Mechanical and Electrical Components

Course Information

Developers: Automotive Collision and Repair State Curriculum Committee


Development Date: 01/29/2014

KBOR Facilitators: Shirley Antes/ April Henry

Credit Hours: 3

Description:

Through classroom and/or lab/shop learning and assessment activities, in this course students will: determine how to diagnose steering and suspension; diagnose electrical concerns; complete headlamp and fog/driving lamp assemblies and repairs; demonstrate self-grounding procedures for handling electronic components; determine diagnosis, inspection and service needs for brake system hydraulic components; examine components of heating and air conditioning systems; determine the inspection, service and repair needs for collision damaged cooling system components; distinguish between the under car components and systems; and determine the diagnosis, inspection and service requirements of active and passive restraint systems.

Exit Learning Outcomes

Program Outcomes

A Analyze automotive structural damage and repair requirements
B Analyze automotive non-structural damage and repair requirements
C Diagnose and repair collision-damaged mechanical and electrical components
D Demonstrate automobile painting and refinishing skills
E Demonstrate safe working habits and procedures within an auto collision/repair facility

External Standards

by meeting any institution-required NATEF Tasks from the criteria outlined below. NATEF Guidelines of: 95% of HP-I items must be taught in the curriculum; 90% of HP-G items must be taught in the curriculum
Competencies

Determine how to diagnose steering and suspension

Properties
Domain: Cognitive   Level: Application

Linked External Standards
3.A Suspension and Steering
DAM03: Mechanical Systems Analysis
DAM06: Steering And Suspension Damage Analysis
STE01: Tires And Wheels
STE02: Suspension Systems
STE03: Rack And Pinion And Parallelogram Steering Systems

You will demonstrate your competence:
- in the classroom or classroom shop setting

Your performance will be successful when:
- 3.A.1 Identify one time use fasteners. HP-I
- 3.A.2 Remove, replace, inspect or adjust power steering pump, pulleys, belts, hoses, fittings and pump mounts. HP-G
- 3.A.5 Inspect and adjust (where applicable) steering linkage geometry (attitude/parallelism). HP-G
- 3.A.6 Inspect and replace pitman arm. HP-G
- 3.A.7 Inspect and replace relay (center link/intermediate) rod. HP-G
- 3.A.8 Inspect, remove and replace idler arm and mountings. HP-G
- 3.A.9 Inspect, remove and replace tie rod sleeves, clamps, and tie rod ends. HP-G
- 3.A.10 Inspect, remove and replace steering linkage damper. HP-G
- 3.A.11 Inspect, remove and replace upper and lower control arms. HP-G
- 3.A.12 Inspect, remove and replace upper and lower control arm bushings, shafts, and rebound bumpers. HP-G
- 3.A.13 Inspect, remove and replace upper and lower ball joints. HP-G
- 3.A.14 Inspect, remove and replace steering knuckle/spindle/hub assemblies (including bearings, races, seals, etc.). HP-G
- 3.A.15 Inspect, remove and replace front suspension system coil springs and spring
insulators (silencers). HP-G
3.A.16 Inspect, remove, replace, and adjust suspension system torsion bars, and inspect mounts. HP-G
3.A.17 Inspect, remove and replace stabilizer bar bushings, brackets, and links. HP-G
3.A.18 Inspect, remove and replace MacPherson strut cartridge or assembly, upper bearing, and mount. HP-G
3.A.19 Inspect, remove, and replace rear suspension system transverse links, control arms, stabilizer bars, bushings, and mounts. HP-G
3.A.20 Inspect, remove, and replace suspension system leaf spring(s), leaf spring insulators (silencers), shackles, brackets, bushings, and mounts. HP-G
3.A.21 Inspect axle assembly for damage and misalignment. HP-G
3.A.22 Inspect, remove and replace shock absorbers. HP-G
3.A.23 Diagnose, inspect, adjust, repair or replace active suspension systems and associated lines and fittings. HP-G
3.A.25 Inspect, remove, replace, and align front and rear frame (cradles/sub). HP-G
3.A.27 Inspect, remove and replace steering shaft U-joint(s), flexible coupling(s), collapsible columns, and steering wheels. HP-G
3.A.38 Identify toe-out-on-turns (turning radius) related problems; determine needed repairs. HP-I
3.A.40 Identify thrust angle related problems; determine needed repairs. HP-I
3.A.41 Check for front wheel setback; determine needed repairs. HP-I
3.A.43 Inspect tires, identify direction of rotation and location; check and adjust air pressure. HP-I
3.A.39 Identify SAI (steering axis inclination), included angle, and KPI (king pin inclination) related problems; determine needed repairs. HP-I
3.A.47 Reinstall wheels and torque lug nuts. HP-I

Diagnose electrical concerns

Properties
Domain: Cognitive  Level: Analysis

Linked External Standards
3.B Electrical
DAM03: Mechanical Systems Analysis
DAM04: Restraints, Interior, Glass, Side And Rear Impact Analysis
ELE01: Electrical Circuits And DVOM Usage
ELE02: Diagnosis, Testing, And Repair Of Common Electrical Loads
PWR01: Power Accessories
LSC01: Lighting, Starting, And Charging Systems

You will demonstrate your competence:

in the classroom or classroom shop setting

Your performance will be successful when:

