

Automotive Service Technology A

Automotive Service Technology (AST) A is a one-credit course that provides students with a service knowledge and skills regarding Safety, Engine Repair, Automatic Transmission, and Manual Drive Trains. Upon successful completion of the course, students are able to diagnose and repair engine performance related systems. This course incorporates all personal and environmental safety practices associated with clothing, eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

AST A,B, C, and D, comprehensively meet the requirements for the National Automotive Technicians Education Foundation (NATEF) AST accreditation and prepare students for the Automotive Service Excellence (ASE) student credential. The AST courses may be taken in any order. The prerequisite for all AST courses is successful completion of Maintenance and Light Repair A, B, C, and D. The content standards, task lists, tools and equipment, program hours, and safety standards must meet NATEF requirements.

Career and technical student organizations are integral, co-curricular components of each career and technical education course. These organizations serve as a means to enhance classroom instruction while helping students develop leadership abilities, expand workplace-readiness skills, and broaden opportunities for personal and professional growth.

Safety

Students will:

1. Identify general shop safety rules and procedures related to Safety, Engine Repair, Automatic Transmission, and Manual Drive Trains.
 - Utilizing safe procedures for handling of tools and equipment
 - Identifying and proper placement of floor jacks and jack stands
 - Identifying and proper procedures for safe lift operation use
 - Utilizing proper ventilation procedures for working within the lab/shop area
 - Identifying marked safety areas
 - Identifying the location and the types of fire extinguishers and other fire safety equipment; demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment
 - Identify the location and use of eye wash stations
 - Identifying the location of the posted evacuation routes
 - Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities
 - Identifying and wearing appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities
 - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits
 - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
 - Locating and demonstrate knowledge of material safety data sheets (MSDS)

ENGINE REPAIR

General: Engine Diagnosis; Removal and Reinstallation (R & R)

2. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
3. Inspect, remove and replace engine mounts.

Cylinder Head and Valve Train Diagnosis and Repair

4. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specifications and procedures.
5. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.
6. Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine necessary action.
7. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/tone-wheel, and valve timing components; verify correct camshaft timing.
8. Establish camshaft position sensor indexing.

Engine Block Assembly Diagnosis and Repair

9. Remove, inspect, or replace crankshaft vibration damper (harmonic balancer).

Lubrication and Cooling Systems Diagnosis and Repair

10. Identify causes of engine overheating.
11. Inspect, remove, and replace water pump.
12. Remove and replace radiator.
13. Inspect and test fan(s) (electrical or mechanical), fan clutch, fan shroud, and air dams.
14. Perform oil pressure tests; determine necessary action.
15. Inspect auxiliary coolers; determine necessary action.
16. Inspect, test, and replace oil temperature and pressure switches and sensors.

AUTOMATIC TRANSMISSION AND TRANSAXLE

General: Transmission and Transaxle Diagnosis

17. Identify and interpret transmission/transaxle concern, differentiate between engine performance and transmission/transaxle concerns; determine necessary action.
18. Diagnose fluid loss and condition concerns; determine necessary action.
19. Perform stall test; determine necessary action.
20. Perform lock-up converter system tests; determine necessary action.
21. Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.
22. Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).

In-Vehicle Transmission/Transaxle Maintenance and Repair

23. Inspect for leakage; replace external seals, gaskets, and bushings.
24. Inspect, test, adjust, repair, or replace electrical/electronic components and circuits including computers, solenoids, sensors, relays, terminals, connectors, switches, and harnesses.

Off-Vehicle Transmission and Transaxle Repair

25. Remove and reinstall transmission/transaxle and torque converter; inspect engine core plugs, rear crankshaft seal, dowel pins, dowel pin holes, and mating surfaces.
26. Inspect, leak test, and flush or replace transmission/transaxle oil cooler, lines, and fittings.
27. Inspect converter flex (drive) plate, converter attaching bolts, converter pilot, converter pump drive surfaces, converter end play, and crankshaft pilot bore.

MANUAL DRIVE TRAIN AND AXLES

General: Drive Train Diagnosis

28. Identify and interpret drive train concerns; determine necessary action.
29. Check fluid condition; check for leaks; determine necessary action.

Clutch Diagnosis and Repair

30. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine necessary action.
31. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform necessary action.

32. Inspect and replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing and linkage, and pilot bearing/bushing (as applicable).

33. Bleed clutch hydraulic system.

34. Inspect flywheel and ring gear for wear and cracks; determine necessary action.

35. Measure flywheel runout and crankshaft end play; determine necessary action.

Transmission/Transaxle Diagnosis and Repair

36. Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers.

Drive Shaft and Half Shaft, Universal and Constant-Velocity (CV) Joint Diagnosis and Repair

37. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine necessary action.

38. Diagnose universal joint noise and vibration concerns; perform necessary action.

39. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.

