



# Power Skills Technical Center

## **Module I: FUNDAMENTALS OF AUTOMOTIVE TECHNOLOGY (80hrs)**

### **INTRODUCTION TO THE AUTOMOBILE**

- Defining the automotive
- History of the automobile
- Construction of the automobile
- Under the hood
- Identifying the drive wheels
- Source of power

### **SUPPORTING ENGINE OPERATION**

- The Fuel system
- The Ignition system
- The Lubricating system
- The cooling system

### **GETTING POWER TO THE WHEELS**

- The power Train
- The Clutch
- Transmission and Transaxles

### **CONTROLLING RIDE AND HANDLING**

- Suspension system
- The steering system
- The breaking system

### **NEED FOR ELECTRICITY AND ELECTRONICS**

- The electrical system
- The electronic control system
- Electricity
- Electronic components and symbols
- Actual resistance measurement
- Electronic engine control

### **BODY DESIGN AND CONSTRUCTION**

- Body styles
- Body construction
- Supportin body operation

### **REGULATING THE AUTOMOBILE**

- Federal legislation
- Automotive Air Pollution
- Automotive safety
- Automotive fuel economy
- Effects of federal laws

### **INTRODUCTION TO AUTOMOTIVE SERVICE**

- Automotive Service



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- The Automotive Industry
- Career Opportunities in Automotive service
- Automotive Dealer

## **SHOP WORK AND SERVICE INFORMATION**

- The automotive service procedure
- The six steps in automotive repair job.
- Service specifications
- Service manuals and shop manuals

## **AUTOMOTIVE SHOP SAFETY**

- Safety in the shop
- Shop Layout
- Signs
- Shop Hazard
- Hazards due to faulty work habits or conditions
- Hazards due to equipment defects or misuse
- Hand-tool hazards
- Fire prevention
- Fire Extinguishers
- Shop safety rules

## **WORKING SAFELY**

- Using power tools
- What to do in emergencies
- Hazardous materials
- Hand Protection
- Driving cars in the shop

## **MEASUREMENTS AND MEASURING SYSTEMS**

- Measurements
- USC and metric systems
- Reasons for going metric
- Thickness gauges
- Micrometers
- Dial indicators
- Vernier caliper
- Depth gauge
- Small-hole gauge
- Vacuum gauge

## **AUTOMOTIVE FASTENERS, GASKETS, AND SEALANTS**

- Fasteners
- Screw threads
- USC screw threads
- Metric screw threads
- Screw and bolt and nuts
- Lock washer
- Prevailing-Torque fasteners
- Torque-to-yield bolts
- Antiseize compound



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- Thread insert

## **SHOP HAND TOOLS**

- Hand tools and power tools
- Striking tools
- Turning tools
- Wrenches
- Screwdrivers
- Open-end-wrenches
- Box wrench
- Combination wrench
- Flare-nut wrench
- Adjustable wrench
- Socket wrench
- Torque wrench
- Torque-angle gauge
- Gripping tools
- Cutting tools
- Twist drills
- Taps and dies
- Tube cutting, bending, and flaring
- Building your tool set

## **SHOP EQUIPMENT AND POWER TOOLS**

- Power tools and shop equipment
- Bench Vise
- Electric tools
- Drill Press
- Grinding wheel
- Cordless tools
- Air compressor and air-supply system
- Shop crane
- Hydraulic tools
- Automotive lift

## **FUNDAMENTALS OF ENGINE OPERATION**

- Chemical reactions
- Combustion in the engine
- Essential for operation engine
- The engine cylinder
- Actions in the engine cylinder
- Expansion of solids with heat
- Expansion of fluids with heat
- Increase of pressure with temperature
- The Thermometer
- The Thermostat

## **PISTON-ENGINE OPERATION**

- Internal combustion engine
- Piston-engine basics



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- Engine construction
- Pistons and piston rings
- Reciprocating to rotary motion
- Engine valves and operation
- Four stroke cycle
- Multiple-cylinder engines
- Supporting engine operation
- Flywheel and drive plate

## **ENGINE TYPE AND CLASSIFICATIONS**

- Engine classification
- Engine types
- Two cylinder engines
- Three-cylinder engines
- Four-cylinder engines
- V-4 engine
- Opposed four-cylinder engine
- Five cylinder-engine
- Six cylinder-engine
- Eight engine-cylinder

## **ENGINE TYPE AND ARRANGEMENT OF VALVE**

- Arrangement of valves and valve trains
  - Camshaft location
  - Type of camshaft drive
  - Type of valve train
  - Number of valve per cylinder
  - Engine rotation and numbering
  - Firing Order
  - Classification by cooling
  - Rotary Engine valve
  - Wankel engine valve
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## **Module II: AUTOMOTIVE PREVENTIVE MAINTENANCE (80hrs)**

