

MARTIN COMMUNITY COLLEGE
COURSE SYLLABUS
Semester/Year: Spring 2011

COURSE NUMBER: AUT 151A-01

INSTRUCTOR: S. M. Denis

COURSE TITLE: Brake Systems

OFFICE NO: Building 3, Room 7

CREDIT HOURS: 1

OFFICE/VIRTUAL HOURS: MF 3:00-3:50,
TTH 2:00-2:50, F 11:00-2:50

CONTACT HRS/WK: 3 (3 lab)

PHONE NO: (252)789-0263

PREREQUISITES: NONE

FAX: (252)792-0826

COREQUISITES: AUT 151

E-MAIL: sdenis@martincc.edu

COURSE DESCRIPTION: This course is an optional lab to be used as an alternative to co-op placement in meeting the NATEF standards for total hours. Topics include drum and disc brakes involving hydraulic, vacuum boost, hydra-boost, electrically powered boost, and anti-lock and parking brake systems and emerging brake systems technologies. Upon completion, students should be able to diagnose, service, and repair various automotive braking systems.

PROGRAM LEARNING OUTCOMES:

Upon successful program completion, the student shall be able to:

1. Inspect, diagnose, disassemble, repair, replace and service each of the basic systems in various types of vehicles to a NATEF (National Automotive Technician Education Foundation) standard.
2. Inspect, diagnose, disassemble, repair, replace and service each of the advanced systems in various types of vehicles to a NATEF (National Automotive Technician Education Foundation) standard.
3. Demonstrate knowledge and understanding of automotive systems to a level at, or above that required for ASE (National Institute for Automotive Service Excellence) certification in general automotive service.

COURSE LEARNING OUTCOMES:

Upon successful course completion, the student shall be able to:

1. Inspect, diagnose, disassemble, repair, replace and service basic brake systems in various types of vehicles to a NATEF (National Automotive Technician Education Foundation) standard.
2. Inspect, diagnose, disassemble, repair, replace and service advanced brake systems, including ABS, in various types of vehicles to a NATEF (National Automotive Technician Education Foundation) standard.
3. Demonstrate knowledge and understanding of brake systems to a level at, or above that required for ASE (National Institute for Automotive Service Excellence) certification in general automotive service.

NATEF OBJECTIVES:

Upon completion of this course, the student should be able to:

1. Identify and interpret brake system concern; determine necessary action. P-1
2. Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins. P-1

3. Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals). P-1
4. Diagnose pressure concerns in the brake system using hydraulic principles (Paschal's Law). P-1
5. Measure brake pedal height; determine necessary action. P-2
6. Check master cylinder for internal and external leaks and proper operation; determine necessary action. P-2
7. Remove, bench bleed, and reinstall master cylinder. P-1
8. Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system; determine necessary action. P-1
9. Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action. P-2
10. Fabricate and/or install brake lines (double flare and ISO types); replace hoses, fittings, and supports as needed. P-2
11. Select, handle, store, and fill brake fluids to proper level. P-1
12. Inspect, test, and/or replace metering (hold-off), proportioning (balance), pressure differential, and combination valves. P-2
13. Inspect, test, and adjust height (load) sensing proportioning valve. P-3
14. Inspect, test, and/or replace components of brake warning light system. P-3
15. Bleed (manual, pressure, vacuum or surge) brake system. P-1
16. Flush hydraulic system. P-3
17. Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. P-1
18. Remove, clean (using proper safety procedures), inspect, and measure brake drums; determine necessary action. P-1
19. Refinish brake drum. P-1
20. Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. P-1
21. Remove, inspect, and install wheel cylinders. P-2
22. Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings. P-1
23. Install wheel, torque lug nuts, and make final checks and adjustments. P-1
24. Diagnose poor stopping, noise, pulling, grabbing, dragging or pedal pulsation concerns; determine necessary action. P-1
25. Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action. P-1
26. Clean and inspect caliper mounting and slides for wear and damage; determine necessary action. P-1
27. Remove, clean, and inspect pads and retaining hardware; determine necessary action. P-1
28. Disassemble and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts. P-2
29. Reassemble, lubricate, and reinstall caliper, pads, and related hardware; seat pads, and inspect for leaks. P-1
30. Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer's recommendations in determining need to machine or replace. P-1
31. Remove and reinstall rotor. P-1
32. Refinish rotor according to manufacturer's recommendations. P-1
33. Adjust calipers equipped with an integrated parking brake system. P-3
34. Install wheel, torque lug nuts, and make final checks and adjustments. P-1
35. Test pedal free travel with and without engine running; check power assist operation. P-2
36. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster. P-2
37. Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action. P-2