Drive Axle Diagnosis and Repair

40. Inspect and replace companion flange and pinion seal; measure companion flange runout.

41. Remove and replace drive axle shafts.

42. Inspect and replace drive axle shaft seals, bearings, and retainers.

43. Measure drive axle flange runout and shaft end play; determine necessary action.

Automotive Service Technology B

Automotive Service Technology (AST) B is a one-credit course that provides students with a service knowledge and skills regarding Safety, Suspension & Steering and Brakes. Upon successful completion of the course, students are able to diagnose and repair engine performance related systems. This course incorporates all personal and environmental safety practices associated with clothing, eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

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Safety

Students will:

1. Identify general shop safety rules and procedures related to Suspension & Steering and Brakes.
 - Utilizing safe procedures for handling of tools and equipment
 - Identifying and proper placement of floor jacks and jack stands
 - Identifying and proper procedures for safe lift operation use
 - Utilizing proper ventilation procedures for working within the lab/shop area
 - Identifying marked safety areas
 - Identifying the location and the types of fire extinguishers and other fire safety equipment; demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment
 - Identify the location and use of eye wash stations
 - Identifying the location of the posted evacuation routes
 - Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities
 - Identifying and wearing appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities
 - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits
 - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
 - Locating and demonstrate knowledge of material safety data sheets (MSDS)

MANUAL DRIVE TRAIN AND AXLES

2. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.
3. Inspect front-wheel bearings and locking hubs; perform necessary action(s).
4. Identify concerns related to variations in tire circumference and/or final drive ratios.

SUSPENSION AND STEERING

Steering Systems Diagnosis and Repair

5. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
6. Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms); determine necessary action.
7. Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.
8. Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, and noise concerns; determine necessary action.
9. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel; perform necessary action.
10. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.
11. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots; replace as needed.
12. Remove and reinstall power steering pump.
13. Remove and reinstall press fit power steering pump pulley; check pulley and belt alignment.
14. Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
15. Identify hybrid vehicle power steering system electrical circuits and safety precautions.

Suspension Systems Diagnosis and Repair

16. Diagnose short and long arm suspension system noises, body sway, and uneven ride height concerns; determine necessary action.
17. Diagnose strut suspension system noises, body sway, and uneven ride height concerns; determine necessary action.
18. Inspect, remove and install upper and lower control arms, bushings, shafts, and rebound bumpers.
19. Inspect, remove and install strut rods and bushings.

20. Inspect, remove and install upper and/or lower ball joints (with or without wear indicators).
21. Inspect, remove and install steering knuckle assemblies.
22. Inspect, remove and install short and long arm suspension system coil springs and spring insulators.
23. Inspect, remove and install torsion bars and mounts.
24. Inspect, remove and install front stabilizer bar (sway bar) bushings, brackets, and links.
25. Inspect, remove and install strut cartridge or assembly, strut coil spring, insulators (silencers), and upper strut bearing mount.
26. Inspect, remove and install track bar, strut rods/radius arms, and related mounts and bushings.
27. Inspect rear suspension system leaf spring(s), bushings, center pins/bolts, and mounts.

Related Suspension and Steering Service

28. Remove, inspect, and service or replace front and rear wheel bearings.
29. Describe the function of the power steering pressure switch.

Wheel Alignment Diagnosis, Adjustment, and Repair

30. Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns; determine necessary action.
31. Perform pre-alignment inspection and measure vehicle ride height; perform necessary action.
32. Prepare vehicle for wheel alignment on alignment machine; perform four-wheel alignment by checking and adjusting front and rear wheel caster, camber; and toe as required; center steering wheel.
33. Check toe-out-on-turns (turning radius); determine necessary action.
34. Check SAI (steering axis inclination) and included angle; determine necessary action. P-2
35. Check rear wheel thrust angle; determine necessary action.
36. Check for front wheel setback; determine necessary action.
37. Check front and/or rear cradle (subframe) alignment; determine necessary action.

Wheels and Tires Diagnosis and Repair

38. Diagnose wheel/tire vibration, shimmy, and noise; determine necessary action.
39. Measure wheel, tire, axle flange, and hub runout; determine necessary action.
40. Diagnose tire pull problems; determine necessary action.

Automotive Service Technology C

Automotive Service Technology (AST) C is a one-credit course that provides students with a service knowledge and skills regarding Safety, Brakes, and Electrical/Electronics Systems. Upon successful completion of the course, students are able to diagnose and repair engine performance related systems. This course incorporates all personal and environmental safety practices associated with clothing, eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

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Safety

Students will:

1. Identify general shop safety rules and procedures related to Brakes and Electrical/Electronics.
 - Utilizing safe procedures for handling of tools and equipment
 - Identifying and proper placement of floor jacks and jack stands
 - Identifying and proper procedures for safe lift operation use
 - Utilizing proper ventilation procedures for working within the lab/shop area
 - Identifying marked safety areas
 - Identifying the location and the types of fire extinguishers and other fire safety equipment; demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment
 - Identify the location and use of eye wash stations
 - Identifying the location of the posted evacuation routes
 - Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities
 - Identifying and wearing appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities
 - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits
 - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
 - Locating and demonstrate knowledge of material safety data sheets (MSDS)

BRAKES

General: Brake Systems Diagnosis

2. Identify and interpret brake system concerns; determine necessary action.

Hydraulic System Diagnosis and Repair

3. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).
4. Check master cylinder for internal/external leaks and proper operation; determine necessary action.
5. Remove, bench bleed, and reinstall master cylinder.
6. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action.
7. Replace brake lines, hoses, fittings, and supports.
8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO).
9. Inspect, test, and/or replace components of brake warning light system.

