



Wayne County Community College District

COURSE SYLLABUS

AUT 120 Brakes I

CREDIT HOURS: 3.00

CONTACT HOURS: 60.00

COURSE DESCRIPTION:

This course is designed to provide students with the necessary skills and understanding to research, diagnose, repair and maintain the automotive braking systems. In addition, it will provide the necessary skills to be prepared for the ASE certification brakes exam. Hydraulic theory, brake operating principles, anti-locking brake theory & systems, construction maintenance, and inspection will be performed by the student.

PRE-REQUISITES: AUT 114, AUT 115, AUT 116 and AUT 117

EXPECTED COMPETENCIES:

Upon successful completion of this course, the student will be able to:

Industry Information

- **Identify various career types in the automotive field**
Objective
 - Identify the eight Automotive Service Excellence (ASE) service areas for technicians and the components included in each.
 - Identify career opportunities directly related to the automotive technology field.
 - Identify various methods used to pay automotive technicians.
 - Identify the difference between a union and a non-union shop.

Shop Safety

For every task in Brakes, the following safety requirements must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

- **Identify protective clothing and equipment and their proper use; proper shop behavior; principles of fire safety; and federal regulations concerning hazardous material and shop safety.**
Objective
 - Describe how to select individual personal protective clothing and equipment.
 - Identify the dangers of improper behavior in the shop.
 - Identify the importance of proper grooming and hygiene.
 - Identify the classes of fires and the types of fire extinguishers.
 - Identify the use of a fire blanket.
 - Identify general fire emergency procedures.
 - Identify the Occupational Safety and Health Administration (OSHA) regulations.
 - Identify the Environmental Protection Agency (EPA) regulations.
 - Identify the safe use of fire protection equipment
 - Identify the safe use of shop equipment following Environmental Protection Agency (EPA) and Occupational Safety and Health Act (OSHA) regulations



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- **Identify and explain the safe and proper use of chemicals**

Objective

- Identify the types and uses of solvents.
- Identify the types and uses of soaps and cleaning solutions.
- Identify the types and uses of oils.
- Identify the types and uses of greases.
- Identify the types and uses of specialty additives.
- Identify the types and uses of specialty chemicals.
- Describe the five general rules for using automotive chemicals.
- Complete the assignment sheet on lubricants.
- Complete the assignment sheet on lubricants.
- Identify gasses and the hazards they present.
- Identify the hazards of asbestos dust.

- **Identify and explain the safe and proper use of basic hand tools**

Objective

- Identify the types and uses of common end wrenches.
- Identify the types and uses of socket set components.
- Identify the types and uses of wrenches.
- Identify the types and uses of screwdrivers.
- Identify the types and uses of pliers.
- Identify the types and uses of hammers.
- Identify the types and uses of punches and chisels.

- **Identify and explain the safe and proper use of specialty tools, fasteners, and measuring tools**

- Identify the types and uses of specialty tools.
- Describe the procedures for cutting threads onto a rod or into a hole, repairing damaged threads, and removing broken bolts.
- Identify common nuts and bolts in the English system.
- Identify common nuts and bolts in the metric system.
- Identify other types of common fasteners.
- Identify the types and uses of measuring tools.
- Identify the procedures for the care and use of measuring tools.

- **Identify and explain the safe and proper use of power tools and shop equipment**

- Identify the types and uses of pneumatic, hydraulic, and electric power tools.
- Identify the hazards of power tools.
- Identify the types, purposes, and safety considerations of common shop equipment.
- Demonstrate the ability to:
 - A. Lift a vehicle

General Brake Systems Diagnosis

- **Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction. P-1**

Objective

- Identify the procedures for identifying the customer's concern.
- Identify terms and definitions associated with basic principles of automotive braking.
- Identify the basic principles by which an automotive braking system functions.



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- Identify terms and definitions associated with basic principles of automotive braking.
 - Identify the basic principles by which an automotive braking system functions.
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- **Identify and interpret brake system concern; determine necessary action. P-1**
Objective
 - Identify the procedures for identifying the customer's concern.
- **Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins. P-1**
Objective
 - Identify terms and definitions associated with basic principles of automotive braking.
 - Identify the basic principles by which an automotive braking system functions.
- **Locate and interpret vehicle and major component identification numbers. P-1**
Objective
 - Identify terms and definitions associated with basic principles of automotive braking.
 - Identify the basic principles by which an automotive braking system functions.

