Automotive Technician (NATEF)

Level I &II

Program Description: The Automotive Technology program incorporates the Automotive Service Excellence (ASE) program certification standards and the National Automotive Technicians Education Foundation (NATEF) standards. The program consists of four main focus areas: Suspension and Steering, Brakes, Electrical/Electronic Systems and Engine Performance. Each course is aligned to Industry requirements for certification and success in the automotive field. All students are required to pass the Safety Pollution Prevention (SP2) exam prior to working in the automotive lab. Students are required to wear uniform and protective equipment as required in the automotive industry. Students must comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, proper ventilation and the handling/storage and disposal of chemicals in accordance with local, state and federal safety and environmental regulations.

Level I: Introduction to Automotive Technology

Course Objective: Students will be introduced to the various aspects of the automotive industry and two of the main systems of an automobile. The focus of this course will be on safety, basic theory, shop operations, brakes, manual transmissions, automatic transmissions, and steering and suspension.

Unit 1: Safety

Unit Competencies:

1. Identify general shop safety rules and procedures.
2. Utilize safe procedures for handling of tools and equipment.
3. Identify and use proper placement of floor jacks and jack stands.
4. Identify and use proper procedures for safe lift operation.
5. Utilize proper ventilation procedures for working within the lab/shop area.
6. Identify marked safety areas.
7. Identify the location and the types of fire extinguishers and other fire safety equipment; demonstrate knowledge of the pro
8. Identify the location and use of eye wash stations.
9. Identify the location of the posted evacuation routes.
10. Comply with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
11. Identify and wear appropriate clothing for lab/shop activities.
12. Secure hair and jewelry for lab/shop activities.
13. Demonstrate awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, a
14. Demonstrate awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignitio
15. Locate and demonstrate knowledge of material safety data sheets (MSDS).

Unit 2: Tools and equipment

Unit Competencies:

1. Identify tools and their usage in automotive applications.
2. Identify standard and metric designation.
3. Demonstrate safe handling and use of appropriate tools.
4. Demonstrate proper cleaning, storage, and maintenance of tools and equipment.
5. Demonstrate proper use of precision measuring tools (i.e. micrometer, dial-indicator, dial-caliper).

Unit 3: Preparing Vehicle for Service

Unit Competencies:

1. Identify information needed and the service requested on a repair order.
2. Identify purpose and demonstrate proper use of fender covers, mats.
3. Demonstrate use of the three C's (concern, cause, and correction).
4. Review vehicle service history.
5. Complete work order to include customer information, vehicle identifying information, customer concern, related service h

Unit 4: Employability

Unit Competencies:

1. Reports to work daily on time; able to take directions and motivated to accomplish the task at hand.
2. Dresses appropriately and uses language and manners suitable for the workplace.
3. Maintains appropriate personal hygiene
4. Meets and maintains employment eligibility criteria, such as drug/alcohol-free status, clean driving record, etc.
5. Demonstrates honesty, integrity and reliability
6. Complies with workplace policies/laws
7. Contributes to the success of the team, assists others and requests help when needed.
8. Works well with all customers and coworkers.
9. Negotiates solutions to interpersonal and workplace conflicts.
10. Contributes ideas and initiative
11. Follows directions
12. Communicates (written and verbal) effectively with customers and coworkers.
13. Reads and interprets workplace documents; writes clearly and concisely.
14. Analyzes and resolves problems that arise in completing assigned tasks.
15. Organizes and implements a productive plan of work.
16. Uses scientific, technical, engineering and mathematics principles and reasoning to accomplish assigned tasks
17. Identifies and addresses the needs of all customers, providing helpful, courteous and knowledgeable service and

Unit 5: Steering and Suspension

Unit Competencies:

A. General Suspension and Steering Systems Diagnosis

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

B. Steering Systems Diagnosis and Repair

1. Disable and enable supplemental restraint system (SRS).
2. Remove and replace steering wheel; center/time supplemental restraint system (SRS) coil (clock spring).
3. Diagnose steering column noises, looseness, and binding concerns and determine necessary action.
4. Diagnose power steering gear rack and pinion/non rack and pinion binding, uneven turning effort, looseness, hard steering, and noise concerns and determine necessary action.
5. Inspect steering shaft universal-joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel and perform necessary action.
6. Remove and replace rack and pinion steering gear; inspect mounting bushings and brackets.
7. Inspect and replace rack and pinion gear inner tie rod ends and bellows boots.
8. Determine power steering fluid type; inspect fluid level and condition.
9. Flush and fill power steering system.
10. Diagnose power steering fluid leakage and determine necessary action.
11. Remove, inspect, replace and adjust power steering pump belt.
12. Inspect and replace power steering hoses and fittings.
13. Inspect and replace pitman arm, relay rod, idler arm and mountings and steering linkage damper.
14. Inspect, replace, and adjust tie rod ends, tie rod sleeves, and clamps.
15. Inspect and test electric power assist steering.
16. Identify hybrid vehicle power steering system electrical circuits, service and safety precautions.

