

JEFFERSON COLLEGE

COURSE SYLLABUS

AUT131

AUTOMOTIVE BRAKE SYSTEMS

2 Credit Hours

Prepared by: Gerard Uhls

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AUT131 Automotive Brake Systems

I. CATALOGUE DESCRIPTION

- A. Pre-requisite: AUT100 Automotive Shop Safety
Co-requisite: AUT132 Automotive Brake Systems Lab
- B. 2 Credit Hours
- C. Automotive Brake System involves the study of automotive disc and drum brake systems. The emphasis is placed on the theory and operation of automotive drum and disc brakes, hydraulic systems, power assist units, parking brakes, antilock brake systems and regenerative brake systems. This course will help prepare the student for 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 an understanding of completing a work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of identifying and interpreting brake system concern; determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of researching applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of describing a procedure for performing a road test to check brake system operation: including an anti-lock brake system (ABS).	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of Installing wheel and torquing lug nuts	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

B. Hydraulic System Diagnosis and Repair		
Demonstrate an understanding of diagnosing pressure concerns in the brake system using hydraulic principles (Pascal's Law)	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of measuring brake pedal height, travel, and free play (as applicable); determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of checking master cylinder for internal/external leaks and proper operation; determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of removing, bench bleeding, and reinstalling master cylinder	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of diagnosing poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action	P-3	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of inspecting brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; check for loose fittings and supports; determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of replacing brake lines, hoses, fittings, and supports	P-2	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of fabricating brake lines using proper material and flaring procedures (double flare and ISO types)	P-2	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of selecting, handling, storing, and filling brake fluids to proper level	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of identifying components of a brake warning light system.	P-2	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of inspecting, testing, and/or replacing components of brake warning light system	P-3	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

Demonstrate an understanding of bleeding and/or flushing brake system	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of testing brake fluid for contamination	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

C. Drum Brake Diagnosis and Repair

Demonstrate an understanding of diagnosing poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of removing, cleaning, inspecting, and measuring brake drums; determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of refinishing brake drum and measuring final drum diameter	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding 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	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of inspecting and installing wheel cylinders	P-2	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of pre-adjusting brake shoes and parking brake; installing brake drums or drum/hub assemblies and wheel bearings	P-2	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of installing wheel, torquing lug nuts, and making final checks and adjustments	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

D. Disc Brake Diagnosis and Repair

Demonstrate an understanding of diagnosing poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of removing caliper assembly; inspecting for leaks and damage to caliper housing	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

Demonstrate an understanding of cleaning and inspecting caliper mounting and slides/pins for operation, wear, and damage; determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of removing, inspecting and replacing pads and retaining hardware; determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of removing and cleaning caliper assembly; inspecting for leaks and damage/wear to caliper housing; determine necessary action.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of cleaning and inspecting caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of removing, inspecting, and replacing pads and retaining hardware; determine necessary action.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of lubricating and reinstalling caliper, pads, and related hardware; determine necessary action.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of cleaning and inspecting rotor; measure rotor thickness, thickness variation, and lateral run-out; determine necessary	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of removing and reinstalling rotor.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of re-finishing a rotor on a vehicle; measuring final rotor thickness and comparing with specifications.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of re-finishing a rotor off of a vehicle; measuring final rotor thickness and comparing with specifications.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of retracting and re adjusting caliper piston on an integrated parking brake system.	P-3	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

Demonstrate an understanding of checking brake pad wear indicator; determine necessary action.	P-2	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of the importance of operating a vehicle to burnish/break-in replacement brake pads according to manufacturer's recommendations.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

E. Power Assist Units Diagnosis and Repair

Demonstrate an understanding of testing brake pedal travel with, and without, engine running to verify proper power booster operation.	P-2	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of checking vacuum supply (manifold or auxiliary pump) to vacuum- type power booster.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of inspecting the vacuum-type power booster unit for leaks; inspecting the check valve for proper operation	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of inspecting and testing hydraulically assisted power brake system for leaks and proper operation; determine necessary action.	P-3	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of measuring and adjusting master cylinder pushrod length	P-3	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

