

**Odessa College
Technical Studies Division
Automotive Technology**

Course Syllabus

COURSE NUMBER: AUMT 1310

COURSE TITLE: Automotive Brake Systems

CREDIT HOURS: 3 **LECTURE HOURS:** 1 **LAB HOURS:** 6

PREREQUISITE: Consent of department chair or instructor.

CATALOG DESCRIPTION:

Operation and repair of drum/disc type brake systems. Emphasis on safe use of modern equipment. Topics include brake theory, diagnosis, and repair of power, manual, anti-lock brake systems, and parking brakes. May be taught with manufacturer specific instructions. Lab fee required. (SCANS 1, 2, 3, 5, 6, 7, 9, 10, 11) Prerequisite: Consent of department chair or instructor.

COURSE LEARNING OUTCOMES:

Explain the operation of disc and drum-type brakes; explain hydraulic system physical principles; describe the operation of power assist components; and explain the operation and theory of anti-lock brake systems.

COMPETENCIES:

After completing this course, the student should be able to demonstrate automotive competency in:

V. BRAKES

TEXTBOOK

Classroom Manual: Automotive Brake Systems, Clifton E. Owen, 4th Edition, Thomson Delmar Learning, 2008

SUPPLIES:

Students will need course textbook, job sheets, paper, notebook, pen and pencils.

COURSE GRADE EVALUATION:

- 25% Professionalism (*A grade will be assessed using the following guide lines.*)
 - Punctuality
 - Desire to learn
 - Appropriate appearance
 - Quality workmanship
 - Ability to work with others
 - Safe working habits (*Students will be graded in all areas of shop safety.*)
 - Positive attitude
 - Work ethics
 - Integrity
 - Attendance
- 25% Research Paper and/or Final Exam
- 25% Lab Participation
- 25% Quizzes and/or Daily

Also see instructor information sheet:

ATTENDANCE POLICY:

YOUR attendance is the greatest predictor of your success. **Student attendance at EVERY class is expected.** You should expect that each absence will adversely affect your course grade. Please see the instructor regarding anticipated absences or conflicts due to college sponsored activities.

ACADEMIC ETHICS:

You are expected to participate and contribute as a group in the labs and classroom; test will be taken without notes or other outside-assistance. If unethical behavior is detected, all parties involved will be denied credit for that project or exam. The questioned material and report of the ethics violation will be submitted to the department chair for further action if deemed necessary.

STUDENT ASSISTANCE:

- Admissions: 432-335-6443
- Book Store: 432-335-6654
- Cafeteria: 432-335-6435
- Career Services: 432-335-6835
- Cashier's: 432-335-6600
- Counseling: (Help center) 432-335-6346
- Auto/Diesel Department Chair: 432-335-6633
- .edu: (Student Service Center) 432-335-6833
- Financial Services: 432-335-6429
- Housing/Judicial Affairs: 432-335-6300
- Learning Resources Center: 432-335-6641
- Registrar: 432-335-6443
- Student Learning Center:
 - Peer tutoring available
 - PLATO: Computer tutoring available (LRC 300) 432-335-6878
- Student Support Services: 432-335-6868
- Technical Studies Dean: 432-335-6686
- Testing Center: 432-335-6834
- Vice President Instruction: 432-335-6413
- Vice President for Student Services:
 - 432-335-6683
- Wi-Fi Java, Cyber Café: 432-335-6509

FACULTY:

James McCutcheon, chair;	Office Dm102	432-335-6633	jmccutcheon@odessa.edu
Jerry Griffith	Office Dm101	432-335-6632	jgriffith@odessa.edu
Perry Griffith	Office Dm105A	432-335-6603	pgriffith@odessa.edu

LAB REQUIREMENTS:

