

I. CATALOG DESCRIPTION:

- A. Department Information:
Division: Technical
Department: Automotive
Course ID: AUTO 051
Course Title: Advanced Automotive Brakes
Units: 4
Lecture: 3 Hours
Laboratory: 3 Hours
Prerequisite: AUTO 050
- B. Catalog Description:
This course is based on NATEF standards and is designed for students and current technicians to gain advanced knowledge and skills in automotive brakes. Advanced study of disc, drum, hydraulics, and power boosters systems. Emphasis on antilock brakes, traction control, and machining. Advanced theory and practical work in the repair of brake system. Shop instruction to include safety, reconditioning, machinery, procedures for trouble shooting and recondition brake systems.
- C. Schedule Description:
Advanced theory and practical work in the repair of brake system. Shop instruction to include safety, reconditioning, machinery, procedures for trouble shooting and recondition brake systems.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

- Upon completion of the course the student should be able to:
- A. Calculate hydraulic pressures using Pascal's theory;
 - B. Estimate the cost of a typical customers brake system repair;
 - C. Measure brake drums and rotors with micrometers and dial indicators;
 - D. Operate tool post grinder and on-the-vehicle brake lathe;
 - E. Differentiate a standard master cylinder from quick take-up master cylinder;
 - F. Service a wide variety of power brake boosters (vacuum, Hydra-boost, and electro-hydraulic boosters).

IV. COURSE CONTENT:

- A. Shop safety
 - 1. Hazardous materials
 - 2. Material Safety Data Safety Sheets
 - 3. Machinery Hazards
- B. Shop techniques
 - 1. Tools
 - 2. Torque
 - 3. Fasteners
 - 4. Brake tube bending and flaring
- C. Brake System Principles
 - 1. Hydraulics
 - a) Pascal's Theory
 - b) Brake fluids
 - c) Rubber types
 - 2. Physics of braking
 - a) Friction
 - b) Weight transfer
 - c) Energy

3. Brake lining compositions
 - a) Lining edge codes
 - b) SHA standards and handling guidelines
4. Brakes operation, diagnosis, and service
5. Caliper types
 - a) Fixed calipers
 - b) Floating calipers
6. Disc brake pads
 - a) Wear sensors
 - b) Wear compensation
 - c) Visual inspection
7. Caliper overhaul
 - a) Disassemble
 - b) Inspection
 - c) Reassemble
 - d) Rotating pistons back into calipers
8. Test drive and troubleshooting
 - a) Burning-in new pads
 - b) Cause and correction of brake pad squeal
 - c) Wheel pull and lockup
- E. Parking Brakes
 1. Parking brake standards
 2. Styles of parking brakes
 - a) Integral Disc type
 - b) Auxiliary Drum type
 - c) Standard Drum type
- F. Brake inspection
- G. Rear disc brakes
- H. Parking brake operation and adjustments
- I. Wheel bearing inspection and replacement
 1. Driving type
 2. Non-driving type
- J. Brake lathe operation
 1. Bench style
 2. On the car style
- K. Power Brake Operation, Diagnosis, and service
 1. Types of power assist
 - a) Vacuum booster
 - b) Hydraulic boosters
 - c) Tandem diaphragm boosters
 2. System test
 - a) Operation test
 - b) Leak test
 - c) Check valve test
 - d) Push-rod check
 3. Trouble shooting power boosters
- L. Antilock Brake Systems
 1. Theory of operation
 2. Steering control
 3. Skid control
 4. Braking distances
 5. Purpose of ABS components
 - a) Brake pedal sensor
 - b) Wheel sensors
 - c) Acceleration sensors
- M. Types of ABS systems
 1. Three channel system
 2. Four channel system

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- a) Rear wheel ABS
 - b) Integral ABS
 - c) Non-integral ABS
 - d) Traction control
- N. Manufacturers of ABS and servicing
- 1. Robert Bosch II/III
 - 2. Teves Mark II/IV
 - 3. Delco Delphi VI
 - 4. Servicing ABS
 - a) Safety precautions
 - b) Brake bleeding
 - c) ABS troubleshooting

V. METHODS OF INSTRUCTION:

- A. Lecture
- B. Class and group discussion
- C. Manufacturers video instructions
- D. Lab demonstrations

VI. TYPICAL ASSIGNMENTS:

- A. Read test book: Answer questions at end of each chapter (Example): Explain the term "co-efficient of friction".
- B. Class discussion (Typical): What are the advantages of "semi-metallic brake pads"?
- C. Manufacturer's instruction: Review videotape and write overview of the presentation.
- D. Lab assignments
 - 1. Complete task sheets (Examples).
 - a) Replace disc pads and machine rotors
 - b) Write a work order detailing customer's needs
 - c) Evaluate a customer's vehicle and prepare an accurate cost of repairs

VII. EVALUATION(S):

- A. One midterm and final examination: Multiple choice, True/False and essay questions:
Typical questions: Draw an illustration of a typical anti-lock brake system including electronics, valves and solenoids.
- B. Chapter review questions (Example): What is the difference between gas brake fade and thermal brake fade?
- C. Assigned advanced lab projects
- D. Communication: Writing assignments: Write a term paper detailing a brake system theory.
- E. Frequency of evaluation
 - 1. One mid-term examination
 - 2. One final exam
 - 3. Approximately fifteen lab projects
 - 4. One writing assignment
 - 5. Bi-weekly text book chapter review questions

VIII. TYPICAL TEXT(S):

Eichhorn Lane, Automotive Brake Systems (2nd Edition), Stamford, Ct: Delmar Publishing 2000.
Halderman James D., Automotive Brake Systems (2nd Edition), Columbus, Ohio: Prentice Hall 2000.

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

Personal safety gear to include safety glasses, adequate works clothes and shoes providing proper personal protection.