Hydraulic System Diagnosis and Repair

- **Diagnose pressure concerns in the brake system using hydraulic principles (Paschal's Law). P-1**
Objective
 - Identify terms and definitions associated with the diagnosis of brake systems.
 - Identify safety precautions for dealing with asbestos.
 - Identify safety precautions for lifting a vehicle.
 - Identify brake service equipment.
 - Identify the procedure for road testing a vehicle.
 - Identify the procedure for inspecting the master cylinder.
 - Identify the procedure for diagnosing power-assist brake systems.
- **Remove, bench bleed, and reinstall master cylinder. P-1**
Objective
 - Identify terms and definitions associated with the diagnosis of brake systems.
 - Identify safety precautions for dealing with asbestos.
 - Identify safety precautions for lifting a vehicle.
 - Identify brake service equipment.
 - Identify the procedure for road testing a vehicle.
 - Identify the procedure for inspecting the master cylinder.
 - Identify the procedure for diagnosing power-assist brake systems.
- **Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. P-2**
Objective
 - Identify terms and definitions associated with the diagnosis of brake systems.
 - Identify safety precautions for dealing with asbestos.
 - Identify safety precautions for lifting a vehicle.
 - Identify brake service equipment.
 - Identify the procedure for road testing a vehicle.
 - Identify the procedure for inspecting the master cylinder.
 - Identify the procedure for diagnosing power-assist brake systems.



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- **Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action. P-1**

Objective

- Identify the properties of brake fluid.
- Identify the methods of storing and handling three classifications of brake fluid.
- Identify the procedures for selecting brake fluid and adding it to a vehicle.

- **Replace brake lines, hoses, fittings, and supports. P-2**

Objective

- **Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). P-2**

Objective

- Identify terms and definitions associated with brake system switches and valves in the brake hydraulic system.
- Identify the procedures for inspecting and testing hydraulic brake switches and brake valves.
- Demonstrate the ability to:
 - A. Diagnose, adjust, and repair brake valves

- **Select, handle, store, and fill brake fluids to proper level. P-1**

Objective

- Identify terms and definitions associated with brake fluid.
- Identify the properties of brake fluid.
- Identify the methods of storing and handling three classifications of brake fluid.
- Identify the procedures for identifying the customer's concern.
- Identify the procedures for selecting brake fluid and adding it to a vehicle.
- Demonstrate the ability to:
 - A. Identify and interpret brake system concern
 - B. Check and adjust the master cylinder fluid level

- **Bleed brake system. P-1**

Objective

- Identify terms and definitions associated with bleeding brake systems.
- Identify the procedures for bleeding the brake system.

Drum Brake Diagnosis and Repair

- **Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. P-1**

Objective

- Identify the procedure for visually inspecting the drum brake system.
- Identify the procedure for inspecting and adjusting drum parking brakes.



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- **Remove, clean, inspect, and measure brake drums; determine necessary action. P-1**

Objective

- Identify terms and definitions associated with servicing brake drums.
- Identify the procedures for machining brake drums.
- Demonstrate the ability to:
 - A. Disassemble and inspect drum brakes.
 - B. Service wheel cylinders.
 - C. Machine brake drums.
 - D. Reinstall drum brake assemblies.

- **Refinish brake drum; measure final drum diameter. P-1**

Objective

- Identify terms and definitions associated with drum brake inspection.
- Identify the procedures for disassembling, inspecting, and servicing drum brakes.
- Identify the procedures for installing and adjusting drum brake components.

- **Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1**

Objective

- Identify the procedures for disassembling and inspecting the wheel cylinder.

