



## COURSE OUTLINE: MPT230 - AIR BRAKES SYSTEMS

Prepared: George Parsons

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	MPT230: AIR BRAKES SYSTEMS
<b>Program Number: Name</b>	4044: MOT POWER ADV REPAIR
<b>Department:</b>	MOTIVE POWER
<b>Semesters/Terms:</b>	21W
<b>Course Description:</b>	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.
<b>Total Credits:</b>	3
<b>Hours/Week:</b>	5
<b>Total Hours:</b>	35
<b>Prerequisites:</b>	MPF103, MPF122
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Vocational Learning Outcomes (VLO's) addressed in this course:</b>	<b>4044 - MOT POWER ADV REPAIR</b>
<b>Please refer to program web page for a complete listing of program outcomes where applicable.</b>	VLO 1 Analyse, diagnose, and solve various motive power system problems by using problem-solving and critical thinking skills and strategies and by applying fundamental knowledge of motor vehicle operation, components, and their interrelationships.
	VLO 6 Diagnose and repair suspension, steering, and brake components and systems in compliance with manufacturer's recommendations.
	VLO 7 Disassemble and assemble components to required specifications by applying workshop skills and knowledge of basic shop practices.
	VLO 8 Select and use a variety of troubleshooting techniques and test equipment to assess electronic circuits, vehicle systems, and subsystems.
	VLO 9 Apply knowledge of hydraulics and pneumatics to the testing and analysis of motive power systems and subsystems.
	VLO 10 Communicate information effectively, credibly, and accurately by producing supporting documentation to appropriate standards.
	VLO 11 Use information technology and computer skills to support work in a motive power environment.
	VLO 16 Complete all assigned work in compliance with occupational, health, safety, and

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2020-2021 academic year.



SAULT COLLEGE | 443 NORTHERN AVENUE | SAULT STE. MARIE, ON P6B 4J3, CANADA | 705-759-2554

environmental law; established policies and procedures; codes and regulations; and in accordance with ethical principles.

**Essential Employability Skills (EES) addressed in this course:**

- EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.
- EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.
- EES 3 Execute mathematical operations accurately.
- EES 4 Apply a systematic approach to solve problems.
- EES 5 Use a variety of thinking skills to anticipate and solve problems.
- EES 6 Locate, select, organize, and document information using appropriate technology and information systems.
- EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.
- EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.
- EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.
- EES 10 Manage the use of time and other resources to complete projects.
- EES 11 Take responsibility for ones own actions, decisions, and consequences.

**Course Evaluation:**

Passing Grade: 50%, D

A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.

**Other Course Evaluation & Assessment Requirements:**

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:

Grade

Definition Grade Point Equivalent

A+ 90 - 100% 4.00

A 80 - 89%

B 70 - 79% 3.00

C 60 - 69% 2.00

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2020-2021 academic year.



SAULT COLLEGE | 443 NORTHERN AVENUE | SAULT STE. MARIE, ON P6B 4J3, CANADA | 705-759-2554

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.

**Books and Required Resources:**

Heavy Duty Truck Systems by Bennett  
 Publisher: Cengage Learning Edition: 6th

**Course Outcomes and Learning Objectives:**

<b>Course Outcome 1</b>	<b>Learning Objectives for Course Outcome 1</b>
1. Explain what impact the Regulations Of CMVSS 121 have on all Commercial Vehicles using Air Brake Systems.	1.1 Explain the origin of CMVSS 121 . 1.2 Describe the changes implemented in the 121 braking system 1.3 Explain the standards and safety responsibilities of drivers related to CMVSS 121 systems and circle check requirements. 1.4 Communicate accurately how the Air Brake Z Endorsement affects the Commercial Vehicle Industry.
<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>
2. Understand the Mechanics of Stopping a Vehicle.	2.1 Analyze Stopping Distances Required for Commercial Vehicles. 2.2 Interpret how the Regulations implemented for stopping distances is affected by the vehicle GVWR (gross vehicle weight rating). 2.3 Apply Pneumatic principals to the operation of air brake systems and components. 2.4 Outline the differences between hydraulic and pneumatic brake systems 2.5 Explain how law of levers applies to air brake systems. 2.6 Identify how weight and speed affect stopping distances. 2.7 Explain the relationship of brake lag and brake application time. 2.8 Explain how friction and brake fade problems are related. 2.9 Describe why proper brake adjustment is critical to stopping of a commercial vehicle
<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>
3. Interpret the Schematics of the Brake Circuits of the 121 Air Brake Systems.	3.1 Trace the air flow within the Supply system circuit. 3.2 Identify the Primary system circuit components. 3.3 Follow the air flow through the Secondary system circuit components. 3.4 Identify the Parking system circuit components. 3.5 Identify the Trailer system circuit components (where Used).
<b>Course Outcome 4</b>	<b>Learning Objectives for Course Outcome 4</b>

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2020-2021 academic year.



