

**AUTOMOTIVE: MAINTENANCE AND LIGHT REPAIR I, II, III, IV
CURRICULUM STANDARDS**

AUTOMOTIVE: MAINTENANCE AND LIGHT REPAIR I

COURSE DESCRIPTION

The Maintenance and Light Repair I course prepares students for entry into Maintenance and Light Repair II. Students explore career opportunities and requirements of a professional service technician. Content emphasizes beginning transportation service skills and workplace success skills. Students study safety, tools, equipment, shop operations, basic engine fundamentals, and basic technician skills. Upon completing all of the Maintenance and Light Repair courses, students may enter automotive service industry as an ASE Certified MLR Technician.

It is strongly recommended that administration and guidance follow the scope and sequence and course recommendations as listed.

Recommended Prerequisite: None

Recommended Credits: 1

Recommended Grade Level: 9th - 10th

Number of Competencies in Course: 57

Note: Hours earned in the *MAINTENANCE AND LIGHT REPAIR I* course may be used toward meeting NATEF standards and Tennessee Department of Ed 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.

MAINTENANCE AND LIGHT REPAIR I

STANDARDS

- 1.0** Students will perform safety examinations and maintain safety records.
- 2.0** Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 3.0** Students will demonstrate shop and personal safety.
- 4.0** Students will identify and properly use, maintain, and store automotive service hand tools, power tools, and shop equipment.
- 5.0** Students will prepare a vehicle for service.
- 6.0** Students will perform basic vehicle engine service and maintenance.
- 7.0** Students will properly inspect and service tires and wheels.

MAINTENANCE AND LIGHT REPAIR I

STANDARD 1.0

Students will perform safety examinations and maintain safety records.

LEARNING EXPECTATIONS

The student will:

- 1.1** Demonstrate a positive attitude regarding safety practices and issues.
- 1.2** Use and inspect personal protective equipment.
- 1.3** Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 1.4** Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.
- 1.5** Assume responsibilities under HazCom (Hazard Communication) regulations.
- 1.6** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards.
- 1.7** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures.
- 1.8** Demonstrate appropriate related safety procedures.
- 1.9** Pass with 100 % accuracy a written examination relating to safety issues relating specifically to Maintenance and Light Repair.
- 1.10** Pass with 100% accuracy a performance examination relating to safety issues relating specifically to Maintenance and Light Repair.
- 1.11** Maintain a portfolio record of written safety examinations and equipment examination for which the student has passed an operational checkout by the instructor.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 1.1A** Is attentive during safety discussions.
- 1.1B** Actively seeks information about safe procedures.
- 1.1C** Responds positively to instruction, advice, and correction regarding safety issues.
- 1.1D** Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
- 1.1E** Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, alcohol, etc.
- 1.2** Selects, inspects, and uses the correct personal protective equipment for the assigned task.
- 1.3A** Inspects power tools for intact guards, shields, insulation, and other protective devices.
- 1.3B** Inspects extension cords for the presence of a functional ground connection, prior to use.
- 1.3C** Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.
- 1.3D** Properly places and secures ladders and scaffolding prior to use.
- 1.4A** Is observant of personnel and activities in the vicinity of the work area.

- 1.4B** Warns nearby personnel, prior to starting potentially hazardous actions.
- 1.5A** When asked to use a new hazardous material, retrieves MSDSs (material safety data sheets), and identifies the health hazards associated with the new material.
- 1.5B** Reports hazards found on the job site to the supervisor.
- 1.6A** Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.
- 1.6B** Provides and activates adequate ventilation equipment as required by the task.
- 1.7A** Reports all injuries to self to the immediate supervisor.
- 1.7B** Reports observed unguarded hazards to their immediate supervisor.
- 1.8** Complies with personal assignments regarding emergency assignments.
- 1.9** Passes with 100% accuracy a written examination relating specifically to Maintenance and Light Repair.
- 1.10** Passes with 100% accuracy a performance examination relating specifically to Maintenance and Light Repair.
- 1.11** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

MAINTENANCE AND LIGHT REPAIR I

STANDARD 2.0

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

LEARNING EXPECTATIONS

The student will:

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

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1A** Demonstrates character and leadership using creative and critical-thinking skills.
- 2.1B** Uses creative thought process by “thinking outside the box.”
- 2.2A** Relates the creed, purposes, motto, and emblem of SkillsUSA, directly related to personal and professional development.
- 2.2B** Plans and conducts meetings and other business according to accepted rules of parliamentary procedure.
- 2.3A** Makes decisions and assumes responsibilities.
- 2.3B** Analyzes a situation and uses the Professional Development Program or SkillsUSA materials directly related to the student’s program of study to resolve it.
- 2.3C** Understands the importance of learning new information for both current and future problem solving and decision making.
- 2.4A** Organizes committees and participates in functions.
- 2.4B** Cooperates with peers to select and organize a community service project.
- 2.5A** Researches different customs and individual differences of others.
- 2.5B** Interacts respectfully with individuals of different cultures, genders, and backgrounds.
- 2.5C** Resolves conflicts and differences to maintain a smooth workflow and classroom environment.
- 2.6A** Creates personal career development by identifying career interests, strengths, and opportunities.
- 2.6B** Identifies opportunities for career development and certification requirements.
- 2.6C** Plans personal educational paths based on available courses and current career goals.
- 2.6D** Creates a resumé that reflects student’s skills, abilities, and interests.

MAINTENANCE AND LIGHT REPAIR I

STANDARD 3.0

Students will demonstrate shop and personal safety.

