to starting a business. 6. Evaluate sources of monetary investment in a business opportunity. 7. Describe various licensing requirements in the auto repair and maintenance business. 8. Develop a scenario depicting the student as the repair and maintenance business owner. 9. Differentiate between sustainable and green business practices and standard business practices.	**Career Ready Practice:** 1, 2, 5, 7, 8, 10, 11, 12 **CTE Anchor:** Communications: 2.2, 2.3, 2.4, 2.5 Career Planning and Management: 3.2, 3.3, 3.5, 3.6, 3.7 Technology: 4.1, 4.2, 4.3 Problem Solving and Critical Thinking: 5.1, 5.2, 5.4 Health and Safety: 6.1, 6.2, 6.5 Responsibility and Flexibility: 7.1, 7.2, 7.3, 7.4, 7.6, 7.7, 7.8 Ethics and Legal Responsibilities: 8.1, 8.4, 8.7 Leadership and Teamwork: 9.1, 9.3, 9.4, 9.6 **CTE Pathway:** C1.1, C5.1, C5.2, C5.3, C5.4, C5.5, C5.6

SUGGESTED INSTRUCTIONAL MATERIALS and OTHER RESOURCES

TEXTBOOKS

Duffy, James E. Modern Automotive Technology, 9th Edition. Goodheart-Willcox Publishing, 2017.

VanGelder, Kirk, Fundamentals of Automotive Technology, Principles and Practice, 2nd Edition, CDX Learning Systems, 2018.

Stockel, Martin W., Stockel, Martin T., and Johnson, Chris, Auto Fundamentals, 12th Edition, Goodheart-Wilcox, 2020.

Hadfield, Chris and Witthauer, John. Basic Automotive Service & Systems, 6th Edition. Cengage Learning, 2021.

Halderman, James. Automotive Technology 6th Edition. Pearson, 2020

Johansson, Chris and Martin T. Stockel. Auto Fundamentals, 11th Edition. Goodheart-Willcox Publisher, 2015.

RESOURCES

Employer Advisory Board members

California Career Technical Education Model Curriculum Standards
https://www.cde.ca.gov/ci/ct/sf/documents/transportation.pdf

Automotive Retailing Today (ART) 8400 Westpark Dr., MS 2, McLean, VA 22102. Phone: (703) 556-8578.

Automotive Youth Educational Systems (AYES) 50 W. Big Beaver, Suite 145, Troy, MI 48084. Phone: (248) 526-1750. Fax: (248) 526-1751.

National Automobile Dealers Association (NADA) Public Relations Dept., 8400 Westpark Dr., McLean, VA 22102-3591. Phone: (703) 821-7000.

Automotive Service Excellence (ASE) Education Foundation 101 Blue Seal Dr. SE, Suite 101, Leesburg, VA 20175. Phone (703) 669-6650 Fax (703) 669-6125. https://www.aseeducationfoundation.org/

SkillsUSA P.O. Box 3000, Leesburg, VA 20177-0300. Phone: (703) 777-8810. Fax: (703) 777-8999. www. skillsusa.org

www.familycar.com

www.freeonlineautorepair.com/automotive_fuel_system.html

www.fueleconomy.gov

COMPETENCY CHECKLIST

TEACHING STRATEGIES and EVALUATION

METHODS AND PROCEDURES

A. Lecture and discussion

B. Multimedia presentations

C. Visual aids

D. Projects

E. Individualized instruction

EVALUATION

SECTION A – Introduction and Safety – Pass the safety test with 100% accuracy.

SECTION B – Resource Management Review – Pass all assignments and exams on resource management review with a minimum score of 80% or higher.

SECTION C – Measurements Review – Pass all assignments and exams on measurements review with a minimum score of 80% or higher.

SECTION D – Tools and Equipment Review – Pass all assignments and exams on tools and equipment review with a minimum score of 80% or higher.

SECTION E – Engine Designs Review: Foreign – Pass all assignments and exams on engine designs: foreign with a minimum score of 80% or higher.

SECTION F – Ignition Systems – Pass all assignments and exams on ignition systems with a minimum score of 80% or higher.

