COURSE OUTLINE OF RECORD

Number: AUTO G140  TITLE: Automotive Chassis: Brakes

ORIGINATOR: Eli Jaramillo  EFF TERM: Fall 2012
FORMERLY KNOWN AS:  DATE OF
OUTLINE/REVIEW: 04-03-2012
CROSS LISTED COURSE: TOP NO: 0948.00

SEMESTER UNITS: 5.0  CID:
HRS LEC: 72.0  HRS LAB: 54.0  HRS OTHER: 0.0
CONTACT HRS TOTAL: 126.0
STUDY NON-CONTACT HRS RECOMMENDED: 144.0

CATALOG DESCRIPTION:
This is an introductory course that 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 repair 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.

JUSTIFICATION FOR COURSE:

PREREQUISITES:
COREQUISITES:
ADVISORIES:

ASSIGNED DISCIPLINES:
Automotive technology

MATERIAL FEE: Yes [ ] No [X] Amount: $0.00

CREDIT STATUS: Noncredit [ ] Credit - Degree Applicable [X] Credit - Not Degree Applicable [ ]

GRADING POLICY: Pass/No Pass [X] Standard Letter [X] Not Graded [ ] Satisfactory Progress [ ]

OPEN ENTRY/OPEN EXIT: Yes [ ] No [X]

TRANSFER STATUS: CSU Transferable[X] UC/CSU Transferable[ ] Not Transferable[ ]

BASIC SKILLS STATUS: Yes [ ] No [X]  LEVELS BELOW TRANSFER: Not Applicable

CALIFORNIA CLASSIFICATION CODES: Y - Not Applicable

NON CREDIT COURSE CATEGORY: Y - Not applicable, Credit Course

OCCUPATIONAL (SAM) CODE: C

REPEATABLE ACCORDING TO STATE GUIDELINES: No [X] Yes [ ] NUMBER REPEATS:

REQUIRED FOR DEGREE OR CERTIFICATE: No [ ] Yes [X]
Chassis and Drivetrain Specialist(Associate in Arts)
Chassis and Drivetrain Specialist(Certificate of Achievement)

GE AND TRANSFER REQUIREMENTS MET:

COURSE LEVEL STUDENT LEARNING OUTCOME(S) Supported by this course:
1. Demonstrate an ability to self-assess progress and development in a specific area and to further design and pursue a course of action based on the self-assessment.

2. Evaluate brake components based on precision measurements compared to factory specifications.

3. Demonstrate mastery of diagnostic tools and equipment used for automotive repair.

4. Analyze and diagnose automotive engines and related components for correct system operation.

**COURSE OBJECTIVES:**
1. Pass the SP-2 Mechanical Safety and Mechanical Pollution Prevention Test.
2. Describe disk 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.

**COURSE CONTENT:**

**LECTURE CONTENT:**

A. Safety
   1. Basic Auto Technology shop safety instruction and demonstrations
   2. SP-2 Mechanical Safety and Mechanical Pollution Prevention tests

B. General Brake System Diagnosis
   1. Basic principles and theory
      1. Hydraulics principles: Pascal's Law
      2. Principles of friction: Kinetic theory
   2. Overview of system components
   3. Applicable vehicle and service information
   4. Vehicle Identification Number (VIN) decals
   5. Measurement math concepts
   6. Conversion principles: SAE and metric

C. Hydraulic System Diagnosis and Repair
   1. Overview of system parts and components
   2. Master cylinder operation and brake pedal height
   3. Symptoms of hydraulic malfunctions
   4. System leaks: Internal and external
   5. Brake lines and hoses
   6. Combination valves
   7. Proportioning valves
   8. Warning lights

D. Drum Brakes Diagnosis and Repair
   1. Overview: System components
   2. Backing plate assembly and related components
   3. Friction materials and brake shoes
   4. Parking brake
   5. Symptoms of component failures
   6. Brake drums and micrometer measurement

E. Disc Brakes Diagnosis and Repair
   1. Overview: System components
   2. Caliper assembly
3. Friction materials and brake pads
4. Hardware
5. Rotor designs
6. Integrated parking brake
7. Symptoms of component failures
8. Brake rotors and micrometer measurement

F. Power Assist Units Diagnosis and Repair
   1. Positive and negative air pressure theory and concepts
   2. Power booster
   3. Hydro-booster

G. Miscellaneous (Wheel Bearings, Parking Brakes, electrical, Etc. Diagnosis and Repair)
   1. Wheel bearing types, service, and repair
   2. Wheel shimmy, and vibration issues
   3. Parking brake cable types, service, and repair
   4. Stop light operation, circuitry, diagnostics and repair

H. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair
   1. Body Control Module (BCM) system control and communication
   2. PC-based diagnostics
   3. Flash codes
   4. Speed sensor testing
   5. Traction control integration
   6. System pressure testing

LABORATORY CONTENT:

After acquiring the appropriate lecture information, the successful student will demonstrate skill accomplishment by completing worksheet-driven NATEF-approved tasks. NATEF (National Automotive Technicians Education Foundation) is a non-profit agency that evaluates technician training programs against standards developed by the automotive industry. All of the current NATEF approved tasks for this class are listed below, and are also contained in a separate document that is handed out on the first day of class.