LEARNING EXPECTATIONS

The student will:

- 3.1** Utilize proper ventilation procedures for working within the lab/shop area.
- 3.2** Identify marked safety areas.
- 3.3** Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the procedures for using fire extinguishers and other fire safety equipment.
- 3.4** Identify the location and use of eye wash stations.
- 3.5** Identify the location of the posted evacuation routes.
- 3.6** Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
- 3.7** Identify and wear appropriate clothing for lab/shop activities.
- 3.8** Secure hair and jewelry for lab/shop activities.
- 3.9** Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
- 3.10** Locate and demonstrate knowledge of material safety data sheets (MSDS).

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 3.1** Demonstrates the proper use of ventilation and exhaust fans in the shop/lab area.
- 3.2** Identifies the yellow and black lines marking shop equipment and safe walking paths.
- 3.3** Identifies the location of all shop fire extinguishers and emergency cut-off switches.
- 3.4** Identifies emergency eye wash station and demonstrates its use.
- 3.5** Identifies posted emergency routes for evacuation.
- 3.6** Complies with mandatory use of safety glasses and other PPE (personal protective equipment) whenever students are working in the shop/lab.
- 3.7** Wears appropriate clothing for automotive service.
- 3.8** Secures long hair and jewelry.
- 3.9** Demonstrates awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
- 3.10** Locates and demonstrates knowledge of material safety data sheets (MSDS).

MAINTENANCE AND LIGHT REPAIR I

STANDARD 4.0

Students will identify and properly use, maintain, and store automotive service hand tools, power tools, and shop equipment.

LEARNING EXPECTATIONS

The student will:

- 4.1** Identify tools and their usage in automotive applications.
- 4.2** Identify standard and metric designation.
- 4.3** Demonstrate safe handling and use of appropriate tools.
- 4.4** Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
- 4.5** Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 4.1** Identifies specialty tools used in servicing automobiles, light trucks, and vans.
- 4.2** Identifies standard and metric open end and closed end wrenches, various ratchets (air and manual), hammers, and specialty tools (torque sticks, oil filter wrenches) used in servicing automobiles, light trucks, and vans.
- 4.3** Demonstrates safe use, handling, and storage of shop tools and equipment.
- 4.4** Maintains and cleans tools and equipment.
- 4.5** Demonstrates proper use of precision measuring tools; especially dial and analog calipers on brake discs and drums.

MAINTENANCE AND LIGHT REPAIR I

STANDARD 5.0

Students will prepare a vehicle for service.

LEARNING EXPECTATIONS

Student will:

- 5.1** Identify information needed and the service requested on a repair order.
- 5.2** Identify purpose and demonstrate proper use of fender covers, mats.
- 5.3** Demonstrate use of the three C's (concern, cause, and correction).
- 5.4** Review vehicle service history.
- 5.5** Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 5.1** Identifies and interprets needed information and requests made on a repair order.
- 5.2** Identifies purpose and demonstrates proper use of fender covers, mats.
- 5.3** Identifies the customer's concern, the cause of the discrepancy, and correction of the discrepancy.
- 5.4** Reviews vehicle history and TSBs using online vehicle information system such as Mitchell On Demand, Shopkey, and Alldata.
- 5.5** Completes a work order to include customer information, vehicle identifying information, customer concern, related service history cause, and correction.

MAINTENANCE AND LIGHT REPAIR I

STANDARD 6.0

Students will perform basic vehicle engine service and maintenance.

LEARNING EXPECTATIONS

Student will:

- 6.1** Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. (P-1)
- 6.2** Verify operation of the instrument panel engine warning indicators. (P-1)
- 6.3** Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action. (P-1)
- 6.4** Install engine covers using gaskets, seals, and sealers as required. (P-1)
- 6.5** Remove and replace timing belt; verify correct camshaft timing. (P-1)
- 6.6** Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert. (P-1)
- 6.7** Identify hybrid vehicle internal combustion engine service precautions. (P-3)
- 6.8** Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, and heater core; determine necessary action. (P-1)
- 6.9** Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment. (P-1)
- 6.10** Remove, inspect, and replace thermostat and gasket/seal. (P-1)
- 6.11** Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required. (P-1)
- 6.12** Perform engine oil and filter change. (P-1)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 6.1** Uses OEM service manuals, CDs, or internet based vehicle information system to locate repair information, TSBs, vehicle specifications, maintenance schedules, and repair cost estimates and labor times.
- 6.2** Verifies operation of the instrument panel engine warning indicators and MIL check.
- 6.3** Inspects engine and transaxle assembly for fuel, oil, coolant, and other leaks determines necessary action.
- 6.4** Installs engine covers (valve covers, timing chain covers, oil pans, transmission pans) using gaskets, seals, and sealers as required.
- 6.5** Removes and replaces timing belt; checks water pump, tensioners, and idlers where applicable.
- 6.6** Performs common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repairing internal threads with thread insert (helicoil).
- 6.7** Identifies hybrid vehicle internal combustion engine service precautions.
- 6.8** Performs cooling system pressure and dye tests to identify leaks; checks coolant condition and level;inspects and tests radiator, pressure cap, coolant recovery tank, and heater core; determines necessary action.
- 6.9** Inspects, replaces, and adjusts drive belts, tensioners, and pulleys; checks pulley and belt alignment.

- 6.10** Removes, inspects, and replaces thermostat and gasket/seal.
- 6.11** Inspects and tests coolant; drains and recovers coolant; flush and refills cooling system with recommended coolant; bleeds air as required.
- 6.12A** Performs engine oil and filter changes on various automobile models and engine sizes.
- 6.12B** Identifies proper manufacturer recommended oil and filters.

MAINTENANCE AND LIGHT REPAIR I

STANDARD 7.0

Students will properly inspect and service tires and wheels.