- **Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings. P-2**

Objective

- Identify terms and definitions associated with drum brake inspection.
- Identify the procedures for disassembling, inspecting, and servicing drum brakes.
- Demonstrate the ability to:
 - A. Disassemble and inspect drum brakes
 - B. Service wheel cylinders
 - C. Machine brake drums
 - D. Reinstall drum brake assemblies

- **Install wheel, torque lug nuts, and make final checks and adjustments. P-1**

Objective

- Demonstrate the ability to:
 - A. Disassemble and inspect drum brakes
 - B. Service wheel cylinders
 - C. Machine brake drums
 - D. Reinstall drum brake assemblies



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Disc Brake Diagnosis and Repair

- **Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action. P-1**
Objective
 - Identify the procedure for visually inspecting the disc brake system.
 - Identify the procedure for determining the cause of pulsating pedal or brake fade in disc brake systems.
 - Identify the procedures for inspecting and adjusting disc parking brakes.

- **Remove caliper assembly; inspect for leaks and damage to caliper housing; determine necessary action. P-1**
Objective
 - Identify terms and definitions associated with disc brake calipers.
 - Identify procedures for removing disc brake calipers.
 - Identify procedures for inspecting and repairing calipers.
 - Identify procedures for installing and adjusting disc brake calipers.

- **Clean and inspect caliper mounting and slides/pins for operation wear, and damage; determine necessary action. P-1**
Objective
 - Identify terms and definitions associated with disc brake calipers.
 - Identify procedures for removing disc brake calipers.
 - Identify procedures for inspecting and repairing calipers.
 - Identify procedures for installing and adjusting disc brake calipers.

- **Remove, inspect, and replace pads and retaining hardware; determine necessary action. P-1**
Objective
 - Identify terms and definitions associated with disc brake rotors.
 - Identify procedures for determining rotor thickness, parallelism, and run-out.
 - Identify procedures for machining rotors.
 - Demonstrate the ability to:
 - A. Remove, disassemble, and inspect calipers
 - B. Determine rotor thickness, parallelism, and run-out
 - C. Machine rotors
 - D. Remove and install disc rotor
 - E. Reassemble and reinstall calipers

- **Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts. P-3**
Objective
 - Identify the procedures for inspecting and adjusting disc parking brakes.

- **Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks. P-1**
Objective
 - Identify the procedures for installing and adjusting drum brake components



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- **Clean, inspect, and measure rotor thickness, lateral run out, and thickness variation; determine necessary action. P-1**
Objective
 - Demonstrate the ability to:
 - A. Remove, disassemble, and inspect calipers
 - B. Determine rotor thickness, parallelism, and run-out
 - C. Machine rotors
 - D. Remove and install disc rotor
 - E. Reassemble and reinstall calipers

- **Remove and reinstall rotor. P-1**
Objective
 - Demonstrate the ability to:
 - A. Remove, disassemble, and inspect calipers
 - B. Determine rotor thickness, parallelism, and run-out
 - C. Machine rotors
 - D. Remove and install disc rotor
 - E. Reassemble and reinstall calipers

- **Refinish rotor on vehicle, measure final rotor thickness. P-1**
Objective
 - Identify procedures for machining rotors.
 - Demonstrate the ability to:
 - A. Remove, disassemble, and inspect calipers
 - B. Determine rotor thickness, parallelism, and run-out.
 - C. Machine rotors
 - D. Remove and install disc rotor
 - E. Reassemble and reinstall calipers.

- **Refinish rotor off vehicle, measure final rotor thickness. P-1**
Objective
 - Identify procedures for machining rotors.
 - Demonstrate the ability to:
 - A. Remove, disassemble, and inspect calipers
 - B. Determine rotor thickness, parallelism, and run-out.
 - C. Machine rotors
 - D. Remove and install disc rotor
 - E. Reassemble and reinstall calipers.

- **Install wheel, torque lug nuts, and make final checks and adjustments. P-1**
Objective
 - Demonstrate the ability to:
 - A. Reassemble and reinstall calipers.



