

Colorado CTE Course – Scope and Sequence

Course Name	Maintenance and Light Repair IV		Course Details	Credit= 1.0- 2.0 (dependent on time spent on tasks.)	
			Course = 0.50 Carnegie Unit Credit	Prerequisite: MLR III	
				CTE Credential: CTE Transportation	
Course Description	The Maintenance and Light Repair IV (MLR IV) course prepares students for entry into the automotive workforce or into postsecondary training. Students study and service automotive HVAC systems, engine performance systems, automatic and manual transmission/transaxle systems, and practice workplace soft skills. Students who successfully complete all MLR courses will have the knowledge needed to pass the ASE certification exam for MLR. Students who pass the exam and meet the work-based requirement will be eligible and encouraged to enter the workforce as an ASE-Certified MLR Technician.				
Note:	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.				
SCED Identification #	20104	Schedule calculation based on 60 calendar days of a 90-day semester. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.			
All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at https://www.cde.state.co.us/standardsandinstruction/essentialskills					
Instructional Unit Topic	Suggested Length of Instruction	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Career Development		<p>Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.</p> <p>Develop an education and career plan aligned with personal goals and employment in the automotive service industry.</p>	<p>The student demonstrates professional standards/employability skills as required by business and industry. The student is expected to:</p> <p>(A) demonstrate the principles of group participation, team concept, and leadership related to citizenship and career preparation;</p>	<p>Understand the certification requirements for the ASE Automobile Maintenance and Light Repair Certification.</p> <p>Cultivate positive leadership skills. Take part in opportunities to practice and demonstrate personal leadership skills. For example, taking advantage of opportunities provided by a career and technical student organization (CTSO), such as SkillsUSA.</p>	

			<p>(B) apply competencies related to resources, information, interpersonal skills, problem solving, critical thinking, and systems of operation in the automotive technology industry;</p> <p>(C) discuss certification opportunities;</p> <p>(D) discuss response plans to emergency situations;</p> <p>(E) identify employers' expectations and appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills; and</p> <p>(F) develop personal goals, objectives, and strategies as part of a plan for future career and educational opportunities.</p>	<p>Build personal career development by identifying career interests and strengths. Research local job and internship opportunities and compare the announcements to identified career interests.</p>	
Safety		<p>Understand and demonstrate adherence to industry safety standards.</p>	<p>Students will perform safety examinations and maintain safety records in accordance with industry standards. Student is expected to:</p> <p>(A) Use and inspect personal protective equipment. Demonstrate</p>	<p>Pass with 100% accuracy a written examination relating to safety issues relating specifically to Maintenance and Light Repair.</p> <p>Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed</p>	

			<p>appropriate related safety procedures;</p> <p>(B) Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment;</p> <p>(C) Demonstrate continuous awareness of potential hazards to self and others and respond appropriately;</p> <p>(D) Assume responsibilities under HazCom (Hazard Communication) regulations; and</p> <p>(E) Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards; reporting of accidents and observed hazards; and regarding emergency response procedures.</p>	<p>an operational checkout by the instructor.</p> <p>Demonstrate appropriate use of PPE.</p> <p>Demonstrate safe handling of equipment and materials.</p>	
Automotive service foundational employment skills		Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading	<p>The student relates core academic skills to the requirements of automotive technology.</p> <p>The student is expected to:</p>		

		<p>to postsecondary education and employment.</p> <p>Use existing and emerging technology to investigate, research, and produce products and services, including new information, as required in the Transportation sector workplace environment.</p> <p>Apply essential technical knowledge and skills common to all pathways in the Transportation sector, following procedures when carrying out experiments or performing technical tasks.</p>	<p>(A) demonstrate effective written communication skills throughout the course, including documenting on a repair order customer concern/compliant, root cause of the failure, and corrective action to complete the repair;</p> <p>(B) estimate the cost of parts and labor operations on repair orders throughout the course, including the flat rate system;</p> <p>(C) demonstrate mathematical skills in performing addition, subtraction, multiplication, division, and measurements using decimals and fractions in the metric and U.S. standard systems as appropriate; and</p> <p>(D) research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.</p>		
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<p>Tools and Equipment</p>		<p>Use appropriate tools and equipment and perform necessary procedures to maintain, diagnose, service, and repair vehicle systems and components</p>	<p>The student knows the functions and applications of the tools, equipment, technologies, and materials used in automotive technology. The student is expected to:</p> <p>(A) demonstrate the proper and safe use of hand and power tools and equipment commonly employed in the maintenance and repair of vehicles;</p> <p>(B) discuss and demonstrate the proper handling and disposal of environmentally hazardous materials used in servicing vehicles;</p> <p>(C) demonstrate proper use of diagnostic tools and equipment; and</p> <p>(D) locate, read, and interpret service repair information such as schematics, charts, diagrams, graphs, parts catalogs, and service-repair bulletins.</p>	<p>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).</p> <p>Select and use the appropriate measurement device(s) and use mathematical functions necessary to perform required fabrication, maintenance, and operation procedures.</p> <p>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.</p>	
<p>HVAC Vehicle Systems</p>			<p>The student applies the technical knowledge and skills related to heating and air conditioning (A/C)</p>	<p>Inspect, test, service and repair heating and a/c systems:</p> <ul style="list-style-type: none"> • Research applicable vehicle and service information, 	

