

JEFFERSON COLLEGE

COURSE SYLLABUS

AUT132

AUTOMOTIVE BRAKE SYSTEMS LAB

4 Credit Hours

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Revised by: Gerard Uhls
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AUT132 Automotive Brake Systems Lab

I. CATALOGUE DESCRIPTION

- A. Pre-requisite: AUT100 Automotive Shop Safety
Co-requisite: AUT131 Automotive Brake Systems
- B. 4 Credit Hours
- C. Automotive Brake System includes diagnosis and repair of drum and disc brakes, hydraulic systems, power assist units, parking brakes, antilock brake systems and regenerative brake systems in a shop environment. This course will help prepare the student for entry level employment and the National Institute for Automotive Service Excellence (ASE) Brakes test (A5). (S)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

A. General Brake Systems Diagnosis		
Demonstrate knowledge of completing work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction	P-1	Complete Work Order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction
Demonstrate knowledge of identifying and interpreting brake system concern; determine necessary action	P-1	Identify and interpret brake system concern; determine necessary action.
Demonstrate knowledge of researching applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins	P-1	Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins
Demonstrate knowledge of locating and interpreting vehicle and major component identification numbers		Locate and interpret vehicle and major component identification numbers
Demonstrate knowledge of performing a road test to check brake system operation; including an anti-lock brake system (ABS).	P-1	Describe road test and perform road test on vehicle.
Demonstrate knowledge of installing wheel and properly torquing lug nuts.	P-1	Locate service information for proper torquing of lug nuts. Install wheel and torque lug nuts in sequence with proper torque.

B. Hydraulic System Diagnosis and Repair		
Demonstrate knowledge of diagnosing pressure concerns in the brake system using hydraulic principles (Pascal's Law)	P-1	Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law)
Demonstrate knowledge of measuring brake pedal height, travel, and free play (as applicable); determine necessary action	P-1	Measure brake pedal height, travel and free play (as applicable); determine necessary action
Demonstrate knowledge of checking master cylinder for internal/external leaks and proper operation; determine necessary action	P-1	Check master cylinder for internal/external leaks and proper operation; determine necessary action
Demonstrate knowledge of removing, bench bleeding, and reinstalling master cylinder	P-1	Remove, bench bleed, and reinstall master cylinder
Demonstrate knowledge of diagnosing poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action	P-3	Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action
Demonstrate knowledge of inspecting 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	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action
Demonstrate knowledge of replacing brake lines, hoses, fittings, and supports	P-2	Replace brake lines, hoses, fittings, and supports
Demonstrate knowledge of fabricating brake lines using proper material and flaring procedures (double flare and ISO types)	P-2	Fabricate brake Lines using proper material and flaring procedures (Double Flare and ISO types)
Demonstrate knowledge of selecting, handling, storing, and filling brake fluids to proper level	P-1	Select, handle, store, and fill brake fluids to proper level
Demonstrate knowledge of inspecting, testing, and/or replacing metering (hold-off), proportioning (balance), pressure differential, and combination valves		Inspect, test, and/or replace metering (Hold-Off), proportioning (Balance), pressure differential, and combination Valves
Demonstrate knowledge of inspecting, testing, and/or replacing components of brake warning light system	P-2	Inspect, test and/or replace components of brake warning light system
Demonstrate knowledge of bleeding and/or flushing brake system	P-1	Bleed and/or flush brake system

