LAUSD UNIFIED Division of Adult and Career Education

Career Technical Education (CTE) Course Outline

Course Title:	Technology/2: Automotive Systems
Course Number:	79-90-85
Date:	August 2024
Industry Sector:	Transportation
Pathway:	Systems Diagnostics and Service
CBEDS Title:	Intro to Automotive
CBEDS Code:	5652
Credits:	5

Hours:

Total
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, safety, resource management, measurement review, tools and equipment review, service manuals and computer-based information systems review, engine performance systems, HVAC systems, manual drive train and axles systems, automatic transmission and transaxle systems, employability skills and resume preparation review, and entrepreneurial skills. 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 **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. Johansson, Chris. Auto Fundamentals, 13th Edition, Goodheart-Willcox Publishing, 2024.
Link to Resource Folder	https://bit.ly/tech2autoresources Access to: Content Standards and resource links. Employer Advisory Board members

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, 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. 5. Review the opportunities available for promoting gender equity and the representation of non-traditional populations in the automotive industry. 6. Review and recognize the importance of ethics, teamwork, respecting individual and cultural differences, and diversity in the workplace. 7. Review the role of the Automotive Service of Excellence (ASE) as it applies to the automotive industry. 8. 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 Understand safety procedures and	1. Review classroom and workplace procedures for first aid, emergencies, and accidents/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.	**Career Ready Practice:** 1, 2, 10, 12 **CTE Anchor:** Academics:

techniques in the auto repair and maintenance sector. (3 hours)	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 11. Review personal safety when lifting, bending, or moving equipment and supplies. 12. Pass the safety test with 100% accuracy.	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
C. RESOURCE MANAGEMENT REVIEW Understand, apply, and evaluate the resource management principles and techniques in the auto repair and maintenance field.	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	**Career Ready Practice:** 1, 2, 7 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3

(1 hour)	3. Pass a resource management assessment with an 80% score or higher.	Responsibility & Flexibility: 7.1, 7.4 Technical Knowledge & Skills: 10.1 **CTE Pathway:** C5.2
D. MEASUREMENTS REVIEW Understand, apply, and evaluate the principles of precision measurement and the use of precision measuring instruments. (2 hours)	1. Review the measurement pre-test. 2. Review and describe the features and functions of the following automotive measuring tools: a. steel ruler b. Vernier calipers c. combination square d. inside calipers e. outside calipers f. micrometer depth gauges g. telescoping gauges h. hole gauges i. plastic gauges 3. Review and demonstrate the following: a. using of a conversion chart properly b. measuring to 1/64 inch with a steel ruler c. measuring to 1/100 inch with a steel ruler d. measuring to .5mm with a steel ruler e. measuring to .005 with micrometers f. measuring to 1/100mm with micrometers g. measuring to 1/1000 mm with Vernier calipers h. measuring to .05mm with Vernier calipers i. qualifying, setting up, and reading dial indicators 4. Review, demonstrate, and interpret the English and metric units of the measuring system, and draw conclusions to make informed decisions. 5. Pass a measurement assessment with an 80% score or higher.	**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 Technical Knowledge & Skills: 10.1 Demonstration & Application: 11.1 **CTE Pathway:** C2.4
E. TOOLS AND EQUIPMENT REVIEW Understand, apply, and evaluate the use,	1. Define, review, discuss, and demonstrate the proper use, maintenance, and storage techniques for the most common automotive hand tools. 2. Review and demonstrate the following: a. selection of the appropriate hand, power tools, and equipment for each job	**Career Ready Practice:** 1, 2, 10 **CTE Anchor:**

maintenance, and storage techniques for automotive tools and equipment. (2 hours)	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 in the auto shop 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.	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
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. (2 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 the advantages of using web-based search engines over service manuals in finding automotive technical information. 6. Review completing a work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. 7. 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. ENGINE PERFORMANCE SYSTEMS Understand, apply, and evaluate the principles of engine performance systems.	1. Define the following terms: a. input processing b. output processing c. open and close loops d. analog and digital signals e. primary and secondary circuit f. electrical induction	**Career Ready Practice:** 1, 2, 4, 5, 9, 10, 11 **CTE Anchor:** Academics:

	g. step up transformer h. ignition timing i. firing order j. spark plug k. oxygen and air fuel sensors l. catalytic converter m. muffler n. exhaust back pressure o. tail pipes p. resonator q. gasoline r. diesel s. Compressed natural Gas (CNG) t. propane u. hydrogen v. ethanol w. methanol x. smog y. Hydrocarbons (HC) z. Carbon Monoxide (CO) aa. Carbon Dioxide (CO2) bb. Oxides of Nitrogen (NOX) cc. particulates dd. Exhaust Gas Recirculation (EGR) ee. Positive Crankcase Ventilation (PCV) ff. Secondary Air Injection (AIR) 2. Demonstrate how to retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. 3. Discuss the causes of emissions or drivability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data. 4. Discuss emissions or drivability concerns without stored diagnostic trouble codes; determine necessary action. 5. Form teams and perform active tests of actuators using a scan tool; determine necessary action. 6. Describe the importance of running all OBDII monitors for repair verification. 7. Discuss ignition system related problems such as no-starting, hard starting, engine misfire, poor drivability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action. 8. Distinguish between coil, coil pack, distributorless, and direct ignition system.	1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.1, 4.2 Problem Solving & Critical Thinking: 5.4 Leadership & Teamwork: 9.3, 9.7 Technical Knowledge & Skills: 10.1 Demonstration & Application: 11.1 **CTE Pathway:** C2.2, C4.3, C6.1, C6.