LEARNING EXPECTATIONS

Student will:

- 7.1** Inspect tire condition; identify tire wear patterns; check for correct size and application (load and speed ratings) and adjust air pressure; determine necessary action.
- 7.2** Rotate tires according to manufacturer's recommendations.
- 7.3** Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly (static and dynamic).
- 7.4** Dismount, inspect, and remount tire on wheel equipped with tire pressure monitoring system sensor.
- 7.5** Inspect tire and wheel assembly for air loss; perform necessary action.
- 7.6** Repair tire using internal patch.
- 7.7** Identify and test tire pressure monitoring systems (indirect and direct) for operation; verify operation of instrument panel lamps.
- 7.8** Demonstrate knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 7.1** Inspects tire condition; identifies tire wear patterns; checks for correct size and application (load and speed ratings) and adjusts air pressure; determines necessary action.
- 7.2** Rotates tires (fwd and rwd) according to manufacturer's recommendations.
- 7.3** Using a tire machine, dismounts, inspects, and remounts tire on wheel; balances wheel and tire assembly (static and dynamic) using a balancing machine.
- 7.4** Dismounts, inspects, and remounts tire on wheel equipped with tire pressure monitoring system sensor.
- 7.5** Inspects tire and wheel assembly for air loss; performs necessary action.
- 7.6** Repairs tire using internal patch.
- 7.7** Identifies and tests tire pressure monitoring systems (indirect and direct) for operation using TPMS (tire pressure monitoring system) scan tool; verifies operation of instrument panel lamps.
- 7.8** Demonstrates knowledge of steps required to remove and replace sensors in a tire pressure monitoring system.

SAMPLING OF AVAILABLE RESOURCES

- *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

AUTOMOTIVE: MAINTENANCE AND LIGHT REPAIR II

COURSE DESCRIPTION

The Maintenance and Light Repair 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.

It is strongly recommended that administration and guidance follow the scope and sequence and course recommendations as listed.

Recommended Prerequisite: Maintenance and Light Repair I/Transportation Core

Recommended Credits: 1

Recommended Grade Level: 10th

Number of Competencies in Course: 54

Note: Hours earned in the Maintenance and Light Repair II course may be used toward meeting 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.

MAINTENANCE AND LIGHT REPAIR II

STANDARDS

- 1.0** Students will perform safety examinations and maintain safety records.
- 2.0** Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 3.0** Students will properly test, diagnose, repair, and service general automotive electrical systems.
- 4.0** Students will service inspect, test, and service vehicle batteries.
- 5.0** Students will inspect, test, service, and repair vehicle starting and charging systems.
- 6.0** Students will inspect, test, service, and repair vehicle lighting and accessory systems.

MAINTENANCE AND LIGHT REPAIR II

STANDARD 1.0

Students will perform safety examinations and maintain safety records.

LEARNING EXPECTATIONS

The student will:

- 1.1** Demonstrate a positive attitude regarding safety practices and issues.
- 1.2** Use and inspect personal protective equipment.
- 1.3** Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 1.4** Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.
- 1.5** Assume responsibilities under HazCom (Hazard Communication) regulations.
- 1.6** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards.
- 1.7** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures.
- 1.8** Demonstrate appropriate related safety procedures.
- 1.9** Pass with 100 % accuracy a written examination relating to safety issues relating specifically to Maintenance and Light Repair.
- 1.10** Pass with 100% accuracy a performance examination relating to safety issues relating specifically to Maintenance and Light Repair.
- 1.11** Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 1.1A** Is attentive during safety discussions.
- 1.1B** Actively seeks information about safe procedures.
- 1.1C** Responds positively to instruction, advice, and correction regarding safety issues.
- 1.1D** Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
- 1.1E** Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, alcohol, etc.
- 1.2** Selects, inspects, and uses the correct personal protective equipment for the assigned task.
- 1.3A** Inspects power tools for intact guards, shields, insulation, and other protective devices.
- 1.3B** Inspects extension cords for the presence of a functional ground connection, prior to use.
- 1.3C** Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.
- 1.3D** Properly places and secures ladders and scaffolding prior to use.
- 1.4A** Is observant of personnel and activities in the vicinity of the work area.

- 1.4B** Warns nearby personnel, prior to starting potentially hazardous actions.
- 1.5A** When asked to use a new hazardous material, retrieves MSDSs (material safety data sheets), and identifies the health hazards associated with the new material.
- 1.5B** Reports hazards found on the job site to the supervisor.
- 1.6A** Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.
- 1.6B** Provides and activates adequate ventilation equipment as required by the task.
- 1.7A** Reports all injuries to self to the immediate supervisor.
- 1.7B** Reports observed unguarded hazards to their immediate supervisor.
- 1.8A** Complies with personal assignments regarding emergency assignments.
- 1.9A** Passes with 100% accuracy a written examination relating to safety issues relating specifically to Maintenance and Light Repair.
- 1.10A** Passes with 100% accuracy a performance examination relating to safety issues relating specifically to Maintenance and Light Repair.
- 1.11A** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

MAINTENANCE AND LIGHT REPAIR II

STANDARD 2.0

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

LEARNING EXPECTATIONS

The student will:

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

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1A** Demonstrates character and leadership using creative and critical-thinking skills.
- 2.1B** Uses creative thought process by “thinking outside the box.”
- 2.2A** Relates the creed, purposes, motto, and emblem of SkillsUSA, directly related to personal and professional development.
- 2.2B** Plans and conducts meetings and other business according to accepted rules of parliamentary procedure.
- 2.3A** Makes decisions and assumes responsibilities.
- 2.3B** Analyzes a situation and uses the SkillsUSA Professional Development Program to resolve it.
- 2.3C** Understands the importance of learning new information for both current and future problem solving and decision making.
- 2.4A** Organizes committees and participates in functions.
- 2.4B** Cooperates with peers to select and organize a community service project.
- 2.5A** Researches different customs and individual differences of others.
- 2.5B** Interacts respectfully with individuals of different cultures, genders, and backgrounds.
- 2.5C** Resolves conflicts and differences to maintain a smooth workflow and classroom environment.
- 2.6A** Creates personal career development by identifying career interests, strengths, and opportunities.
- 2.6B** Identifies opportunities for career development and certification requirements.
- 2.6C** Plans personal educational paths based on available courses and current career goals.
- 2.6D** Creates a resumé that reflects student’s skills, abilities, and interest.

