

# Automotive Brakes

Course Number - 20122

## Rationale Statement:

There is a high demand for trained individuals in the automotive service field. The desire for the students to receive industry based training at the basic level and step up to the higher level of competency in this field is the ultimate goal of this course. Completion of this course will aide students as they continue their education at the post-secondary level or in the workforce and in the preparation for their ASE certification test. (The examples are NATEF Tasks that the student may complete for ASE certification)

**Suggested grade level:** 10-12

## Topics covered:

- Automotive technology safety practices
- General brake systems diagnosis
- Hydraulic system diagnosis and repair
- Drum brake diagnosis and repair
- Disc brake diagnosis and repair
- Power assist units diagnosis and repair
- Miscellaneous (wheel bearings, parking brakes, electrical, etc.)
- Antilock brake and traction control systems
- Career exploration

## Core Technical Standards & Examples

<b>Indicator #1: Demonstrate automotive technology safety practices, including Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements, for an automotive repair facility</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standard and Examples</b>
Apply	<b>AB1.1 Demonstrate automotive technology safety practices.</b>  Examples: <ul style="list-style-type: none"><li>• Use protective clothing and safety equipment according to OSHA and EPA requirements.</li><li>• Summarize the proper use of MSDS (material safety data sheet)</li><li>• Demonstrate the proper use of hand and power tools.</li><li>• Examine basic shop safety using OSHA (Occupational Safety Health Administration) standards.</li><li>• Maintain a portfolio of successfully completed safety and equipment exams.</li></ul>

<b>Indicator #2: Properly test, diagnose, service and repair general brake system</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standard and Example</b>
Understand	<p><b>AB2.1 Understand general brake systems.</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Identify and interpret brake system concern; determine necessary action</li> <li>• Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions and technical service bulletins</li> <li>• Locate and interpret vehicle and major components identification numbers (VIN, vehicle certification label, calibration decals)</li> <li>• Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction</li> </ul>

**Indicator #3: Properly test, diagnose, service, and repair hydraulic system**

<b>Bloom's Taxonomy Level</b>	<b>Standard and Example</b>
Analyze	<p><b>AB3.1 Diagnose and determine necessary action to repair hydraulic brake system.</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law)</li> <li>• Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action</li> <li>• Identify and interpret brake system concern; determine necessary action</li> <li>• Measure brake pedal height; determine necessary action</li> <li>• Check master cylinder for internal and external leaks and proper operation: determine necessary action</li> <li>• Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear: tighten loose fittings and supports; determine necessary action</li> </ul>
Apply	<p><b>AB3.2 Repair hydraulic brake system</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Remove, bench bleed, and reinstall master cylinder</li> <li>• Bleed (manual, pressure, vacuum or surge) brake system</li> <li>• Fabricate and or install brake lines (double flare and ISO types); replace hoses, fittings and supports as needed</li> <li>• Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves</li> <li>• Inspect, test and or replace components of brake warning light system</li> <li>• Flush hydraulic system</li> </ul>

<b>Indicator #4: Properly test, diagnose, service, and repair drum brake system</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standard and Examples</b>
Analyze	<p><b>AB4.1 Diagnosis and determine necessary action to repair drum brake system.</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Diagnosis poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action</li> <li>• Remove, clean (using proper safety procedures), inspect, and measure brake drums: determine necessary action</li> </ul>
Apply	<p><b>AB4.2 Repair drum brake system.</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Refinish brake drum</li> <li>• Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self adjusters, other related brake hardware, and backing support plates; lubricate and reassemble</li> <li>• Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings</li> <li>• Remove, inspect, and install wheel cylinders</li> </ul>

<b>Indicator #5: Properly test, diagnose, service, and repair disc brake system</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standard and Examples</b>
Analyze	<p><b>AB5.1 Diagnosis and determine necessary action to repair disc brake system.</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Diagnosis poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action</li> <li>• Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action</li> <li>• Clean and inspect caliper mounting and slides for wear and damage; determine necessary action</li> <li>• Remove, clean, and inspect pads and retaining hardware; determine necessary action</li> <li>• Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer's recommendation in determining need to machine or replace</li> </ul>
Apply	<p><b>AB5.2 Repair disc brake system.</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks</li> </ul>

