



## I. **COURSE DESCRIPTION:**

Upon successful completion, the CICE student will have a basic understanding of the principles of operation, diagnose and repair Truck and Coach, Automotive, and Heavy Duty Equipment, heating, ventilation and air conditioning systems (HVAC) to manufacturer and environmental safety standards.

## 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 purpose and fundamentals of HVAC theory.***

Potential Elements of the Performance:

- **thermodynamics**
- **heat transfer**
- **climate control systems**
- **temperature and relative humidity relationship**
- **change of state, latent and sensible heat**
- **properties of refrigerants**
- **gas laws, temperature, pressure and volume**
  - storage
  - purchasing
  - recovery
  - disposal
  - legal Issues
- **environmental effects of refrigerant**

### 2. ***Identify the functions, construction, composition, types, styles and application of Truck and Coach, Automotive and Heavy Equipment HVAC theory and reefer systems.***

Potential Elements of the Performance:

- **climate control systems**
- **reefer circuit components**
- **heating and ventilation**
- **electronic**
- **mechanical**
- **cycling clutch systems**
- **orifice tube**
- **expansion valve**
- **identify types of refrigerants**

- OEM Recommended
- alternate
- **lubricants**
- **system control devices**
  - zone control
- **flow control valves**
- **system protection devices**
  - low temperature / pressure
  - high temperature / pressure
- **expansion valves and orifice tubes**
- **clutch controls**
- **condensers**
- **receiver dryer**
- **accumulator-dryer**
- **evaporator**
- **heater cores compressors**
- **axial recirculating**
- **radial**
- **variable displacement**
  - hoses, lines and fittings
  - van insulation requirements

**3. *Discuss the principle(s) of operation of Truck and Coach, Automotive and Heavy Equipment HVAC systems.***

Potential Elements of the Performance:

- **heating system operation**
- **AC system operation**
- **climate control**
  - temperature controls
  - airflow management
  - characteristics of refrigerants
- **characteristics of lubricants**
- **system protection devices**
  - low and high-pressure cutout
  - low charge protection
  - low pressure cycling control
- **compressor cycle**
  - cycling clutch
  - variable displacement
- **reefer system operation**
- **cryogenic systems**

- 4. Perform/assist with basic inspection, testing and diagnostic procedures on Truck and Coach, Automotive and Heavy Equipment HVAC systems.**

Potential Elements of the Performance:

- **identify the location of system components and controls**
- **performance test**
  - heating system
  - AC system
  - climate control
- **test for refrigerant and coolant leaks**
- **test system for operating pressure and control functions**
- **outline service requirements of various refrigerants**

- 5. Contribute to recommending reconditioning or repairs following manufacturers' procedures on Truck and Coach, Automotive and Heavy Equipment HVAC systems.**

Potential Elements of the Performance:

- **outline procedures required removing and replacing HVAC system components**
- **assist with/perform drive belt adjustments**
- **assist with demonstrating recovery, recycling, evacuation, and recharging procedures**

### III. TOPICS:

1. Fundamentals of the refrigeration cycle.
2. Refrigerant types.
3. Compressor operation.
4. Condenser types and styles.
5. Expansion valves and fixed orifice systems.
6. Evaporator types and styles.
7. System design and layout.
8. Evacuation/Recharge Equipment.

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

**Automotive Technology-A Systems Approach – Canadian Edition  
Erjavec-Restoule-Playter**

**Heavy Duty Truck Systems 5<sup>th</sup> Edition  
Bennett-Norman**

## V. EVALUATION PROCESS/GRADING SYSTEM:

Theory letter grades are based on; (also see attached information below)

- 50% of semester Theory Tests, averaged
- 20% of Final Theory Exam
- 20% of semester theory assignments, averaged
- 10% of assessed employability skills ( attendance, punctuality, work ethics, and general attitude)

A **60% Average of the total semester exam, assignments and employability skills** must be achieved to receive a passing grade of at least C in Theory.

A student **cannot rewrite** a test to improve his/her mark. If a test is missed by a student, without a good reason, an **“Incomplete”** grade is allotted.

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

The following semester grades will be assigned to students:

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
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  
in the classrooms or shop areas during class time.**

## 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.