C. Suspension System Diagnosis and Repair

1. Diagnose short and long arm system noises, body sway and uneven ride height concerns, and determine necessary action.
2. Diagnose strut suspension system noises, body sway and uneven ride height concerns and determine necessary action.
3. Remove, inspect and install strut rod bushings.
4. Remove, inspect and install upper and /or lower ball joints.
5. Remove, inspect and install steering knuckle assemblies.
6. Remove, inspect, and install short and long arm coil springs and spring insulators.
7. Remove, inspect and install stabilizer bar bushings, brackets and links.
8. Remove, inspect and install and adjust suspension system torsion bars; inspect mounts.
9. Remove, inspect and install strut cartridge or assembly, strut coil spring, insulators, and upper strut bearing mount.

D. Related Suspension and Steering Service

1. Inspect, remove and replace shock absorbers.
2. Remove, inspect and service or replace front and rear wheel bearings.
3. Describe the function of the idle speed compensation switch.
4. Lubricate a suspension and steering system.

E. Wheel Alignment Diagnosis, Adjustment and Repair

1. Diagnose vehicle wander, drift, pull, hard steering, bump steer.

2. Perform pre-alignment inspection and measure vehicle ride height and determine necessary action.
3. Prepare vehicle for wheel alignment on the alignment machine; perform four wheel alignments by checking and adjusting front and rear wheel caster, camber and toe as required; center steering wheel.
4. Check toe-out-toe-on-turns and determine necessary action.
5. Check steering axis inclination (SAI) and included angle and determine appropriate action.
6. Check rear wheel thrust angle and determine necessary action.
7. Check for front wheel set back and determine necessary action.
8. Check front and/ or rear cradle alignment and determine necessary action.

F. Wheel and Tire Diagnosis and Repair

1. Inspect tire condition, identify tire wear patterns, check and adjust air pressure and determine necessary action.
2. Diagnose wheel/tire vibration, shimmy, and noise and determine necessary action.
3. Rotate tires according to manufacturer's recommendations.
4. Diagnose tire pull problems and determine necessary action.
5. Dismount, inspect, and remount tire on wheel; balance wheel and tire assembly.
6. Dismount, inspect and remount tire on wheel equipped with tire pressure monitoring system.
7. Reinstall wheel and torque lug nuts.
8. Inspect tire and wheel assembly for air loss and perform necessary action.
9. Repair tire using internal patch.
10. Inspect, diagnose, and calibrate tire pressure monitoring system.

Unit 6: Brakes

Unit Competencies:

A. General Brake System Diagnosis

1. Describe procedure for performing a road test to check brake system operation; including an anti-lock brake system (ABS).
2. Identify and interpret brake system concerns and determine necessary action.
3. Research applicable vehicle and service information such as brake system operation, vehicle service history, service precautions and technical service bulletins.
4. Install wheel and torque lug nuts.

B. Hydraulic System Diagnosis and Repair

1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).
2. Measure break pedal height, travel, and free play and determine necessary action.
3. Check master cylinder for internal/external leaks and proper operation and determine necessary action.
4. Remove, bench bleed, and reinstall master cylinder.
5. Diagnose poor stopping, pulling or grabbing concerns caused by malfunctions in the hydraulic system and determine appropriate action.
6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings supports and determine necessary action.
7. Replace brake lines, hoses, fittings and supports.
8. Fabricate brake lines using proper material and flaring procedures.
9. Select, handle, store and fill brake fluids to proper level.
10. Inspect, test and/or replace metering, proportioning, pressure differential and combination valves.

11. Inspect, test and/or replace components of the brake warning light system.
12. Bleed and/or flush brake system.
13. Test brake fluid for contamination.

C. Drum Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsations concerns and determine necessary action
2. Remove, clean, inspect and measure brake drums and determine necessary action
3. Refinish brake drum; measure final diameter.
4. Remove, clean and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters and other related brake hardware, and backing support plates; lubricate and reassemble.
5. Pre-adjust brake shoes and parking brake; install brake drums or brake/hub assemblies and wheel bearings.
6. Install wheel, torque lug nuts, and make final checks and adjustments.