38. Inspect and test hydro-boost system and accumulator for leaks and proper operation; determine necessary action. P-3
 39. Diagnose wheel bearing noises, wheel shimmy, and vibration concerns; determine necessary action. P-1
 40. Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust wheel bearings. P-1
 41. Check parking brake cables and components for wear, rusting, binding, and corrosion; clean, lubricate, or replace as needed. P-2
 42. Check parking brake operation; determine necessary action. P-1
 43. Check operation of parking brake indicator light system. P-3
 44. Check operation of brake stop light system; determine necessary action. P-1
 45. Replace wheel bearing and race. P-1
 46. Inspect and replace wheel studs. P-1
 47. Remove and reinstall sealed wheel bearing assembly. P-2
 48. Identify and inspect antilock brake system (ABS) components; determine necessary action. P-1
 49. Diagnose poor stopping, wheel lock-up, abnormal pedal feel or pulsation, and noise concerns caused by the antilock brake system (ABS); determine necessary action. P-2
 50. Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action. P-1
 51. Depressurize high-pressure components of the antilock brake system (ABS). P-3
 52. Bleed the antilock brake system's (ABS) front and rear hydraulic circuits. P-2
 53. Remove and install antilock brake system (ABS) electrical/electronic and hydraulic components. P-3
 54. Test, diagnose and service ABS speed sensors, toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). P-1
 55. Diagnose antilock brake system (ABS) braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). P-3
 56. Identify traction control system components. P-3
- *Note: Safety procedures and precautions, which relate to application and use of equipment and personal health and safety, will be taught as it applies to brakes.

REQUIRED TEXTBOOKS

Text: Gilles. (2008) Automotive service : Inspection maintenance repair. (3rd ed.) Clifton Park: Thompson Delmar. ISBN: 1-4180-3758-3.

Worktext: Hadfield. (2008) Automotive job sheets for NATEF task mastery. (1st ed.) Clifton Park: Thompson Delmar. ISBN: 1-4180-7302-1

SUPPLEMENTAL RESOURCES:

Required Supplies: Approved Safety Glasses

NOTE: SAFETY GLASSES ARE REQUIRED TO BE WORN AT ALL TIMES WHILE IN THE SHOP AREA AND IN THE OUTSIDE WORK AREA

Basic Tool Set (See Attached)

Reference Materials: Information on Shop-Key, Internet, video/DVD information from manufactures

LEARNING/TEACHING METHODS

Hands-on lab, Outside Reading Assignments

ASSESSMENTS/METHODS OF EVALUATION:

Grading will be based on lab work. Successful completion of assigned job sheets will be used to determine percentage of NATEF tasks mastered. Total percentages of the prioritized NATEF tasks will determine final grade.

A=90-100 B=80-89 C=70-79 D=60-69 F=59 and below

COURSE OUTLINE:

- Week 1. Brake Principles and Fundamentals
- Week 2. Hydraulic Systems--Component Operations
- Week 3. Hydraulic Systems—Bleeding
- Week 4. Hydraulic Systems—Servicing
- Week 5. Drum Brakes—Operation
- Week 6. Drum Brakes--Inspecting and Servicing
- Week 7. Disc Brakes—Operation
- Week 8. Disc Brakes--Inspection and Servicing
- Week 9. Parking Brakes--Operation and Servicing
- Week 10. Power Brakes--Operation and Servicing
- Week 11. Antilock Brake System--Operation and Servicing
- Week 12. Light Duty Truck Brakes
- Week 13. Import Brakes
- Week 14-15. Diagnosing Brake System Problems
- Week 16. Lab Clean up and Review

STUDENT ATTENDANCE POLICY:

Martin Community College recognizes that academic success is tied to regular attendance and completion of assigned work and tasks in a timely manner. Students are expected to attend a minimum of 80 percent of the total hours in this course, which includes classes, labs. Students must be present in at least one class during the first ten percent (10%) of a course in order to be considered enrolled in the class. If a student has not attended at least one class by the ten percent census date, the instructor will administratively withdraw the student.