Drum Brake Diagnosis and Repair

10. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action.

Disc Brake Diagnosis and Repair

11. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine necessary action.

Power-Assist Units Diagnosis and Repair

12. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action.
13. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action.
14. Measure and adjust master cylinder pushrod length.

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

15. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action.

16. Remove and reinstall sealed wheel bearing assembly.

Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

17. Identify and inspect electronic brake control system components; determine necessary action.

ELECTRICAL/ELECTRONIC SYSTEMS

General: Electrical System Diagnosis

18. Use wiring diagrams during the diagnosis (troubleshooting) of electrical/electronic circuit problems.

19. Diagnose the cause(s) of excessive key-off battery drain (parasitic draw); determine necessary action.

20. Inspect and test switches, connectors, relays, solenoid solid state devices, and wires of electrical/electronic circuits; determine necessary action.

21. Repair wiring harness.

Starting System Diagnosis and Repair

22. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition.

Charging System Diagnosis and Repair

23. Diagnose (troubleshoot) charging system for causes of undercharge, no-charge, or overcharge conditions.

Lighting Systems Diagnosis and Repair

24. Diagnose (troubleshoot) the causes of brighter-than-normal, intermittent, dim, or no light operation; determine necessary action.

Gauges, Warning Devices, and Driver Information Systems Diagnosis and Repair

25. Inspect and test gauges and gauge sending units for causes of abnormal gauge readings; determine necessary action.

26. Diagnose (troubleshoot) the causes of incorrect operation of warning devices and other driver information systems; determine necessary action.

Horn and Wiper/Washer Diagnosis and Repair

27. Diagnose (troubleshoot) causes of incorrect horn operation; perform necessary action.

28. Diagnose (troubleshoot) causes of incorrect wiper operation; diagnose wiper speed control and park problems; perform necessary action.

29. Diagnose (troubleshoot) windshield washer problems; perform necessary action.

Accessories Diagnosis and Repair

30. Diagnose (troubleshoot) incorrect operation of motor-driven accessory circuits; determine necessary action.

31. Diagnose (troubleshoot) incorrect electric lock operation (including remote keyless entry); determine necessary action.

32. Diagnose (troubleshoot) incorrect operation of cruise control systems; determine necessary action.

33. Diagnose (troubleshoot) supplemental restraint system (SRS) problems; determine necessary action.

34. Check for module communication errors (including CAN/BUS systems) using a scan tool.

HEATING AND AIR CONDITIONING

General: A/C System Diagnosis and Repair

35. Identify and interpret heating and air conditioning problems; determine necessary action.

36. Performance test A/C system; identify problems.

37. Identify abnormal operating noises in the A/C system; determine necessary action.

38. Identify refrigerant type; select and connect proper gauge set; record temperature and pressure readings.

39. Leak test A/C system; determine necessary action.

40. Inspect condition of refrigerant oil removed from A/C system; determine necessary action.

41. Determine recommended oil and oil capacity for system application.

42. Using a scan tool, observe and record related HVAC data and trouble codes.

Refrigeration System Component Diagnosis and Repair

42. Inspect, test, service or replace A/C compressor clutch components and/or assembly; check compressor clutch air gap; adjust as needed.

43. Remove, inspect, and reinstall A/C compressor and mountings; determine recommended oil quantity.

44. Determine need for an additional A/C system filter; perform necessary action.

45. Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves; perform necessary action.

46. Inspect A/C condenser for airflow restrictions; perform necessary action.

47. Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine recommended oil quantity.

48. Remove, inspect, and install expansion valve or orifice (expansion tube).

49. Inspect evaporator housing water drain; perform necessary action.

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Automotive Service Technology D

Automotive Service Technology (AST) D is a one-credit course that provides students with service knowledge and skills regarding Safety, Engine Performance, Electrical/Electronics, and Heating and Air Conditioning. Upon successful completion of the course, students are able to diagnose and repair engine performance related systems. This course incorporates all personal and environmental safety practices associated with clothing, eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

AST A,B, C, and D, comprehensively meet the requirements for the National Automotive Technicians Education Foundation (NATEF) AST accreditation and prepare students for the Automotive Service Excellence (ASE) student credential. The AST courses may be taken in any order. The prerequisite for all AST courses is successful completion of Maintenance and Light Repair A, B, C, and D. The content standards, task lists, tools and equipment, program hours, and safety standards must meet NATEF requirements.

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Safety

Students will:

1. Identify general shop safety rules and procedures related to Engine Performance, Electrical, and Heating and Air Conditioning. .
 - Utilizing safe procedures for handling of tools and equipment
 - Identifying and proper placement of floor jacks and jack stands
 - Identifying and proper procedures for safe lift operation use
 - Utilizing proper ventilation procedures for working within the lab/shop area
 - Identifying marked safety areas
 - Identifying the location and the types of fire extinguishers and other fire safety equipment; demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment
 - Identify the location and use of eye wash stations
 - Identifying the location of the posted evacuation routes
 - Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities
 - Identifying and wearing appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities
 - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits
 - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
 - Locating and demonstrate knowledge of material safety data sheets (MSDS)

HEATING AND AIR CONDITIONING

Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

2. Inspect and test heater control valve(s); perform necessary action.
3. Inspect and test A/C-heater blower motors, resistors, switches, relays, wiring, and protection devices; perform necessary action.
4. Diagnose A/C compressor clutch control systems; determine necessary action.
5. Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system; determine necessary action.
6. Inspect and test A/C-heater control panel assembly; determine necessary action.
7. Inspect and test A/C-heater control cables, motors, and linkages; perform necessary action.
8. Check operation of automatic or semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems; determine necessary action.

