

I. COURSE DESCRIPTION:

This course deals with the Air Brake Systems on medium and heavy duty trucks, tractor trailers, and buses used in the on-road Commercial Vehicle Industry. The CICE Student, with assistance from a Learning Specialist, will be taught about the pneumatic principals and the construction and operation of air brake system components required to meet Canadian Motor Vehicle Safety Standards (CMVSS “121”) Regulations. The CICE student will gain an understanding of the different styles of foundation brake configurations used. He/she will be required to perform testing, inspections, diagnostic procedures, and the removal, installation, and servicing of brake systems and their components. This course will also introduce the CICE student to Antilock Brake Systems used for Medium and Heavy Duty Trucks and Trailers.

Students will be required to follow proper safety procedures when performing the above tasks according to both the Sault College Motive Power Department Standards and Vehicle Manufacturers’ safety regulations and specifications.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the CICE student, with assistance from a Learning Specialist, will demonstrate the basic ability to:

1. ***Explain the impact that CMVSS “121” Regulations have on all commercial vehicles using air brake systems.***

Potential Elements of the Performance of:

- 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 of:

- analyze stopping distances required for commercial vehicles
- interpret how the regulations implemented for stopping distances are affected by 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 the law of levers applies to air brake systems.
- identify how weight and speed affect stopping distances
- explain the relationship between brake lag and brake application time
- explain how friction and brake fade problems are related
- describe why proper brake adjustment is critical to the stopping of a commercial vehicle

3. *Interpret the schematics of the brake circuits included in Bill “121” Air Brake Systems.*

Potential Elements of the Performance of:

- trace air flow within a supply system circuit
- identify primary system circuit components
- follow the air flow through secondary system circuit components
- identify parking system circuit components
- identify trailer system circuit components (where used)

4. *Explain the function and operation of the components, storage tanks, and safety devices used in supply, primary, secondary and parking brake circuits.*

Potential Elements of the Performance of:

- describe how air compressors, governor controls, air dryer and alcohol devices operate
- explain the mechanical and capacity requirements for storage tanks
- identify the types and location of safety valves, check valves and drain valves in each circuit
- describe the operation of safety and warning system components and gauges
- identify the size of the lines and fittings required to supply air to storage tanks, dash valves, gauges, actuator valves, and other components
- describe the operation of 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 of:

- describe the function of tractor protection valves, trailer supply lines, service lines, and couplers (glad hands)
- explain the operation of 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 of:

- describe the operation of combination spring brake and service chambers
- explain the operation of slack adjusters and S-cam assemblies
- outline the function of brake shoe and lining anchor brackets
- describe the operation of disc brake calipers and actuator assemblies

7. ***Perform the inspection, testing, diagnosis, removal and replacement of air brake system circuits and components.***

Potential elements of the Performance of:

- inspect compressor mounting systems and drive mechanisms
- test governor and safety valve operation
- test the build-up time of a compressor
- test the operation of one way check valves and dash gauges
- evaluate air brake systems for excessive leakage
- test the operation of the parking and service brake systems
- test the operation of a 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 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 Anti-Lock Braking Systems.*

Potential elements of the performance of:

- 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 the basic knowledge of electrical and electronics required to operate Anti-lock Braking System components
- identify the working components of “ABS”
- use a variety of test equipment to access information about the electrical and electronic components of a system
- discuss the input and output components required
- use an 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 Commercial Vehicle regulations
2. Mechanics of stopping a vehicle
3. CMVSS “121” brake circuits and schematics
4. Brake System components and operation
5. Trailer-related brake system components and operation
6. Commercial Vehicle foundation brake components
7. Service, testing, diagnosis, and repair of air brake systems
8. Introduction to Anti-Lock Brake Systems

REQUIRED RESOURCES/TEXTS/MATERIALS:

Title: Heavy Duty Truck Systems

Edition: 6th Canadian edition

Author: Bennett

Publisher: Thomson Nelson Learning Canada

Pens, pencils, calculator, 3-ring binder

The following items are mandatory for shop:

- CSA approved steel toe boots (high top)
- CSA approved safety glasses
- Approved coveralls

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 – 35% of the final grade is comprised of term tests
- Assignments – 10% of the final grade is comprised 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, ability to follow direction, and being a team player

Students 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:

Grade	<u>Definition</u>	<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.	

If a faculty member determines that a student is at risk of not being successful in their academic pursuits and has exhausted all strategies available to faculty, student contact information may be confidentially provided to Student Services in an effort to offer even more assistance with options for success. Any student wishing to restrict the sharing of such information should make their wishes known to the coordinator or faculty member.

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.

A Department Attendance Policy will be discussed.

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 during class time.**

VII. COURSE OUTLINE ADDENDUM:

The provisions contained in the addendum located in D2L and on the portal form part of this course outline.

Addendum:

Further modifications may be required as needed as the semester progresses based on individual student(s) abilities and must be discussed with and agreed upon by the instructor.

CICE Modifications:**Preparation and Participation**

1. A Learning Specialist will attend class with the student(s) to assist with inclusion in the class and to take notes.
2. Students will receive support in and outside of the classroom (i.e. tutoring, assistance with homework and assignments, preparation for exams, tests and quizzes.)
3. Study notes will be geared to test content and style which will match with modified learning outcomes.
4. Although the Learning Specialist may not attend all classes with the student(s), support will always be available. When the Learning Specialist does attend classes he/she will remain as inconspicuous as possible.

A. Tests may be modified in the following ways:

1. Tests, which require essay answers, may be modified to short answers.
2. Short answer questions may be changed to multiple choice or the question may be simplified so the answer will reflect a basic understanding.
3. Tests, which use fill in the blank format, may be modified to include a few choices for each question, or a list of choices for all questions. This will allow the student to match or use visual clues.
4. Tests in the T/F or multiple choice format may be modified by rewording or clarifying statements into layman's or simplified terms. Multiple choice questions may have a reduced number of choices.

B. Tests will be written in CICE office with assistance from a Learning Specialist.***The Learning Specialist may:***

1. Read the test question to the student.
2. Paraphrase the test question without revealing any key words or definitions.
3. Transcribe the student's verbal answer.
4. Test length may be reduced and time allowed to complete test may be increased.

C. Assignments may be modified in the following ways:

1. Assignments may be modified by reducing the amount of information required while maintaining general concepts.
2. Some assignments may be eliminated depending on the number of assignments required in the particular course.

The Learning Specialist may:

1. Use a question/answer format instead of essay/research format
2. Propose a reduction in the number of references required for an assignment
3. Assist with groups to ensure that student comprehends his/her role within the group
4. Require an extension on due dates due to the fact that some students may require additional time to process information
5. Formally summarize articles and assigned readings to isolate main points for the student
6. Use questioning techniques and paraphrasing to assist in student comprehension of an assignment

D. Evaluation:

Is reflective of modified learning outcomes.