



**I. COURSE DESCRIPTION:**

In this course, you will focus on the construction, repair and diagnosis of modern motive power hydraulic brake systems. Common sources of vehicle brake problems will be outlined at this time. The CICE student will perform system pressure tests to verify proper operation of master cylinders, power brake boosters and brake pressure control valves. The CICE student will also learn the construction and operation of modern anti-lock brake systems and verify components using scan tools a digital multi meters.

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

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

**1. *Outline the construction and operation of brake lines, cylinders, shoes, pads, drums, discs, combination valve, power brake boosters and cables.***

Potential Elements of the Performance:

- Compare and contrast materials used to make brake pads and shoes.
- Explore master cylinders, wheel cylinders and calipers to determine operation.
- Assist in the testing of combination valves with pressure gauges to check operation
- Inspect brake lines and flex hoses.
- Look at parking brake mechanisms to verify operation.
- Assist with the servicing of calipers and drum brake assemblies and verify proper operation.
- Describe power brake booster operation, vacuum and hydraulic.

**2. *Assist in diagnosing hydraulic brake system faults following manufacturer procedures.***

Potential Elements of the Performance:

- Examine brake noises.
- Solve brake drag and lock up problems.
- Measure brake drums and rotors to determine sources of vibration.
- Identify corrective actions as required.
- Assist in verifying proper power brake booster operation.

**3. *Outline the purpose and fundamentals of hydraulic anti-lock brake systems.***

Potential Elements of the Performance:

- Describe velocity and acceleration.
- Compare and contrast wheel skid to wheel lock.
- Outline tire coefficient of friction pertaining to stopping and acceleration.
- Describe predetermined deceleration and accelerations rates.

**4. *Outline the construction and operation of hydraulic anti-lock brake systems.***

Potential Elements of the Performance:

- Outline accumulator and pump operation.
- Describe wheel speed sensor location and operation.
- Identify and compare one, two, three and four channel systems.
- Identify the differences between integrated and none integrated systems.
- Discuss hydraulic modulation.
- Discuss the effects of using different sized tires.

**5. *Assist in performing inspection and diagnostic procedures on hydraulic anti-lock brake systems following manufacturers' recommendations.***

Potential Elements of the Performance:

- Perform a visual inspection.
- Scan system and extract data.
- Retrieve trouble codes.
- Outline hydraulic system pressure precautions.
- Assist in testing and verifying wheel speed sensor operation.

**6. *Assist in performing inspection, testing, and diagnostic procedures following manufacturers' recommendations and safe work practices on heavy duty hydraulic brake systems.***

Potential Elements of the Performance:

Assist in interpreting test results and performance problems

- noises
- drag or lockup
- vibrations
- imbalance
- check park brake operation

**7. *Assist in recommending reconditioning or repairs following manufacturers' recommendations for Heavy Duty Hydraulic brake systems.***

Potential Elements of the Performance:

- identify corrective repair actions according to manufacturers' recommended procedures

**III. TOPICS:**

1. Explain the construction and operation of brake lines, cylinders, shoes, pads, drums, discs, combination valve, power brake boosters and cables.
2. Diagnose brake system faults following manufacturer procedures
3. Describe the purpose and fundamentals of anti-lock brake systems.
4. Describe the construction and operation of anti-lock and traction control systems.
5. Perform inspection and diagnostic procedures on ABS systems following manufacturers' recommendations.
6. Perform inspection, testing, and diagnostic procedures following manufacturers' recommendations and safe work practices on Heavy Duty Hydraulic brake systems.
7. Recommend reconditioning or repairs following manufacturers' recommendations for Heavy Duty Hydraulic brake systems.

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

Automotive Technology First Canadian Edition

Pens, pencils, calculator, 3-ring binder

The following items are mandatory in 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 – 50% of the final grade is comprised of term tests.
- Assignments – 10% of the final grade is comprised of a number of technical reports.
- Shop – 40% of the final grade is comprised of attendance, punctuality, preparedness, student ability, work organization and general attitude.

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

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.***

## VII. COURSE OUTLINE ADDENDUM:

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

**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.