MAINTENANCE AND LIGHT REPAIR II

STANDARD 3.0

Students will properly test, diagnose, repair, and service general automotive electrical systems.

LEARNING EXPECTATIONS

The student will:

- 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)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 3.1** Researches applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 3.2** Demonstrates knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law) by completing formulas and solving resistance, voltage, and amperage problems.
- 3.3** Uses wiring diagrams/schematics to trace electrical/electronic circuits.
- 3.4** Demonstrates proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
- 3.5** Demonstrates knowledge of the causes and effects from shorts, grounds, opens, and resistance in electrical/electronic circuits.
- 3.6** Correctly uses a test light to check operation of an electrical circuit.
- 3.7** Checks operation of electrical circuits using fused jumper wires.
- 3.8** Uses DMM to measure key-off battery drain (parasitic draw).
- 3.9** Inspects and tests fusible links, circuit breakers, and fuses with DMM; determines necessary action.
- 3.10** Performs a solder repair of electrical wiring using resin solder and various soldering irons.
- 3.11** Correctly replaces and repairs electrical connectors and terminal ends.

MAINTENANCE AND LIGHT REPAIR II

STANDARD 4.0

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

LEARNING EXPECTATIONS

The student will:

- 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 an 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)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 4.1** Performs battery state-of-charge test using DMM and various load testers; determines necessary action.
- 4.2** Confirms proper battery capacity for vehicle application; performs battery capacity test; determines necessary action.
- 4.3** Maintains or restores electronic memory functions.
- 4.4** Inspects and cleans battery posts; fill battery cells (where applicable); checks battery cables, connectors, clamps, and hold-downs.
- 4.5** Performs slow/fast battery charge according to manufacturer's recommendations.
- 4.6** Properly jump-starts vehicle using jumper cables and a booster battery (donor vehicle) or an auxiliary power supply.
- 4.7** Identifies high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
- 4.8** Identifies electronic modules, security systems, radios, and other accessories that require reinitialization or code entry (radio) after reconnecting vehicle battery.
- 4.9** Identifies hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.

MAINTENANCE AND LIGHT REPAIR II

STANDARD 5.0

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

LEARNING EXPECTATIONS

Student will:

- 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)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 5.1** Performs starter current draw test using DMM; determines necessary action.
- 5.2** Performs starter circuit voltage drop tests using DMM; determines necessary action.
- 5.3** Inspects and tests starter relays and solenoids using DMM; determines necessary action.
- 5.4** Removes and installs starter in a vehicle with 4 and 6 cylinder engines.
- 5.5** Inspects and tests switches, connectors, and wires of starter control circuits using DMM; determines necessary action.
- 5.6** Performs charging system output test using proper test equipment; determine necessary action.
- 5.7** Inspects, adjusts, or replaces generator (alternator) drive belts; check pulleys and tensioners for wear; checks pulley and belt alignment.
- 5.8** Removes, inspects, and re-installs generator (alternator).
- 5.9** Performs charging circuit cables voltage drop tests using DMM; determines necessary action.
- 5.10** Inspects interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replaces as needed.
- 5.11** Aims headlights using wall charts or headlight tester.
- 5.12** Identifies system voltage and safety precautions associated with high-intensity discharge headlights.

MAINTENANCE AND LIGHT REPAIR II

STANDARD 6.0

Students will properly inspect and service electrical accessory systems.

LEARNING EXPECTATIONS

Student will:

- 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

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 6.1** Disables and enables airbag system for vehicle service; verifies indicator lamp operation.
- 6.2** Removes and reinstalls door panels on various makes and models of automobiles .
- 6.3** Describes and demonstrates the operation of keyless entry/remote-start systems.
- 6.4** Verifies the operation of instrument panel gauges and warning/indicator lights; resets maintenance indicators.
- 6.5** Verifies windshield wiper and washer operation; replaces wiper blades.

SAMPLING OF AVAILABLE RESOURCES

- *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

AUTOMOTIVE: MAINTENANCE AND LIGHT REPAIR III

COURSE DESCRIPTION

The *Maintenance and Light Repair III* course prepares students for entry into *Maintenance and Light Repair IV*. Students study suspension and steering systems and brake systems. Students will service suspension and steering systems and brake systems. Upon completing all of the *Maintenance and Light Repair* courses, students may enter automotive service industry as an ASE Certified MLR Technician.

It is strongly recommended that administration and guidance follow the scope and sequence and course recommendations as listed.

Recommended Prerequisite: Maintenance and Light Repair I and II

Recommended Credits: 2

Recommended Grade Level: 11th

Number of Competencies in Course: 79

Note: Hours earned in the *Maintenance and Light Repair III* course may be used toward meeting 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.

MAINTENANCE AND LIGHT REPAIR III

STANDARDS

- 1.0** Students will perform safety examinations and maintain safety records.
- 2.0** Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 3.0** Students will inspect, service, and repair suspension and steering systems.
- 4.0** Students will inspect, service, and repair vehicle brake systems
- 5.0** Students will inspect, service, and repair related vehicle brake systems

MAINTENANCE AND LIGHT REPAIR III

STANDARD 1.0

Students will perform safety examinations and maintain safety records.