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Power Assist Units Diagnosis and Repair

- **Check vacuum supply to vacuum-type power booster. P-1**

Objective

- Identify terms and definitions associated with power-assisted brake systems.
- Identify vacuum- and hydro-boost power brake systems.
- Identify the operating principles of vacuum- and hydro-boost power brake systems.
- Identify the procedures for repairing power boosters.
- Demonstrate the ability to:
 - A. Remove and replace a vacuum power booster.
 - B. Test the hydro-boost system

- **Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action. P-1**

Objective

- Identify terms and definitions associated with power-assisted brake systems.
- Identify vacuum- and hydro-boost power brake systems.
- Identify the operating principles of vacuum- and hydro-boost power brake systems.
- Identify the procedures for repairing power boosters.
- Demonstrate the ability to:
 - A. Remove and replace a vacuum power booster

- **Measure and adjust master cylinder pushrod length. P-3**

Objective

- Identify terms and definitions associated with power-assisted brake systems.
- Identify vacuum- and hydro-boost power brake systems.
- Identify the operating principles of vacuum- and hydro-boost power brake systems.
- Identify the procedures for repairing power boosters.
- Demonstrate the ability to:
 - A. Remove and replace a vacuum power booster

Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

- **Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. P-1**

Objective

- Identify terms and definitions associated with wheel bearing service.
- Identify the principles of wheel bearing service and adjustment.
- Identify the procedures for inspecting and servicing non-sealed wheel bearings.
- Identify the procedure for adjusting non-sealed wheel bearings.
- Identify the procedures for inspecting and servicing sealed wheel bearings.
- Demonstrate the ability to:
 - A. Diagnose wheel bearing noise, wheel shimmy, and vibrations
 - B. Inspect, replace, and adjust serviceable wheel bearings
 - C. Inspect and replace nonadjustable or non-serviceable wheel bearings
 - D. Inspect and replace wheel studs



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- **Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings. P-1**

Objective

- Identify terms and definitions associated with wheel bearing service.
- Identify the principles of wheel bearing service and adjustment.
- Identify the procedures for inspecting and servicing non-sealed wheel bearings.
- Identify the procedure for adjusting non-sealed wheel bearings.
- Identify the procedures for inspecting and servicing sealed wheel bearings.
- Demonstrate the ability to:
 - A. Diagnose wheel bearing noise, wheel shimmy, and vibrations
 - B. Inspect, replace, and adjust serviceable wheel bearings
 - C. Inspect and replace nonadjustable or non-serviceable wheel bearings
 - D. Inspect and replace wheel studs

- **Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.P-2**

Objective

- Identify the procedure for inspecting and adjusting drum parking brakes.
- Identify the procedures for inspecting and adjusting disc parking brakes.

- **Check parking brake and indicator light system operation; determine necessary action. P-1**

Objective

- Identify the procedures for inspecting and adjusting disc parking brakes.
- Identify the procedures for testing the brake light circuit and brake warning indicator light.

- **Check operation of brake stop light system; determine necessary action. P-1**

Objective

- Identify the procedures for testing the brake light circuit and brake warning indicator light.

- **Replace wheel bearing and race. P-2**

Objective

- Identify terms and definitions associated with wheel bearing service.
- Identify the principles of wheel bearing service and adjustment.
- Identify the procedures for inspecting and servicing non-sealed wheel bearings.
- Identify the procedure for adjusting non-sealed wheel bearings.
- Identify the procedures for inspecting and servicing sealed wheel bearings.
- Demonstrate the ability to:
 - A. Diagnose wheel bearing noise, wheel shimmy, and vibrations
 - B. Inspect, replace, and adjust serviceable wheel bearings
 - C. Inspect and replace nonadjustable or non-serviceable wheel bearings
 - D. Inspect and replace wheel studs



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- **Remove and reinstall sealed wheel bearing assembly. P-1**

Objective

- Identify terms and definitions associated with wheel bearing service.
- Identify the principles of wheel bearing service and adjustment.
- Identify the procedures for inspecting and servicing non-sealed wheel bearings.
- Identify the procedure for adjusting non-sealed wheel bearings.
- Identify the procedures for inspecting and servicing sealed wheel bearings.
- Demonstrate the ability to:
 - A. Diagnose wheel bearing noise, wheel shimmy, and vibrations
 - B. Inspect, replace, and adjust serviceable wheel bearings
 - C. Inspect and replace nonadjustable or non-serviceable wheel bearings
 - D. Inspect and replace wheel studs

ASSESSMENT METHODS:

Student performance may be assessed by examination, quizzes, case studies, oral conversation, group discussion, oral presentations. The instructor reserves the option to employ one or more of these assessment methods during the course.

GRADING SCALE:

90%-100% = A

80%-89.9%= B

70%-79.9%= C

60%-69.9%= D

<60% = E