LAUSD UNIFIED Division of Adult and Career Education

Career Technical Education (CTE) Course Outline

Course Title:	Auto Tech: Engine Performance/2
Course Number:	79-90-72
Date:	July 2024
Industry Sector:	Transportation
Pathway:	Systems Diagnostics and Service
CBEDS Title:	Advanced Automotive
CBEDS Code:	5669
Credits:	10

Hours:

Total
150

Course Description:

This competency-based course is second in a sequence of two courses. It provides students with technical instruction and practical experience in an automobile area incorporating sustainable and green vehicle technologies. Instruction includes introduction, safety – general, resource management, trade mathematics, tools and equipment, service manuals and computer-based information systems, basic automotive electricity, fuel, air induction, and exhaust systems diagnosis and repair, emission control systems diagnosis and repair, and employability and resume preparation. 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 Auto Tech: Engine Performance/1 (79-90-68) course.
NOTE:	For Perkins purposes this course has been designated as a **capstone** course. This course **cannot** be repeated once a student receives a Certificate of Completion.
A-G Approval	N/A
Methods of Instruction:	Lecture and discussion, multimedia presentations, visual aids, projects individualized instruction, shop work
Student Evaluation:	Summative: End of section assessments
Industry Certification:	N/A
Recommended Texts:	Duffy, James E. Modern Automotive Technology, 10th Edition. Goodheart-Willcox Publishing, 2022. VanGelder, Kirk. Fundamentals of Automotive Technology Principles & Practices, 3rd Edition. Jones & Bartlett Learning, 2023.
Link to Resource Folder	https://bit.ly/engineperformance2resources

Approved by: Renny L. Neyra, Executive Director

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
A. INTRODUCTION REVIEW Understand, apply, and evaluate classroom and workplace policies and procedures. (2 hours)	1. Review the scope and purpose of the course. 2. Review the classroom policies and procedures. 3. Review and demonstrate Zoom, Schoology, and basic computer skills. 4. Review and assess students' basic knowledge in engine performance principles. 5. Review, identify, research, and draw conclusions on the different career paths, occupations, employment outlook, and career advancements in the transportation industry sector which have an impact on vehicles. 6. Review the opportunities available for promoting gender equity and the representation of non-traditional populations in the automotive industry. 7. Review and recognize the importance of ethics, teamwork, respecting individual and cultural differences and diversity in the workplace. 8. Review the role of the Automotive Service of Excellence (ASE) as it applies to the automotive industry. 9. Review the role of the Automotive Service Education Foundation (ASEF) in auto technician training.	**Career Ready Practice:** 1, 2, 3, 4, 5, 8, 9, 10, 11 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Career Planning & Management: 3.1, 3.4, 3.5, 3.6, 3.9 Technology: 4.1, 4.5 Problem Solving & Critical Thinking: 5.4 Ethics & Legal Responsibilities: 8.2, 8.3, 8.4, 8.5 Leadership & Teamwork: 9.3, 9.4, 9.6 Demonstration & Application: 11.1, 11.2 **CTE Pathway:** C2.6
B. SAFETY – GENERAL REVIEW		**Career Ready Practice:**