Students who miss more than six contiguous contact hours or fail to attend the required percentage of total hours without a justifiable absence and verifiable contact with the instructor may be administratively withdrawn from the class and given a grade of "WF." The "WF" will be equivalent to an "F" when calculated into the student's GPA. An absence MAY, the instructor's sole discretion, be considered justifiable if proper, verifiable documentation of medical emergency is supplied. Verifiable contact will consist exclusively of a email to the instructor with an instructor reply and/or a registered/return-receipt letter to the instructor. Students may remove a "WF" by submitting appropriate paperwork for an official withdrawal by the last day to officially withdraw without receiving an "F." The last day to officially withdraw without receiving an "F" is published in the academic calendar for each academic year.

Make-up work will be allowed only with written prior approval of the instructor.

Habitual tardiness and/or early departure in a course will be considered in computing class attendance. A student will be considered tardy if they are not in their seat and prepared for work at the published class starting time. Students will be considered absent if not present when the roll is taken. Students may enter the classroom after the after the published class starting time if they can do so without disruption. It is the student's responsibility at the end of class or first break to make the instructor aware of their presence and arrival time. Students failing to do this will be considered absent for the entire class period. Early departure will be

considered any time the student is absent from class for more than 5 minutes per class hour without direct instructor permission. Students departing more than 5 minutes before the published class ending time without prior instructor approval will be considered absent for the entire class period.

Students will be counted absent from the date they register for each course.

Note: Under DVA regulations, the enrollment of veterans or dependents will be terminated or adjusted if they are administratively withdrawn or if they officially withdraw.

If an instructor fails to report for a class within 15 minutes of the scheduled beginning time and has not left instructions, those students present should sign a sheet before leaving and designate a student to submit it to the Dean of Academic Affairs and Student Services

REQUEST FOR EXCUSED ABSENCES FOR RELIGIOUS OBSERVANCES*

***In compliance with G.S. 115D-5, MCC policy permits a student to be excused, with the opportunity to make-up any test or other missed work, a minimum of two excused absences per academic year for religious observances required by the student's faith. The policy limits the excused absences to a maximum of two days per academic year.**

Students who wish to be excused for a Religious Observance required by their faith must complete and submit a request form to the instructor(s) prior to the census date of each class. The ***Request for Excused Absences for Religious Observances*** form can be picked up from Student Services. This does not supersede the college-wide attendance policy as outlined in the college catalog or syllabus, with the exception of a reasonable accommodation for the make-up of missed course work.

COURSE POLICIES:

All persons will have and wear safety glasses at all times in shop or lab areas. Failure to adhere to safety glasses rules will result in removal from the lab area and may result in disciplinary action.

The shop area is defined as Rm 10A, 10B, 10C and the area the area enclosed by the chain link fence outside the lab bay doors of building 3

Students are permitted, when entering the lab, to do so, at their own risk, without glasses if they are going directly to their tool box/work station to retrieve their glasses. "Passing through" to classrooms or hallways by employing the lab area while not wearing safety glasses is not allowed. This includes entry to the lab/class area from the parking area via the fence gate.

1. Eating /Drinking not allowed in classroom or Laboratory.
2. Work-style pants are recommended or proper fitting jeans that meet the following requirements (length above the shoes, jeans above the hip with belt/suspenders). No oversized pants/jeans will be permitted. **Shorts are not allowed.** Labcoats/Aprons are highly recommended to prevent damage to regular clothing.
3. We suggest that you refrain from wearing necklaces, rings, or bracelets of any kind as these items may pose a safety hazard. Likewise, facial jewelry can compound injury and wearing of same is discouraged in the lab

4. All belts will be of the type that does not have an exposed buckle. No keys, chains or wallets hanging out of pockets.
5. Hats are permitted in the shop area only! If a hat has a brim, it must be worn with it facing forward.
6. Students must wear leather or composite work boots or shoes. We highly recommend those with steel toes, oil resistant soles. No open toed shoes are permitted.
7. Other appearance issues not directly covered by these rules will be considered on a case-by-case basis. MCC staff will decide what is safe and professional in appearance and what is not.

Any Student Not Following These Guidelines Will Be Dismissed From Class and Attendance Credit for That Day Will Not Be Given. No Excuses Will Be Considered.

Students must have their tools required for class available to them at class time.

No Tools, No Lab Credit.

If you cannot reach your instructor, you may contact Dr. Phyllis Broughton, Dean of Academic Affairs and Student Services at (252)789-0246 or (252)789-0247 by phone, pbroughton@martincc.edu by e-mail, or in person at her office in Building 2, Room 33.