D. Disc Brake Diagnosis and Repair

1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsations concerns and determine necessary action.
2. Remove caliper assembly; inspect for leaks and damage to caliper housing and determine necessary action.
3. Clean and inspect caliper mounting and slides/pins for operation, wear, and damage and determine necessary action.
4. Remove, inspect and replace pads and retaining hardware and determine necessary action.
5. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
6. Clean, inspect, and measure rotor thickness, lateral run-out and thickness variation and determine necessary action.
7. Remove and install rotor.
8. Refinish rotor on/off vehicle and measure rotor final thickness.
9. Retract caliper piston on an integrated parking brake system.
10. Install wheel torque lug nuts and make final checks and adjustments.
11. Check brake pad wear indicator system operation and determine necessary action.
12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.

E. Power Assist Units Diagnosis and Repair

1. Check pedal free travel; check power assist operation.
2. Check vacuum supply to vacuum-type power booster.
3. Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation and determine necessary action.
4. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine necessary action.

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

1. Diagnose wheel bearing noises, wheel shimmy and vibration concerns and determine necessary action.
2. Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearing.

3. Check parking brake components and cables for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.
4. Check parking brake indicator light system operation and determine necessary action.
5. Inspect and replace wheel studs.
6. Replace wheel bearing and race.
7. Inspect and replace wheel studs.
8. Remove and reinstall sealed wheel bearing assembly.

G. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

1. Identify and inspect electronic brake control system components and determine necessary action.
2. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with electronic brake control system and determine appropriate action.
3. Diagnose electronic brake control system electronic control and components by retrieving diagnostic trouble codes, and/or using recommended test equipment and determine necessary action.
4. Depressurize high-pressure components of the electronic brake control system.
5. Bleed the electronic brake control system hydraulic circuits.
6. Test, diagnose, and service electronic brake control system speed sensors, toothed ring, and circuits using a graphic multimeter (GMM)/digital storage oscilloscope (DSO).
7. Diagnose electronic brake control system braking concerns caused by vehicle modifications.
8. Identify traction control/vehicle stability control system component.

Unit 7: Manual Transmission

A. General

1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins.
2. Drain and refill manual transmission/transaxle and final drive unit.
3. Check fluid condition; check for leaks.

B. Clutch

1. Check and adjust clutch master cylinder fluid level.
2. Check for system leaks.

C. Transmission/transaxle

1. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle.

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

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

E. Differential Case Assembly

1. Clean and inspect differential housing; check for leaks; inspect housing vent.
2. Check and adjust differential housing fluid level.
3. Drain and refill differential housing.

F. Four-wheel drive/ All-wheel drive

1. Inspect front-wheel bearings and locking hubs.
2. Check for leaks at drive assembly seals; check vents; check lube level.

Unit 8: Automatic Transmission

A. General

1. Research applicable vehicle and service information, fluid type, vehicle service history, service precautions, and technical service bulletins**.**
2. Check fluid level in a transmission or a transaxle equipped with a dip-stick.
3. Check fluid level in a transmission or a transaxle not equipped with a dip-stick.

4. Check transmission fluid condition; check for leaks.

B. In-Vehicle Transmission/Transaxle

1. Inspect, adjust, and replace external manual valve shift linkage, transmission range sensor/switch, and park/neutral position switch.
2. Inspect for leakage at external seals, gaskets, and bushings.
3. Inspect replace and align power train mounts.
4. Drain and replace fluid and filter(s).

C. Off-Vehicle Transmission and Transaxle

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

Level II: Review of Safety and Environmental Regulations (SP2), Electrical/Electronic Systems and Engine Performance

Unit 1: Employability

Unit Competencies

1. Properly fill out a job application
2. Properly prepare a professional resume.
3. Prepare to set for a job interview

Unit 2: Electrical/Electronic Systems

Unit Competencies:

A. General Electrical Systems Diagnosis

1. Correctly complete a work order.
2. Identify and interpret electrical/electronic system concerns and determine necessary action.
3. Research applicable service information; locate and interpret identification numbers, certification and calibraion decals.
4. Diagnose electrical/electronic integrity of ciurcuits using principles of electricity and wiring diagrams.
5. Demonstrate proper use of a digital multimeter during electrical circuit diagnosis.
6. Check and measure electrical circuits using a test light,voltmeter, ammeter, and ohmmeter and determine necessary action.
7. Check electrical circuits using fused jumper wires; inspect and test fusible links, circuti brekers, and fuses and determine necessary action.
8. Locate shorts, grounds, opens, resistance problems, and parastitic draw in switches, connectors, relays, solid-state devices, and wires.
9. Remove, repair and replace wiring harnesses, conncectors and terminal ends; perform solder repair of electrical wiring.
10. Identify location of hybrid vehicle service plug; identify hybrid vehicle safey procedures.