### **Prepare for Predelivery Inspection**

- Identify required items before pre-delivery inspection on the vehicle
- Prepare required items in the vehicle
- Install factory-loaded parts on the vehicle
- Removal of emergency towing eyelets, spring locks, labels, tags, stickers, covers and body
- Protective film
- Adjust tire pressure into standard pressure based on manufacturer's standard

### **Perform Physical and Functional Inspection**

- Check all electrical components operation in the vehicle
- Check all fluid level in the vehicle
- Check the vehicle for leaks
- Check the vehicle performance
- Check minor defects of the vehicle.
- Accomplish inspection checklist based on manufacturers standards

### **Complete Work Processes.**

- Perform engine oil top-up based on Manufacturer's standards
- Perform Automatic Transmission oil top-up based on Manufacturer's standards
- Perform Brake fluid top-up based on Manufacturer's standards
- Perform Coolant oil top-up based on Manufacturer's standards

### **Prepare for inspection and service engine**

- Determine job requirements from workplace instructions
- Source and interpret servicing information
- Identify hazards associated with the work and manage risks
- Select tools, equipment and materials and check it's serviceability

### **Inspect engine**

- Carried out inspection according to manufacturer specifications, workplace procedures and safety requirements
- Compared inspection results with manufacturer specifications
- Report inspection findings according to workplace procedures, including recommendations for necessary repairs or adjustments

### **Service engine**

- Carry out service and adjustments according to manufacturer specifications, workplace procedures, and safety and environmental requirements, and without causing damage to components or systems
- Carry out post-service testing according to workplace procedures

### **Complete work processes**

- Make final inspection to ensure work is according to workplace expectations and vehicle or machinery is presented ready for use
- Clean work area, dispose waste and non-recyclable materials and collect recyclable material
- Check tools and equipment and store according to workplace procedures



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- Process workplace documentation according to workplace procedures.

## **Perform pre service preparations**

- Determine job requirements
- Source servicing information from service manual
- Use vehicle mileage as reference for changing fluid
- Inspect transmission fluids condition
- Acquire transmission fluids
- Prepare tools for periodic maintenance of drive train
- Manage hazards and risks

## **Conduct periodic maintenance of drive trains**

- Drain fluids
- Replace fluids
- Clean drain plug
- Replace drain plug washers
- Lubricate propeller shafts
- Inspect cracks and leaks of drive train components
- Report findings to immediate superior
- Apply safety practices

## **Perform post service activities**

- Confirm fluid level
- Dispose wastes
- Perform final inspection
- Write down job done
- Restore workplace

## **Prepare for periodic maintenance of brake system**

- Demonstrate Job requirements are determined based on brake system repair order
- Explain the service information sourced from the service manual
- Prepare tools based on suspension system repair order
- Explain hazards and risks associated in the workplace are managed following OSHS
- Job and inspection performed is written/noted down on the repair order.

## **Carry-out periodic maintenance procedures**

- Demonstrate inspection of Brake system components according manufacturer's service workshop manual
- Enumerate brake system components are replaced according manufacturer's service workshop manual
- Demonstrate cleaning & lubrication of Brake caliper guide pins
- Demonstrate bleeding of brake system according to service workshop manual
- Demonstrate Adjustment of Parking brake lever/pedal travel and cable tension according to service workshop manual
- Demonstrate calibration of Electric parking brake according to service workshop manual
- Explain reports of findings and recommendations to immediate superior following company's standard procedures
- Apply safety practices



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## **Complete periodic maintenance procedure**

- Explain wastes disposal according to good housekeeping practices
- Perform Road test following established standard operating procedure
- Explain Job done written on the Repair Order
- Workplace is restored according company's standard procedure

## **Perform preperiodic maintenance of suspension system**

- State the basic function of the suspension system
- Identify the different types of suspension system
- Explain the features of the different types of suspension system
- Identify the tools, equipment and materials required to service suspension system
- Identify the different safety precautions, hazards and risks when servicing suspension system
- Prepare tools, materials and equipment to be used for suspension system service

## **Apply periodic maintenance procedures**

- Explain why tightening torque must be in accordance with the specified torque
- Identify the suspension system fasteners that requires inspection of tightening torque
- Describe how to check suspension system components
- Describe how to use the torque wrench
- Describe how to check tires
- Describe how to check wheels
- Describe how to check wheel bearing
- Describe how to use the vernier caliper
- Describe how to use the dial gauge
- Apply safety practice when conducting suspension system maintenance
- Demonstrate the correct method for handling of torque wrench
- Demonstrate how to use torque when tightening suspension system fasteners
- Demonstrate how to check tires using a vernier caliper
- Demonstrate how to check wheel bearing axial play using a dial gauge
- Demonstrate how to check tire axial run-out
- Write job done on the repair order