(24 hours)	9. Describe the basic parts and construction of an exhaust system. 10. Define the major components of the fuel supply system. 11. Describe the operation of mechanical and electrical fuel pumps. 12. Research, inspect, service, and replace PCV valves, breather caps, tubes, and hoses by using technical reports, manuals, etc. 13. Summarize how OBD II system uses oxygen and multiple sensors to check air fuel mixture and catalytic efficiency. 14. Pass a computerized engine controls diagnosis and repair assessment with an 80% score or higher.	
H. HVAC SYSTEMS Understand, apply, and evaluate the principles of heating, ventilation, and air conditioning systems.	1. Discuss the importance of conducting a performance test on an A/C system. 2. Identify abnormal operating noises in the A/C system; determine necessary action: a. worn out bearings, hoses, belt, and pulleys b. a/c clutches c. a/c compressor d. fan clutch 3. Form teams to identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings: a. HFC-134a b. R1234YF 4. Identify the refrigerant oils: a. Polyolester (POE) b. Polyalkylene Glycol (PAG) c. mineral oil 5. Determine recommended oil and oil capacity for system application. 6. Demonstrate how to perform cooling system pressure tests; inspect and test radiator, cap (pressure/vacuum), coolant recovery tank, and hoses; perform necessary action. 7. Inspect and test electric cooling fan, fan control system and circuits; determine necessary action. 8. Explain the process to recycle, label, and store refrigerant and the appropriate handling and disposal of hazardous materials. 9. Discuss license requirements in order to work on an A/C system.	**Career Ready Practice:** 1, 2, 4, 5, 9, 10, 12 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2 Problem Solving & Critical Thinking: 5.1 Leadership & Teamwork: 9.3, 9.7 Demonstration & Application: 11.1 **CTE Pathway:** C1.1, C1.2, C2.2, C3.2, C4.2, C5.2, C5.3, C7.

(18 hours)	10. Pass an HVAC systems assessment with an 80% score or higher.	
I. MANUAL DRIVE TRAIN AND AXLES SYSTEMS Understand, apply, and evaluate the principles of manual drive train and axles systems. (18 hours)	1. Discuss, explain, and demonstrate how to diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action. 2. Form teams to bleed the clutch hydraulic system. 3. Discuss, explain, and demonstrate how to diagnose universal joint noise and vibration concerns. 4. Discuss, explain, and demonstrate how to diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns. 5. Explain the difference between four-wheel drive variations: a. four-wheel drive b. all-wheel drive c. front wheel drive d. rear wheel drive 6. Explain the construction and operation of a transfer case and check fluid levels. 7. Form teams to diagnose fluid loss, level, and condition concerns; determine necessary action. 8. Drain and fill manual transmission/transaxle and final drive unit. 9. Pass a manual drive train and axles systems assessment with an 80% score or higher.	**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: 5.1, 5.4 Leadership & Teamwork: 9.3, 9.7 Demonstration & Application: 11.1 **CTE Pathway:** C8.2
J. AUTOMATIC TRANSMISSION AND TRANSAXLE SYSTEMS Understand, apply, and evaluate the principles of automatic transmission and axle systems.	1. Demonstrate how to diagnose fluid loss and condition concerns; check fluid level in transmissions with and without dip-stick; determine necessary action. 2. Inspect, replace, and align powertrain mounts. 3. Service transmission; perform visual inspection; replace fluid and filters. 4. Describe the operational characteristics of a Continuously Variable Transmission (CVT). 5. Pass an automatic transmission and transaxle systems assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 4, 5, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2 Problem Solving & Critical Thinking:

(10 hours)		5.1, 5.4 Leadership & Teamwork: 9.3, 9.7 Demonstration & Application: 11.1 **CTE Pathway:** C8.2
K. 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 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. Demonstrate, 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.	**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: 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

(4 hours)	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. Review and create 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	Technical Knowledge & Skills: 10.1, 10.3 Demonstration & Application: 11.1, 11.2, 11.5 **CTE Pathway:** C5.4, C5.5
L. ENTREPRENEURIAL SKILLS Understand, apply, and evaluate the process involved in becoming an entrepreneur in the automotive industry. (4 hours)	1. Define entrepreneurship. 2. Identify and research the necessary characteristics of successful entrepreneurs. 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.	**Career Ready Practice:** 1, 2, 4, 10, 11 **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

ACKNOWLEDGEMENTS

Thanks to the following individuals for their contributions in developing and editing this curriculum:

Ana Martinez, Seyed Saidi, and Juan Soltero