COURSE OUTLINE

MECH 103 – Intro to HVAC-R

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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

J. **STUDENT LEARNING OUTCOMES:**

<table>
<thead>
<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tbody>
<tr>
<td>a. Describe the three methods of heat transfer and give practical examples of</td>
<td>2. Critical Thinking</td>
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<tr>
<td>each.</td>
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<td>b. List the common fuels used for heating and describe their characteristics</td>
<td>1. Communication</td>
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<td>and BTU values.</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>f. Design a simple distribution system to heat/cool a small building</td>
<td>1. Communication</td>
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<td>j. Apply basic electrical knowledge of Ohm’s Law and read schematics</td>
<td>2. Critical Thinking</td>
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<td>l. Size condenser and evaporators for a residential air conditioning system.</td>
<td>2. Critical Thinking</td>
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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