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

Demonstrate an understanding of diagnosing wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action.	P-3	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of removing, cleaning, inspecting, repacking, and installing wheel bearings and replace seals; install hub and adjusting bearings	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of checking parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed.	P-2	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

Demonstrate an understanding of checking parking brake operation and parking brake indicator light system operation; determine necessary action.	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of checking operation of brake stop light system; determine necessary action	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate understanding of replacing wheel bearing and race.	P-2	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of inspecting and replacing wheel studs	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of removing and reinstalling sealed wheel bearing assembly	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

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

Demonstrate an understanding of identifying and inspecting electronic brake control system components	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of diagnosing electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment		Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of bleeding the electronic brake control system hydraulic circuits	P-1	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of testing, diagnosing, and servicing electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO).		Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of identifying traction control/vehicle stability control system components	P-3	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests
Demonstrate an understanding of the operation of a regenerative braking system.	P-3	Classroom Discussion, Lecture, Classroom Exercises, Reading Assignments, Tests

III. OUTLINE OF TOPICS

- A. Explain Brake System Concerns and Symptoms
 1. Explain possible causes for a low/fading brake pedal
 2. Properly discuss causes for a brake pull
 3. Properly explain causes for brake noises

- B. Be able to Locate Vehicle Service Information
 1. Locate service information and technical service bulletins
 2. Locate vehicle service history
 3. Identify vehicle service precautions

- C. Explain the Function of the Hydraulic System
 1. Properly discuss the function of the hydraulic system using Paschal's Law
 2. Explain identification, proper handling and storage of brake fluid
 3. Describe the different types of brake fluid lines and hoses
 4. Describe the function of the metering, pressure differential and proportioning valve.

- D. Explain the Function of a Drum Brake System
 1. Identify the components of a drum brake system
 2. Properly discuss the function of each component
 3. Properly discuss the parking brake system
 4. Properly discuss maintenance procedures and intervals
 5. Properly describe correct repair procedures for drum brakes

- E. Explain the Function of a Disc Brake System
 1. Identify the components of a disc brake system
 2. Properly discuss the function of each component
 3. Properly discuss the correct diagnostic procedure
 4. Properly discuss maintenance procedures and intervals
 5. Properly describe correct repair procedures for disc brakes

- F. Explain the Testing and Replacement of Wheel Bearings
 1. Identify the components of unsealed and sealed wheel bearings
 2. Properly discuss the different types of wheel bearings
 3. Properly describe the diagnostic procedure for wheel bearings
 4. Properly describe the correct repair/replacement procedure for wheel bearings and bearing preload settings

- G. Explain the Function and Operation of the Brake Warning Light
 - 1. Properly discuss the operation of the brake warning light
 - 2. Explain all the failures that would cause the brake warning light to illuminate

- H. Explain the Function of the ABS Warning Light
 - 1. Explain what might cause the ABS warning light to illuminate
 - 2. Properly discuss the steps to diagnose an ABS warning light

- I. Explain Tires and Installation of Wheel Studs and Lug Nuts
 - 1. Discuss the installation of wheel studs
 - 2. Discuss the installation of lug nuts
 - 3. Discuss tire sidewall information and tire construction

- J. Explain Regenerative Brake System
 - 1. Discuss the regenerative brake system

IV. METHOD(S) OF INSTRUCTION

- A. Lectures
- B. Textbook Assignments
- C. Classroom Assignments
- D. Classroom Discussions
- E. Small Group Projects

V. REQUIRED TEXTBOOK(S)

James D. Halderman, *Automotive Chassis Systems*, (current edition), Pearson
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. Work Boots (Steel Toe Preferred)

VII. SUPPLEMENTAL REFERENCES

None

VIII. METHOD OF EVALUATION

- A. Tests 50%
- B. Homework 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.