Refrigerant Recovery, Recycling, and Handling

9. Perform correct use and maintenance of refrigerant handling equipment according to equipment manufacturer's standards.
10. Identify and recover A/C system refrigerant.
11. Recycle, label, and store refrigerant.
12. Evacuate and charge A/C system; add refrigerant oil as required.

ENGINE PERFORMANCE

General: Engine Diagnosis

13. Identify and interpret engine performance concerns; determine necessary action.
14. Diagnose abnormal engine noises or vibration concerns; determine necessary action.
15. Diagnose abnormal exhaust color, odor, and sound; determine necessary action.
16. Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns; determine necessary action.
17. Verify engine operating temperature; determine necessary action.
18. Verify correct camshaft timing.

Computerized Engine Controls Diagnosis and Repair

19. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
20. Access and use service information to perform step-by-step (troubleshooting) diagnosis.
21. Perform active tests of actuators using a scan tool; determine necessary action.

Ignition System Diagnosis and Repair

22. Diagnose (troubleshoot) ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns; determine necessary action.
23. Inspect and test crankshaft and camshaft position sensor(s); perform necessary action.
24. Inspect, test, and/or replace ignition control module, powertrain/engine control module; reprogram as necessary.
25. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

26. Check fuel for contaminants; determine necessary action.
27. Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.
28. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.
29. Inspect and test fuel injectors.
30. Verify idle control operation.
31. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; perform necessary action.
32. Perform exhaust system back-pressure test; determine necessary action.

Emissions Control Systems Diagnosis and Repair

33. Diagnose oil leaks, emissions, and drivability concerns caused by the positive crankcase ventilation (PCV) system; determine necessary action.
34. Diagnose emissions and driveability concerns caused by the exhaust gas recirculation (EGR) system; determine necessary action.
35. Inspect, test, service, and replace components of the EGR system including tubing, exhaust passages, vacuum/pressure controls, filters, and hoses; perform necessary action.

36. Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.

37. Inspect and test catalytic converter efficiency.

38. Inspect and test components and hoses of the evaporative emissions control system; perform necessary action.

39. Interpret diagnostic trouble codes (DTCs) and scan tool data related to the emissions control systems; determine necessary action.

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Maintenance and Light Repair A

Maintenance and Light Repair (MLR) A is a one-credit course that provides students with a foundational knowledge and skills regarding Safety, Engine Repair, Automatic Transmission, and Manual Drive Trains. Strong emphasis is placed on system and component operations. Upon successful completion of the course, students are able to diagnose and repair engine performance related systems. This course incorporates all personal and environmental safety practices associated with clothing, eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

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Safety

Students will:

1. Identify general shop safety rules and procedures related to Engine Repair, Automatic Transmission, and Manual Drive Trains.
 - Utilizing safe procedures for handling of tools and equipment
 - Identifying and proper placement of floor jacks and jack stands
 - Identifying and proper procedures for safe lift operation use
 - Utilizing proper ventilation procedures for working within the lab/shop area
 - Identifying marked safety areas
 - Identifying the location and the types of fire extinguishers and other fire safety equipment; demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment
 - Identify the location and use of eye wash stations
 - Identifying the location of the posted evacuation routes
 - Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities
 - Identifying and wearing appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities
 - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits
 - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
 - Locating and demonstrate knowledge of material safety data sheets (MSDS)

Automotive Service Tools

2. Identify tools and their usage in automotive applications related to Engine Repair, Automatic Transmission, and Manual Drive Trains.
 - Identifying standard and metric designation
 - Demonstrating proper cleaning, storage, and maintenance of tools and equipment
 - Demonstrating proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper)

Customer Service/Care

3. Identify information needed and the service requested on a repair order related to Engine Repair, Automatic Transmission, and Manual Drive Trains.
 - a. Researching applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins
 - b. Completing work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction
 - c. Identifying purpose and demonstrate proper use of fender covers, mats
 - d. Demonstrating use of the three C's (concern, cause, and correction)
 - e. Ensuring vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)

General Engine Repair

4. Verify operation of the instrument panel engine warning indicators.
5. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.
6. Install engine covers using gaskets, seals, and sealers as required.
7. Remove and replace timing belt; verify correct camshaft timing.
8. Perform common fastener and thread repair, to include: remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
9. Identify hybrid vehicle internal combustion engine service precautions.

Cylinder Head and Valve Train

10. Adjust valves (mechanical or hydraulic lifters).

Lubrication and Cooling Systems

11. 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.
12. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.

13. Remove, inspect, and replace thermostat and gasket/seal.
14. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.
15. Perform engine oil and filter change.

