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**REQUIRED TEXT AND MATERIALS:**
Please see bookstore for current textbook(s) and other required material.

**COURSE DESCRIPTION:**
In this course students will: Determine necessary brake system correction; Conduct system pressure tests utilizing service specifications; Perform diagnosis and correction for poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; Conduct inspection, fabrication and/or replacement of brake lines and hoses; Diagnose poor stopping noise vibration, pulling, grabbing, dragging or pedal pulsation concerns; Perform service specifications pertaining to the removal, cleaning and refinishing procedures on brake drums; Perform drum brake repair and replacement procedures; Diagnose poor stopping noise vibration, pulling, grabbing, dragging or pedal pulsation concerns; Perform disc brake repair and replacement procedures; Machine rotor according to service specifications; Perform caliper piston retraction where applicable; Inspect and test power assist systems; Determine necessary action on wheel bearing
noise, wheel shimmy and vibration concern diagnoses; Perform the removal, inspection and replacement of bearing and hub assemblies through a variety of classroom and lab/shop learning and assessment activities.

METHOD OF INSTRUCTION:
A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, and panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE:
All students must 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.

I. Documenting complex brake system concerns
   A. Completing work order
      1. Vehicle identifying information
      2. Customer concerns
      3. Service history
      4. Cause
      5. Correction
   B. Identifying and interpret concerns
   C. Researching vehicle information
      1. Operation
      2. Precautions
      3. Technical service bulletins
   D. Locating and interpreting identification numbers

II. System pressure testing
   A. Hydraulic principles (Paschal’s Law)
   B. Brake pedal
      1. Height
      2. Travel
      3. Free play
   C. Master cylinder
      1. Internal/external leaks
      2. Proper operation
      3. Bench bleeding

III. Malfunctions in the hydraulic system
   A. Master cylinder internal/external leakage
   B. Leaks
   C. Dents
   D. Kinks
   E. Rust
F. Cracks
G. Bulging
H. Loose fittings

IV. Fabrication and/or replacement of brake lines and hoses
   A. Flexible hoses
   B. Fittings
   C. Brake lines
   D. Fabricate brake lines
      1. ISO flaring
      2. Double flaring

V. Diagnosis of drum brake problems
   A. Poor stopping
   B. Noise
   C. Vibration
   D. Pulling
   E. Grabbing
   F. Dragging
   G. Pedal pulsation

VI. Brake drum specifications
   A. Measuring brake drum
   B. Wear limits

VII. Drum brake repair
   A. Brake shoes
   B. Springs
   C. Pins
   D. Clips
   E. Levers
   F. Adjusters/self-adjusters
   G. Backing support plates
   H. Lubrication
   I. Wheel cylinders
   J. Adjustments
      1. Brake shoes
      2. Parking brake
      3. Drums/hub
      4. Wheel bearings
   K. Wheel
      1. Lug nut torque
      2. Final checks
   L. Turning brake drums

VIII. Brake rotor diagnosis
   A. Poor stopping
   B. Noise
   C. Vibration
   D. Pulling
   E. Grabbing
F. Dragging
G. Pedal pulsation
H. Caliper seizing
I. Rotor measurements
   1. Lateral run-out
   2. Thickness
   3. Out of round
   4. Parallelism
IX. Perform disc brake repair and replacement procedures
   A. Replace pads
   B. Retaining hardware
   C. Disassemble and clean
   D. Inspection
      1. Wear
      2. Rust
      3. Scoring
      4. Damage
   E. Seal
   F. Boot
   G. Lubrication
   H. Calipers
   I. Pad wear indicator system
X. Rotor refinishing
   A. Brake lathe operation
      1. On car lathe
      2. Off car lathe
   B. Measuring rotor thickness
XI. Retracting caliper pistons
   A. Front
   B. Rear
XII. Power assist systems
   A. Vacuum Booster
   B. Hydraulically assisted power brake systems
   C. Electric brakes
XIII. Vibration diagnosis
   A. Wheel bearing noise
   B. Wheel shimmy
   C. Vibrations
XIV. Wheel bearing and hub service
   A. Cleaning
   B. Inspect
   C. Adjust
   D. Wheel stud
   E. Sealed bearings
XV. Antilock brakes
   A. ABS components
EXPECTED LEARNER OUTCOMES:
A. Students will be able to identify necessary brake system correction
B. Students will be able to describe system pressure tests utilizing service specifications
C. Students will be able to explain diagnosis and correction for poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system
D. Students will be able to summarize inspection, fabrication and/or replacement of brake lines and hoses
E. Students will be able to explain poor stopping noise vibration, pulling, grabbing, dragging or pedal pulsation concerns
F. Students will be able to distinguish service specifications pertaining to the removal, cleaning and refinishing procedures on break drums
G. Students will be able to explain drum brake repair and replacement procedures
H. Students will be able to identify poor stopping noise vibration, pulling, grabbing, dragging or pedal pulsation concerns
I. Students will be able to describe disc brake repair and replacement procedures
J. Students will be able to machine rotor according to service specifications
K. Students will be able to explain caliper piston retraction where applicable
L. Students will be able to inspect and test power assist systems
M. Students will be able to identify necessary action on wheel bearing noise, wheel shimmy and vibration concern diagnoses
N. Students will be able to explain the removal, inspection and replacement of bearing and hub assemblies

