SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE:	Heating, Ventilation and Air Conditioning		
CODE NO. :	HMI 214	**SEMESTER:**	FOUR
PROGRAM:	Home Inspection Technician		
AUTHOR:	Greg Antoniow		
DATE:	January 2013	**PREVIOUS OUTLINE DATED:**	April 2012
APPROVED:			

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CHAIR **DATE**

TOTAL CREDITS:	Three
PREREQUISITE(S):	HMI 202 Heat Transfer
HOURS/WEEK:	3

For additional information, please contact Corey Meunier, Chair
School of Technology & Skilled Trades
(705) 759-2554, Ext. 2610

I. COURSE DESCRIPTION:

This course applies concepts learned in HMI 202 to home heating, air conditioning and ventilation systems. We will be using air conditioning and refrigeration principles to help with the home inspector's role in defect recognition when examining a home's HVAC system. Students will also become familiar with types of heat pumps as well as their functions.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. ***Demonstrate safe work practices as they relate to the air conditioning system and be able to identify these hazards.***
   Potential Elements of the Performance
   - Understand the hazards and know the safety precautions to be used when handling refrigerants
   - State the shop safety rules
   - Discuss refrigerant recovery techniques
   - Discuss how to safely use hand and power tools
   - Name electrical hazards and discuss electrical safety rules
   - Identify the physical and chemical hazards of an air conditioning system
   - List types of refrigerant leak detection
   - Describe MSDS's including content along with the WHMIS regulations

2. ***Understand the benefits that can be achieved through proper maintenance of HVAC equipment.***
   Potential Elements of the Performance:
   - In the shop setting, measure and record the entering and leaving dry bulb temperatures
   - Explain the fundamental principles of Psychrometrics
   - List the reasons for evacuating a refrigeration system
   - Describe the pressure-temperature relationship of saturated refrigerant
   - Describe the fundamental principles of heat transfer as they apply to the water-cooled condensers, cooling towers, and evaporative condensers
   - Identify the four major components of the air conditioning system and explain their operating functions.

- Describe how to safely and properly perform preventative maintenance on the air conditioning system.
- Discuss the importance of replacing the air filter on a regular basis

3. Demonstrate the ability to safely use selected tools, meters, and refrigeration equipment.

Potential Elements of the Performance:

- Identify the major tools used in HVAC/R work
- List the different types of electrical meters and explain how they are used
- Explain the relationship of voltage, current, and resistance in an electrical circuit
- Recognize the importance of properly sized wire for varying load requirements
- Distinguish the difference between the high side and low side of an air conditioning system
- In a lab setting, demonstrate the safe use of electrical meters and refrigeration gauges
- Understand the benefits of having a programmable thermostat control the air conditioning system.

4. Recognize the principles of operation of an air conditioning system.

Potential Elements of the Performance:

- Explain the fundamental principles of the refrigeration cycle
- Perform practical assignments in the lab environment and be able to put recognize and analyze the data
- Use examples when describing the three basic methods of heat transfer
- Discuss the difference between recovered, recycled, and reclaimed refrigerant
- Know how the properties of moist humid air relates to human comfort
- Explain why the suction line requires insulation on it.
- Identify how the first and second laws of thermodynamics apply to the air conditioning system
- Compare sensible heat to latent heat

5. Distinguish between the different types/styles of air conditioning systems.

Potential Elements of the Performance:

- Explain the operation of a ductless split air conditioning unit
- Describe the cooling and dehumidification process
- Compare the operation between an air cooled and water cooled condenser
- Understand the operation of fluid pressure in circulating pumps as they apply to geothermal operations
- State how a heat pump works
- Explain the operating function of the major components of an air conditioning system and heat pump system including: compressor, reversing valves, expansion valve, condenser coil and evaporator coils
- Understand that the efficiency of a system can change, depending on the physical size of a component

6. Explain how the ventilation system affects air distribution in air conditioning system.

Potential Elements of the Performance:

- Understand how airflow and air quantity are affected by fitting losses of the duct systems
- Be able to explain the effect of the equipment selection and operation will have on the humidity level of the air
- Explain the purpose of the condensate trap on the drain line from an air conditioning evaporator
- Explain the differences between static pressure and velocity pressure
- Recognize signs of poor airflow across a furnace or air conditioning system
- Interpret between the different styles of fans and explain their applications
- Comprehend the design considerations for locating duct runs
- Understand the benefits of proper thermostat location placement can have on a system

7. Identify the differences between Ground-Source, Air to Air, and Geothermal Heat Pumps

Potential Elements of Performance:

- Understand the operation of the heat pumps components
- Describe the applications best suited for air source and water source heat pumps
- Understand the considerations for sizing the water loop circulating pump.

- List the types of water loops for water source heat pumps
- Understand the characteristics of refrigerant as it flows through the air conditioning components in the heating and cooling modes
- Describe what happens to the refrigerant in the evaporator coil and condenser coil
- Explain how a geothermal system works
- Understand the environment that is necessary for an air conditioning unit and furnace to function properly

III. TOPICS:

1. Protect yourself and others using safe work practices
2. Principles of heat transfer
3. Electrical meters and troubleshooting
4. Understand how thermodynamic principles relate to heat transfer
5. Types of HVAC equipment
6. Ventilation requirements for an HVAC system
7. Refrigeration and heating cycle troubleshooting guides

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

-Fundamentals of HVAC/R, Carter Stanfield and David Skaves; I Prentice Hall ISBN-10: 0-13-222367-8 I ISBN-13: 978-0-13-222367-6
-Handouts specific to course topics

V. EVALUATION PROCESS/GRADING SYSTEM:

Attendance	*5%*
Participation	*10%*
Theory test #1	*15%*
Theory test #2	*15%*
Theory test #3	*15%*
Practical project #1	*20%*
Practical project #2	20%
	100%

Unexcused late assignments reduces grade by three marks per day.

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
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.

VII. COURSE OUTLINE ADDENDUM:

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