## **Perform work to completion**

- Recognize good housekeeping practices (5S)
- Demonstrate the proper storage of torque wrench
- Demonstrate the proper storage of vernier caliper
- Demonstrate the proper storage of dial gauge
- Conduct final inspection on job performed
- Report findings and recommendations to immediate superior
- Perform good housekeeping practices before and after each job

## **Perform preperiodic maintenance of steering system**

- State the basic function of the steering system
- Identify the different types of steering system
- Identify the tools, equipment and materials required to service steering system
- Identify the different safety precautions, hazards and risks when servicing steering system
- Prepare tools, materials and equipment to be used for steering system service



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## **Apply periodic maintenance procedures**

- Explain why tightening torque must be in accordance with the specified torque
- Identify the steering system fasteners that requires inspection of tightening torque
- Describe how to check steering system components
- Describe how to use the torque wrench
- Describe how to replace power steering fluid
- Describe how to check if malfunction exist on electric power steering
- Apply safety practice when conducting steering system maintenance
- Demonstrate the correct method for handling of torque wrench
- Demonstrate how to use torque when tightening steering system fasteners
- Demonstrate how to replace power steering fluid
- Demonstrate how to check electric power steering malfunction
- Write job done on the repair order

## **Perform work to completion**

- Recognize good housekeeping practices (5S)
- Demonstrate the proper storage of torque wrench
- Conduct final inspection on job performed
- Report findings and recommendations to immediate superior
- Perform good housekeeping practices before and after each job





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## **Module III: AUTOMOTIVE ELECTRICAL SYSTEM SERVICING (80hrs)**

### **Principle of Automotive Electricity and Components of Automotive Electricity**

- Electricity and electric current
- Electrical Charges
- Measuring Electricity

### **Service Automotive Battery and Service Ignition system**

- Battery Construction and Operation
- Chemicals in Battery
- Battery Construction
- Battery Rating
- Battery Efficiency
- Purpose of Ignition System
- Components of Ignition System
- Ignition Coil
- Ignition Distributor
- Secondary Ignition Cables

### **Service Starting System and Charging System**

- Need for Starting System
- Basic Motor Principle
- Starting Motor Construction and operation
- Starting Motor Drive
- Purpose of Charging System
- Alternator Operation
- Alternator Principle
- Rectifying Alternator Current
- Overrunning Clutch
- Alternator Regulator

### **Install Wiring /Lighting System**

- Head Lamp
- Park Light
- Clearance Lamp
- Tail lamp
- Signal Lamp
- Horn
- Stop lamp
- Reverse Lamp
- Fog Lamp
- Wiper Motor

### **Head and Signal Light Wiring Diagram and Operation**

- Diagraming Signal Lamp Positive Trigger
- Diagraming Signal Lamp Negative Trigger
- Diagraming Head lamp Positive Trigg



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- Diagraming Head Lamp Negative Trigger

## **Horn, Hazard Light, Park Light, Tail lamp, Plate light Wiring Diagram and operation**

- Diagraming Park Light, Tail Lamp Plate light Positive Trigger
- Diagraming Park Light, Tail Lamp and Plate light Negative Trigger
- Horn Diagraming Positive Trigger
- Horn Diagraming Negative Trigger

## **Dome Light, Fog Lamp Wiring Diagram, Back up or Reverse Light Wiring Diagram and Operation**

- Dome and Reverse Light Diagraming Positive Trigger
- Dome and Reverse Light Diagraming Negative Trigger

## **Stop Light Wiring Diagram and Operation**

- Stop Light Diagraming Positive Trigger
- Stop Light Diagraming Negative Trigger

## **Wiper Motor Wiring Diagram and Operation**

- Int
- Low Wiper
- High Wiper
- Water Wash
- Wiper Motor

## **Lighting System Wiring Diagram using Toggle Switch**

- Plate No. 1 Positive Trigger
- Plate No. 2 Negative Trigger
- Plate No. 3 Positive Trigger
- Plate No. 4 Negative Trigger
- Plate No. 5 Positive Trigger
- Plate No. 6 Negative Trigger
- Plate No. 7 Positive Trigger
- Plate No. 8 Negative Trigger

## **Lighting System Wiring Diagram using Combination Switch**

- Plate No. 1 Positive Trigger
- Plate No. 2 Negative Trigger
- Plate No. 3 Positive Trigger
- Plate No. 4 Negative Trigger
- Plate No. 5 Positive Trigger
- Plate No. 6 Negative Trigger
- Plate No. 7 Positive Trigger
- Plate No. 8 Negative Trigger

## **Hands on Repairing System Trouble Shooting**

- Controlled Signal Lamp 2 relays and 1 fuse. Positive Trigger and Negative Trigger
- Not Controlled Clearance lamp, Tail lamp and License Plate 2 relays and 1 fuse.
- Horn Low and high with relays in One Switch