AUTOMATIC TRANSMISSION AND TRANSAXLE

16. Research applicable vehicle and service information related to transmissions, fluid type, vehicle service history, service precautions, and technical service bulletins.
17. Check fluid level in transmissions or a transaxles equipped with a dip-stick, or without.
 - Check transmission fluid condition; check for leaks

In-Vehicle Transmission/Transaxle

18. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
19. Inspect for leakage at external seals, gaskets, and bushings.
20. Inspect power train mounts.
21. Drain and replace fluid and filter(s).

Off-Vehicle Transmission and Transaxle

22. Describe the operational characteristics of a continuously variable transmission (CVT).
23. Describe the operational characteristics of a hybrid vehicle drive train.

MANUAL DRIVE TRAIN AND AXLES

24. Research applicable vehicle and service information related to manual drive trains and axles, fluid type, vehicle service history, service precautions, and technical service bulletins.
25. Drain and refill manual transmission/transaxle and final drive unit.
26. Check fluid condition; check for leaks.

Clutch

27. Check and adjust clutch master cylinder fluid level.
 - a. Checking for system leaks

Transmission/Transaxle

28. Describe the operational characteristics of an electronically-controlled manual

transmission/transaxle.

Drive Shaft, Half Shafts, Universal and Constant-Velocity (CV) Joints

29. Inspect, remove, and replace front wheel drive (FWD) bearings, hubs, and seals.
30. Inspect, service, and replace shafts, yokes, boots, and universal/CV joints.

Differential Case Assembly

31. Clean and inspect differential housing; check for leaks; inspect housing vent.
 - Checking and adjusting differential housing fluid level
 - Draining and refilling differential housing

Drive Axles

32. Inspect and replace drive axle wheel studs.
 - Inspect front-wheel bearings and locking hubs on four-wheel drive vehicles
 - Checking for leaks at drive assembly seals; check vents; check lube level.

SUSPENSION AND STEERING SYSTEMS

33. Research applicable vehicle and service information related to suspension and steering systems, vehicle service history, service precautions, and technical service bulletins.
 - Disabling and enable supplemental restraint system (SRS).

Maintenance and Light Repair B

Maintenance and Light Repair (MLR) B is a one-credit course that provides students with a foundational knowledge and skills regarding Safety, Suspension & Steering and Brakes. Strong emphasis is placed on system and component operations. Upon successful completion of the course, students are able to diagnose and repair engine performance related systems. This course incorporates all personal and environmental safety practices associated with clothing, eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

MLR A, B, C, & D comprehensively meet the requirements for the National Automotive Technicians Education Foundation (NATEF) MLR accreditation and prepare students for the Automotive Service Excellence (ASE) student credential. These courses may be taken in any order without prerequisite. The content standards, task lists, tools and equipment, program hours, and safety standards must meet NATEF requirements.

Career and technical student organizations are integral, co-curricular components of each career and technical education course. These organizations serve as a means to enhance classroom instruction while helping students develop leadership abilities, expand workplace-readiness skills, and broaden opportunities for personal and professional growth.

Safety

Students will:

1. Identify general shop safety rules and procedures related to Suspension, Steering, and Brakes.
 - Utilizing safe procedures for handling of tools and equipment
 - Identifying and proper placement of floor jacks and jack stands
 - Identifying and proper procedures for safe lift operation use
 - Utilizing proper ventilation procedures for working within the lab/shop area
 - Identifying marked safety areas
 - Identifying the location and the types of fire extinguishers and other fire safety equipment; demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment
 - Identify the location and use of eye wash stations
 - Identifying the location of the posted evacuation routes
 - Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities
 - Identifying and wearing appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities
 - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits
 - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
 - Locating and demonstrate knowledge of material safety data sheets (MSDS)

Automotive Service Tools

2. Identify tools and their usage in automotive applications.
 - Identifying standard and metric designation
 - Demonstrating proper cleaning, storage, and maintenance of tools and equipment
 - Demonstrating proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper)

Customer Service/Care

3. Identify information needed and the service requested on a repair order.
 - Researching applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins
 - Completing work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction
 - Identifying purpose and demonstrate proper use of fender covers, mats
 - Demonstrating use of the three C's (concern, cause, and correction)
 - Ensuring vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)

SUSPENSION AND STEERING

4. Inspect rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
5. Determine proper power steering fluid type; inspect fluid level and condition.
 - Flush, fill, and bleed power steering system.
 - Inspect for power steering fluid leakage; determine necessary action.
6. Remove, inspect, replace, and adjust power steering pump drive belt.
7. Inspect and replace power steering hoses and fittings.
8. Replace power steering pump filter(s).
9. Inspect pitman arm, relay (centerlink/intermediate) rod, idler arm and mountings, and steering linkage damper.
10. Inspect tie rod ends (sockets), tie rod sleeves, and clamps.
11. Inspect upper and lower control arms, bushings, and shafts.
12. Inspect and replace rebound and jounce bumpers.
13. Inspect track bar, strut rods/radius arms, and related mounts and bushings.
14. Inspect upper and lower ball joints (with or without wear indicators).
15. Inspect suspension system coil springs and spring insulators (silencers).