LEARNING EXPECTATIONS

The student will:

- 1.1** Demonstrate a positive attitude regarding safety practices and issues.
- 1.2** Use and inspect personal protective equipment.
- 1.3** Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 1.4** Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.
- 1.5** Assume responsibilities under HazCom (Hazard Communication) regulations.
- 1.6** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards.
- 1.7** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures.
- 1.8** Demonstrate appropriate related safety procedures.
- 1.9** Pass with 100 % accuracy a written examination relating to safety issues
- 1.10** Pass with 100% accuracy a performance examination relating to safety.
- 1.11** Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 1.1A** Is attentive during safety discussions.
- 1.1B** Actively seeks information about safe procedures.
- 1.1C** Responds positively to instruction, advice, and correction regarding safety issues.
- 1.1D** Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
- 1.1E** Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, alcohol, etc.
- 1.2** Selects, inspects, and uses the correct personal protective equipment for the assigned task.
- 1.3A** Inspects power tools for intact guards, shields, insulation, and other protective devices.
- 1.3B** Inspects extension cords for the presence of a functional ground connection, prior to use.
- 1.3C** Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.
- 1.3D** Properly places and secures ladders and scaffolding prior to use.

- 1.4A** Is observant of personnel and activities in the vicinity of the work area.
- 1.4B** Warns nearby personnel, prior to starting potentially hazardous actions.
- 1.5A** When asked to use a new hazardous material, retrieves MSDSs (material safety data sheets), and identifies the health hazards associated with the new material.
- 1.5B** Reports hazards found on the job site to the supervisor.
- 1.6A** Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.
- 1.6B** Provides and activates adequate ventilation equipment as required by the task.
- 1.7A** Reports all injuries to self to the immediate supervisor.
- 1.7B** Reports observed unguarded hazards to their immediate supervisor.
- 1.8A** Complies with personal assignments regarding emergency assignments.
- 1.9A** Passes with 100% accuracy a written examination relating specifically to content area.
- 1.10A** Passes with 100% accuracy a performance examination relating specifically to welding tools, equipment and supplies.
- 1.11A** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

MAINTENANCE AND LIGHT REPAIR III

STANDARD 2.0

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

LEARNING EXPECTATIONS

The student will:

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

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1A** Demonstrates character and leadership using creative and critical-thinking skills.
- 2.1B** Uses creative thought process by “thinking outside the box.”
- 2.2A** Relates the creed, purposes, motto, and emblem of SkillsUSA, directly related to personal and professional development.
- 2.2B** Plans and conducts meetings and other business according to accepted rules of parliamentary procedure.
- 2.3A** Makes decisions and assumes responsibilities.
- 2.3B** Analyzes a situation and uses the SkillsUSA Professional Development Program to resolve it.
- 2.3C** Understands the importance of learning new information for both current and future problem solving and decision making.
- 2.4A** Organizes committees and participates in functions.
- 2.4B** Cooperates with peers to select and organize a community service project.
- 2.5A** Researches different customs and individual differences of others.
- 2.5B** Interacts respectfully with individuals of different cultures, genders, and backgrounds.
- 2.5C** Resolves conflicts and differences to maintain a smooth workflow and classroom environment.
- 2.6A** Creates personal career development by identifying career interests, strengths, and opportunities.
- 2.6B** Identifies opportunities for career development and certification requirements.
- 2.6C** Plans personal educational paths based on available courses and current career goals.
- 2.6D** Creates a resumé that reflects student’s skills, abilities, and interest.

MAINTENANCE AND LIGHT REPAIR III

STANDARD 3.0

Students will inspect, service, and repair suspension and steering systems.

LEARNING EXPECTATIONS

The student will:

- 3.1** Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. (P-1)
- 3.2** Disable and enable supplemental restraint system (SRS). (P-1)
- 3.3** Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots. (P-1)
- 3.4** Determine proper power steering fluid type; inspect fluid level and condition. (P-1)
- 3.5** Flush, fill, and bleed power steering system. (P-2)
- 3.6** Inspect for power steering fluid leakage; determine necessary action. (P-1)
- 3.7** Remove, inspect, replace, and adjust power steering pump drive belt. (P-1)
- 3.8** Inspect and replace power steering hoses and fittings. (P-2)
- 3.9** Replace power steering pump filter(s). (P-2)
- 3.10** Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper. (P-1)
- 3.11** Inspect tie rod ends (sockets), tie rod sleeves, and clamps. (P-1)
- 3.12** Inspect upper and lower control arms, bushings, and shafts. (P-1)
- 3.13** Inspect and replace rebound and jounce bumpers. (P-1)
- 3.14** Inspect track bar, strut rods/radius arms, and related mounts and bushings. (P-1)
- 3.15** Inspect upper and lower ball joints (with or without wear indicators). (P-1)
- 3.16** Inspect suspension system coil springs and spring insulators (silencers). (P-1)
- 3.17** Inspect suspension system torsion bars and mounts. (P-1)
- 3.18** Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links. (P-1)
- 3.19** Inspect strut cartridge or assembly. (P-1)
- 3.20** Inspect front strut bearing and mount. (P-1)
- 3.21** Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms. (P-1)
- 3.22** Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts. (P-1)
- 3.23** Inspect, remove, and replace shock absorbers; inspect mounts and bushings. (P-1)
- 3.24** Inspect electric power-assisted steering. (P-3)
- 3.25** Identify hybrid vehicle power steering system electrical circuits and safety precautions. (P-2)
- 3.26** Describe the function of the power steering pressure switch. (P-3)
- 3.27** Perform pre-alignment inspection and measure vehicle ride height; determine necessary action. (P-1)