Course Competencies

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

Students will be able to describe system pressure tests utilizing service specifications
5. Diagnose pressure concerns in the brake system using hydraulic principles (Paschal’s Law)
6. Measure brake pedal height, travel, and free play (as applicable); determine necessary action
7. Check master cylinder for internal/external leaks and proper operation; determine necessary action
8. Remove, bench bleed, and reinstall master cylinder
9. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action
10. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action
11. Replace brake lines, hoses, fittings, and supports
12. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types)
13. Select, handle, store, and fill brake fluids to proper level
14. Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves
15. Inspect, test, and/or replace components of brake warning light system
16. Bleed and/or flush brake system
17. Test brake fluid for contamination
   Students will be able to explain diagnosis and correction for poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system.
18. Measure brake pedal height, travel, and free play (as applicable); determine necessary action.
19. Check master cylinder for internal/external leaks and proper operation; determine necessary action
20. Remove, bench bleed, and reinstall master cylinder
21. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action
22. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action
23. Replace brake lines, hoses, fittings, and supports
24. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types)
25. Select, handle, store, and fill brake fluids to proper level
26. Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves
27. Inspect, test, and/or replace components of brake warning light system
   Students will be able to summarize inspection, fabrication and/or replacement of brake lines and hoses.
28. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action
29. Replace brake lines, hoses, fittings, and supports
30. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types)
31. Select, handle, store, and fill brake fluids to proper level
   Students will be able to explain poor stopping noise vibration, pulling, grabbing, dragging or pedal pulsation concerns.
32. Diagnose poor stopping, noise vibration, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action
   Students will be able to distinguish service specifications pertaining to the removal, cleaning and refinishing procedures on brake drums.
33. Remove, clean, inspect, and measure brake drums; determine necessary action
34. Refinish brake drum; measure final drum diameter
   *Students will be able to explain drum brake repair and replacement procedures*
35. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble
36. Inspect, and install wheel cylinders
37. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings
38. Install wheel, torque lug nuts, and make final checks and adjustments
   *Students will be able to identify poor stopping noise vibration, pulling, grabbing, dragging or pedal pulsation concerns*
39. Diagnose poor stopping, noise, pulling, grabbing, dragging or pulsation concerns; determine necessary action
40. Remove caliper assembly; inspect for leaks and damage to caliper housing; determine necessary action
41. Clean and inspect caliper mounting and slides/pins for operation, wear, and damage; determine necessary action
   *Students will be able to describe disc brake repair and replacement procedures*
42. Remove, inspect, and replace pads and retaining hardware; determine necessary action
43. Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts
44. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks
45. Clean, inspect, and measure rotor thickness, lateral runout, and thickness variation; determine necessary action
46. Remove and reinstall rotor
47. Check brake pad wear indicator system operation; determine necessary action
   *Students will be able to machine rotor according to service specifications*
48. Refinish rotor on vehicle; measure final rotor thickness
49. Refinish rotor off vehicle; measure final rotor thickness
   *Students will be able to explain caliper piston retraction where applicable*
50. Retract caliper piston on an integrated parking brake system
   *Students will be able to inspect and test power assist systems*
51. Test pedal free travel; check power assist operation
52. Check vacuum supply to vacuum-type power booster
53. Inspect the vacuum-type power booster unit for leaks; inspect the check valve for proper operation; determine necessary action
54. Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action
   *Students will be able to identify necessary action on wheel bearing noise, wheel shimmy and vibration concern diagnosis*
55. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action
   *Students will be able to explain the removal, inspection and replacement of bearing and hub assemblies*

56. Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust bearings

57. Check parking brake cables and components for wear, binding, and corrosion; clean, lubricate, adjust or replace as needed

58. Check parking brake and indicator light system operation; determine necessary action

59. Check operation of brake stop light system; determine necessary action

60. Replace wheel bearing and race

61. Inspect and replace wheel studs

62. Remove and reinstall sealed wheel bearing assembly

**ASSESSMENT OF LEARNER OUTCOMES:**
Assessment methods may include, but are not limited to, the following: Homework, Assignments, Quizzes, Class Participation, Chapter Tests, and Final Exam. The grading scale and the process for calculating the course grades are to be determined by the individual instructors. This information will be included in each instructor's syllabus.

**SPECIAL NOTES:**
This syllabus is subject to change at the discretion of the instructor. Material included is intended to provide an outline of the course and rules that the instructor will adhere to in evaluating the student’s progress. However, this syllabus is not intended to be a legal contract. Questions regarding the syllabus are welcome any time.

Kansas City Kansas Community College is committed to an appreciation of diversity with respect for the differences among the diverse groups comprising our students, faculty, and staff that is free of bigotry and discrimination. Kansas City Kansas Community College is committed to providing a multicultural education and environment that reflects and respects diversity and that seeks to increase understanding.

Kansas City Kansas Community College offers equal educational opportunity to all students as well as serving as an equal opportunity employer for all personnel. Various laws, including Title IX of the Educational Amendments of 1972, require the college’s policy on non-discrimination be administered without regard to race, color, age, sex, religion, national origin, physical handicap, or veteran status and that such policy be made known.

Kansas City Kansas Community College complies with the Americans with Disabilities Act. If you need accommodations due to a documented disability, please contact the Director of the Academic Resource Center in Room 3354 or call (913) 288-7670 V/TDD.