BRAKES

For every task in Brakes, the following safety requirement must be strictly enforced:

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

A. General Brake Systems Diagnosis
   1. Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction
   2. Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins
   3. Locate and interpret vehicle and major component identification numbers
   4. Identify and interpret brake system concern; determine necessary action

B. Hydraulic System Diagnosis and Repair
   1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal’s Law)
   2. Measure brake pedal height, travel, and free play (as applicable); determine necessary action
   3. Check master cylinder for internal/external leaks and proper operation; determine
necessary action
4. Remove, bench bleed, and reinstall master cylinder
5. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action
6. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action.
7. Replace brake lines, hoses, fittings, and supports
8. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types)
9. Select, handle, store, and fill brake fluids to proper level
10. Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves
11. Inspect, test, and/or replace components of brake warning light system
12. Bleed and/or flush brake system
13. Test brake fluid for contamination

C. Drum Brake Diagnosis and Repair
1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns, determine necessary action
2. Remove, clean, inspect, and measure brake drums; determine necessary action
3. Refinish brake drum; measure final drum diameter
4. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble
5. Inspect and install wheel cylinders
6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings
7. Install wheel, torque lug nuts, and make final checks and adjustments

D. Disc Brake Diagnosis and Repair
1. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pulsation concerns; determine necessary action
2. Remove caliper assembly; inspect for leaks and damage to caliper housing; determine necessary action
3. Clean and inspect caliper mounting and slides/pins for operation, wear, and damage, determine necessary action
4. Remove, inspect and replace pads and retaining hardware; determine necessary action
5. Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts
6. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks
7. Clean, inspect, and measure rotor thickness, lateral runout, and thickness variation; determine necessary action
8. Remove and reinstall rotor
9. Refinish rotor on vehicle; measure final rotor thickness
10. Refinish rotor off vehicle; measure final rotor thickness
11. Retract caliper piston on an integrated parking brake system
12. Install wheel, torque lug nuts, and make final checks and adjustments
13. Check brake pad wear indicator system operation; determine necessary action

E. Power Assist Units Diagnosis and Repair
1. Test pedal free travel; check power assist operation
2. Check vacuum supply to vacuum-type power booster
4. Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action
5. Measure and adjust master cylinder pushrod length

F. Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair
1. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action
2. Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings
3. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed
4. Check parking brake and indicator light system operation; determine necessary action
5. Check operation of brake stop light system; determine necessary action
6. Replace wheel bearing and race
7. Inspect and replace wheel studs
8. Remove and reinstall sealed wheel bearing assembly

G. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair
1. Identify and inspect electronic brake control system components; determine necessary action
2. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine necessary action
3. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action

H. Practice sample ASE (A5) Brakes certification test

METHODS OF INSTRUCTION:

A. Lecture:
B. Lab:

INSTRUCTIONAL TECHNIQUES:

COURSE ASSIGNMENTS:

Reading Assignments

Required readings:

Websites
Web-based assignments
Autoshop101.com
CTEonline.com
Other topic-specific websites as needed

Out-of-class Assignments

Writing Assignments

1. Create vehicle repair orders, perform math exercises for flat rate labor, parts and materials totals.
2. Demonstrate an understanding of Pascal’s Law by performing math exercises to validate volume and pressures in brake hydraulic systems.
3. Use information and concepts learned in class to successfully pass a practicum exam or written test or assignment.
4. Use on-line service and repair information to compare factory specs with actual
readings and measurements acquired during brake system diagnostic activities.

**METHODS OF STUDENT EVALUATION:**
- Midterm Exam
- Final Exam
- Short Quizzes
- Written Assignments
- Essay Examinations
- Objective Examinations
- Report
- Projects (ind/group)
- Problem Solving Exercises
- Oral Presentations
- Skills Demonstration

**Demonstration of Critical Thinking:**
1. Analyze and troubleshoot brake systems and restore them to proper service.
2. Analyze, confirm, and diagnose brake faults based on symptoms indicated on repair orders.
3. Relate diagnostic test results directly to brake system and related component failures based on readings or measurements.
4. Analyze brake systems to determine integrity of components by comparing measurements to factory specifications.

**Required Writing, Problem Solving, Skills Demonstration:**
1. Create vehicle repair orders, perform math exercises for flat rate labor, parts and materials totals.
2. Demonstrate an understanding of Pascal’s Law by performing math exercises to validate volume and pressures in brake hydraulic systems.
3. Use information and concepts learned in class to successfully pass a practicum exam or written test or assignment.
4. Use on-line service and repair information to compare factory specs with actual readings and measurements acquired during brake system diagnostic activities.

**TEXTS, READINGS, AND RESOURCES:**

**TextBooks:**

**Other:**
1. GWC Auto Tech work shirt
2. Basic automotive hand tool set

**LIBRARY:**
- Adequate library resources include:

**Comments:**

**Attachments:**
- Attached Files