Mechanical and Electrical Components

Course Information

Developers: Automotive Collision and Repair State Curriculum Committee

Roberto Rodriguez, Butler County Community College, Donnie Smith, Butler County Community College, Cindy Harrold, Coffeyville Community College, Hal Daniels, Coffeyville Community College, Randy Culbertson, Highland Community College, Richard Gravelle, Kansas City KS Community College, Linn Schroll, Manhattan Area Technical College, Corey Isbell, North Central KS Technical College, Dave Engel, North Central KS Technical College, Brenda Chatfield, Northwest KS Technical College, Levi Houston, Northwest KS Technical College, Richard Fairchild, Salina Area Technical College, Sergio Correa, Salina Area Technical College, David Ratzlaff, Seward Community College, Larry McLemore, Seward Community College, Gillian Gabelmann, Washburn Institute of Technology, Eric Showalter, Washburn Institute of Technology, Michael Edwards, Wichita Area Technical College, Tony Deese, Wichita Area Technical College and David Young, Wichita Area Technical College.

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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

3.A Suspension and Steering

3.B Electrical

3.C Brakes

3.D Heating and Air Conditioning

3.E Cooling Systems

3.F Drive Train

3.G Fuel, Intake and Exhaust Systems

3.H Restraint Systems

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:

o in the classroom or classroom shop setting

Your performance will be successful when:

o 3.A.1 Identify one time use fasteners. HP-I

o 3.A.2 Remove, replace, inspect or adjust power steering pump, pulleys, belts, hoses, fittings and pump mounts. HP-G

o 3.A.5 Inspect and adjust (where applicable) steering linkage geometry (attitude/parallelism). HP-G

o 3.A.6 Inspect and replace pitman arm. HP-G

o 3.A.7 Inspect and replace relay (center link/intermediate) rod. HP-G

o 3.A.8 Inspect, remove and replace idler arm and mountings. HP-G

o 3.A.9 Inspect, remove and replace tie rod sleeves, clamps, and tie rod ends. HP-G

o 3.A.10 Inspect, remove and replace steering linkage damper. HP-G

o 3.A.11 Inspect, remove and replace upper and lower control arms. HP-G

o 3.A.12 Inspect, remove and replace upper and lower control arm bushings, shafts, and rebound bumpers. HP-G

o 3.A.13 Inspect, remove and replace upper and lower ball joints. HP-G

o 3.A.14 Inspect, remove and replace steering knuckle/spindle/hub assemblies (including bearings, races, seals, etc.). HP-G

o 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.4 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:

o in the classroom or classroom shop setting

Your performance will be successful when:

o 3.C.3 Identify, handle, store, and install appropriate brake fluids; dispose of in accordance with federal, state, and local regulations. HP-G

o 3.C.7 Reinstall wheel and torque lug nuts. HP-I

o 3.C.10 Check parking brake system operation. HP-I

o 3.C.13 Identify the proper procedures for handling brake dust. HP-G

o 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:

o in the classroom or classroom shop setting

Your performance will be successful when:

o 3.D.1 Identify and comply with environmental concerns relating to refrigerants and coolants. HP-G

o 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:

o in the classroom or classroom shop setting

Your performance will be successful when:

o 3.E.1 Check engine cooling and heater system hoses and belts; determine needed repairs. HP-I

o 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:

o in the classroom or classroom shop setting

Your performance will be successful when:

o 3.F.7 Inspect, remove and replace drive shafts and universal joints. HP-G

o 3.F.6 Inspect, remove and replace half shafts and axle constant velocity (CV) joints. HP-G

o 3.G.1 Inspect, remove and replace exhaust pipes, mufflers, converters, resonators, tail pipes, and heat shields. HP-G

o 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:

o in the classroom or classroom shop setting

Your performance will be successful when:

o 3.H.2 Inspect, remove, and replace seatbelt and shoulder harness assembly and components. HP-G

o 3.H.3 Inspect restraint system mounting areas for damage; repair as needed. HP-G

o 3.H.4 Verify proper operation of seatbelt. HP-G

o 3.H.5 Deactivate and reactivate Supplemental Restraint System (SRS). HP-G

o 3.H.6 Inspect, remove and replace Supplemental Restraint Systems (SRS) sensors and wiring; ensure sensor orientation. HP-G

o 3.H.7 Verify that Supplemental Restraint System (SRS) is operational. HP-I