			<p>in simulated or actual work situations. The student is expected to:</p> <p>(A) identify refrigerant type and the safety and environmental concerns related to handling and storage;</p> <p>(B) inspect engine cooling and heater systems hoses;</p> <p>(C) inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets;</p> <p>(D) inspect A/C condenser for airflow restrictions; and</p> <p>(E) identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.</p>	<p>vehicle service history, service precautions, and technical service bulletins. (P-1)</p> <ul style="list-style-type: none"> • Identify vehicle's A/C components. (P-1) • Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. (P-1) • Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions. (P-2) • Inspect A/C condenser for airflow restrictions; determine necessary action. (P-1) • Inspect engine cooling and heater systems hoses; perform necessary action. (P-1) • Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. (P-1) • Identify the source of A/C system odors. (P-2) 	
Engine Performance			<p>The student applies the technical knowledge and skills related to engine performance in simulated or actual work situations. The student is expected to:</p> <p>(A) inspect and explain the electrical/electronic</p>	<p>Inspect, test, service, and repair engine performance systems;</p> <ul style="list-style-type: none"> • Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. (P-1) 	

			<p>components, sensors and circuits on an on board diagnostics (OBD) controlled engine;</p> <p>(B) perform engine absolute manifold pressure tests such as vacuum or boost;</p> <p>(C) verify engine operating temperature;</p> <p>(D) remove and replace spark plugs and inspect secondary ignition components for wear and damage;</p> <p>(E) describe the importance of operating all OBD II monitors for repair verification;</p> <p>(F) retrieve and record diagnostic trouble codes, OBD II monitor status, and freeze frame data and clear codes when applicable;</p> <p>(G) inspect, service, or replace air filters, filter housings, and intake duct work;</p> <p>(H) replace fuel filter or filters;</p> <p>(I) inspect integrity of the exhaust manifolds, exhaust pipes, mufflers, catalytic converters, resonators,</p>	<ul style="list-style-type: none"> • Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. (P1) • Perform cylinder power balance test; determine necessary action. (P-2) • Perform cylinder cranking and running compression tests; determine necessary action. (P-1) • Perform cylinder leakage test; determine necessary action. (P-1) • Verify engine operating temperature. (P-1) • Remove and replace spark plugs; inspect secondary ignition components for wear and damage. (P1) • Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. (P-1) • Describe the importance of operating all OBDII monitors for repair verification. (P-1) • Replace fuel filter(s). (P-1) • Inspect, service, or replace air filters, filter housings, and intake duct work. (P-1) • Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic 	
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			<p>tail pipes, and heat shields; and</p> <p>(J) inspect, test, and service positive crankcase ventilation (PCV) system and its components such as the filter/breather cap, valve, tubes, orifices, and hoses.</p>	<p>converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action. (P-1)</p> <ul style="list-style-type: none"> • Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed. (P-1) • Check and refill diesel exhaust fluid (DEF). (P-3) • Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. (P-2) 	
<p>Automatic Transmission and Transaxles</p>			<p>The student applies the technical knowledge and skills related to manual and automatic drive train and axles in simulated or actual work situations. The student is expected to:</p> <p>(A) identify the different fluid types used in both an automatic and manual transmission/transaxle;</p> <p>(B) identify the fluid types and capacity required by application using service information;</p> <p>(C) check fluid level in a transmission or a</p>	<p>Inspect and service automatic transmissions and transaxles:</p> <ul style="list-style-type: none"> • Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. (P-1) • Check fluid level in a transmission or a transaxle equipped with a dip-stick. (P-1) • Check fluid level in a transmission or a transaxle not equipped with a dip-stick. (P-1) • Check transmission fluid condition; check for leaks. (P-2) 	

			<p>transaxle equipped with a dip-stick;</p> <p>(D) check fluid level in a transmission or a transaxle not equipped with a dip-stick;</p> <p>(E) check fluid condition and inspect for leaks;</p> <p>(F) drain and replace fluid and filter or filters in an automatic transmission/transaxle;</p> <p>(G) drain and replace fluid in an manual transmission/transaxle; and</p> <p>(H) inspect power train mounts.</p>	<ul style="list-style-type: none"> • Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. (P-2) • Inspect for leakage at external seals, gaskets, and bushings. (P-2) • Inspect power train mounts. (P-2) • Drain and replace fluid and filter(s). (P-1) • Describe the operational characteristics of a continuously variable transmission (CVT). (P-3) • Describe the operational characteristics of a hybrid vehicle drive train. (P-3) 	
<p>Manual Transmission and Transaxles</p>			<p>The student applies the technical knowledge and skills related to manual drive train and axles in simulated or actual work situations. The student is expected to:</p> <p>(A) identify the different fluid types used in manual transmission/transaxle;</p> <p>(B) identify the fluid types and capacity required by application using service information;</p> <p>(C) check fluid level in a transmission or a</p>	<p>Inspect and service manual transmissions and transaxles:</p> <ul style="list-style-type: none"> • Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. (P-1) • Drain and refill manual transmission/transaxle and final drive unit. (P-1) • Check fluid condition; check for leaks. (P-2) • Check and adjust clutch master cylinder fluid level. (P-1) 	

			<p>transaxle equipped with a dip-stick;</p> <p>(D) check fluid level in a transmission or a transaxle not equipped with a dip-stick;</p> <p>(E) check fluid condition and inspect for leaks;</p> <p>(F) drain and replace fluid in an manual transmission/transaxle; and</p> <p>(G) inspect power train mounts.</p>	<ul style="list-style-type: none"> • Check for system leaks. (P-1) • Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. (P-1) • Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals. (P-2) • Inspect, service, and replace shafts, yokes, boots, and universal/CV joints. (P-2) • Clean and inspect differential housing; check for leaks; inspect housing vent. (P-2) • Check and adjust differential housing fluid level. (P-1) • Drain and refill differential housing. (P-1) • Inspect and replace drive axle wheel studs. (P-2) • Inspect front-wheel bearings and locking hubs. (P-3) • Check for leaks at drive assembly seals; check vents; check lube level. (P-2) 	