To access the Martin Community College Career Catalog for policies and curriculum requirements, please go online to www.martincc.edu.

If you have a need for a disability-related accommodation, please notify the Student Services counselor at (252) 789-0293.

**Recommended Minimum Tool List
MARTIN COMMUNITY COLLEGE
AUTOMOTIVE SYSTEMS TECHNOLOGY**

DISCRIPTION	“SUCH AS”
Tool Chest, 8 Drawer	Sears 9-65248
½” Drive Torque Wrench 20-150 lb/ft	Sears 9-44595
Telescoping Inspection Mirror	Sears 9-40931
Brake Retainer Spring tool	Sears 9-47761
Magnetic Pick-up tool	Sears 9-0413
12 volt test light	KD Tools #126
Flashlight, 2 AA, Focusable beam	Mag Instruments “Mini-mag”
10” Mill Bastard file	Sears 9-31257
File handle	
16 oz Ball Peen hammer	Sears 9-38465
16 oz Rubber Mallet	Sears 9-45787
Scratch Awl	Sears 941028
1 inch Gasket Scraper	Sears 9-43292
12 in. square frame hacksaw	Klein 701-S
2, 12 in 24TPI hacksaw blades	Sears 9-36046
2, 12 in 32 TPI hacksaw blades	Sears 9-36049
25 in Pry Bar	Sears 9-43277
TORX™ Screwdrivers T10,T15,T20,T27,T30	Sears 9-4140
Screwdriver, Slotted 1/8 x 4	Sears 9-41589
Screwdriver, Slotted 3/16/ x 4	Sears 9-41581
Screwdriver, Slotted ¼ x 4	Sears 9-41583
Screwdriver, Slotted ¼ x 6	Sears 9-41584
Screwdriver, Slotted 3/16 x 8	Sears 9-41248
Screwdriver, Slotted 3/8 x 8	Sears 9- 41852
Screwdriver, Phillips #1 x3	Sears 9-41294
Screwdriver, Phillips #2 x 4	Sears 9-41295
Screwdriver, Phillips #1 x 1 1/2	Sears 9-418.55
Screwdriver, Phillips #2 x 1.5	Sears 9-04118
Screwdriver, Phillips #2 x 8	Sears 9-41296
Screwdriver, Phillips # 3 x 6	Sears 9-41297
Wrench set, Combination, SAE 1/4 in. to 15/16 in	Sears 9- 46893
Wrench set, Combination, METRIC 7mm to 17mm	Sears 9- 46894
Socket set, 3/8 Drive 6 pt. SAE 5/16-11/16	Sears 9-34437
Socket set, 3/8 Drive 6 pt. Metric 8-17 mm	Sears 9-34441
Socket set, 3/8 Drive 6 pt. SAE deep 5/16-11/16	Sears 9-34439
Socket set, 3/8 Drive 6 pt. Metric deep 8-17 mm	Sears 9-34443
Ratchet, 3/8 Drive	Sears 9-44808
Ratchet, 1/2 Drive	Sears 9-44809
Extension, 3/8 Drive 3”	Sears 9-44264

Extension, 3/8 Drive 6"	Sears 9-44261
Extension, 3/8 Drive 10"	Sears 9-44262
Extension, 1/2 Drive 3"	Sears 9-44133
Extension, 1/2 Drive 6"	Sears 9-44131
Extension, 1/2 Drive 10"	Sears 9-44132
Flex Handle, 10 inch 3/8 Drive	Sears 9-44363
Flex Handle, 18 inch, 1/2 Drive	Sears 9-44202
Spark Plug Socket 5/8	Sears 9-43324
Spark Plug Socket 13/16	Sears 9-43325
Universal Joint, 3/8 drive	Sears 9-4435
Universal Joint, 1/2 drive	Sears 9-4425
Pliers, Diagonal Side cutting	Sears 9-45075
Pliers, Long nose	Sears 9-45102
Pliers, Tongue and groove	Sears 9-45381
Pliers, Slip Joint	Sears 9-45378
Feeler Gauge set	Sears 9-40811
Steel Rule, 6 inch 1/64 graduation	
Brass Drift, 7 inch	
Center punch	Sears 9-42862
Flare Nut Wrench set SAE	Sears 9-44565
Flare Nut Wrench set Metric	Sears 9-44566
Adjustable wrench, 10in.	Sears 9-44604
Digital Volt-Ohm Meter w/ Min-Max feature (Fluke 88 preferred)	Sears 34-82139