

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO



**SAULT
COLLEGE**

COURSE OUTLINE

COURSE TITLE: Air Brake Systems

CODE NO. : MPT230 **SEMESTER:** 4

PROGRAM: Motive Power Technician – Advanced Repair (4044)

AUTHOR: George Parsons

DATE: March 2013 **PREVIOUS OUTLINE DATED:** March 2012

APPROVED:

“Corey Meunier”

CHAIR **DATE**

TOTAL CREDITS: 3

PREREQUISITE(S): MPF103 and MPF122

HOURS/WEEK:

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- I. **COURSE DESCRIPTION:** You learn about the Air Brake Systems used on medium and heavy duty trucks, truck and trailers, and busses used in the on road commercial vehicle industry. They will have in depth training on pneumatic systems as related to the vehicle braking systems as well as in depth training on the mechanical components and pneumatic valves that are used to control the build-up of the air pressure and the application of the air for the emergency parking and service brake systems of such vehicles. You will learn how to test and diagnose system problems related to the pneumatic side of the system and take part in the inspection and servicing of the mechanical foundation brakes used in these types of systems. You will also be taught the proper method of brake adjustment for all of the different types of slack adjuster used on these types of vehicles. You will be required to perform mechanical repairs and regular brake adjustment and service procedures according to manufacturer's specifications and the highway traffic act.

II. **LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:**

Upon successful completion of this course, the student will demonstrate the ability to:

1. ***State the regulations that govern the use of and operation of the CMVSS 121 Air Brake System used on All on road Air Brake Systems in respect to:***

- Requirements of the 121 Dual air brake system
- Vehicle stopping distances
- Relationship of vehicle weight factors and stopping distances
- Vehicle speed factors and stopping distances
- Importance of and use of front wheel brakes

Parking and Service brake systems

2. ***Describe the fundamental operation of an air brake system used on Buses, Highway truck, and Tractor Trailer combination vehicles according to the:***

- Principles of Pneumatics
- Primary and Secondary brake circuits
- Law of levers
- Mechanical advantage
- Coefficient of friction laws
- Functions of the various air brake control valves

Air compressor purpose construction and operation

- 3. *Remove and repair or overhaul the Mechanical Components used in the Wheel End of an Air Brake Vehicle or Trailer:***
 - Inspect the S-cam and support bushing
 - Inspect the brake shoe and lining assemblies
 - Remove and replace or re-install brake shoe and return spring assemblies
 - Remove and replace or re-install the S-cam and bushings

- 4. *Properly diagnose pneumatic problems within the Air brake Systems valves, delivery components and actuator components:***
 - Trace air flow through the supply system
 - List components of primary system
 - Trace air flow through the primary system and list valves used
 - Trace air flow through the secondary system and list valves used
 - Trace air flow through the Parking brake system and list valves and components used

- 5. *Properly and safely perform an Air Brake System Circle check and Systems build up test according to manufactures and Industry Specifications:***
 - Perform visual check of front and rear axle brake external components
 - Perform air pressure build up tests and record their values
 - Perform air pressure leak down test and record pressure drop
 - Record operation and pressure of warning buzzer and light

- 6. *Demonstrate the proper method of checking the slack adjuster for proper applied stroke distance according to brake chamber type and size:***
 - Determine brake chamber size according to diameter of chamber
 - Identify brake chamber style eg. Long stroke normal stroke
 - Check pushrod stroke during a full brake application
 - Check smoothness of operation of slack adjuster during application and release

- 7. *Properly and safely remove and install both parking brake chambers and service brake chamber according to manufactures specifications:***
 - Use of proper tools for the task
 - Use of the safety cage required for safe removal
 - Check the A L Factor of the spring brake chamber

8. Properly and Safely install and adjust manual slack adjusters and automatic slack adjusters according to manufactures instructions and procedures:

- Determine proper length of slack adjuster
- Properly shim slack adjuster for center and side clearance
- Properly install pushrod clevis and pin
- Properly adjust slack adjuster and check operation

III. TOPICS:

1. Air Brake CMVSS 121 Dual System Regulations
2. Air Brake System fundamentals and operation according to CMVSS 121 System Standards
3. Air Brake System Configurations
4. Air Brake System Wheel End Mechanical Components
5. Air Brake System Pneumatic Supply and Delivery Components
6. Air Brake System Testing, Adjustments and Service requirements and Procedures
7. Air Brake Service and Parking Brake Chamber Installation
8. Automatic and Manual Slack Adjuster installation and adjustment

IV. REQUIRED RESOURCES/TEXTBOOKS/MATERIALS:

Title: Heavy Duty Truck Systems

Edition: 5th ed., 12959#

Author: Bennett

Publisher: Thomson Nelson Learning Canada

Title: Automotive Technology: A Systems Approach/AST Test Prep

Edition: 06 ed., 17810#

Author: Erjavec

Publisher: Thomson Nelson Learning Canada

Pens, pencils, calculator, 3-ring binder

Mandatory for entrance into the Shop:

- shop coat or coveralls
- CSA approved steel toe boots (high top)
- CSA approved safety glasses

V. EVALUATION PROCESS/GRADING SYSTEM:

The final grade for this course will be based on the results of classroom, assignments and shop evaluations weighed as indicated:

- Classroom – 60% of the final grade is comprised of term tests
- Assignments – 10% of the final grade is comprised of a number of technical reports
- Shop – 30% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude

(Student will be given notice of test and assignment dates in advance)

The following semester grades will be assigned to students:

Grade	<u>Definition</u>	<i>Grade Point Equivalent</i>
A+	90 – 100%	4.00
A	80 – 89%	
B	70 - 79%	3.00
C	60 - 69%	2.00
D	50 – 59%	1.00
F (Fail)	49% and below	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field /clinical placement or non-graded subject area.	
U	Unsatisfactory achievement in field/clinical placement or non-graded subject area.	
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.	
NR	Grade not reported to Registrar's office.	
W	Student has withdrawn from the course without academic penalty.	

VI. SPECIAL NOTES:Attendance:

Sault College is committed to student success. There is a direct correlation between academic performance and class attendance; therefore, for the benefit of all its constituents, all students are encouraged to attend all of their scheduled learning and evaluation sessions. This implies arriving on time and remaining for the duration of the scheduled session.

It is the departmental policy that once the classroom door has been closed, the learning process has begun. Late arrivers will not be granted admission to the room.

**Cell phones are not allowed to be on
in the classrooms or shop areas.**

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located on the portal form part of this course outline.

**Professor Parsons
Student Assessment Procedure
For
Motive Power
THEORY ASSIGNMENTS and REPORTS**

Theory assessment is based on regularly scheduled tests and assignments and final exam. Attendance and homework checks are recorded and used as an aid for counseling.

The following grades will be assigned for Theory Assignments and Reports:

A+	90 to 100
A	85
A-	80
B +	79
B	75
B-	70
C +	69
C	65
C-	60
D	50
F (Fail)	49 or less

Assignments will be graded as follows:

- a) One day after the original due date – 70% maximum.
- b) Two or more days after the original due date – 50% maximum.

Professor Parsons' Motive Power Program Policies and Procedures

1. During your program, you are considered to be a member of the Motive Power Department. As such, your actions and behavior, both in the college and the community reflect on this Department. We trust that your influence will be positive.
2. College policy prohibits the consumption of food and drink in the classrooms and shop. Smoking is allowed only outside of the building in designated smoking areas. No smokeless tobacco is allowed in theory class or shop class.
3. CSA approved Safety Glasses and Safety Boots must be worn in the Shop at all times. This means going to and from all of the classrooms located in the shop. It is the responsibility of the STUDENT to wear them. You will be marked absent if the aforementioned policy is not adhered to.
Note; All safety glasses and boots must meet Sault College CSA approval rating.

NO GLASSES-NO BOOTS-NO ENTRY!!.

4. SAFETY
 - 4.1 Students must not enter the shop area or commence work before their scheduled time.
 - 4.2 Students must not work alone or in an unsupervised area.
 - 4.3 Students must have lift truck training prior to operating those units.
 - 4.4 Students must have equipment training and Technologist/Professor approval before operating any equipment.
 - 4.5 Students must not use or operate equipment that is found to be unsafe or damaged. All such equipment must be reported to the Professor or Technologist who will replace and/or repair the said equipment.
 - 4.6 Where damaged or unsafe equipment cannot be repaired or replaced, the Professor/Technologist will provide students alternate shop activity.
 - 4.7 Students must follow instructions and safe work practices in order to use or operate any shop equipment.

5. Repairs to your private vehicles in our facilities can be educational to you. We will accommodate you if the work is part of our program and schedules in. No car should be parked in the shop compound or outside a shop door without staff permission and a temporary parking pass clearly displayed.

6. Attendance – if late, don't bother coming until the next class (period), you will be marked absent. The student is to be continuously present and actively participating during all scheduled theory and shop classes (scheduled breaks accepted).

6.1 A terminal objective of the Motive Power Department is the demonstration of satisfactory attendance and punctuality performance that the Motive Power Industry, itself, relies on, for efficiency, productivity and profitability.

6.2 If you are marked absent, and no reasonable excuse is given your absence will be termed unexcused. There should NOT be a reason to NOT let us know nor related subject Professors, in writing or by telephone why you're absent.

6.3 Students will lose marks from their theory and shop mark grade for unexcused absences. Poor attendance can mean a repeat of both theory and shop courses if your employment skills are poor. This is based on what is considered: Employability Skills.

6.4 At 10% of accumulated hours of unexcused absence you will be asked to a scheduled meeting with your Professor and will be asked to sign a contract enabling you to continue the course.

6.5 If you are absent from class, the lesson material is your responsibility.

7. BEHAVIOR/ATTITUDE

7.1 Students are required to:

- a. Properly care for and maintain all shop and classroom equipment.
- b. Properly clean the shop/classroom facility and equipment at the end of each class.
- c. Remain in the class during clean-up and assist in the cleaning and shutting down of their shop/classroom.

7.2 Students are expected to conduct themselves in a manner that does not interfere with or obstruct the overall learning environment.

7.3 The following activities are not allowed in the shop/classrooms:

- a. Horseplay.
- b. Making unnecessary noise.
- c. Swearing.

- d. Abusive behavior.
- e. Smoking, chewing smokeless tobacco, beverages and eating.

8. ASSIGNMENTS AND THEORY TESTS

8.1 Students are required to hand in assignments or write theory tests on the day and at the time specified/scheduled. See item #18 in the aforementioned document.

8.2 Assignments will be graded as follows:

- a) One day after the original due date – 70% maximum.
- b) Two or more days after the original due date – 50% maximum.

NOTE: The only exception of Policy # 8 shall be those arising from personal emergencies (i.e. car accident, family death, serious illness, employment reasons) and the student supplies a written statement to that effect. See item #18.

9. Please, coffee breaks only 10 to 12 minutes MAXIMUM. NOTE: Individual Professors will address each class with their expectations. Some may only allow 10 minutes.

10. Please refrain from loitering in “C” wing hallways, around shop hallway entry doors and outside entrance doorways/walkways.

11. Being under the influence of alcohol or drugs during any shop or theory class will not be tolerated and the student will be excused from class at the Professor’s discretion.

12. Please remember that you must attend all related subject areas and pass successfully to obtain a Certificate or Diploma.

13. If you miss a test with an “unexcused absence” (as deemed legitimate by your professor) you will NOT be allowed to write that test. Only if; a doctor’s note, airline ticket, etc., or circumstances arising from a family emergency; and legitimate written proof can be presented to the professor. See item number 18 below for clarification.

14. If a class is missed or going to be missed it is your responsibility to notify in writing (see item #18 below) your Professor and make arrangements for handouts and notes taken while you are away.

15. The use of Lap Tops, cell phones/PDA's, electronic information/image capturing, recording device for any form of communication or recording (voice, text, recording, image, etc...) during theory class or shop is strictly prohibited. Cell phones/PDA's must be silenced during regular class and shop times and must be turned off and kept out of sight during all classes and test sittings. Failure to follow the latter requirement during a test sitting will result in a grade of 0 (zero) being assigned and if not out of sight or being used during class, the unit WILL be confiscated for the duration of the class.
NO EXCEPTIONS

16. Students may not wear earphones/headphones of any kind (i.e. for playback of recorded music/voice) during theory classes, shop classes and test sittings. This does not include hearing aids as required by hearing impaired students.

17. NO Lap Top Computers will be allowed in any class unless proper documentation is provided that the computer is required for learning assistance.

18. Any request to deviate from the aforementioned course outline requirements must be made to the Professor in writing or via Sault College email. If permission is granted it must also be granted in writing or via Sault College email. Verbal requests/permissions are not acceptable. It is the student's responsibility to maintain a copy of all such requests and associated permissions.

Student

Signature: _____

Date: _____

Students refusing to sign this form will not be allowed to register or continue in their course.