16. Inspect suspension system torsion bars and mounts.
17. Inspect and replace front stabilizer bar (sway bar) bushings, brackets, and links.
18. Inspect strut cartridge or assembly.
19. Inspect front strut bearing and mount.
20. Inspect rear suspension system lateral links/arms (track bars), control (trailing) arms.
21. Inspect rear suspension system leaf spring(s), spring insulators (silencers), shackles, brackets, bushings, center pins/bolts, and mounts.
22. Inspect, remove, and replace shock absorbers; inspect mounts and bushings.
23. Inspect electric power-assisted steering.
24. Identify hybrid vehicle power steering system electrical circuits and safety precautions.
25. Describe the function of the power steering pressure switch.

Wheel Alignment

26. Perform pre-alignment inspection and measure vehicle ride height; determine necessary action.

Wheels and Tires

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

BRAKES

35. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins as related to brakes.
- Describe procedure for performing a road test to check brake system operation, including an anti-lock brake system (ABS).

Hydraulic System

36. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.
- Check master cylinder for external leaks and proper operation.
 - Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear, loose fittings and supports; determine necessary action.
 - Select, handle, store, and fill brake fluids to proper level.
 - Identify components of brake warning light system.
 - Bleed and/or flush brake system.
 - Test brake fluid for contamination.

Maintenance and Light Repair C

Maintenance and Light Repair (MLR) C is a one-credit course that provides students with a foundational knowledge and skills regarding Safety, Brakes, and Electrical/Electronics Systems. Upon successful completion of the course, students are able to diagnose and repair engine performance related systems. This course incorporates all personal and environmental safety practices associated with clothing, eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

MLR A, B, C, & D comprehensively meet the requirements for the National Automotive Technicians Education Foundation (NATEF) MLR accreditation and prepare students for the Automotive Service Excellence (ASE) student credential. These courses may be taken in any order without prerequisite. The content standards, task lists, tools and equipment, program hours, and safety standards must meet NATEF requirements.

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Safety

Students will:

1. Identify general shop safety rules and procedures.
 - Utilizing safe procedures for handling of tools and equipment
 - Identifying and proper placement of floor jacks and jack stands
 - Identifying and proper procedures for safe lift operation use
 - Utilizing proper ventilation procedures for working within the lab/shop area
 - Identifying marked safety areas
 - Identifying the location and the types of fire extinguishers and other fire safety equipment; demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment
 - Identify the location and use of eye wash stations
 - Identifying the location of the posted evacuation routes
 - Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities
 - Identifying and wearing appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities
 - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits
 - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
 - Locating and demonstrate knowledge of material safety data sheets (MSDS)

Automotive Service Tools

2. Identify tools and their usage in automotive applications.
 - Identifying standard and metric designation
 - Demonstrating proper cleaning, storage, and maintenance of tools and equipment
 - Demonstrating proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper)

Customer Service/Care

3. Identify information needed and the service requested on a repair order.
 - Researching applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins
 - Completing work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction
 - Identifying purpose and demonstrate proper use of fender covers, mats
 - Demonstrating use of the three C's (concern, cause, and correction)
 - Ensuring vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)

Drum Brakes

4. Remove, clean, inspect, and measure brake drum diameter; determine necessary action.
5. Refinish brake drum and measure final drum diameter; compare with specifications.
6. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
7. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed.
8. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; make final checks and adjustments.
9. Install wheel and torque lug nuts.

Disc Brakes

10. Remove and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.
11. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.
12. Remove, inspect, and replace pads and retaining hardware; determine necessary action.
13. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.

14. Clean and inspect rotor, measure rotor thickness, thickness variation, and lateral runout; determine necessary action.
15. Remove and reinstall rotor.
16. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
17. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
18. Retract and re-adjust caliper piston on an integral parking brake system.
19. Check brake pad wear indicator; determine necessary action.
20. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.

Power-Assist Units

21. Check brake pedal travel with, and without, engine running to verify proper power booster operation.
 - Checking vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.)

22. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings.
23. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.
 - Checking parking brake operation and parking brake indicator light system operation; determine necessary action.
24. Check operation of brake stop light system.
25. Replace wheel bearing and race.

Electronic Brakes, and Traction and Stability Control Systems

26. Identify traction control/vehicle stability control system components.
 - Describing the operation of a regenerative braking system.

ELECTRICAL/ELECTRONIC SYSTEMS

27. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins as related to electrical/electronic systems.
 - Demonstrate knowledge of electrical/electronic series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
 - Use wiring diagrams to trace electrical/electronic circuits.

28. Demonstrate proper use of a digital multimeter (DMM) when measuring source voltage, voltage drop (including grounds), current flow, and resistance.
 - Check operation of electrical circuits with a test light
 - Check operation of electrical circuits with fused jumper wires
29. Demonstrate knowledge of the causes and effects from shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
30. Measure key-off battery drain (parasitic draw).
31. Inspect and test fusible links, circuit breakers, and fuses; determine necessary action.
32. Perform solder repair of electrical wiring.
 - Replace electrical connectors and terminal ends.