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
Understand safety procedures and techniques in the auto repair and maintenance sector. (5 hours)	1. Review classroom and workplace first aid, emergency procedures, and accidents or injury prevention. 2. Review the California Occupational Safety and Health Administration (Cal/OSHA) workplace requirements for auto technicians to maintain a safe and healthy working environment. 3. Review the impact of Environmental Protection Agency (EPA) legislation on Transportation Industry Sector practices in protecting and preserving the environment. 4. Review and demonstrate ASEF standards regarding proper handling, storage and disposal of chemicals and materials used in an auto shop. 5. Review the impact of California Air Resources Board (ARB) legislation on the Transportation Industry Sector. 6. Review the Bureau of Automotive Repair (BAR) standards for consumer and environmental protection. 7. Review the use of the Safety Data Sheet (SDS) as it applies to the automotive industry. 8. Review the safety items required by the federal, state, and local regulations. 9. Review the importance of proper personal hygiene in the classroom and auto shop. 10. Review and demonstrate the standards regarding proper use of protective equipment in an auto shop: a. clothing and gloves b. respiratory gear c. eye gear d. work shoes e. ventilation f. handling, storage, and disposal of chemicals and hazardous materials used in an auto shop g. proper use of tools and equipment h. proper use of tools and equipment 11. Review personal safety when lifting, bending, or moving equipment and supplies.	1, 2, 10, 12 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3 Health & Safety: 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7 Technical Knowledge & Skills: 10.2, 10.4 Demonstration & Application: 11.1 **CTE Pathway:** C1.2, C1.4, C2.2

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
	12. Pass the safety test with 100% accuracy.	
C. RESOURCE MANAGEMENT REVIEW Understand, apply, and evaluate the resource management principles and techniques in the auto repair and maintenance business. (1 hour)	1. Review and describe the benefits of the following: a. resources b. management c. sustainability d. profitability e. company growth 2. Review and list specific examples of the effective management of the following resources in the auto shop repair and maintenance business: a. time b. materials c. personnel 3. Pass a resource management assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 7 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3 Responsibility & Flexibility: 7.1, 7.4 Technical Knowledge & Skills: 10.1 **CTE Pathway:** C5.2
D. TRADE MATHEMATICS REVIEW Understand, apply, and evaluate the mathematical requirements used in auto diagnosis, maintenance, and repair.	1. Review and identify the practical math terminology in auto repair and maintenance. 2. Review, demonstrate, and ask questions regarding problem-solving techniques involving: a. basic trade mathematical operations. b. changing fractions to decimals c. changing decimals to fractions d. engineering notation 3. Review, demonstrate, and interpret the English and metric units of the measuring system and draw conclusions to make informed decisions.	**Career Ready Practice:** 1, 2, 5, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3 Problem Solving & Critical Thinking: 5.1, 5.2

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(6 hours)	4. Review and demonstrate problem-solving techniques for: a. algebraic problems b. percentages c. reading and interpreting graphs d. calculator e. geometric problems that apply to auto repair and maintenance such as angles and degrees 5. Pass a trade mathematics assessment with an 80% score or higher.	Technical Knowledge & Skills: 10.1 Demonstration & Application: 11.1 **CTE Pathway:** C2.4
E. TOOLS AND EQUIPMENT REVIEW Understand, apply, and evaluate the use, maintenance, storage techniques for automotive tools and equipment.	1. Review, discuss, and demonstrate the proper use, maintenance, and storage techniques for: a. four or five gas exhaust analyzer (five gas recommended) b. fuel injection pressure gauge sets with adapters c. injector pulse tester d. leak detector (smoke or nitrogen) e. logic probe (suggested) f. oxygen sensor socket g. pinch-off pliers h. sending unit socket(s) i. spark plug thread tap j. spark tester k. timing advance light l. vacuum/pressure gauge m. Digital Storage Oscilloscope (DS0) n. scanners o. memory saver p. chemicals q. automotive hand tools r. power tools and equipment s. multimeter t. soldering tools 2. Review and demonstrate the following:	**Career Ready Practice:** 1, 2, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3 Health & Safety: 6.4 Technical Knowledge & Skills: 10.1 Demonstration & Application: 11.1 **CTE Pathway:** C2.2, C2.3