General Shop Practices and Procedures

- **Safety requirements will 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 in accordance with local, state, and federal environmental regulations.**
- Proper **Personal Protection Equipment (PPE)** will be used in all required areas.
- **Safety Glasses** must be worn **at all times** in the **lab/shop area**. No exceptions!
- **Adhere to all Safety signs** posted on equipment, fire extinguishers, tool groups, vehicle lifts, support stands, grinders, drill presses, or any other equipment or areas marked with Safety signage.
- Do not restrict the passage of any marked walkway.
- **Safety is paramount** and you are responsible for your work area and your safe work habits! **Therefore, do not leave fluid spills on floor and keep your area free of clutter!**
- Equipment use is limited to those knowledgeable enough to operate the equipment safely; otherwise the equipment is **OFF LIMITS!** (**Consult your instructor**).
- Tools and equipment **will not be loaned** or taken from the Odessa College premises.
- Students **MUST** sign out for any specialty tool needed and will only be issued by an instructor or designated person. The student will be **responsible for safety and care of those tools, when finished or at the end of each lab period**, return all tools to the checkout person so they can sign the tool back in.
- NATEF job sheets will be filled out for each lab assignment. When finished, give completed job sheets to the instructor and those will be recorded on your progress report.
- All vehicles are to be treated as customer vehicles. As a student **YOU ARE TO RESPECT THIS**, do not sit in, lean on, or handle any vehicle that has not been specifically assigned to you by your instructor.
- Any time a vehicle hood is open, fender covers must be in place on the fenders at all times.
- Students must get approval from the instructor **before** bringing vehicles in the shop. **Only certain vehicles qualify for NATEF required tasks.**
- Visitors are not allowed in the lab/shop area, however they may be escorted through the lab/shop area by approved personal.

COURSE COMPETENCIES:

NATEF RECOMMENDED TASKS FOR AUTOMOTIVE TECHNOLOGY

V. BRAKES

For every task in Brake Systems, the following safety requirement must be strictly enforced as a number 1 priority: Comply with personal and environmental safety practices associated with clothing, eye protection, hand tools, power equipment, and handling, storage and disposal of chemicals in accordance with local, state, and federal safety and environmental regulations, listen to and verify the operator's concern, review past maintenance and repair documents, and determine

necessary action.

V. BRAKES

V.A General Brake System Diagnosis

Task	Job Sheet	Priority	
A.1	1	P1	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.
A.2	2	P1	Identify and interpret brake system concern; determine necessary action.
A.3	3	P1	Research applicable vehicle and service information, such as brake system operation, vehicle service history, service precautions, and technical service bulletins.
A.4	3	P1	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, calibration decals).

V.B Hydraulic System Diagnosis and Repair

B.1	4	P1	Diagnose pressure concerns in the brake system using hydraulic principles (PASCAL's Law).
B.2	5	P2	Measure brake pedal height; determine necessary action.
B.3	6	P2	Check master cylinder for internal and external leaks and proper operation; determine necessary action.
B.4	7	P1	Remove, bench bleed, and reinstall master cylinder.
B.5	8	P1	Diagnose poor stopping pulling/dragging concerns caused malfunctions in hydraulic system determine necessary action.
B.6	9	P2	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports; determine necessary action.
B.7	9	P2	Fabricate and/or install brake lines (double flare or ISO types); replace hoses, fittings, and supports as needed.
B.8	10	P1	Select, handle, store and install brake fluids to proper level.
B.9	11	P2	Inspect, test, and replace metering (hold-off), proportioning (balance), pressure differential, and combination valves.
B.10	12	P3	Inspect, test, replace, and adjust height (load) sensing-type proportioning valve.
B.11	13	P3	Inspect, test, and replace components of brake warning light system.
B.12	14	P1	Bleed (manual, pressure, vacuum, or surge) brake system.
B.13	10	P3	Flush hydraulic system.

