



Maintenance and Light Repair II (MLR II)

Primary Career Cluster:	Transportation
Course Contact:	CTE.Standards@tn.gov
Course Code(s):	C20H10
Prerequisite(s):	<i>Maintenance and Light Repair I</i> (C20H09)
Credit:	1
Grade Level:	10
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 second 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 diagnosing and repairing electrical systems.
- **Standard 4** | Have a technician discuss batteries.
- **Standard 5** | Have a technician discuss vehicle starting and charging systems.
- **Standard 6** | Visit a shop that allows the students to help repair a lighting system or accessory.

Course Description

The *Maintenance and Light Repair II (MLR II)* course prepares students for entry into *Maintenance and Light Repair III*. Students study automotive general electrical systems, starting and charging systems, batteries, lighting, and electrical accessories. 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 II is the second 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, and 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 properly test, diagnose, repair, and service general automotive electrical 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 Demonstrate knowledge of electrical/electronic series, parallel, and series parallel circuits using principles of electricity (Ohm's Law). (P-1)
- 3.3 Use wiring diagrams to trace electrical/electronic circuits. (P-1)
- 3.4 Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance. (P-1)
- 3.5 Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits. (P-2)
- 3.6 Check operation of electrical circuits with a test light. (P-2)
- 3.7 Check operation of electrical circuits with fused jumper wires. (P-2)
- 3.8 Measure key-off battery drain (parasitic draw). (P-1)
- 3.9 Inspect and test fusible links, circuit breakers, and fuses; determine necessary action. (P-1)
- 3.10 Perform solder repair of electrical wiring. (P-1)
- 3.11 Replace electrical connectors and terminal ends. (P-1)

Standard 4.0

Students will service inspect, test, and service vehicle batteries.

Learning Expectations and Performance Indicators:

- 4.1 Perform battery state-of-charge test; determine necessary action. (P-1)
- 4.2 Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action. (P-1)
- 4.3 Maintain or restore electronic memory functions. (P-1)
- 4.4 Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs. (P-1)
- 4.5 Perform slow/fast battery charge according to manufacturer's recommendations. (P-1)
- 4.6 Jump-start vehicle using jumper cables and a booster battery or auxiliary power supply. (P-1)

- 4.7 Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions. (P-3)
- 4.8 Identify electronic modules, security systems, radios, and other accessories that require reinitialization or code entry after reconnecting vehicle battery. (P-1)
- 4.9 Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures. (P-3)

Standard 5.0

Students will inspect, test, service, and repair vehicle starting and charging systems.

Learning Expectations and Performance Indicators:

- 5.1 Perform starter current draw test; determine necessary action. (P-1)
- 5.2 Perform starter circuit voltage drop tests; determine necessary action. (P-1)
- 5.3 Inspect and test starter relays and solenoids; determine necessary action. (P-2)
- 5.4 Remove and install starter in a vehicle. (P-1)
- 5.5 Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. (P-2)
- 5.6 Perform charging system output test; determine necessary action. (P-1)
- 5.7 Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. (P-1)
- 5.8 Remove, inspect, and re-install generator (alternator). (P-2)
- 5.9 Perform charging circuit voltage drop tests; determine necessary action. (P-1)
- 5.10 Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed. (P-1)
- 5.11 Aim headlights. (P-2)
- 5.12 Identify system voltage and safety precautions associated with high-intensity discharge headlights. (P-2)

Standard 6.0

Students will inspect, test, service, and repair vehicle lighting and accessory systems.

Learning Expectations and Performance Indicators:

- 6.1 Disable and enable airbag system for vehicle service; verify indicator lamp operation. (P-1)
- 6.2 Remove and reinstall door panel. (P-1)
- 6.3 Describe the operation of keyless entry/remote-start systems. (P-3)
- 6.4 Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. (P-1)
- 6.5 Verify windshield wiper and washer operation; replace wiper blades. (P-1)

Teacher Resources

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

- *Development Guidance: Classroom Activities*, Center on Education and Work, Madison, Wisconsin
- *A0 Fundamentals of Transportation Service Technology Course*, AYES Curriculum: A Tenth Grade Course, AYES Corporation, www.ayes.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
- *Today's Technician Basic Transportation Service & Systems*, Webster & Owens, Delmar/ITP
- 2008 Automobile Task List, National Automotive Technicians Education Foundation (NATEF), www.natef.org
- General Motors Diagnostic Plan
- Ford Motor Company Diagnostic Plan
- Harley Davidson Institute