



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

**AST 1310A Brakes**  
**4 Semester Hours**

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**Student Learning Outcomes & Enabling Objectives**

1. Demonstrate general brake systems diagnosis techniques.
  - a. Identify and interpret brake system 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. Describe procedure for performing a road test to check brake system operation including an anti-lock brake system (ABS). (P-1)
  - d. Install wheel and torque lug nuts. (P-1)
  
2. Demonstrate hydraulic system diagnosis and repair techniques.
  - a. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law). (P1)
  - b. Measure brake pedal height, travel, and free play (as applicable); determine needed action. (P-1)
  - c. Check master cylinder for internal/external leaks and proper operation; determine needed action. (P-1)
  - d. Remove, bench bleed, and reinstall master cylinder. (P-1)
  - e. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine needed action. (P-1)
  - f. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging, wear; and loose fittings/supports; determine needed action. (P-1)
  - g. Replace brake lines, hoses, fittings, and supports. (P-2)
  - h. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). (P-2)
  - i. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. (P-1)
  - j. Inspect, test, and/or replace components of brake warning light system. (P-3)
  - k. Identify components of hydraulic brake warning light system. (P-2)

- l. Bleed and/or flush brake system. (P-1)
  - m. Test brake fluid for contamination. (P-1)
3. Demonstrate drum brake diagnosis and repair techniques.
- a. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine needed action. (P-1)
  - b. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. (P-1)
  - c. Refinish brake drum and measure final drum diameter; compare with specification. (P-1)
  - d. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. (P-1)
  - e. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. (P2)
  - f. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. (P-1)
4. Demonstrate disc brake diagnosis and repair techniques.
- a. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action. (P-1)
  - b. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action. (P-1)
  - c. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action. (P-1)
  - d. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action. (P-1)
  - e. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads; inspect for leaks. (P-1)
  - f. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. (P-1)
  - g. Remove and reinstall/replace rotor. (P-1)
  - h. Refinish rotor on vehicle; measure final rotor thickness and compare with specification. (P1)
  - i. Refinish rotor off vehicle; measure final rotor thickness and compare with specification. (P1)
  - j. Retract and re-adjust caliper piston on an integrated parking brake system. (P-2)
  - k. Check brake pad wear indicator; determine needed action. (P-1)
  - l. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations. (P-1)

5. Demonstrate power-assist units diagnosis and repair techniques.
  - a. Check brake pedal travel with and without engine running to verify proper power booster operation. (P-2)
  - b. Identify components of the brake power assist system (vacuum and hydraulic); check vacuum supply (manifold or auxiliary pump) to vacuum – type power. (P-1)
  - c. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine needed action. (P-1)
  - d. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action. (P-3)
  - e. Measure and adjust master cylinder pushrod length. (P-3)
  
6. Demonstrate related systems (i.e. Wheel Bearings, Parking Brakes, Electrical) diagnosis and repair techniques.
  - a. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine needed action. (P-1)
  - b. Remove, clean, inspect, repack, and install wheel bearings; replace seals; install hub and adjust bearings. (P-2)
  - c. Check parking brake system and components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. (P-1)
  - d. Check parking brake operation and parking brake indicator light system operation; determine needed action. (P-1)
  - e. Check operation of brake stop light system. (P-1)
  - f. Replace wheel bearing and race. (P-3)
  - g. Remove, reinstall, and/or replace sealed wheel bearing assembly. (P-1)
  - h. Inspect and replace wheel studs. (P-1)
  
7. Demonstrate electronic brake control systems: Antilock Brakes (ABS), Traction Control (TCS), and Electronic Stability Control (ESC) systems diagnosis and repair techniques.
  - a. Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action. (P-1)
  - b. Describe the operation of a regenerative braking system. (P-3)
  - c. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action. (P-2)
  - d. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action. (P-2)
  - e. Depressurize high-pressure components of an electronic brake control system (P-2)
  - f. Bleed the electronic brake control system hydraulic circuits. (P-1)

- g. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). (P-2)
- h. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). (P-1)

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: Summer 2018**