V.C Drum Brake Diagnosis and Repair

C.1	15	P1	Diagnose poor stopping noise vibration pulling grabbing, dragging/pedal pulsation problems determine necessary action.
C.2	16	P1	Remove, clean (using proper safety procedures), inspect, and measure brake drums; service or replace as needed.
C.3	17	P1	Refinish brake drum.
C.4	16	P1	Remove, clean, and inspect brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble.
C.5	18	P2	Remove, inspect, and install wheel cylinders.
C.6	16	P1	Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.
C.7	19	P1	Install wheel, torque lug nuts, and make final checks and adjustments.

V.D Disc Brake Diagnosis and Repair

D.1	20	P1	Diagnose poor stopping, noise vibration, pulling, grabbing, dragging/pedal pulsation concerns; determine necessary action.
D.2	21	P1	Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing; determine necessary action.
D.3	21	P1	Clean and inspect caliper mounting and slides for wear and damage; determine necessary action.
D.4	21	P1	Remove, clean, and inspect pads and retaining hardware; determine necessary action.
D.5	22	P2	Disassemble, and clean caliper assembly; inspect parts for wear, rust, scoring, and damage; replace seal, boot, and damaged or worn parts.
D.6	22	P1	Reassemble, lubricate and reinstall caliper, pads, and related hardware; seat pads and inspect for leaks.
D.7	23	P1	Clean, inspect and measure rotor with a dial indicator and a micrometer; follow manufacturer recommendations in determining need to machine or replace.
D.8	24	P1	Remove and install rotor.
D.9	25	P1	Refinish rotor on vehicle
D.10	26	P1	Refinish rotor off vehicle
D.11	27	P3	Adjust calipers with integrated parking brakes.
D.12	28	P1	Install wheel, torque lug nuts, and make final checks and adjustments.

V.E Power Assist Units Diagnosis and Repair

E.1	29	P2	Test pedal free travel with and without engine running; check power assist operation.
E.2	30	P2	Check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster.
E.3	30	P2	Inspect the vacuum-type power booster unit for vacuum leaks; inspect the check valve for proper operation; determine necessary action.
E.4	31	P3	Inspect and test hydraulically assisted power brake system for leaks and proper operation; determine necessary action.
E.5	32	P3	Measure and adjust master cylinder pushrod length.

V.F Miscellaneous (Wheel Bearings, Parking Brakes, Electrical, Etc.) Diagnosis and Repair

Task	Job Sheet	Priority	
F.1	33	P1	Diagnose wheel bearing noises, wheel shimmy and vibration concerns; determine necessary action.
F.2	34	P1	Remove, clean, inspect, repack, and install wheel bearings and replace seals; install hub and adjust wheel bearings.
F.3	35	P1	Check parking brake cables & components for wear, rusting, binding & corrosion; clean, lubricate & replace as needed.
F.4	36	P1	Check parking brake operation; determine necessary action.
F.5	13	P3	Check operation of parking brake indicator light system.
F.6	13	P1	Check operation of brake stop light system; determine necessary action.
F.7	34	P1	Replace wheel bearing and race.
F.8	37	P1	Inspect and replace wheel studs.
F.9	38	P2	Remove and reinstall sealed wheel bearing assembly.

V.G Anti-lock Brake and Traction Control Systems

G.1	39	P1	Identify and inspect anti-lock brake system (ABS) components; determine necessary action.
G.2	39	P2	Diagnose poor stopping, wheel lock-up, pedal feel or pulsation and noise concerns caused by the anti-lock brake system (ABS); determine necessary action.
G.3	40	P1	Diagnose anti-lock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment; determine necessary action.
G.4	41	P3	Depressurize high pressure components of the anti-lock brake system (ABS).
G.5	42	P2	Bleed the anti-lock brake system's (ABS) front and rear hydraulic circuits.
G.6	43	P3	Remove and install anti-lock brake system (ABS) electrical/electronic and hydraulic components.
G.7	44	P1	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 & frequency data)
G.8	45	P3	Diagnose anti-lock brake system (ABS) braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).
G.9	46	P3	Identify traction control/vehicle stability control system components.