



Maintenance and Light Repair IV (MLR IV)

Primary Career Cluster:	Transportation
Course Contact:	CTE.Standards@tn.gov
Course Code(s):	C20H12
Prerequisite(s):	<i>Maintenance and Light Repair III</i> (C20H11)
Credit:	2
Grade Level:	12
Elective Focus - Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Transportation courses.
POS Concentrator:	This course satisfies one out of two required courses that meet the Perkins V concentrator definition, when taken in sequence in the approved program of study.
Programs of Study and Sequence:	This is the fourth course in the <i>Automotive Maintenance and Light Repair</i> program of study.
Aligned Student Organization(s):	SkillsUSA: https://www.skillsusatn.org/
Coordinating Work-Based Learning:	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html .
Promoted Tennessee Student Industry Credentials:	Credentials are aligned with postsecondary and employment opportunities and with the competencies and skills that students acquire through their selected program of study. For a listing of promoted student industry credentials, visit https://www.tn.gov/education/career-and-technical-education/student-industry-certification.html
Teacher Endorsement(s):	506, 508, 770
Required Teacher Certifications/Training:	ASE A-4, ASE A-5, ASE A-6, and ASE A-8, or G1 Industry Certification 2016-17
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-transportation-distribution-logistics.html Best for All Central: https://bestforall.tnedu.gov/

Course at a Glance

CTE courses provide students with an opportunity to develop specific academic, technical, and 21st century skills necessary to be successful in career and in life. In pursuit of ensuring every student in Tennessee achieves this level of success, we begin with rigorous course standards which feed into intentionally designed programs of study.

Students engage in industry relevant content through general education integration and experiences such as career & technical student organizations (CTSO) and work-based learning (WBL). Through these experiences, students are immersed with industry standard content and technology, solve industry-based problems, meaningfully interact with industry professionals and use/produce industry specific, informational texts.

Using a Career and Technical Student Organization (CTSO) in Your Classroom

CTSOs are a great resource to put classroom learning into real-life experiences for your students through classroom, regional, state, and national competitions, and leadership opportunities. Below are CTSO connections for this course, note this is not an exhaustive list.

- Participate in CTSO Fall Leadership Conference to engage with peers by demonstrating logical thought processes and developing industry specific skills that involve teamwork and project management.
- Participate in contests that highlight job skill demonstration. These include Career Pathways Showcase, Job Interview, Maintenance Light Repair, and Automotive Service Technology.

Using a Work-based Learning (WB) in Your Classroom

Sustained and coordinated activities that relate to the course content are the key to successful work-based learning. Possible activities for this course include the following. This is not an exhaustive list.

- **Standard 1** | Include a safety briefing in a visit to a shop.
- **Standard 3** | Have a technician discuss issues related to air-conditioning systems.
- **Standard 4** | Have a technician discuss engine performance systems.
- **Standards 5-6** | Have a technician discuss transmissions.
- **Standard 7** | Have a manager discuss workplace etiquette.

Course Description

The *Maintenance and Light Repair IV (MLR IV)* course prepares students for entry into the automotive workforce or into post secondary training. Students study and service automotive HVAC systems, engine performance systems, automatic and manual transmission/transaxle systems, and practice workplace soft skills. Upon completing all of the *Maintenance and Light Repair* courses, students may enter automotive service industry as an ASE Certified MLR Technician.

Hours earned in the *Maintenance and Light Repair* courses may be used toward meeting National Automotive Technicians Education Foundation (NATEF) standards and Tennessee Department of Education standards. NATEF requires that 95% of the P-1 tasks, 80% of the P-2 tasks, and 50% of the P-3 tasks will be accomplished. These tasks are notated in these standards.

Program of Study Application

MLR IV is the fourth, and final, course in the *Automotive Maintenance and Light Repair* program of study and covers important skills and knowledge on becoming a professional service technician. For more information on the benefits and requirements of implementing these programs in full, please see the program of study description documents found on the Transportation, Distribution, & Logistics website at <https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-transportation-distribution-logistics.html>.

Course Standards

Standard 1.0

Students will perform safety examinations and maintain safety records.

Learning Expectations and Performance Indicators:

- 1.1 Use and inspect personal protective equipment. Demonstrate appropriate related safety procedures.
- 1.2 Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 1.3 Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.
- 1.4 Assume responsibilities under HazCom (Hazard Communication) regulations.
- 1.5 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.
- 1.6 Pass with 100% accuracy a written examination relating to safety issues relating specifically to Maintenance and Light Repair.
- 1.7 Pass with 100% accuracy a performance examination relating to safety issues relating specifically to Maintenance and Light Repair.
- 1.8 Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

Standard 2.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

Learning Expectations and Performance Indicators:

- 2.1 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.
- 2.2 Assess situations, apply problem-solving techniques and decision-making skills within the school, community, and workplace.
- 2.3 Participate as a team member in a learning environment.
- 2.4 Respect the opinions, customs, and individual differences of others.
- 2.5 Build personal career development by identifying career interests, strengths, and opportunities.