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 3.1** Researches applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins using web based vehicle information sites.
- 3.2** Disables and enables supplemental restraint system (SRS) using proper scan tools.
- 3.3** Inspects rack and pinion steering gear inner tie rod ends (sockets) and bellow boots.
- 3.4** Determines proper power steering fluid type; inspect fluid level and condition.
- 3.5** Flushes, fills, and bleeds power steering system.
- 3.6** Inspects for power steering fluid leakage; determines necessary action.
- 3.7** Removes, inspects, replaces, and adjusts power steering pump drive belt.
- 3.8** Inspects and replaces power steering hoses and fittings.
- 3.9** Replaces power steering pump filter(s).
- 3.10** Inspects pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.
- 3.11** Inspects tie rod ends (sockets), tie rod sleeves, and clamps.
- 3.12** Inspects upper and lower control arms, bushings, and shafts.
- 3.13.** Inspects and replaces rebound and jounce bumpers.
- 3.14** Inspects track bar, strut rods/radius arms, and related mounts and bushings.
- 3.15** Inspects upper and lower ball joints (with or without wear indicators).
- 3.16** Inspects suspension system coil springs and spring insulators (silencers).
- 3.17** Inspects suspension system torsion bars and mounts.
- 3.18** Inspects and replace front stabilizer bar (sway bar) bushings, brackets, and links.
- 3.19** Inspects strut cartridge or assembly.
- 3.20** Inspects front strut bearing and mount.
- 3.21** Inspects rear suspension system lateral links/arms (track bars), control (trailing) arms.
- 3.22** Inspects rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.
- 3.23** Inspects, removes, and replaces shock absorbers; inspect mounts and bushings.
- 3.24** Inspects electric power-assisted steering.
- 3.25** Identifies hybrid vehicle power steering system electrical circuits and safety precautions.
- 3.26** Describes the function of the power steering pressure switch.
- 3.27** Performs pre-alignment inspection and measures vehicle ride height; determines necessary action.

MAINTENANCE AND LIGHT REPAIR III

STANDARD 4.0

Students will service vehicle brake systems.

LEARNING EXPECTATIONS

The student will:

- 4.1** Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins. (P-1)
- 4.2** Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS). (P-1)
- 4.3** Measure brake pedal height, travel, and free play (as applicable); determine necessary action. (P-1)
- 4.4** Check master cylinder for external leaks and proper operation. (P-1)
- 4.5** Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action. (P-1)
- 4.6** Select, handle, store, and fill brake fluids to proper level. (P-1)
- 4.7** Identify components of brake warning light system. (P-3)
- 4.8** Bleed and/or flush brake system. (P-1)
- 4.9** Test brake fluid for contamination. (P-1)
- 4.10** Remove, clean, inspect, and measure brake drum diameter; determine necessary action. (P-1)
- 4.11** Refinish brake drum and measure final drum diameter; compare with specifications. (P-1)
- 4.12** Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. (P-1)
- 4.1** Inspect wheel cylinders for leaks and proper operation; remove and replace as need (P-2)
- 4.14** Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments. (P-2)
- 4.15** Install wheel and torque lug nuts. (P-1)
- 4.16** Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action. (P-1)
- 4.17** Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action. (P-1)
- 4.18** Remove, inspect, and replace pads and retaining hardware; determine necessary action. (P-1)
- 4.19** Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks. (P-1)
- 4.20** Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determine necessary action. (P-1)
- 4.21** Remove and reinstall rotor. (P-1)
- 4.22** Refinish rotor on vehicle; measure final rotor thickness and compare with specification (P-1)
- 4.23** Refinish rotor off vehicle; measure final rotor thickness and compare with specifications. (P-1)

- 4.24 Retract and re-adjust caliper piston on an integral parking brake system. (P-3)
- 4.25 Check brake pad wear indicator; determine necessary action. (P-2)
- 4.26 Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. (P-1)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 4.1 Researches applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins using vehicle information systems.
- 4.2 Describes procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).
- 4.3 Measures brake pedal height, travel, and free play (as applicable); determines necessary action.
- 4.4 Checks master cylinder for external leaks and proper operation.
- 4.5 Inspects brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determines necessary action.
- 4.6 Selects, handles, stores, and fills brake fluids to proper level.
- 4.7 Identifies components of brake warning light system.
- 4.8 Bleeds and/or flushes brake system.
- 4.9 Tests brake fluid for contamination.
- 4.10 Removes, cleans, inspects, and measures brake drum diameter; determines necessary action.
- 4.11 Refinishes brake drum and measures final drum diameter; compares with specifications.
- 4.12 Removes, cleans, and inspects brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricates and reassembles.
- 4.13 Inspects wheel cylinders for leaks and proper operation; removes and replaces as needed.
- 4.14 Pre-adjusts brake shoes and parking brake; installs brake drums or drum/hub assemblies and wheel bearings; makes final checks and adjustments.
- 4.15 Installs wheel and torques lug nuts.
- 4.16 Removes and cleans caliper assembly; inspects for leaks and damage/wear to caliper housing; determines necessary action.
- 4.17 Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.
- 4.18 Removes, inspects, and replaces pads and retaining hardware; determines necessary action.
- 4.19 Lubricates and reinstalls caliper, pads, and related hardware; seat pads and inspects for leaks.
- 4.20 Cleans and inspects rotor, measure rotor thickness, thickness variation, and lateral runout; determines necessary action.
- 4.21 Removes and reinstalls rotor.
- 4.22 Refinishes rotor on vehicle; measures final rotor thickness and compares with specifications.

- 4.23** Refinishes rotor off vehicle; measures final rotor thickness and compares with specifications.
- 4.24** Retracts and re-adjusts caliper piston on an integral parking brake system.
- 4.25** Checks brake pad wear indicator; determines necessary action.
- 4.26** Describes importance of operating vehicle to burnish/break-in replacement brake pads.

