



# Maintenance and Light Repair IV (MLR IV)

<b>Primary Career Cluster:</b>	Transportation
<b>Course Contact:</b>	<a href="mailto:CTE.Standards@tn.gov">CTE.Standards@tn.gov</a>
<b>Course Code(s):</b>	C20H12
<b>Prerequisite(s):</b>	<i>Maintenance and Light Repair III</i> (C20H11)
<b>Credit:</b>	2
<b>Grade Level:</b>	12
<b>Elective Focus - Graduation Requirements:</b>	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Transportation courses.
<b>POS Concentrator:</b>	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.
<b>Programs of Study and Sequence:</b>	This is the fourth course in the <i>Automotive Maintenance and Light Repair</i> program of study.
<b>Aligned Student Organization(s):</b>	SkillsUSA: <a href="https://www.skillsusatn.org/">https://www.skillsusatn.org/</a>
<b>Coordinating Work-Based Learning:</b>	Teachers are encouraged to use embedded WBL activities such as informational interviewing, job shadowing, and career mentoring. For information, visit <a href="https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html">https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html</a> .
<b>Available Student Industry Certifications:</b>	Students are encouraged to demonstrate mastery of knowledge and skills learned in this course by earning the appropriate, aligned department-promoted industry certifications. Access the promoted list <a href="#">here</a> for more information.
<b>Teacher Endorsement(s):</b>	506, 508, 770
<b>Required Teacher Certifications/Training:</b>	ASE A-4, ASE A-5, ASE A-6, and ASE A-8, or G1 Industry Certification 2016-17
<b>Teacher Resources:</b>	<a href="https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-transportation-distribution-logistics.html">https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-transportation-distribution-logistics.html</a>

## 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](http://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