**Syllabus – AUSV 1023 – Fall Semester 2014**

**Weber State University – Automotive Technology Department**

**Brake Systems Part 2**

**(2 credit hours)**

**Course Description:**

This course covers the theory of operation, diagnosis, and repair of braking systems. This is part 2 of a two-part course. Each part is two credit hours for a total of four credit hours.

**Prerequisite**

1. The WSU Shop Safety Module [www.weber.edu/automotive](http://www.weber.edu/automotive)
2. Completion of the two required S/P2 certifications [www.sp2.org](http://www.sp2.org/)
3. AUSV 1000 – Introduction to Automotive Service

**Communication Policy**:

* When necessary, the professor will contact the students through text messaging or their WSU wildcat email address (unless you provide a different preferred email address in your online preferences).  Students should check their email a few times per week; this is especially important on the weekends and before driving to class.
* Text messaging, phone calls, and surfing the Internet during class is unprofessional, distracting, and is prohibited.  Many employers do not allow cell phone use during normal work hours.  Please silence all cell phones and audible “silent” vibrations.  Communication with the instructor via phone, email, and text messaging is allowed until 6:00 p.m. (please include your name). Unwanted phone calls and/or text messaging is considered harassment and is against the law.

**Behavioral Expectations and skills**

According to the WSU Automotive Department National Advisory Committee recommendations, all students are expected to have the following behavioral traits:

1. Integrity - Behaves with honor and dignity; does the right thing.
2. Reliability - Sticks with it to get the job done
3. Trustworthy and Honest - Holds self and others to highest standards
4. Passion for Excellence
5. Initiative - Thinks outside the box
6. Innovation and Technical Excellence - Discovers better ideas and applies expertise
7. Commitment to Quality
8. Courage - Fights to turn dreams into realities
9. Community Commitment - Acts to enhance the community
10. Conduct – Follow the WSU student code of conduct:

**All students are expected to have the following skills:**

1. Be self-motivated enough to be able to plan, organize and prioritize time and workload in order to accomplish tasks and meet deadlines.
2. Develop and safeguard professional relationships; demonstrate interpersonal networking skills
3. Demonstrate computer information literacy (including: email, typing, Internet navigation, Microsoft Office Professional (Access, Excel, Word, PowerPoint))
4. Demonstrate analytical skills
5. Work with or contribute to a work group or team to complete assigned task(s)
6. Communicate in professional written form
7. Compose and produce technical reports, documents and related material present technical information in a professional manner to a variety of audiences
8. Monitor or track information or data
9. Evaluate information against a set of standards
10. Weigh the relative costs and benefits of a potential action and make a decision; acumen (good judgment).

**Contact Information:**

* Professor:
* Office:
* Office Hours:
* Office Phone:
* Cell Phone:
* Fax:
* E-mail:
* Facebook: [www.facebook.com/weberauto](http://www.facebook.com/weberauto)
* YouTube: [www.youtube.com/weberauto](http://www.youtube.com/weberauto)

**Class Time and Location:**

* Room
* Class Dates:

**Required Materials:**

* Text Book - TBD
	+ A WSU Student Photo ID Card. – This is required to check out tools or equipment from the tool room.
	+ Basic hand tool set.
	+ Access to Internet to access web-based training.
* Safety goggles/glasses.  These must be worn in the shop at all times.

**Learning Outcomes (NATEF Tasks):**

The Automotive Technology program at Weber State University is accredited by the [National Automotive Technicians Education Foundation](http://www.natef.org/) (NATEF).  To obtain NATEF accreditation, certain [tasks](http://www.natef.org/program_standards/auto/task_list.cfm) must be taught or performed in each of the eight Automotive Service Excellence ([ASE](http://www.ase.com/)) areas.

The course covers about half of the NATEF Master Automotive Service Technician (MAST) tasks from area A5 – Brake Systems. Approximately half of the following tasks are covered in the part 1 class; the remainder will be covered in the parts 2 class. For concurrent enrollment classes, determination of task coverage for part 1 must be made in cooperation with the high school instructors and the WSU automotive department.

**V. BRAKES**

**A. General: Brake Systems Diagnosis**

1. Identify and interpret brake system concerns; determine necessary action.
2. Research applicable vehicle and service information, vehicle service history, service precautions, and technical service bulletins.
3. Describe procedure for performing a road test to check brake system operation; including an anti-lock brake system (ABS).
4. Install wheel and torque lug nuts.