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(6 Hours)	a. selection of the appropriate hand, power tools, and equipment for each job b. procedure for checking out hand, power tools, and equipment from the tool room c. safe use of the most common hand, power tools and equipment d. practice personal safety when lifting, bending, or moving equipment and supplies 3. Pass a tools and equipment assessment with an 80% score or higher.	
F. SERVICE MANUALS AND COMPUTER-BASED INFORMATION SYSTEMS REVIEW Understand, apply, and evaluate the contents of service manuals and computer-based information systems as important sources of reference to an auto technician. (6 Hours)	1. Review the different types of service manuals. 2. Review the different types of information that can be found in service manuals such as specifications, troubleshooting charts, and repair information. 3. Review and demonstrate the use of service manuals. 4. Review and demonstrate the use of web-based search engines in finding automotive technical information. 5. Review and complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. 6. Pass a service manual and computer-based information system assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 4, 10, 11 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3 Technology: 4.1, 4.2 Demonstration & Application: 11.1 **CTE Pathway:** C2.6, C4.3, C4.4
G. BASIC AUTOMOTIVE ELECTRICITY REVIEW Understand the fundamentals of	1. Review the following: a. electricity b. current c. conductor d. resistance e. inductance f. voltage	**Career Ready Practice:** 1, 2, 4, 5, 9, 10, 11 **CTE Anchor:** Academics:

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
electricity as it is used in automobiles. (15 hours)	2. Review devices used in measuring electricity. 3. Review and demonstrate Ohm's Law problems. 4. Review the similarities and differences between alternating current (AC) and direct current (DC). 5. Review electrical circuits and their components. 6. Review magnetism. 7. Review how electricity can be generated. 8. Review the electrical systems list found in cars. 9. Review an automotive storage battery. 10. Form teams to interpret information and draw conclusions when testing an automotive storage battery. 11. Review the function of fuses. 12. Review and list and describe the different types of electrical accessories and their function. 13. Pass a basic automotive electricity assessment with an 80% score or higher.	1.0 Communications: 2.1, 2.3 Problem Solving & Critical Thinking: 5.3, 5.4 Leadership & Teamwork: 9.3, 9.7 Technical Knowledge & Skills: 10.1, 10.3 Demonstration & Application: 11.1 **CTE Pathway:** C2.2, C2.3, C2.4, C7.1, C7.2, C7.3, C7.4, C7.7
H. FUEL, AIR INDUCTION, AND EXHAUST SYSTEMS DIAGNOSIS AND REPAIR Understand, apply, and evaluate the diagnostic and repair techniques for the fuel, air induction and exhaust systems	1. Diagnose hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action. 2. Research, diagnose, and repair the fuel, air induction, and exhaust systems using the scan tool. 3. Check fuel for contaminants and quality; determine necessary action. 4. Inspect, test, and repair the fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.	**Career Ready Practice:** 1, 2, 4, 5, 9, 10, 11 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2, 4.5

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
according to the manufacturer's specifications. (50 hours)	5. Demonstrate how to replace fuel filters. 6. Inspect throttle body, air induction system, intake manifold, cabin air filter, and gaskets for vacuum leaks and/or unmetered air. 7. Inspect and test fuel injectors. 8. Verify idle control operation. 9. Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action. 10. Perform exhaust system back-pressure test; determine necessary action. 11. Test the operation of turbocharger/supercharger systems; determine necessary action. 12. Pass a fuel, air induction, and exhaust systems assessment with an 80% score or higher.	Problem Solving & Critical Thinking: 5.2, 5.3 Leadership & Teamwork: 9.3, 9.7 Technical Knowledge & Skills: 10.3 Demonstration & Application: 11.1 **CTE Pathway:** C2.2, C2.7, C3.5, C3.7, C6.4
I. EMISSION CONTROL SYSTEMS DIAGNOSIS AND REPAIR Understand, apply, and evaluate the diagnostic and repair techniques for the emission systems according to the manufacturer's specifications.	1. Know and understand common environmental conservation practices and their applications by using reference books, technical service bulletins, etc. 2. Define, explain, and interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action. 3. Diagnose oil leaks, emissions, and driveability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action. 4. Diagnose emissions and drivability concerns, caused by the exhaust gas recirculation (EGR) system; determine necessary action. 5. Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action.	**Career Ready Practice:** 1, 2, 4, 5, 9, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2 Problem Solving & Critical Thinking: 5.2, 5.3, 5.4