SECTION G – Fuel Systems – Pass all assignments and exams on fuel systems with a minimum score of 80% or higher.

SECTION H – Exhaust Systems – Pass all assignments and exams on exhaust systems with a minimum score of 80% or higher.

SECTION I – Emission Controls – Pass all assignments and exams on emission controls with a minimum score of 80% or higher.

SECTION J – Major Engine Operations – Pass all assignments and exams on major engine operations with a minimum score of 80% or higher.

SECTION K –Alternative Fuels and Energy – Pass all assignments and exams on alternative power sources with a minimum score of 80% or higher.

SECTION L –Employability Skills Review – Pass all assignments and exams on employability skills review with a minimum score of 80% or higher.

SECTION M –Entrepreneurial Skills – Pass all assignments and exams on entrepreneurial skills with a minimum score of 80% or higher.

DEFINITIONS OF TECHNICAL TERMS

ADJUST - to bring components to specified operational settings.

ALIGN - to restore the proper position of components.

ANALYZE - to assess the condition of a component or system.

ASSEMBLE (REASSEMBLE) - to fit together the components of a device or system.

BALANCE - to establish correct linear, rotational or weight relationship.

BLEED - to remove air from a closed system.

CAN – Controller Area Network. CAN is a network protocol (SAE J2284/ISO 15765-4) used to interconnect a network of electronic control modules

CHARGE - to bring to a specified state, e.g., battery or air conditioning system.

CHECK - to verify condition by performing an operational or comparative examination.

CLEAN - to rid component of foreign matter for the purpose of reconditioning, repairing, measuring or reassembling.

DEGLAZE – to remove a smooth glossy surface.

DETERMINE - to establish the procedure to be used to perform the necessary repair.

DETERMINE NECESSARY ACTION – indicates that the diagnostic routine(s) is the primary emphasis of a task. The student is required to perform the diagnostic steps and communicate the diagnostic outcomes and corrective actions required addressing the concern or problem. The training program determines the communication method (worksheet, test, verbal communication, or other means deemed appropriate) and whether the corrective procedures for these tasks are actually performed.

DIAGNOSE - to identify the cause of a problem.

DISASSEMBLE - to separate a component's parts as a preparation for cleaning, inspection or service.

DISCHARGE - to empty a storage device or system.

EVACUATE - to remove air, fluid or vapor from a closed system by use of a vacuum pump.

FLUSH - to internally clean a component or system.

HIGH VOLTAGE – voltages of 50 volts and higher.

HONE - to restore or resize a bore by using rotating cutting stones.

JUMP START - to use an auxiliary power supply to assist a battery to crank an engine.

LOCATE – to determine or establish a specific spot or area.

MEASURE - to determine existing dimensions/values for comparison to specifications.

NETWORK - a system of interconnected electrical modules or devices.

ON-BOARD DIAGNOSTICS (OBD) - diagnostic protocol which monitors computer inputs and outputs for failures.

PARASITIC DRAW - electrical loads which are still present when the ignition circuit is OFF.

PERFORM - to accomplish a procedure in accordance with established methods and standards.

PERFORM NECESSARY ACTION – indicates that the student is to perform the diagnostic routine(s) and perform the corrective action item. Where various scenarios (conditions or situations) are presented in a single task, at least one of the scenarios must be accomplished.

PURGE - to remove air or fluid from a closed system.

REMOVE - to disconnect and separate a component from a system.

REPAIR - to restore a malfunctioning component or system to operating condition.

REPLACE - to exchange a component; to reinstall a component.

RESURFACE – to restore correct finish.

SERVICE - to perform a procedure as specified in the owner's or service manual.

TEST - to verify condition through the use of meters, gauges or instruments.

TORQUE - to tighten a fastener to specified degree or tightness (in a given order or pattern if multiple fasteners are involved on a single component).

VERIFY - to confirm that a problem exists after hearing the customer's concern; or, to confirm the effectiveness of a repair.

VOLTAGE DROP - a reduction in voltage (electrical pressure) caused by the resistance in a component or circuit.