MAINTENANCE AND LIGHT REPAIR III

STANDARD 5.0

Students will inspect, service, and repair related vehicle brake systems

LEARNING EXPECTATIONS

Student will:

- 5.1** Check brake pedal travel with, and without, engine running to verify proper power booster operation. (P-2)
- 5.2** Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. (P-1)
- 5.3** Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. (P-1)
- 5.4** Check parking brake cables and components for wear, binding, and corrosion; clean lubricate, adjust or replace as needed. (P-2)
- 5.5** Check parking brake operation and parking brake indicator light system operation; determine necessary action. (P-1)
- 5.6** Check operation of brake stop light system. (P-1)
- 5.7** Replace wheel bearing and race. (P-2)
- 5.8** Identify traction control/vehicle stability control system components. (P-3)
- 5.9** Describe the operation of a regenerative braking system. (P-3)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 5.1** Checks brake pedal travel with and without engine running to verify proper power booster operation. (P-2)
- 5.2** Checks vacuum supply (manifold or auxiliary pump) to vacuum-type power booster using a vacuum gage. (P-1)
- 5.3** Removes, cleans, inspects, repacks, and installs wheel bearings; replaces seals; installs hub and adjusts bearings. (P-1)
- 5.4** Checks parking brake cables and components for wear, binding, and corrosion; cleans, lubricates, adjusts or replaces as needed. (P-2)
- 5.5** Checks parking brake operation and parking brake indicator light system operation; determines necessary action. (P-1)
- 5.6** Checks operation of brake stop light system and adjusts brake light switch if necessary. (P-1)
- 5.7** Replaces wheel bearing and race using proper tools. (P-2)
- 5.8** Identifies traction control/vehicle stability control system components. (P-3)
- 5.9** Describes the operation of a regenerative braking system. (P-3)

SAMPLING OF AVAILABLE RESOURCES

- *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.eyes.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
- 2012 Automobile Task List, National Automotive Technicians Education Foundation (NATEF), www.natef.org
- General Motors Diagnostic Plan
- Ford Motor Company Diagnostic Plan
- Harley Davidson Institute

AUTOMOTIVE: MAINTENANCE AND LIGHT REPAIR IV

COURSE DESCRIPTION

The *Maintenance and Light Repair 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.

It is strongly recommended that administration and guidance follow the scope and sequence and course recommendations as listed.

Recommended Prerequisite: Maintenance and Light Repair I, II, & III

Recommended Credits: 2

Recommended Grade Level: 12th

Number of Competencies in Course: 69

Note: Hours earned in the *Maintenance and Light Repair IV* course may be used toward meeting 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.

MAINTENANCE AND LIGHT REPAIR IV

STANDARDS

- 1.0** Students will perform safety examinations and maintain safety records.
- 2.0** Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 3.0** Students will inspect, test, service and repair heating and a/c systems.
- 4.0** Students will inspect, test, service, and repair engine performance systems.
- 5.0** Students will properly inspect and service automatic transmissions and transaxles.
- 6.0** Students will properly inspect and service manual transmissions and transaxles.
- 7.0** Students will properly demonstrate workplace etiquette, communication skills, writing skills, and professional appearance.

MAINTENANCE AND LIGHT REPAIR IV

STANDARD 1.0

Students will perform safety examinations and maintain safety records.

LEARNING EXPECTATIONS

The student will:

- 1.1** Demonstrate a positive attitude regarding safety practices and issues.
- 1.2** Use and inspect personal protective equipment.
- 1.3** Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 1.4** Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.
- 1.5** Assume responsibilities under HazCom (Hazard Communication) regulations.
- 1.6** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards.
- 1.7** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures.
- 1.8** Demonstrate appropriate related safety procedures.
- 1.9** Pass with 100 % accuracy a written examination relating to safety issues
- 1.10** Pass with 100% accuracy a performance examination relating to safety.
- 1.11** Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 1.1A** Is attentive during safety discussions.
- 1.1B** Actively seeks information about safe procedures.
- 1.1C** Responds positively to instruction, advice, and correction regarding safety issues.
- 1.1D** Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
- 1.1E** Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, alcohol, etc.
- 1.2** Selects, inspects, and uses the correct personal protective equipment for the assigned task.
- 1.3A** Inspects power tools for intact guards, shields, insulation, and other protective devices.
- 1.3B** Inspects extension cords for the presence of a functional ground connection, prior to use.
- 1.3C** Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.
- 1.3D** Properly places and secures ladders and scaffolding prior to use.
- 1.4A** Is observant of personnel and activities in the vicinity of the work area.
- 1.4B** Warns nearby personnel, prior to starting potentially hazardous actions.

- 1.5A** When asked to use a new hazardous material, retrieves MSDSs (material safety data sheets), and identifies the health hazards associated with the new material.
- 1.5B** Reports hazards found on the job site to the supervisor.
- 1.6A** Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.
- 1.6B** Provides and activates adequate ventilation equipment as required by the task.
- 1.7A** Reports all injuries to self to the immediate supervisor.
- 1.7B** Reports observed unguarded hazards to their immediate supervisor.
- 1.8** Complies with personal assignments regarding emergency assignments.
- 1.9** Passes with 100% accuracy a written examination relating specifically to content area.
- 1.10** Passes with 100% accuracy a performance examination relating specifically to welding tools, equipment and supplies.
- 1.11** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

MAINTENANCE AND LIGHT REPAIR IV

STANDARD 2.0

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

LEARNING EXPECTATIONS

The student will:

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

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1A** Demonstrates character and leadership using creative-and critical-thinking skills.
- 2.1B** Uses creative thought process by “thinking outside the box.”
- 2.2A** Relates the creed, purposes, motto, and emblem of their student organization, directly related to personal and professional development.
- 2.2B** Plans and conducts meetings and other business according to accepted rules of parliamentary procedure.
- 2.3A** Makes decisions and assumes responsibilities.
- 2.3B** Analyzes a situation and uses the Professional Development Program or career technical student organization materials directly related to the student’s program of study to resolve it.
- 2.3C** Understands the importance of learning new information for both current and future problem solving and decision making.
- 2.4A** Organizes committees and participates in functions.
- 2.4B** Cooperates with peers to select and organize a community service project.
- 2.5A** Researches different customs and individual differences of others.
- 2.5B** Interacts respectfully with individuals of different cultures, genders, and backgrounds.
- 2.5C** Resolves conflicts and differences to maintain a smooth workflow and classroom environment.
- 2.6A** Creates personal career development by identifying career interests, strengths, and opportunities.
- 2.6B** Identifies opportunities for career development and certification requirements.
- 2.6C** Plans personal educational paths based on available courses and current career goals.
- 2.6D** Creates a resumé that reflects student’s skills, abilities, and interests.