Battery Service

33. Perform battery state-of-charge test; determine necessary action.
 - Confirm proper battery capacity for vehicle application; perform battery capacity test; determine necessary action.
34. Maintain or restore electronic memory functions.
35. Inspect and clean battery; fill battery cells; check battery cables, connectors, clamps, and hold-downs.
36. Perform slow/fast battery charge according to manufacturer's recommendations.
37. Jump-start vehicle using jumper cables and a booster battery or an auxiliary power supply.
38. Identify high-voltage circuits of electric or hybrid electric vehicle and related safety precautions.
39. Identify electronic modules, security systems, radios, and other accessories that require re-initialization or code entry after reconnecting vehicle battery.
40. Identify hybrid vehicle auxiliary (12v) battery service, repair, and test procedures.

Maintenance and Light Repair D

Maintenance and Light Repair (MLR) D is a one-credit course that provides students with a foundational knowledge and skills regarding Safety, Engine Performance, Electrical/Electronics, and Heating and Air Conditioning. Upon successful completion of the course, students are able to diagnose and repair engine performance related systems. This course incorporates all personal and environmental safety practices associated with clothing, eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

MLR A, B, C, & D comprehensively meet the requirements for the National Automotive Technicians Education Foundation (NATEF) MLR accreditation and prepare students for the Automotive Service Excellence (ASE) student credential. These courses may be taken in any order without prerequisite. The content standards, task lists, tools and equipment, program hours, and safety standards must meet NATEF requirements.

Career and technical student organizations are integral, co-curricular components of each career and technical education course. These organizations serve as a means to enhance classroom instruction while helping students develop leadership abilities, expand workplace-readiness skills, and broaden opportunities for personal and professional growth.

Safety

Students will:

1. Identify general shop safety rules and procedures related to engine performance, heating and air conditioning, and electrical/electronics.
 - Utilizing safe procedures for handling of tools and equipment
 - Identifying and proper placement of floor jacks and jack stands
 - Identifying and proper procedures for safe lift operation use
 - Utilizing proper ventilation procedures for working within the lab/shop area
 - Identifying marked safety areas
 - Identifying the location and the types of fire extinguishers and other fire safety equipment; demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment
 - Identify the location and use of eye wash stations
 - Identifying the location of the posted evacuation routes
 - Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities
 - Identifying and wearing appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities
 - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits
 - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
 - Locating and demonstrate knowledge of material safety data sheets (MSDS)

Automotive Service Tools

2. Identify tools and their usage in automotive applications.
 - Identifying standard and metric designation
 - Demonstrating proper cleaning, storage, and maintenance of tools and equipment
 - Demonstrating proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper)

Customer Service/Care

3. Identify information needed and the service requested on a repair order.
 - Researching applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins
 - Completing work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction
 - Identifying purpose and demonstrate proper use of fender covers, mats
 - Demonstrating use of the three C's (concern, cause, and correction)
 - Ensuring vehicle is prepared to return to customer per school/company policy (floor mats, steering wheel cover, etc.)

ELECTRICAL/ELECTRONIC SYSTEMS

Starting System

4. Perform starter current draw test; determine necessary action.
 - Performing starter circuit voltage drop tests; determine necessary action.
 - Inspecting and testing starter relays and solenoids; determine necessary action.
5. Remove and install starter in a vehicle.
6. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action.

Charging System

7. Perform charging system output test; determine necessary action.
 - Performing charging circuit voltage drop tests; determine necessary action
8. Inspect, adjust, or replace generator (alternator) drive belts; check pulleys and tensioners for wear; check pulley and belt alignment.
9. Remove, inspect, and re-install generator (alternator).

Lighting Systems

10. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights (fog lights/driving lights); replace as needed.
 - Aim headlights.

- Identify system voltage and safety precautions associated with high-intensity discharge headlights.

Accessories

11. Disable and enable airbag system for vehicle service; verify indicator lamp operation.
12. Remove and reinstall door panel.
13. Describe the operation of keyless entry/remote-start systems.
14. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators.
15. Verify windshield wiper and washer operation; replace wiper blades.

HEATING AND AIR CONDITIONING

16. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.

Refrigeration System Components

17. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
18. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.
19. Inspect A/C condenser for airflow restrictions; determine necessary action.

Heating, Ventilation, and Engine Cooling Systems

20. Inspect engine cooling and heater systems hoses; perform necessary action.

Operating Systems and Related Controls

21. Inspect A/C-heater ducts, doors, hoses, cabin filters, and outlets; perform necessary action.
 - Identify the source of A/C system odors.

ENGINE PERFORMANCE

22. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins related to engine performance.
23. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action
24. Perform cylinder power balance test; determine necessary action.
25. Perform cylinder cranking and running compression tests; determine necessary action.
26. Perform cylinder leakage test; determine necessary action.

27. Verify engine operating temperature.
28. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

Computerized Engine Controls

29. Retrieve and record diagnostic trouble codes, OBD monitor status, and freeze frame data; clear codes when applicable.
 - Describing the importance of operating all OBDII monitors for repair verification

Fuel, Air Induction, and Exhaust Systems

30. Replace fuel filter(s).
31. Inspect, service, or replace air filters, filter housings, and intake duct work.
32. Inspect integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shields; determine necessary action.
 - Inspecting condition of exhaust system hangers, brackets, clamps, and heat shields; repair or replace as needed
33. Check and refill diesel exhaust fluid (DEF).

