AUTO G140: AUTOMOTIVE CHASSIS: BRAKES

Item	Value
Curriculum Committee Approval Date	02/01/2022
Top Code	094800 - Automotive Technology
Units	5 Total Units
Hours	126 Total Hours (Lecture Hours 72; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

This course covers theory, knowledge, and skills necessary to understand automotive disc and drum brake systems, antilock-braking systems and related components. Instruction is given and lab experience provided which will enable students to successfully perform diagnostics and repairs on automotive brake systems. Information presented is based on the Automotive Service Excellence (ASE) Engine Performance Tasks and Standards intended to prepare students for the ASE A-5 Brakes examination. Transfer Credit: CSU. C-ID: AUTO 150X. **C-ID:** AUTO 150X.

Course Level Student Learning Outcome(s)

1. Course Outcomes
2. Analyze automotive braking systems and related components for correct system operation.
3. Demonstrate mastery of diagnostic tools and equipment used for automotive repair.
4. Evaluate brake components based on precision measurements compared to factory specifications.

Course Objectives

- 1. Pass safety test(s) assigned by instructor.
- 2. Describe disc and drum-brake systems theory.
- 3. Identify hydraulic system failures using analytical skills.
- 4. Perform brake-related services and repairs.
- 5. Demonstrate the operation of Power Assist (PA) systems.
- 6. Analyze Antilock Brake Systems (ABS) by using PC-based software.

Lecture Content

Safety Basic Auto Technology shop safety instruction and demonstrations Instructor assigned safety certifications General Brake System Diagnosis Basic principles and theory Hydraulic principles: Pascals Law Principles of friction: Kinetic theory Overview of system components Applicable vehicle and service information Vehicle Identification Number (VIN) decals Measurement math concepts Conversion principles: SAE and metric Hydraulic System Diagnosis and Repair Overview of system parts and components Master cylinder operation and brake pedal height Symptoms of hydraulic malfunctions System leaks: Internal and External Brakes lines and hoses Combination valves Proportioning valves Warning lights Drum Brakes Diagnosis and Repair Overview: System components Backing plate assembly and related components Friction materials and brake shoes Parking brake Symptoms of component failures Brake drums and micrometer measurement Disc Brakes Diagnosis and Repair Overview: System components Caliper assembly Friction materials and brake pads Hardware Rotor designs Integrated parking brake Symptoms of component failures Brake rotors and micrometer measurement Power Assist Units Diagnosis and Repair Positive and negative air pressure theory and concepts Power booster Hydro booster Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair Wheel shimmy, and vibration issues Parking Brake cable types, service, and repair Stop light operation, circuitry, diagnostics and repair Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair Body Control Module (BCM) system control and communication PC-based diagnostics Flash codes Speed sensor testing Traction control integration System pressure testing

Lab Content

General Brake Systems Diagnosis Complete work order to include customer information, vehicle identifying information, customer concern, related service history, causes, and correction Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical services bulletins Locate and interpret vehicle and major component identification numbers Identify and interpret brake system concerns; determine necessary action Hydraulic System Diagnosis and Repair Diagnose pressure concerns in the brake system using hydraulic principles (Pascals Law) Measure brake pedal height, travel, and free play (as applicable); determine necessary action Check master cylinder for internal/external leaks and proper operation; determine necessary action Remove, bench bleed and reinstall master cylinder Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action. Replace brake lines, hoses, fittings, and supports Fabricate brake lines using proper material and flaring procedures (double flare and ISO types) Select, handle, store and fill brake fluids to proper level Inspect, test and/or replace components of brake warning light system Bleed and/or flush brake system Test brake fluid for contamination Drum Brake Diagnosis and Repair Diagnose poor stopping, noise, vibration, pulling grabbing, dragging, or pedal pulsation concerns, determine necessary action Remove, clean, inspect and measure brake drums; determine necessary action< / Refinish brake drum; measure final drum diameter Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble Inspect and install wheel cylinders Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings Install wheel, torque lug nuts, and make final checks and adjustments Disc Brake diagnosis and Repair Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation Remove caliper assembly; inspect for leaks and damage to caliper housing; determine necessary action Clean and inspect caliper mounting and slides/pins for operation, wear, and damage, determine necessary action Remove, inspect and replace pads and retaining hardware; determine necessary action Disassemble and clean caliper assembly; Inspect parts for wear, rust, scoring, damage replace seal, boot, and damaged, or worn parts Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks Clean, inspect, and measure rotor

thickness, lateral runout, and thickness variation; determine necessary action Remove and reinstall rotor Refinish rotor on vehicle, measure final rotor thickness Refinish rotor off vehicle, measure final rotor thickness Install wheel, torque lug nuts, and make final checks and adjustments Power Assist Units Diagnosis and Repair Test pedal free travel; check power assist operation Check vacuum supply to vacuum-type power booster Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action Measure and adjust master cylinder pushrod length Miscellaneo us (Wheel Bearings, Parking Brakes, Electrical, Etc.); Diagnosis and Repair Diagnose wheel Bearing noises, wheel shimmy, and vibration concerns; determine necessary action Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate adjust or replace wheel bearing race Inspect and replace wheel studs Remove and reinstall sealed wheel bearing assembly Electronic Brake, Traction and Stability Control Systems; Diagnose and Repair Identify and inspect electronic brake control system components; determine necessary action Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine necessary action Diagnose electronic brake control system electronic(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action Practice sample Automotive Service Excellence (ASE) A5 Brakes certification test questions.

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- Lab (04)
- DE Live Online Lab (04S)

Reading Assignments

Textbook Reading Assignments

Writing Assignments

Create vehicle repair orders related to various on-vehicle lab assignments.

Out-of-class Assignments

Reading Assignments Interactive Web-based Training Modules Worksheets

Demonstration of Critical Thinking

Analyze and troubleshoot brake systems and restore them to proper service. Analyze, confirm, and diagnose brake faults based on symptoms indicated on repair orders. Relate diagnostic test results directly to brake system and related component failures based on readings or measurements Analyze brake sysems to determine integrity of compoents by comparing measurements to factory specifications.

Required Writing, Problem Solving, Skills Demonstration

Create vehicle repair orders, perform math exercises for flat rate labor, parts and materials totals. Use online service and repair information to compare factory specifications with actual reading and measurements acquired during brake system diagnostic activities.

Eligible Disciplines

Automotive technology: Any bachelors degree and two years of professional experience, or any associate degree and six years of professional experience.

Textbooks Resources

1. Required James D Halderman. Automotive Brak Systems, Seventh ed. Pearson Education, 2017

Other Resources

1. GWC Auto Tech work shirt