	<ul style="list-style-type: none"> <li>• Refinish rotor on and off vehicle</li> <li>• Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts</li> <li>• Adjust calipers equipped with an integrated parking brake system</li> </ul>
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<b>Indicator #6: Properly test, diagnose, service and repair power assist unit</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standard and Examples</b>
Analyze	<p><b>AB6.1 Diagnosis and determine necessary action to repair power assist unit.</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Test pedal free travel with and without engine running; check power assist operation</li> <li>• Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster</li> <li>• Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action</li> <li>• Inspect and test hydraulically assisted power brake systems for leaks and proper operation; determine necessary action</li> </ul>
Apply	<p><b>AB6.2 Repair power assist unit.</b></p> <p>Example:</p> <ul style="list-style-type: none"> <li>• Measure and adjust master cylinder pushrod length</li> </ul>

<b>Indicator #7: Properly test, diagnose, service, and repair Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc)</b>	
<b>Bloom's Taxonomy Level</b>	<b>Standard and Examples</b>
Analyze	<p><b>AB7.1 Diagnosis and determine necessary action to repair miscellaneous (wheel bearings, parking brakes, electrical, etc.)</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action</li> <li>• Check parking brake operation; determine necessary action</li> <li>• Check operation of brake stop light system; determine necessary action</li> <li>• Check operation of parking brake indicator</li> </ul>
Apply	<p><b>AB7.2 Repair miscellaneous (wheel bearings, parking brakes, electrical, etc.)</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust wheel bearings</li> <li>• Replace wheel bearing and race</li> <li>• Inspect and replace wheel studs</li> <li>• Check parking brake cable and components for wear, rusting, binding, and corrosion; clean, lubricate, or replace as needed</li> <li>• Remove and reinstall sealed wheel bearing assembly</li> </ul>

**Indicator #8: Properly test, diagnose, service, and repair Antilock Brake and Traction Control Systems**

Bloom's Taxonomy Level	Standard and Examples
Analyze	<p><b>AB8.1 Diagnosis and determine necessary action to repair antilock brake and traction control systems.</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Identify and inspect antilock brake system (ABS) components; determine necessary action</li> <li>• Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and or recommended test equipment: determine necessary action</li> <li>• Test, diagnose, and service ABS speed sensors, 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)</li> <li>• Diagnose poor stopping, wheel lock-up, abnormal pedal or feet pulsation, and noise concerns caused by the antilock brake system (ABS); determine necessary action</li> <li>• Diagnose antilock brake system (ABS) braking concerns caused by vehicle modification (tire size, curb height, final drive ration, etc.)</li> <li>• Identify traction control system/vehicle stability control system components</li> </ul>
Apply	<p><b>AB8.2 Repair antilock and traction control systems.</b></p> <p>Examples:</p> <ul style="list-style-type: none"> <li>• Bleed the antilock brake system (ABS) front and rear hydraulic circuits</li> <li>• Depressurize high-pressure components of the antilock brake system (ABS)</li> <li>• Remove and install antilock brake system (ABS) electrical/electronic and hydraulic components</li> </ul>

**Indicator #9: Students explore career opportunities in the transportation, distribution, and logistics career cluster and develop leadership skills.**

<b>Bloom's Taxonomy Level</b>	<b>Standard and Examples</b>
Understand	<p><b>AB9.1 Research career opportunities in the Transportation, Distribution and Logistics (TD&amp;L) fields.</b></p> <p>Examples:</p> <ul style="list-style-type: none"><li>• Utilizing the career exploration software research and write a report on career opportunities in the TD&amp;L field</li><li>• Utilizing the career exploration software to research educational requirements for a chosen career path</li><li>• Utilizing career exploration software, update the student's portfolio</li></ul>