Standards for Career Ready Practice

1. **Apply appropriate technical skills and academic knowledge.**
   Career-ready individuals readily access and use the knowledge and skills acquired through experience and education. They make connections between abstract concepts with real-world applications and recognize the value of academic preparation for solving problems, communicating with others, calculating measures, and performing other work-related practices.

2. **Communicate clearly, effectively, and with reason.**
   Career-ready individuals communicate thoughts, ideas, and action plans with clarity, using written, verbal, electronic, and/or visual methods. They are skilled at interacting with others: they are active listeners who speak clearly and with purpose, and they are comfortable with terminology that is common to workplace environments. Career-ready individuals consider the audience for their communication and prepare accordingly to ensure the desired outcome.

3. **Develop an education and career plan aligned with personal goals.**
   Career-ready individuals take personal ownership of their educational and career goals and manage their individual plan to attain these goals. They recognize the value of each step in the educational and experiential process, and they understand that nearly all career paths require ongoing education and experience to adapt to practices, procedures, and expectations of an ever-changing work environment. They seek counselors, mentors, and other experts to assist in the planning and execution of education and career plans.

4. **Apply technology to enhance productivity.**
   Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring and using new technology. They understand the inherent risks—personal and organizational—of technology applications, and they take actions to prevent or mitigate these risks.

5. **Utilize critical thinking to make sense of problems and persevere in solving them**
   Career-ready individuals recognize problems in the workplace, understand the nature of the problems, and devise effective plans to solve the problems. They thoughtfully investigate the root cause of a problem prior to introducing solutions. They carefully consider options to solve a problem and, once agreed upon, follow through to ensure the problem is resolved.

6. **Practice personal health and understand financial literacy.**
   Career-ready individuals understand the relationship between personal health and workplace performance. They contribute to their personal well-being through a healthy diet, regular exercise, and mental health activities. Career-ready individuals also understand that financial literacy leads to a secure future that enables career success.

7. **Act as a responsible citizen in the workplace and the community.**
   Career-ready individuals understand the obligations and responsibilities of being a member of a community and demonstrate this understanding every day through their interactions with others. They are aware of the impacts of their decisions on others and the environment around them, and they think about the short-term and long-term consequences of their actions. They are reliable and consistent in going beyond minimum expectations and in participating in activities that serve the greater good.

8. **Model integrity, ethical leadership, and effective management.**
Career-ready individuals consistently act in ways that align with personal and community-held ideals and principles. They employ ethical behaviors and actions that positively influence others. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the direction and actions of a team or organization, and they recognize the short-term and long-term effects that management's actions and attitudes can have on productivity, morale, and organizational culture.

9. **Work productively in teams while integrating cultural and global competence.**
Career-ready individuals contribute positively to every team, as both team leaders and team members. To avoid barriers to productive and positive interaction, they apply an awareness of cultural differences. They interact effectively and sensitively with all members of the team and find ways to increase the engagement and contribution of other members.

10. **Demonstrate creativity and innovation.**
Career-ready individuals recommend ideas that solve problems in new and different ways and contribute to the improvement of the organization. They consider unconventional ideas and suggestions by others as solutions to issues, tasks, or problems. They discern which ideas and suggestions may have the greatest value. They seek new methods, practices, and ideas from a variety of sources and apply those ideas to their own workplace practices.

11. **Employ valid and reliable research strategies.**
Career-ready individuals employ research practices to plan and carry out investigations, create solutions, and keep abreast of the most current findings related to workplace environments and practices. They use a reliable research process to search for new information and confirm the validity of sources when considering the use and adoption of external information or practices.

12. **Understand the environmental, societal, and economic impacts of decisions.**
Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact other people, organizations, the workplace, and the environment. They are aware of and utilize new technologies, understandings, procedures, and materials and adhere to regulations affecting the nature of their work. They are cognizant of impacts on the social condition, environment, workplace, and profitability of the organization.

Statement for Civil Rights

All educational and vocational opportunities are offered without regard to race, color, national origin, gender, or physical disability.