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(50 hours)	6. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action. 7. Forms teams and diagnose emissions and drivability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action. 8. Inspect and test mechanical components of secondary air injection systems; perform necessary action. 9. Inspect and test electrical/electronically operated components and circuits of air injection systems; perform necessary action. 10. Diagnose emissions and drivability concerns caused by the evaporative emissions control system; determine necessary action. 11. Inspect and demonstrate how to test components and hoses of the evaporative emissions control system; perform necessary action. 12. Pass an emission control systems diagnosis and repair assessment with an 80% score or higher.	Leadership & Teamwork: 9.3, 9.7 Technical Knowledge & Skills: 10.1, 10.3 Demonstration & Application: 11.1 **CTE Pathway:** C1.1, C2.2, C2.3, C4.3, C6.4
J. EMPLOYABILITY SKILLS AND RESUME PREPARATION REVIEW Understand, apply, and evaluate the employability skills and resume preparation desired of automotive technicians.	1. Review and define employer requirements for soft skills such as: a. attitude toward work b. communication and collaboration c. critical thinking, problem solving, and decision-making d. customer service e. diversity in the workplace f. flexibility and adaptability g. interpersonal skills h. leadership and responsibility i. punctuality and attendance j. quality of work	**Career Ready Practice:** 1, 2, 3, 4, 5, 7, 8, 9, 10, 11 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.4. 2.5 Career Planning & Management:

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
(4 hours)	k. respect, cultural and diversity differences l. teamwork m. time management n. trust and ethical behavior o. work ethic 2. Review a career plan that reflects career interests, pathways, and post-secondary options. 3. Revise a resume, cover letter and/or portfolio. 4. Review, analyze, research, and review the role of online job searching platforms and career websites to make informed decisions. 5. Review the importance of assessing social media account content for professionalism. 6. Review and complete and/or review an on-line job application. 7. Review and demonstrate interview skills to get the job: a. do's and don'ts for job interviews b. how to dress for the job 8. Revise sample follow-up letters. 9. Review the importance of the continuous upgrading of job skills as it relates to: a. certification, licensure, and/or renewal b. professional organizations/events c. industry associations and/or organized labor	3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.8, 3.9 Technology: 4.1, 4.2, 4.3, 4.5 Problem Solving & Critical Thinking: 5.1, 5.4 Responsibility & Flexibility: 7.2, 7.3, 7.4, 7.7 Ethics & Legal Responsibilities: 8.3, 8.4, 8.5 Leadership & Teamwork: 9.1, 9.2, 9.3, 9.4, 9.6, 9.7 Technical Knowledge & Skills: 10.1, 10.3 Demonstration & Application: 11.1, 11.2, 11.5 **CTE Pathway:** C5.4, C5.5
K. ENTREPRENEURIAL SKILLS	1. Define entrepreneurship. 2. Identify and research the necessary characteristics of successful entrepreneurs.	**Career Ready Practice:** 1, 2, 4, 10, 11

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Understand, apply, and evaluate the process involved in becoming an entrepreneur in the automotive industry. (5 hours)	3. Examine personal goals prior to starting a business. 4. Evaluate sources of monetary investment in a business opportunity. 5. Explain licensing/permit requirements for a business. 6. Explain how the Small Business Administration (SBA) assists entrepreneurs with lenders and funding to help them plan, start and grow a business. 7. Demonstrate a budget to identify start-up expenses. 8. Pass an entrepreneurial skills assessment with an 80% score or higher.	**CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.1, 4.2, 4.5 Responsibility & Flexibility: 7.1, 7.6 Technical Knowledge & Skills: 10.1, 10.3, 10.4 Demonstration & Application: 11.1, 11.2, 11.3, 11.4, **CTE Pathway:** C5.1, C5.2, C5.3, C5.5

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