Emissions Control Systems

34. Inspect, test, and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action.

Master Automobile Service Technology

Master Automobile Service Technology (MAST) is a one-credit course that provides students with a mastery knowledge and skills regarding Safety, Automatic Transmission and Transaxle, Manual Drive Train and Axles, Suspension and Steering, Brakes, Engine Repair, Engine Performance, Electrical/Electronics, and Heating and Air Conditioning. Upon successful completion of the course, students are able to diagnose and repair engine performance related systems. This course incorporates all personal and environmental safety practices associated with clothing, eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals and materials in accordance with local, state, and federal safety and environmental regulations.

MAST meets the requirements for the National Automotive Technicians Education Foundation (NATEF) MAST accreditation and prepare students for the Automotive Service Excellence (ASE) student credential. The prerequisite for MAST completion of Maintenance and Light Repair A, B, C, and D and Automotive Service Technology A, B, C, and D. The content standards, task lists, tools and equipment, program hours, and safety standards must meet NATEF requirements.

Career and technical student organizations are integral, co-curricular components of each career and technical education course. These organizations serve as a means to enhance classroom instruction while helping students develop leadership abilities, expand workplace-readiness skills, and broaden opportunities for personal and professional growth.

Safety

Students will:

1. Identify general shop safety rules and procedures.
 - Utilizing safe procedures for handling of tools and equipment
 - Identifying and proper placement of floor jacks and jack stands
 - Identifying and proper procedures for safe lift operation use
 - Utilizing proper ventilation procedures for working within the lab/shop area
 - Identifying marked safety areas
 - Identifying the location and the types of fire extinguishers and other fire safety equipment; demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment
 - Identify the location and use of eye wash stations
 - Identifying the location of the posted evacuation routes
 - Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities
 - Identifying and wearing appropriate clothing for lab/shop activities. Secure hair and jewelry for lab/shop activities
 - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits
 - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.)
 - Locating and demonstrate knowledge of material safety data sheets (MSDS)

AUTOMATIC TRANSMISSION AND TRANSAXLE

General: Transmission and Transaxle Diagnosis

2. Perform pressure tests (including transmissions/transaxles equipped with electronic pressure control); determine necessary action.
3. Diagnose noise and vibration concerns; determine necessary action.
4. Diagnose electronic transmission/transaxle control systems using appropriate test equipment and service information.

MANUAL DRIVE TRAIN AND AXLES

Transmission/Transaxle Diagnosis and Repair

5. Diagnose noise concerns through the application of transmission/transaxle power flow principles.
6. Diagnose hard shifting and jumping out of gear concerns; determine necessary action.
7. Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action.

Drive Axle Diagnosis and Repair

8. Diagnose noise and vibration concerns; determine necessary action.

Limited Slip Differential

9. Diagnose noise, slippage, and chatter concerns; determine necessary action.

Drive Axles

10. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage.

Four-wheel Drive/All-wheel Drive Component Diagnosis and Repair

11. Diagnose noise, vibration, and unusual steering concerns; determine necessary action.
12. Diagnose, test, adjust, and replace electrical/electronic components of four-wheel drive systems.

SUSPENSION AND STEERING

General: Suspension and Steering Systems

13. Identify and interpret suspension and steering system concerns; determine necessary action.

Steering Systems Diagnosis and Repair

14. Test and diagnose components of electronically-controlled steering systems using a scan tool; determine necessary action.

BRAKES

Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

15. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine necessary action.
16. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action.
17. Depressurize high-pressure components of an electronic brake control system.
18. Bleed the electronic brake control system hydraulic circuits.
19. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).
20. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). P-3

ELECTRICAL/ELECTRONIC SYSTEMS

General: Electrical System Diagnosis

21. Check electrical/electronic circuit waveforms; interpret readings and determine needed repairs.
22. Repair wiring harness (including CAN/BUS systems).

Accessories Diagnosis and Repair

23. Diagnose (troubleshoot) radio static and weak, intermittent, or no radio reception; determine necessary action.
24. Diagnose (troubleshoot) body electronic system circuits using a scan tool; determine necessary action.
25. Diagnose the cause(s) of false, intermittent, or no operation of anti-theft systems.
26. Perform software transfers, software updates, or flash reprogramming on electronic modules.

HEATING AND AIR CONDITIONING

Heating, Ventilation, and Engine Cooling Systems Diagnosis and Repair

27. Diagnose temperature control problems in the heater/ventilation system; determine necessary action.

ENGINE PERFORMANCE

Computerized Engine Controls Diagnosis and Repair

28. Diagnose the causes of emissions or driveability concerns with stored or active diagnostic trouble codes; obtain, graph, and interpret scan tool data.
29. Diagnose emissions or driveability concerns without stored diagnostic trouble codes; determine necessary action.
30. Inspect and test computerized engine control system sensors, powertrain/engine control module (PCM/ECM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action.
31. Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM installed accessories, or similar systems); determine necessary action.

ENGINE PERFORMANCE

Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

32. Diagnose (troubleshoot) hot or cold no-starting, hard starting, poor drivability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems; determine necessary action.

Emissions Control Systems Diagnosis and Repair

33. Diagnose emissions and drivability concerns caused by the secondary air injection and catalytic converter systems; determine necessary action.
34. Diagnose emissions and drivability concerns caused by the evaporative emissions control system; determine necessary action.
35. Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action.