Fundamentals of Heating and Cooling

Industrial Mechanical Apprenticeship Program

Course Outline

Day 1

1. Introduction
    - 1.1. Definitions and Scope
    - 1.2. Dimensions and Units
    - 1.3. Nature of Heat, Temperature and its Measurement

2. Basic Thermodynamics Concepts
    - 2.1. Systems, Surroundings, Univers
    - 2.2. Open System, Closed System, Isolated System
    - 2.3. Zeroth Law of Thermodynamics
    - 2.4. First Law of Thermodynamics

3. State,Process and Path
    - 3.1. Thermodynamic Equilibrium
    - 3.2. Cyclic Process
    - 3.3. Reversible/Irreversible Process

Day 2

4. Thermodynamic Cycles
    - 4.1. Heat Cycles
    - 4.2. Heat and Work
    - 4.3. Relationship between Temperature, Pressure and Volume

5. Heat and Properties of Matter
    - 5.1. Expansion and Contraction of Gases
    - 5.2. Change of State
    - 5.3. Boiling and Condensing

6. Heat Transfer
    - 6.1. Steady State Conduction
    - 6.2. Natural and Forced Convection

6.3. Radiation

Day 3

7. Heat Treating
    7.1. Reasons for Heat Treating
    7.2. Heat-Treating Equipment
    7.3. Hot Working of Steel
    7.4. Cold Working of Steel

    8. Heat Treating-cont
    8.1. Cooling Medium and Devices
    8.2. Effects of Hot Working on Microstructure
    8.3. Temperature Measurement and Control

9. Fuels
    9.1. Theory of Combustion
    9.2. Types of Fuels
    9.3. Heat Loss
    9.4. Burning Fuel for Maximum Energy

Day 4

10. Furnace Atmosphere
    10.1. Selection of Atmosphere
    10.2. Prepared Atmosphere
    10.3. Atmosphere Sensors

11. Heat Exchangers
    11.1. Heat Exchange Process
    11.2. Physical State of Fluids
    11.3. Flow Arrangement
    11.4. Design and Construction

12. Tools and Equipments
    12.1.