<p>4. Explain the function and Operation of Brake components, storage tanks and safety devices of Supply, Primary, Secondary and Parking Brake Circuits.</p>	<p>4.1 Describe how the air compressors, governor controls, air dryer and alcohol devices operate.  4.2 Explain the mechanical and capacity requirements for Storage tanks.  4.3 Identify the location and types of safety valves, check valves and drain valves required in each circuit.  4.4 Describe the operation of the safety and warning system components and gauges.  4.5 Identify the size of lines and fittings required for supply of air to the storage tanks, dash Valves, gauges and actuator valves and components.  4.6 Describe of operation of the dash control valves, treadle valves, relay valves, quick release valves, spring brake and anti-compounding valves.</p>
<p><b>Course Outcome 5</b></p>	<p><b>Learning Objectives for Course Outcome 5</b></p>
<p>5. Describe the Operation of Trailer related Brake Control valves, lines and storage tank components.</p>	<p>5.1 Describe the function of the tractor protection valve, trailer supply line, service line, and couplers (glad hands).  5.2 Glad hand couplers  5.3 Explain the operation of the Trailer task valves, relay valves and parking brake valves  5.4 Describe the trailer air system priority designation</p>
<p><b>Course Outcome 6</b></p>	<p><b>Learning Objectives for Course Outcome 6</b></p>
<p>6. Outline the description and Construction of Commercial Vehicle Foundation Brake Components and Types.</p>	<p>6.1 Describe the operation of the combination Spring brake and service chambers  6.2 Explain the operation of the slack adjusters and s-cam assemblies  6.3 Outline the function of the brake shoe and lining anchor bracket  6.4 Describe the operation of the disc brake calipers and actuator assembly</p>
<p><b>Course Outcome 7</b></p>	<p><b>Learning Objectives for Course Outcome 7</b></p>
<p>7. Perform, Inspection, testing, diagnosis, removal and Replacement of Air Brake system circuits and components.</p>	<p>7.1 Inspect the compressor mounting system s and drive mechanism.  7.2 Test governor and safety valve operation.  7.3 Test the build- up time of compressor.  7.4 Test operation of one way check valves and dash gauges.  7.5 Evaluate the air brake system for excessive leakage.  7.6 Test operation of the parking and service brake systems.  7.7 Test operation of the tractor protection system.  7.8 Perform brake Inspection and measure drums, calipers and lining wear.  7.9 Diagnose uneven wear problems associated with drum and disc foundation brake assemblies.  7.10 Inspect S-cam shoe rollers and return springs.  7.11 Measure S-Cam bushing and spline wear.  7.12 Measure Brake Chamber pushrod stroke.  7.13 Remove and replace brake shoes.  7.14 Perform brake adjustment for manual and automatic slack Adjusters.</p>

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2020-2021 academic year.

	<p>7.15 Replace air brake supply lines and trailer coupling devices.</p> <p>7.16 Remove and replace spring brake chambers using the proper installation and safety guidelines and procedures.</p> <p>7.17 Diagnose pneumatic and mechanical problems associated with air compressors and governors.</p>
<b>Course Outcome 8</b>	<b>Learning Objectives for Course Outcome 8</b>
8. Explain the Purpose, outline the components of the system and discuss the fundamental operation of the Anti-lock Braking System.	<p>8.1 Identify when ABS was first introduced to Air Brake Systems.</p> <p>8.2 Analyze the benefits ABS would provide for the Trucking Industry.</p> <p>8.3 Describe the basic operation of ABS</p> <p>8.4 Apply basic knowledge of electrical and electronics required to operate the Anti-lock Braking System components.</p> <p>8.5 Identify the working components of the ABS .</p> <p>8.6 Use a variety of test equipment to access information about the electrical and electronic components on the system.</p> <p>8.7 Discuss the inputs and output components required.</p> <p>8.8 Use a Electronic Scan Tool to read fault codes generated in the ABS</p> <p>8.9 Perform wheel speed sensor tests.</p>

**Evaluation Process and Grading System:**

<b>Evaluation Type</b>	<b>Evaluation Weight</b>
Employability Skills	10%
Shop	45%
Theory Assignments	10%
Theory Tests	35%

**Date:**

September 2, 2020

**Addendum:**

Please refer to the course outline addendum on the Learning Management System for further information.

In response to public health requirements pertaining to the COVID19 pandemic, course delivery and assessment traditionally delivered in-class, may occur remotely either in whole or in part in the 2020-2021 academic year.