COURSE OUTLINE

ACHP 103 – Refrigeration & Air Conditioning Service I

Prepared By: Stan Skowronek
**A. TITLE:** Refrigeration & Air Conditioning Service I

**B. COURSE NUMBER:** ACHP 103

**C. CREDIT HOURS:** (7)

**D. WRITING INTENSIVE COURSE:** No

**E. COURSE LENGTH:** (15 weeks)

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

**G. HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:**
4 hours lecture, 9 hours lab per week

**H. CATALOG DESCRIPTION:** The fundamentals of refrigerating and air conditioning equipment are the emphasis of this course. Students study the basic refrigeration cycle and the function of each component; compressor, condenser, evaporator and metering device. Use of hand and power tools is stressed in laboratory work. Students cut, bend, solder, braze, flare, and swage copper tubing. Flowing nitrogen is stressed during brazing operations.

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

**J. GOALS (STUDENT LEARNING OUTCOMES):**
By the end of this course, the student will be able to:

<table>
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<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tbody>
<tr>
<td>a. Select and operate basic service tools and equipment</td>
<td>3. Prof. Competence</td>
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<tr>
<td>b. Perform joining techniques to complete clean metal to metal tubing connections</td>
<td>3. Prof. Competence</td>
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<td>c. Identify basic refrigeration systems and their applications</td>
<td>2. Critical Thinking 3. Prof. Competence</td>
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<td>d. Explain the components and theory of basic electrical circuits</td>
<td>1. Communication 2. Critical Thinking</td>
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<td>e. Demonstrate the ability to apply pressure-temperature relationships of various refrigerants</td>
<td>2. Crit. Thinking</td>
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<td>f. Work with a diverse group, completing a common task</td>
<td>4. Inter/Intrapersonal skills</td>
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**K. TEXT:** Althouse, Turnquist, Bracciano. 19th edition, Modern Refrigeration and Air Conditioning. Goodheart-Willcox

**REFERENCES:** N/A

**L. EQUIPMENT:** Refrigeration tool list
http://www.canton.edu/csoet/pdf/tools_AC.pdf
N. **GRADING METHOD:** (A-F)

O. **MEASUREMENT CRITERIA/METHODS:**
   - Exams
   - Quizzes
   - Lab Reports
   - Participation

P. **DETAILED COURSE OUTLINE:**

I. Fundamentals of Refrigeration
   A. Heat and Heat Flow
   B. Temperature Measurement
   C. Pressure Measurement
   D. Heat Transfer
   E. Sensible and Latent Heat
   F. Energy Units

II. Refrigeration Tools and Materials
   A. Pipe and Tubing
   B. Pipe Fitting and Sizes

III. Hand Tools and Gages
   A. Instruments
   B. Refrigerants and Oils
   C. Service Valves
   D. System Evacuation

IV. Basic Refrigeration Systems
   A. Evaporative refrigeration
   B. Mechanical Systems

V. Compression Systems and Compressors
   A. Compression Cycle
   B. Evaporators
   C. Filter-Driers
   D. Compressors
   E. Condensers
   F. Receivers
   G. Controls
   H. Compressor Types
   I. Motors

VI. Refrigerant Controls
   A. AEV
   B. TXV
   C. Flash Gas and Superheat
   D. TEXV
   E. Pressure Limiters
   F. Solenoid Valves
   G. Equalizers
   H. Floats
   I. Capillary Tubes

VII. Electrical Fundamentals
   A. Current, Voltage and Resistance
B. Circuit Fundamentals
C. Ohm’s Law
D. Formulas
E. Types of Electricity
F. Power, Single and Three Phase
G. Power Circuits
H. Transformers, Relays and Contactors

VIII. Motors
A. Types and Applications
B. Start and Run Windings
C. Capacitors
D. Horsepower
E. Grounding and Over Current Protection
F. Fan Motors
G. Servicing

IX. Circuits and Controls
A. Wiring Diagrams
   a. Schematics
   b. Ladders
B. Control Systems
C. Differential and Range Adjustment
D. Motor Controls
E. Defrost Controls
F. Checking, Testing, and Servicing Controls

X. Refrigerants
A. Refrigerant Identification
B. Pressure-Temperature Curves
C. Group One Through Three Refrigerants
D. Expendable Refrigerants
E. Refrigerant Cylinders
F. Using Pressure-Temperature Curves
G. Refrigerant Applications
H. Refrigeration Oil
I. Changing Refrigerants
J. New Refrigerants
K. Ozone Protection-EPA Guidelines

Q. **LABORATORY OUTLINE:**

I. Introduction
   A. Safety
   B. Tools

II. Tubing Skills
   A. Tube forming
   B. Brazing
   C. Assembly

III. Heat Transfer
   A. Conduction, Convection, Radiation
   B. Insulation

IV. Change of State
   A. Water
B. Steam ice

V. Refrigeration Cycle
   A. Compressor
   B. Condenser
   C. Expansion
   D. Evaporator

VI. Pressure Measurement
   A. Psi
   B. Iwc
   C. Feet of head

VII. Refrigerant Handling
   A. Moving refrigerants
   B. Recovery
   C. Charging basics

VIII. Single Phase Power
   A. Safety/ isolation
   B. Simple circuits

IX. Low Voltage Control
   A. Transformers
   B. Relays
   C. Thermostats