Demonstrate knowledge of testing brake fluid for contamination	P-1	Test brake fluid for contamination
C. Drum Brake Diagnosis and Repair		
Demonstrate knowledge of diagnosing poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action	P-1	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action
Demonstrate knowledge of removal, cleaning, inspecting, and measuring brake drum diameter; determine necessary action	P-1	Remove, clean, inspect, and measure brake drum diameter; determine necessary action
Demonstrate knowledge of refinishing brake drum; measuring final drum diameter; compare with specifications	P-1	Refinish brake drum; measure final drum diameter; compare with specifications
Demonstrate knowledge of removing, cleaning, and inspecting brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble	P-1	Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjuster/self-adjuster, other related brake hardware, and backing support plates; lubricate and reassemble
Demonstrate knowledge of inspecting wheel cylinders for leaks and proper operation; remove and replace as needed	P-2	Inspect wheel cylinders for leaks and proper operation; remove and replace as needed
Demonstrate knowledge of pre-adjusting brake shoes and parking brake; installing brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments	P-2	Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments
D. Disc Brake Diagnosis and Repair		
Demonstrate knowledge of diagnosing poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action	P-1	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action
Demonstrate knowledge of removing caliper assembly; inspecting for leaks and damage/wear to caliper housing; determine necessary action	P-1	Remove caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action
Demonstrate knowledge of cleaning and inspecting caliper mounting and slides/pins for operation, wear, and damage; determine necessary action	P-1	Clean and inspect caliper mounting and slides/pins for operation, wear, and damage; determine necessary action

Demonstrate knowledge of removing, inspecting and replacing pads and related hardware; determine necessary action	P-1	Remove, inspect, and replace pads and related hardware; determine necessary action
Demonstrate knowledge of reassembly, lubrication, and reinstalling caliper, pads, and related hardware; seat pads, and inspect for leaks	P-1	Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks
Demonstrate knowledge of cleaning, inspecting, and measuring rotor thickness, lateral runout, and thickness variation; determine necessary action	P-1	Clean, inspect, and measure rotor thickness, lateral runout, and thickness variation; determine necessary action
Demonstrate knowledge of removing and reinstalling rotor	P-1	Remove and reinstall rotor
Demonstrate knowledge of refinishing rotor on vehicle; measuring final rotor thickness and compare with specifications	P-1	Refinish rotor on vehicle; measure final rotor thickness and compare with specifications
Demonstrate knowledge of refinishing rotor off vehicle; measure final rotor thickness and compare with specifications	P-1	Refinish rotor of vehicle; measure final rotor thickness and compare with specifications
Demonstrate knowledge of retracting and re-adjusting caliper piston on an integrated parking brake system	P-3	Retract and re-adjust caliper piston on an integrated parking brake system
Demonstrate knowledge of checking brake pad wear indicator system operation; determine necessary action	P-2	Check brake pad wear indicator system operation; determine necessary action
Demonstrate knowledge of the importance of operating vehicle to burnish/break-in replacement pads according to manufacturer's recommendations	P-1	Describe importance of operating vehicle to burnish/break-in replacement pads according to manufacturer's recommendations

E. Power Assist Units Diagnosis and Repair

Demonstrate knowledge of testing brake pedal travel with, and without, engine running to verify proper booster operation	P-2	Test brake pedal travel with, and without, engine running to verify proper power booster operation
Demonstrate knowledge of checking vacuum supply (manifold or auxiliary pump) to vacuum-type power booster	P-1	Check vacuum supply (Manifold or Auxiliary pump) to vacuum-type power booster
Demonstrate knowledge of inspecting the vacuum-type power booster unit for leaks; inspecting the check valve for proper operation; determine necessary action	P-1	Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action

Demonstrate knowledge of inspecting and testing hydraulically assisted power brake system for leaks and proper operation; determine necessary action	P-3	Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action
Demonstrate knowledge of measuring and adjusting master cylinder pushrod length	P-3	Measure and adjust master cylinder pushrod length

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

Demonstrate knowledge of diagnosing wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action	P-3	Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action
Demonstrate knowledge of removing, cleaning, inspecting, repacking, and installing wheel bearings and replace seals; install hub and adjust bearings	P-1	Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings
Demonstrate knowledge of checking parking brake cables and components for wear, binding, and corrosion; cleaning, lubricating, adjusting or replacing as needed	P-2	Check parking brake cables and components for wear, binding and corrosion; cleaning, lubricating, adjusting or replacing as needed
Demonstrate knowledge of checking parking brake operation and indicator light system operation; determine necessary action	P-1	Check parking brake operation and indicator light system operation; determine necessary action
Demonstrate knowledge of checking operation of brake stop light system; determine necessary action	P-1	Check operation of brake light system; determine necessary action
Demonstrate knowledge of replacing wheel bearing and race	P-2	Replace wheel bearing and race
Demonstrate knowledge of inspecting and replacing wheel studs	P-1	Inspect and replace wheel studs
Demonstrate knowledge of removing and reinstalling sealed wheel bearing assembly	P-2	Remove and install sealed wheel bearing assembly

G. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair

Demonstrate knowledge of identifying and inspecting electronic brake control system components; determine necessary action	P-1	Identify and inspect electronic brake control system components; determine necessary action
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Demonstrate the knowledge of diagnosing electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action		Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and or using recommended test equipment; determine necessary action
Demonstrate knowledge of depressurizing high-pressure components of the electronic brake control system	P-3	depressurize high pressure components of the electronic brake control system
Demonstrate knowledge of testing, diagnosing, and servicing electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO)		Test, diagnose, and service electronic brake control system speed sensors (Digital and Analog), toothed ring (Tone Wheel), and circuits using a graphing multi-meter (GMM)/digital storage oscilloscope (DSO)
Demonstrate knowledge of identifying traction control/vehicle stability control system components	P-3	Identify traction control/vehicle stability control system components
Demonstrate the knowledge of the operation of a regenerative braking system	P-3	Describe the operation of a regenerative braking system

III. OUTLINE OF TOPICS

A. Brake Hydraulic System

1. Remove and replace wheel cylinder
2. Remove and replace brake caliper
3. Remove, bench bleed, and reinstall a master cylinder
4. Remove and reinstall a steel brake line
5. Remove and reinstall a brake hose
6. Check and correct brake fluid level with appropriate fluid
7. Check fluid quality

B. Brake Inspection

1. Inspect brake hydraulic system for leaks
2. Inspect brake pads and shoes for abnormal wear and actual wear
3. Measure brake rotors and drums for proper thickness and diameter
4. Inspect brake hardware and mounting assemblies for wear

- C. Wheel Bearing
 - 1. Remove, repack, and reinstall tapered wheel bearings and set preload
 - 2. Remove and reinstall a sealed wheel bearing and set preload
 - 3. Check wheel bearings for wear

- D. Disc Brakes
 - 1. Remove and install brake caliper
 - 2. Install brake pads with hardware and lube caliper slides
 - 3. Resurface a brake rotor both on and off the car
 - 4. Reassemble a disc brake and torque to specifications

- E. Drum Brakes
 - 1. Disassemble a drum brake and inspect/replace wheel cylinder
 - 2. Re-assemble drum brake with proper lubrication and adjust brake
 - 3. Test parking brake system for proper operation

- F. Antilock Brake Systems and Vehicle Stability Control Systems
 - 1. Explain the function of an ABS system
 - 2. Identify ABS/VSC components
 - 3. Perform diagnostics using the scan tool and the Digital Volt/Ohm Meter (DVOM)

- G. Wheel Studs and Lug Nuts
 - 1. Remove lug nuts
 - 2. Remove and reinstall a wheel stud
 - 3. Reinstall wheel and lug nuts using torque sticks or torque wrench

- H. Regenerative Brake System
 - 1. Describe the operation of a regenerative braking system

IV. METHOD(S) OF INSTRUCTION

- A. Demonstrations
- B. Live Work
- C. Lab Exercises
- D. Peer Teaching
- E. Small Group Projects

V. REQUIRED TEXTBOOK(S)

James D. Halderman, *Automotive Chassis Systems Correlated Task Sheets*, (current edition), Pearson

VI. REQUIRED MATERIALS

- A. Jefferson College Automotive Technology Shirt (2)
- B. Safety Glasses (Clear)
- C. Safety Shoes (Steel Toe Preferred)

VII. SUPPLEMENTAL REFERENCES

None

VIII. METHOD OF EVALUATION

- A. Lab Sheets (NATEF Competencies) 50%
- B. Technician Supplemental Tasks 50%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; phone 636-481-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College Website <http://www.jeffco.edu>).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.