COURSE OUTLINE

MECH 103 – Intro to HVAC-R

Prepared By: Michael J. Newtown, P.E.
Updated By: Stan Skowronek (April 2012)
Updated By: Michael J. Newtown, P.E. (May 2015)

CANINO SCHOOL OF ENGINEERING TECHNOLOGY
MECHANICAL & ENERGY TECHNOLOGY
May 2015
A. **TITLE:** Intro to HVAC-R

B. **COURSE NUMBER:** MECH 103

C. **CREDIT HOURS:** 3

D. **WRITING INTENSIVE COURSE: (OPTIONAL)** No

E. **LENGTH OF COURSE:** 15 weeks

F. **SEMESTER(S) OFFERED:** Fall

G. **HOURS OF LECTURE:** 2 – one hour lectures per week, 1- three hour lab per week

H. **CATALOGUE DESCRIPTION:** This course is an introduction to heating and air conditioning systems used to achieve a comfortable indoor environment. It includes a straightforward study of heating and cooling loads and the combustion process of various fuels. Warm air, hydronic, and radiant heating systems and related controls are studied to provide technicians the knowledge to install and repair furnaces and ancillary systems. The topics of proper ventilation and refrigeration requirement of a building is developed through ASHRAE standards.

I. **PRE-REQUISITES:** None
   
   **CO-COURSES:** None

J. **STUDENT LEARNING OUTCOMES:**
   Upon completion of the course, the student should be able to:

<table>
<thead>
<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tr>
<td>a. Describe the three methods of heat transfer and give practical examples of each.</td>
<td>2. Critical Thinking</td>
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<td>b. List the common fuels used for heating and describe their characteristics and BTU values.</td>
<td>1. Communication</td>
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<td>c. Explain the combustion process and describe proper combustion testing.</td>
<td>1. Communication</td>
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<td>d. Assess gas and oil fired appliances.</td>
<td>1. Communication</td>
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<td><strong>f.</strong> Design a simple distribution system to heat/cool a small building</td>
<td>1. Communication</td>
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<td><strong>j.</strong> Apply basic electrical knowledge of Ohm’s Law and read schematics</td>
<td>1. Communication</td>
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<tr>
<td><strong>l.</strong> Size condenser and evaporators for a residential air conditioning system.</td>
<td>2. Critical Thinking</td>
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K. **TEXTBOOK:**
Ronald H. Howell, William J. Coad, and Harry J. Sauer;
American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2010

L. **REFERENCES:**
ASHRAE Fundamentals,
ASHRAE HVAC Applications,
Stein, Benjamin, *Building Technology, Mechanical & Electrical Systems*,

M. **EQUIPMENT:**
Equipment in NS 101 ACET Lab

N. **GRADING METHOD: (P/F, A-F, etc.):** A-F

O. **MEASUREMENT CRITERIA/METHODS:** Quizzes, homework, hourly exams and a final.

P. **DETAILED COURSE OUTLINE:**

I. Indoor Climate
   A. Heat
      1. Sensible
      2. Latent
      3. Specific
   B. Humidity
   C. Air Motion

II. Human Comfort
   A. Requirements
   B. Heat Transfer
      1. Conduction
      2. Convection
      3. Radiation
      4. Evaporation
   C. Temperature
   D. Relative Humidity

III. Fuels
   A. Fuel Oil
      1. Grades of oil
      2. BTU Content
   B. Gas
      1. Types of gases
      2. BTU Content

IV. Combustion
   A. Fuels and Combustion
B. Products of Combustion  
C. Air Requirements  
D. Types of Flame  
E. Efficiency

V. Oil Burners and Controls  
A. Fuel atomization  
B. Pumps  
C. Motors  
D. Nozzles  
E. Drawer assemblies  
F. Fans  
G. Ignition and control Transformers

VI. Gas Burners and Controls  
A. Atmospheric burner  
B. Power Burner  
C. Manifold  
D. Pressure Regulator  
E. Orifice  
F. Pilots  
G. Controls

VII. High Efficiency Equipment  
A. Types and Designs  
B. Combustion Air  
C. Venting  
D. Condensation

VIII. Heat Pumps  
A. Types  
B. Refrigeration Cycle  
C. Supplementary Heat

IX. Forced Air Systems  
A. Components  
B. Duct Sizing  
C. Diffuser Selection

X. Hydronic Systems  
A. Components  
B. Piping Arrangements  
C. Baseboard Selection

XI. Radiant Systems  
A. Slab/Floor
B. Controls

XII. Indoor Air Quality
   A. ASHRAE requirements for low rise residential buildings
   B. Mechanical ventilation required for contaminates.

XIII. Air Conditioning/refrigeration Design
   A. Cooling loads
   B. Sizing of evaporators and condensers

Q. LABORATORY OUTLINE:

   I. Cutting, Bending, Flaring and Soldering Copper Tubing
   II. Pipe Threading and Sheet Metal Fabrication
   III. Calibration of Pressure Compound and Vacuum Gauges
   IV. High Pressure Atomizing Oil Burners
   V. Oil Pumps and Pressure Regulating Valves
   VI. Basic Control Circuits
   VII. Installation of a High Pressure Gun Type Oil Burner
   VIII. Combustion Testing Instrument
   IX. Heating and Air Conditioning Controls – Single Throw Switching Relays
   X. Heating and Air Conditioning Controls – Double Throw Relays
   XI. Oil Burner Primary Controls
   XII. Installation and Testing of an Atmospheric Gas Burner
   XIII. Refrigeration System Operating Conditions and Use of Gage Manifold
   XIV. System Evacuation Charging and Leak Testing
   XV. Evaporator Capacity