3.B.6 Inspect, clean, and replace battery. HP-I
3.B.3 Inspect, test, and replace fusible links, circuit breakers, and fuses. HP-I
3.B.8 Perform slow/fast battery charge. HP-I
3.B.12 Check operation of exterior lighting; determine needed repairs. HP-I
3.B.18 Inspect, remove and replace power seat, motors, linkages, cables, etc. HP-G
3.B.19 Inspect, remove and replace components of electric door and hatch/trunk lock. HP-G
3.B.20 Inspect, remove and replace components of keyless lock/unlock devices and alarm systems. HP-G
3.B.21 Inspect, remove and replace components of electrical sunroof and convertible top. HP-G
3.B.7 Dispose of batteries and battery acid according to local, state, and federal requirements. HP-G

**Complete headlamp and fog/driving lamp assemblies and repairs**

*Properties*
- Domain: Cognitive  
- Level: Application

*Linked External Standards*
- 3.B Electrical
- LSC01: Lighting, Starting, And Charging Systems

**You will demonstrate your competence:**
- in the classroom or classroom shop setting

**Your performance will be successful when:**
- 3.B.13 Aim headlamp assemblies and fog/driving lamps; determine needed repairs. HP-I

**Demonstrate self-grounding procedures for handling electronic components**

*Properties*
- Domain: Cognitive  
- Level: Application

*Linked External Standards*
- 3.B Electrical
- ELE02: Diagnosis, Testing, And Repair Of Common Electrical Loads

**You will demonstrate your competence:**
- in the classroom or classroom shop setting

**Your performance will be successful when:**
- 3.B.24 Demonstrate the proper self-grounding procedures for handling electronic components. HP-I

**Determine diagnosis, inspection and service needs for brake system hydraulic components**

*Properties*
- Domain: Cognitive  
- Level: Application

*Linked External Standards*
- 3.C Brakes
- BRA01: Brakes
- STE01: Tires And Wheels
- ABR01: Anti-Lock Brakes And Traction Control Systems
You will demonstrate your competence:
- in the classroom or classroom shop setting

Your performance will be successful when:
- 3.C.3 Identify, handle, store, and install appropriate brake fluids; dispose of in accordance with federal, state, and local regulations. HP-G
- 3.C.7 Reinstall wheel and torque lug nuts. HP-I
- 3.C.10 Check parking brake system operation. HP-I
- 3.C.13 Identify the proper procedures for handling brake dust. HP-G
- 3.C.14 Check for bent or damaged brake system components. HP-G

Examine components of heating and air conditioning systems

Properties
- Domain: Cognitive  Level: Application

Linked External Standards
- 3.D Heating and Air Conditioning
  WKR01: Hazardous Materials, Personal Safety, And Refinish Safety
  AIR01: Air Conditioning
  HEA01: Heating And Cooling Systems

You will demonstrate your competence:
- in the classroom or classroom shop setting

Your performance will be successful when:
- 3.D.1 Identify and comply with environmental concerns relating to refrigerants and coolants. HP-G
- 3.D.3 Locate and identify A/C system service ports. HP-I

Determine the inspection, service and repair needs for collision damaged cooling system components

Properties
- Domain: Cognitive  Level: Application

Linked External Standards
- 3.E Cooling Systems
  DAM03: Mechanical Systems Analysis
  HEA01: Heating And Cooling Systems

You will demonstrate your competence:
- in the classroom or classroom shop setting

Your performance will be successful when:
- 3.E.1 Check engine cooling and heater system hoses and belts; determine needed repairs. HP-I
- 3.E.2 Inspect, test, remove, and replace radiator, pressure cap, coolant recovery system, and water pump. HP-G

Distinguish between the under car components and systems

Properties
- Domain: Cognitive  Level: Analysis
Linked External Standards
3.F Drive Train
3.G Fuel, Intake and Exhaust Systems
DAM03: Mechanical Systems Analysis
DRT01: Drivetrains And Engine Mounts

You will demonstrate your competence:
- in the classroom or classroom shop setting

Your performance will be successful when:
- 3.F.7 Inspect, remove and replace drive shafts and universal joints. HP-G
- 3.F.6 Inspect, remove and replace half shafts and axle constant velocity (CV) joints. HP-G
- 3.G.1 Inspect, remove and replace exhaust pipes, mufflers, converters, resonators, tail pipes, and heat shields. HP-G
- 3.G.2 Inspect, remove and replace fuel tank, fuel tank filter, fuel cap, fuel filler hose, and inertia switch; inspect and replace fuel lines and hoses; check fuel for contaminants. HP-G

Determine the diagnosis, inspection and service requirements of active and passive restraint systems

Properties
Domain: Cognitive  Level: Application

Linked External Standards
3.H Restraint Systems
DAM04: Restraints, Interior, Glass, Side And Rear Impact Analysis
RES01: Restraints
RES02: Advanced Restraint Systems

You will demonstrate your competence:
- in the classroom or classroom shop setting

Your performance will be successful when:
- 3.H.2 Inspect, remove, and replace seatbelt and shoulder harness assembly and components. HP-G
- 3.H.3 Inspect restraint system mounting areas for damage; repair as needed. HP-G
- 3.H.4 Verify proper operation of seatbelt. HP-G
- 3.H.6 Inspect, remove and replace Supplemental Restraint Systems (SRS) sensors and wiring; ensure sensor orientation. HP-G
- 3.H.7 Verify that Supplemental Restraint System (SRS) is operational. HP-I