**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, and wear; check for 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 components of brake warning light system.
11. Identify 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 drum diameter; determine necessary action.
3. Refinish brake drum and measure final drum diameter; compare with specifications.
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 wheel cylinders for leaks and proper operation; remove and replace as needed.
6. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform 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 and clean caliper assembly; inspect for leaks and damage/wear to caliper housing; determine necessary action.
3. Clean and inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine necessary action.
4. Remove, inspect, and replace pads and retaining hardware; determine necessary action.
5. Lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
6. Clean and inspect rotor; measure rotor thickness, thickness variation, and lateral runout; determine necessary action.
7. Remove and reinstall rotor.
8. Refinish rotor on vehicle; measure final rotor thickness and compare with specifications.
9. Refinish rotor off vehicle; measure final rotor thickness and compare with specifications.
10. Retract and re-adjust caliper piston on an integrated parking brake system.
11. Check brake pad wear indicator; determine necessary action.
12. Describe importance of operating vehicle to burnish/break-in replacement brake pads according to manufacturer’s recommendations.

**E. Power-Assist Units Diagnosis and Repair**

1. Check brake pedal travel with, and without, engine running to verify proper power booster operation.
2. Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; determine necessary action.
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; 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 operation and parking brake indicator light system operation; determine necessary action.
5. Check operation of brake stop light system.
6. Replace wheel bearing and race.
7. Remove and reinstall sealed wheel-bearing assembly.
8. Inspect and replace wheel studs.

**G. Electronic Brake, Traction and Stability Control Systems Diagnosis and Repair**

1. Identify and inspect electronic brake control system components; determine necessary action.
2. Identify traction control/vehicle stability control system components.
3. Describe the operation of a regenerative braking system.
4. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine necessary action.
5. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine necessary action.
6. Depressurize high-pressure components of an electronic brake control system.
7. Bleed the electronic brake control system hydraulic circuits.
8. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), 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).
9. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).

**Safety Information:**

The Weber State University (WSU) Automotive Department has made student safety a top priority.  WSU has made every effort to 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.

Every automotive student is required to complete a shop safety module and two certifications from the Safety and Pollution Prevention (S/P2) website.  These requirements insure that our students have been exposed to local, state, and federal safety and environmental regulations.

**Grading Criteria:**

The following criteria will determine your grade

* Compliance with safety regulations including wearing eye protection during lab assignments (5%)
* Lab assignments and worksheets (40%)
* Completion of required web-based Training (15%)
* Class participation and reading assignments (10%)
* Chapter quizzes (10%)
* Hands-on final exam (20%)

Letter grades are determined by the percentage of possible points accumulated.

* A = 95% - 100%
* A- = 90% - 94%
* B+ = 87% - 89%
* B = 84% - 86%
* B- = 77% - 83%
* C+ = 74% - 76%
* C = 70% - 73%
* C- = 67% - 69% (You must have a grade of C or higher to count towards graduation)
* D+ = 64% - 66%
* D = 60% - 63%
* D- = 57% - 59%
* E = Below 57%

**Policies:**

1. Safety glasses/goggles must be worn in the shop at all times.
2. While working in the shop, proper attire must be worn.  This applies, but is not limited, to:
3. Uniforms/clothing
4. Shoes
5. Jewelry
6. Proper hair restraint
7. A student WSU ID card is required to check out tools from the tool room.
8. Respect:
	1. Customer’s vehicles by using seat and fender covers
	2. Other students and their learning experience
	3. WSU tools and vehicles by identifying problems with tools and vehicles when found.
	4. Class is not over until all tools are put away and everything is clean and organized.
9. Attendance is required every day.  Each day’s topics build on the previous day’s topics.  If you must miss a day of class your grade will suffer. Please make arrangements to obtain the reading assignment and homework from the Professor of you must miss class.
10. Late work will NOT be accepted unless arrangements are made ahead of time with the Professor.  The maximum credit allowed for late work is 50%.
11. All of your assignments must be completed and submitted online by their posted dates at 11:59 p.m. The use of cell phones during class is prohibited except in an emergency.  Text messaging is always prohibited.
12. All of your assignments must be completed on the day assigned.  Class will follow the sequence listed in the schedule.
13. Unless you are assigned to work in groups for lab work, you must do your own work.  Collaboration with other students is not allowed.
14. Dishonesty will not be tolerated and will result in a score of zero for the assignment, quiz, or exam.

**Recommendations to get the most from this course:**

1. Be early or on time.  Class will begin without you.
2. Ask questions to clarify points that you do not understand.
3. Follow directions as they are given to you.

**Services for Students with Disabilities:**

"Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in room 181 of the Student Services Center. SSD can also arrange to provide course materials (including the syllabus) in alternative formats if necessary."

For more information about the SSD contact them at 801-626-6413, ssd@weber.edu, or <http://departments.weber.edu/ssd/>.

**Course Schedule:**

* **TBD**