



**BAKER COLLEGE**  
**STUDENT LEARNING OUTCOMES**

**AST 2250A Manual Drive Train**  
**2 Semester Hours**

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**Student Learning Outcomes & Enabling Objectives**

1. Apply drive train diagnosis techniques
  - a. Identify and interpret drive train concerns; determine needed action. (P-1)
  - b. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. (P-1)
  - c. Check fluid condition; check for leaks; determine needed action. (P-1)
  - d. Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification. (P-1)
  
2. Demonstrate clutch diagnosis and repair techniques.
  - a. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action. (P-1)
  - b. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform needed action. (P-1)
  - c. Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable). (P-1)
  - d. Bleed clutch hydraulic system. (P-1)
  - e. Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification. (P-1)
  - f. Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action. (P-1)
  - g. Measure flywheel runout and crankshaft end play; determine needed action. (P-2)
  - h. Describe the operation and service of a system that uses a dual mass flywheel. (P-3)
  
3. Demonstrate transmission/transaxle diagnosis and repair techniques.

- a. Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers. (P-2)
  - b. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. (P-2)
  - c. Diagnose noise concerns through the application of transmission/transaxle powerflow principles. (P-2)
  - d. Diagnose hard shifting and jumping out of gear concerns; determine needed action. (P-2)
  - e. Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action. (P-3)
  - f. Disassemble, inspect clean, and reassemble internal transmission/transaxle components. (P-2)
4. Demonstrate drive shaft and half shaft, universal and constant-velocity (CV) joint diagnosis and repair techniques.
- a. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action. (P-1)
  - b. Diagnose universal joint noise and vibration concerns; perform needed action. (P-2)
  - c. Inspect, remove, and/or replace bearings, hubs, and seals. (P-1)
  - d. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints. (P-1)
  - e. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. (P-2)
5. Demonstrate drive axle diagnosis and repair and ring and pinion gears and differential case assembly techniques.
- a. Clean and inspect differential case; check for leaks; inspect housing vent. (P-1)
  - b. Check and adjust differential case fluid level; use proper fluid type per manufacturer specification. (P-1)
  - c. Drain and refill differential case; use proper fluid type per manufacturer specification. (P-1)
  - d. Diagnose noise and vibration concerns; determine needed action. (P-2)
  - e. Inspect and replace companion flange and/or pinion seal; measure companion flange runout. (P-2)
  - f. Inspect ring gear and measure runout; determine needed action. (P-3)
  - g. Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings. (P-3)
  - h. Measure and adjust drive pinion depth. (P-3)
  - i. Measure and adjust drive pinion bearing preload. (P-3)

- j. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types). (P-3)
  - k. Check ring and pinion tooth contact patterns; perform needed action. (P-3)
  - l. Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case. (P-3)
  - m. Reassemble and reinstall differential case assembly; measure runout; determine needed action. (P-3)
6. Demonstrate limited slip differential techniques.
- a. Diagnose noise, slippage, and chatter concerns; determine needed action. (P-3)
  - b. Measure rotating torque; determine needed action. (P-3)
7. Demonstrate drive axle inspection and replacement techniques.
- a. Inspect and replace drive axle wheel studs. (P-1)
  - b. Remove and replace drive axle shafts. (P-1)
  - c. Inspect and replace drive axle shaft seals, bearings, and retainers. (P-2)
  - d. Measure drive axle flange runout and shaft end play; determine needed action. (P-2)
  - e. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action. (P-2)
8. Demonstrate four-wheel drive/all-wheel drive component diagnosis and repair techniques.
- a. Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets. (P-3)
  - b. Inspect locking hubs; determine needed action. (P-3)
  - c. Check for leaks at drive assembly and transfer case seals; check vents; check fluid level; use proper fluid type per manufacturer specification. (P-3)
  - d. Identify concerns related to variations in tire circumference and/or final drive ratios. (P-2)
  - e. Diagnose noise, vibration, and unusual steering concerns; determine needed action. (P-3)
  - f. Diagnose, test, adjust, and/or replace electrical/electronic components of four-wheel drive/all-wheel drive systems. (P-2)
  - g. Disassemble, service, and reassemble transfer case and components. (P-2)

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/materials in accordance with local, state, and federal safety and environmental regulations.

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These SLOs are not approved for experiential credit.

**Effective: Fall 2018**