MAINTENANCE AND LIGHT REPAIR IV

STANDARD 3.0

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

LEARNING EXPECTATIONS

Student will:

- 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)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 3.1** Researches applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 3.2** Identifies vehicle's A/C components.
- 3.3** Inspects and replaces A/C compressor drive belts, pulleys, and tensioners; determines necessary action.
- 3.4** Identifies hybrid vehicle A/C system electrical circuits and the service/safety precautions.
- 3.5** Inspects A/C condenser for airflow restrictions; determines necessary action.
- 3.6** Inspects engine cooling and heater systems hoses; performs necessary action.
- 3.7** Inspects A/C-heater ducts, doors, hoses, cabin filters, and outlets; performs necessary action.
- 3.8** Identifies the source of A/C system odors.

MAINTENANCE AND LIGHT REPAIR IV

STANDARD 4.0

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

LEARNING EXPECTATIONS

Student will:

- 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)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 4.1** Researches applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
- 4.2** Performs engine absolute (vacuum/boost) manifold pressure tests; determines necessary action.
- 4.3** Performs cylinder power balance test; determines necessary action.
- 4.4** Performs cylinder cranking and running compression tests; determines necessary action.
- 4.5** Performs cylinder leakage test; determines necessary action.
- 4.6** Verifies engine operating temperature using a scan or temperature gun.
- 4.7** Removes and replaces spark plugs; inspects secondary ignition components for wear and damage.

- 4.8** Retrieves and records diagnostic trouble codes, OBD monitor status, and freeze frame data; clears codes when applicable.
- 4.9** Describes the importance of operating all OBDII monitors for repair verification.
- 4.10** Replaces fuel filter(s).
- 4.11** Inspects, services, or replaces air filters, filter housings, and intake duct work.
- 4.12** Inspects integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determines necessary action.
- 4.13** Inspects condition of exhaust system hangers, brackets, clamps, and heat shields; repairs or replaces as needed.
- 4.14** Checks and refills diesel exhaust fluid (DEF).
- 4.15** Inspects, tests, and services positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; performs necessary action.

MAINTENANCE AND LIGHT REPAIR IV

STANDARD 5.0

Students will properly inspect and service automatic transmissions and transaxles.

LEARNING EXPECTATIONS

- 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)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student will:

- 5.1** Researches applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
- 5.2** Checks fluid level in a transmission or a transaxle equipped with a dip-stick.
- 5.3** Checks fluid level in a transmission or a transaxle not equipped with a dip-stick.
- 5.4** Checks transmission fluid condition; checks for leaks.
- 5.5** Inspects, adjusts, and replaces external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
- 5.6** Inspects for leakage at external seals, gaskets, and bushings.
- 5.7** Inspects power train mounts.
- 5.8** Drains and replaces fluid and filter(s) on automatic transmissions.
- 5.9** Describes the operational characteristics of a continuously variable transmission (CVT).
- 5.10** Describes the operational characteristics of a hybrid vehicle drive train.

MAINTENANCE AND LIGHT REPAIR IV

STANDARD 6.0

Students will properly inspect and service manual transmissions and transaxles.

LEARNING EXPECTATIONS

Student will:

- 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)

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 6.1** Researches applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
- 6.2** Drains and refills manual transmission/transaxle and final drive unit.
- 6.3** Checks fluid condition; checks for leaks.
- 6.4** Checks and adjusts clutch master cylinder fluid level.
- 6.5** Checks for system leaks.
- 6.6** Describes the operational characteristics of an electronically-controlled manual transmission/transaxle.
- 6.7** Inspects, removes, and replaces front wheel drive (FWD) bearings, hubs, and seals.
- 6.8** Inspects, services, and replaces shafts, yokes, boots, and universal/CV joints.
- 6.9** Cleans and inspects differential housing; check for leaks; inspects housing vent.
- 6.10** Checks and adjusts differential housing fluid level.
- 6.11** Drains and refills differential housing.
- 6.12** Inspects and replaces drive axle wheel studs.
- 6.13** Inspects front-wheel bearings and locking hubs.
- 6.14** Checks for leaks at drive assembly seals; checks vents; checks lube level.

MAINTENANCE AND LIGHT REPAIR IV

STANDARD 7.0

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

LEARNING EXPECTATIONS

Student will:

- 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.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 7.1A** Demonstrates how to professionally answer a business phone and take legible messages.
- 7.1B** Demonstrates how to address customers, co-workers, and supervisors.
- 7.1C** Demonstrates ability to listen and follows instructions properly.
- 7.2A** Identifies the need for leadership and describes leadership qualities, such as honesty and integrity, fairness, responsible behavior, ethical work habits, passion for goals, positive attitude, enthusiasm, and empathy.
- 7.2B** Demonstrates professional appearance and good hygiene habits.
- 7.3** Performs mock interviews; prepares resume, job applications, cover letters, and portfolios.
- 7.4** Identifies legal issues of employment, including sexual harassment, discrimination, violence, and unemployment.
- 7.5** Analyzes ways of handling stress in the workplace.

SAMPLING OF AVAILABLE RESOURCES

- *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