B. Battery Diagnosis and Service

1. Perform state-of-charge and capacity test or conductance test; confirm proper battery capacity for application.
2. Maintain or restore electronic memory functions.
3. Inspect, clean, fill, replace and charge battery.
4. Inspect, clean, and secure cables, connectors, clamps, and hold-downs; repair or replace as needed.
5. Start a vehicle using jumper cables and a battery or an auxiliary power supply.
6. Identify electronic modules, security system and radios requiring reinitialization or code entry after battery disconnect.

7. Identify high voltage circuits of electric or hybrid electric vehicles and service precautions.
8. Identify hybrid vehicle auxiliary battery service, repair, and test procedures.

C. Starting System Diagnosis and Repair

1. Perform starter current draw and circuit voltage drop tests and determine necessary action.
2. Inspect and test starter components, relays and solenoids and determine necessary action.
3. Remove and install starter.
4. Differentiate between electrical and engine mechanical problems that cause slow-crank or no-crank.

D. Charging System Diagnosis and Repair

1. Perform charging system tests; determine necessary action.
2. Remove, inspect, adjust and install the generator and components.

E. Lighting Systems Diagnosis and Repair

1. Diagnose lighting system problems and determine necessary action.
2. Inspect, replace, and aim headlights and bulbs.
3. Inspect and diagnose turn signal and hazard light operation and perform necessary action.
4. Identify system voltage and safety precautions for high-intensity discharge headlights.

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

1. Inspect and test gauges, sending units, connectors, sensors, wires, and printed circuit boards and determine necessary action.
2. Diagnose cause of incorrect operation of warning devices and other driver information systems and determine necessary action.

G. Horn and Wiper/Washer Diagnosis and Repair

1. Diagnose incorrect horn operation and perform necessary action.
2. Diagnose incorrect wiper/washer operation and perform necessary action.

H. Accessories Diagnosis and Repair

1. Diagnose and repair motor-driven accessory circuits, heated accessories, electric locks, cruise control, radios, body electronics, communication systems, and anti-theft systems.
2. Diagnose supplemental restraint system concerns and determine appropriate action.
3. Disarm and enable air bag system for vehicle service.
4. Remove and install door panel.
5. Check for module communication errors using a scan tool.

Unit 3: Engine Performance

Unit Competencies:

A. General Engine Diagnosis

1. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
2. Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.
3. Perform cylinder power balance test; determine necessary action.
4. Perform cylinder cranking and running compression tests; determine necessary action.
5. Verify engine operating temperature.

6. Perform cylinder leakage test; determine necessary action.
7. Remove and replace spark plugs; inspect secondary ignition components for wear and damage.

B. Computerized Engine Controls Diagnosis and Repair

1. Retrieve, record and clear stored diagnostic trouble codes.
2. Describe the importance of operating all OBDII monitors for repair verification.

C. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

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

D. Emissions Control Systems Diagnosis and Repair.

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

Unit 4: Engine Repair

A. General

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

B. Cylinder Head and Valve Train

1. Adjust valves (mechanical or hydraulic lifters).

C. Lubrication and Cooling Systems

1. 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 and galley plugs; determine necessary action.
2. Inspect, replace, and adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.
3. Remove, inspect, and replace thermostat and gasket/seal.
4. Inspect and test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.
5. Perform engine oil and filter change.

Unit 5: Heating and Air Conditioning

A. General

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

B. Refrigeration System Components

1. Inspect and replace A/C compressor drive belts, pulleys, and tensioners; determine necessary action.
2. Identify hybrid vehicle A/C system electrical circuits and the service/safety precautions.

3. Inspect A/C condenser for airflow restrictions; determine necessary action.

C. Heating, Ventilation, and Engine Cooling Systems

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

D. Operating Systems and Related Controls

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

Certifications Offered:

NA3SA Certification (Steering and Suspension, Brakes, Electrical/Electronic Systems, Engine Performance)

Articulation Agreements: