



**I. COURSE DESCRIPTION:**

This course is about the Air Brake Systems on medium and heavy duty trucks, tractor trailers, and busses used for the on road Commercial Vehicle Industry. Students will be taught about pneumatic principals, the construction and operation of the air brake system components required to meet Canadian Motor Vehicle Safety Standards (CMVSS 121) Regulations. The student will also gain an understanding of the different styles of foundation brake configurations used. Students will be required to perform testing, inspections, diagnostic procedures, removal, installation and servicing of the brake system and its components according to Sault College Motive Power Department Safety Procedures as well as Manufacturer's specifications and safety precautions. This course will also introduce students to Antilock Brake Systems used for Medium and Heavy Duty Trucks and Trailers.

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

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

**1. Explain what impact the Regulations Of CMVSS “121” have on all Commercial Vehicles using Air Brake Systems.****Potential Elements of the Performance:**

- Explain the origin of CMVSS “121”.
- Describe the changes implemented in the “121” braking system
- Explain the standards and safety responsibilities of drivers related to CMVSS “121” systems and circle check requirements.
- Communicate accurately how the Air Brake “Z” Endorsement affects the Commercial Vehicle Industry.

**2. *Understand the Mechanics of Stopping a Vehicle.*****Potential Elements of the Performance:**

- Analyze Stopping Distances Required for Commercial Vehicles.
- Interpret how the Regulations implemented for stopping distances is affected by the vehicle GVWR (gross vehicle weight rating).

- Apply Pneumatic principals to the operation of air brake systems and components.
- Outline the differences between hydraulic and pneumatic brake systems
- Explain how law of levers applies to air brake systems.
- Identify how weight and speed affect stopping distances.
- Explain the relationship of brake lag and brake application time.
- Explain how friction and brake fade problems are related.
- Describe why proper brake adjustment is critical to stopping of a commercial vehicle

**3. Interpret the Schematics of the Brake Circuits of the “121” Air Brake Systems.**

Potential Elements of the Performance:

- Trace the air flow within the Supply system circuit.
- Identify the Primary system circuit components.
- Follow the air flow through the Secondary system circuit components.
- Identify the Parking system circuit components.
- Identify the Trailer system circuit components (where Used).

**4. Explain the function and Operation of Brake components, storage tanks and safety devices of Supply, Primary, Secondary and Parking Brake Circuits.**

Potential Elements of the Performance:

- Describe how the air compressors, governor controls, air dryer and alcohol devices operate.
- Explain the mechanical and capacity requirements for Storage tanks.
- Identify the location and types of safety valves, check valves and drain valves required in each circuit.
- Describe the operation of the safety and warning system components and gauges.
- Identify the size of lines and fittings required for supply of air to the storage tanks, dash Valves, gauges and actuator valves and components.
- Describe of operation of the dash control valves, treadle valves, relay valves, quick release valves, spring brake and anti-compounding valves.

5. ***Describe the Operation of Trailer related Brake Control valves, lines and storage tank components.***

Potential elements of the performance:

- Describe the function of the tractor protection valve, trailer supply line, service line, and couplers (glad hands).
- Glad hand couplers
- Explain the operation of the Trailer task valves, relay valves and parking brake valves
- Describe the trailer air system priority designation

6. ***Outline the description and Construction of Commercial Vehicle Foundation Brake Components and Types.***

Potential elements of the Performance:

- Describe the operation of the combination Spring brake and service chambers
- Explain the operation of the slack adjusters and s-cam assemblies
- Outline the function of the brake shoe and lining anchor bracket
- Describe the operation of the disc brake calipers and actuator assembly

7. ***Perform, Inspection, testing, diagnosis, removal and Replacement of Air Brake system circuits and components.***

Potential elements of the Performance:

- Inspect the compressor mounting systems and drive mechanism.
- Test governor and safety valve operation.
- Test the build-up time of compressor.
- Test operation of one way check valves and dash gauges.
- Evaluate the air brake system for excessive leakage.
- Test operation of the parking and service brake systems.

- Test operation of the tractor protection system.
  - Perform brake Inspection and measure drums, calipers and lining wear.
  - Diagnose uneven wear problems associated with drum and disc foundation brake assemblies.
  - Inspect S-cam shoe rollers and return springs.
  - Measure S-Cam bushing and spline wear.
  - Measure Brake Chamber pushrod stroke.
  - Remove and replace brake shoes.
  - Perform brake adjustment for manual and automatic slack Adjusters.
  - Replace air brake supply lines and trailer coupling devices.
  - Remove and replace spring brake chambers using the proper installation and safety guidelines and procedures.
  - Diagnose pneumatic and mechanical problems associated with air compressors and governors.
8. ***Explain the Purpose, outline the components of the system and discuss the fundamental operation of the Anti-lock Braking System.***
- Potential elements of the performance:
- Identify when “ABS” was first introduced to Air Brake Systems.
  - Analyze the benefits “ABS” would provide for the Trucking Industry.
  - Describe the basic operation of “ABS”
  - Apply basic knowledge of electrical and electronics required to operate the Anti-lock Braking System components.
  - Identify the working components of the “ABS”.
  - Use a variety of test equipment to access information about the electrical and electronic components on the system.
  - Discuss the inputs and output components required.
  - Use a Electronic Scan Tool to read fault codes generated in the “ABS”
  - Perform wheel speed sensor tests.

**III. TOPICS:**

- 1. Canadian Motor Vehicle Safety Standards (CMVSS “121”) and regulations for Commercial Vehicles.**
- 2. Mechanics of Stopping a Vehicle**
- 3. CMVSS “121” Brake Circuits and schematics.**
- 4. Brake System Components and operation.**
- 5. Trailer related brake systems and components.**
- 6. Commercial Vehicle foundation brake components.**
- 7. Service, testing, diagnosis and repair of air brake systems.**
- 8. Introduction to Anti-lock Brake Systems.**

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

**Title:** Heavy Duty Truck Systems

**Edition:** 5<sup>th</sup> Edition

**Author:** Bennett

**Publisher:** Thomson Nelson Learning Canada

**Pens, Pencils, Calculator and 3 Ring Binder**

**\* Coveralls**

**\*CSA Approved Work boots**

**\*CSA Approved Safety Glasses**

**(\*These Items are Mandatory For The Shop)**

**EVALUATION PROCESS/GRADING SYSTEM:**

- V. The final grade for this course will be based on the results of classroom, assignments and shop evaluations weighed as indicated:
- Classroom – 35% of the final grade is comprised of term tests
  - Assignments – 10% of the final grade is comprised of a number of technical reports
  - Shop – 45% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude
  - Employability Skills – 10% of final grade is comprised of attendance, class participation, show ability to follow direction and being a team player.

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

**NOTE: All assignments will be in typed format. NO hand written assignments will be accepted.**

**The following semester grades will be assigned to students:**

<b>Grade</b>	<b><u>Definition</u></b>	<i>Grade Point Equivalent</i>
A+	90 – 100%	4.00
A	80 – 89%	3.00
B	70 - 79%	2.00
C	60 - 69%	1.00
D	50 – 59%	0.00
F (Fail)	49% and below	
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 On Or Allowed to Be Used As Calculators At Any Time In The Classroom!***

**VII. COURSE OUTLINE ADDENDUM:**

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