AST 1423  Manual Transmission/Transaxle and 4x4

Course Outcome Summary

Course Information

Description
This course covers the operation and the proper repair procedures for the types of manual transmissions/transaxles and transfer cases used in late model vehicles. Four wheel drive locking hubs, axle disconnects, AWD, full-time, and part-time four-wheel drive systems will also be covered. (Prerequisite: Admission into the Automotive Service program and AST1112 or instructor approval)

Total Credits 3
Total Hours 64

Types of Instruction

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Pre/Corequisites
Admission into the Automotive Service program

Institutional Core Competencies

Critical and Creative Thinking - Students will be able to demonstrate purposeful thinking with the goal of using a creative process for developing and building upon ideas and/or the goal of using a critical process for the analyzing and evaluating of ideas.

Course Competencies

1. **Exhibit Professionalism**
   - Learning Objectives
     - Demonstrate shop safety practices
     - Perform Safety Procedures

2. **Identify manual trans/transaxles**
   - Learning Objectives
     - Identify manual trans/transaxle components
     - Diagnose noise concerns using transmission/transaxle powerflow principles
     - Calculate manual trans/transaxle gear ratio
     - Diagnose hard shifting and jumping out of gear, determine necessary action
Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers
Inspect, replace, and align powertrain mounts
Diagnose transaxle final drive assembly noise and vibration concerns; determine necessary action

3. **Define manual trans/transaxle minor service**

**Learning Objectives**
- Diagnose manual trans / transaxle fluid condition, fluid level and leaks
- Identify manual trans/transaxle fluid, drain and refill trans / transaxle and final drive unit

4. **Remove and reinstall transmission / transaxle**

**Learning Objectives**
- Dissassemble manual transaxle, clean and inspect
- Inspect manual transaxle gears / shafts
- Inspect manual transaxle synchros / hubs / blocking rings / sleeves / inserts and springs
- Inspect manual transaxle bearings
- Measure end play or preload (shim or spacer selection procedure) on transmission/transaxle shafts; perform necessary action
- Install countershaft gear assembly
- Inspect / reinstall reverse idler gear, shaft, bearings, thrust washers, and retainer; check end play
- Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly, install final drive
- Install mainshaft assembly
- Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs
- Inspect, test, and replace transmission/transaxle sensors and switches

5. **Disassemble manual transmission, clean and inspect**

**Learning Objectives**
- Inspect manual transmission gears / shafts
- Inspect manual transmission synchros / hubs / blocking rings / sleeves / inserts / springs
- Inspect manual transmission bearings and thrust washers
- Measure end play or preload (shim or spacer selection procedure) on transmission / transaxle shafts; perform necessary action
- Install transmission mainshaft assembly
- Inspect clutch shaft assembly
- Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs
- Inspect lubrication devices (oil pump or slingers)
- Inspect / repair or replace extension housing / case mating surfaces / bores / bushings and vents
- Inspect / replace trans / transaxle gaskets / seals and sealants / inspect sealing surfaces
- Inspect, test, and replace transmission / transaxle sensors and switches

6. **Define four wheel drive driveline components**

**Learning Objectives**
- Analyze planetary gear transfer case power flow
- Analyze gear drive transfer case power flow
- Explain types of transfer case / axle differential systems and concerns related to variations in tire circumference and / or final drive ratios
- Remove and install transfer case
- Disassemble, service, and reassemble transfer case components
- Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification.
- Diagnose noise, vibration, and unusual steering concerns; determine necessary action

7. **Identify part-time 4x4 axle/wheel disconnects**

**Learning Objectives**
- Service manual locking hub wheel disconnects
Service automatic locking hub wheel disconnects
Diagnose IWE (Integrated Wheel End) and pulse vacuum hublock wheel disconnects
Diagnose front axle shaft disconnects
Inspect, service, and replace front axle wheel bearings and races, u-joints, CV joints, and spindle bearings

8. **Describe part-time, full-time, AWD, and automatic four wheel drive systems**

   Learning Objectives
   Explain automatic, AWD, and full-time differential systems
   Explain part-time 4x4 system driveline wind-up and crow hopping

9. **Diagnose 4x4 shift controls**

   Learning Objectives
   Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum)
   Inspect transfer case shift control, bushings, mounts, levers, and brackets
   Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive / all-wheel drive systems

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