Standard 3.0

Students will inspect, test, service and repair heating and a/c systems.

Learning Expectations and Performance Indicators:

- 3.1 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. (P-1)
- 3.2 Identify vehicle's A/C components. (P-1)
- 3.3 Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action. (P-1)
- 3.4 Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions. (P-2)
- 3.5 Inspect A/C condenser for airflow restrictions; determine necessary action. (P-1)
- 3.6 Inspect engine cooling and heater systems hoses; perform necessary action. (P-1)
- 3.7 Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action. (P-1)
- 3.8 Identify the source of A/C system odors. (P-2)

Standard 4.0

Students will inspect, test, service, and repair engine performance systems.

Learning Expectations and Performance Indicators:

- 4.1 Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. (P-1)
- 4.2 Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action. (P-1)
- 4.3 Perform cylinder power balance test; determine necessary action. (P-2)
- 4.4 Perform cylinder cranking and running compression tests; determine necessary action. (P-1)
- 4.5 Perform cylinder leakage test; determine necessary action. (P-1)
- 4.6 Verify engine operating temperature. (P-1)
- 4.7 Remove and replace spark plugs; inspect secondary ignition components for wear and damage. (P-1)
- 4.8 Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable. (P-1)
- 4.9 Describe the importance of operating all OBDII monitors for repair verification. (P-1)
- 4.10 Replace fuel filter(s). (P-1)

- 4.11 Inspect, service, or replace air filters, filter housings, and intake duct work. (P-1)
- 4.12 Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action. (P-1)
- 4.13 Inspect condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed. (P-1)
- 4.14 Check and refill diesel exhaust fluid (DEF). (P-3)
- 4.15 Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. (P-2)

Standard 5.0

Students will properly inspect and service automatic transmissions and transaxles.

Learning Expectations and Performance Indicators:

- 5.1 Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. (P-1)
- 5.2 Check fluid level in a transmission or a transaxle equipped with a dip-stick. (P-1)
- 5.3 Check fluid level in a transmission or a transaxle not equipped with a dip-stick. (P-1)
- 5.4 Check transmission fluid condition; check for leaks. (P-2)
- 5.5 Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch. (P-2)
- 5.6 Inspect for leakage at external seals, gaskets, and bushings. (P-2)
- 5.7 Inspect power train mounts. (P-2)
- 5.8 Drain and replace fluid and filter(s). (P-1)
- 5.9 Describe the operational characteristics of a continuously variable transmission (CVT). (P-3)
- 5.10 Describe the operational characteristics of a hybrid vehicle drive train. (P-3)

Standard 6.0

Students will properly inspect and service manual transmissions and transaxles.

Learning Expectations and Performance Indicators:

- 6.1 Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins. (P-1)
- 6.2 Drain and refill manual transmission/transaxle and final drive unit. (P-1)
- 6.3 Check fluid condition; check for leaks. (P-2)
- 6.4 Check and adjust clutch master cylinder fluid level. (P-1)
- 6.5 Check for system leaks. (P-1)
- 6.6 Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. (P-1)
- 6.7 Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals. (P-2)
- 6.8 Inspect, service, and replace shafts, yokes, boots, and universal/CV joints. (P-2)
- 6.9 Clean and inspect differential housing; check for leaks; inspect housing vent. (P-2)
- 6.10 Check and adjust differential housing fluid level. (P-1)
- 6.11 Drain and refill differential housing. (P-1)
- 6.12 Inspect and replace drive axle wheel studs. (P-2)
- 6.13 Inspect front-wheel bearings and locking hubs. (P-3)
- 6.14 Check for leaks at drive assembly seals; check vents; check lube level. (P-2)

Standard 7.0

Students will properly demonstrate workplace etiquette, communication skills, writing skills, and professional appearance.

Learning Expectations and Performance Indicators:

- 7.1 Identify and exhibit appropriate oral and written communications on a personal and professional level.
- 7.2 Identify the need for leadership and describe leadership qualities, such as honesty and integrity, fairness, responsible behavior, ethical work habits, passion for goals, positive attitude, enthusiasm, and empathy.
- 7.3 Perform mock interviews; prepare resume, job applications, cover letters, and portfolios.
- 7.4 Identify legal issues of employment, including sexual harassment, discrimination, violence, and unemployment.
- 7.5 Analyze ways of handling stress in the workplace.

Teacher Resources

The following resources are available to assist teachers of this course.

- *Development Guidance: Classroom Activities*, Center on Education and Work, Madison, Wisconsin
- 2012 Automobile Task List, National Automotive Technicians Education Foundation (NATEF), www.natef.org
- Introduction to Transportation Service Technology, Service Series, Curriculum and Instructional Material Center (CIMC), Oklahoma Department of Vocational and Technical Education
- Module 1 Introduction to Transportation Technology, Instructional Materials Laboratory (IML), University of Missouri