

<b>AR543</b>	<b>HVAC Systems</b>	<b>HRS 3-0-0</b>	<b>CR-3</b>
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### **Objective**

This course aims to impart fundamental understanding about heating, ventilation and air-conditioning in buildings. Basic principles of thermodynamics and air-conditioning process is covered with a specific orientation towards human comfort. The course enables the student to calculate and estimate heating or cooling load of a building and design the air-conditioning system in an effective manner. Different types of air-conditioning system and ducting system are also taught in the course.

### **Module 1**

#### **DEFINITIONS AND LAWS**

Definition & Units of Thermodynamic quantities - Heat (Specific heat & Latent heat), Pressure (Absolute, Gauge & Atmospheric Pressure), Absolute Temperature (Scales & measurement). PH diagram of water to understand Latent heat, Sensible heat, Superheat & Enthalpy, Degree of Superheat & Dryness Fraction.

Laws of Thermodynamics with respect to refrigerators & heat pumps, COP & EER of HVAC systems. Working principle of a Vapour Compression Refrigeration system with schematics & TS diagram. Application, Properties & Dupont Nomenclature of refrigerants.

### **Module 2**

#### **AIRCONDITIONING PRINCIPLES**

Heat Gains in Building Systems – Thermal Conductivity and U value of Building Materials. Conductive heat transfer through composite walls & pipes. Solar Heat Gain through Fenestration systems. Numerical  
Sensible and Latent Gains, Humidification & Dehumidification, Thermal comfort conditions & Comfort Chart.

Classification, Principle, construction and working of Summer and Winter Air-conditioning systems. Cooling load calculations. Numerical using Psychometric chart.

### **Module 3**

#### **HEATING SYSTEMS**

Space Heating: Conventional & Unconventional Heating systems, Radiant panel and Hydronic Heating systems. Passive heating and cooling techniques, Green heating systems.

### **Module 4**

#### **COOLING SYSTEMS**

Air Distribution Systems – Natural & Mechanical ventilation systems, Supply, Return and Recirculation Ducts. Indoor air quality and Air Filters.

Thermostats and Humidistat. Centrifugal blowers and Exhausters.

Different types of air-conditioning systems. Window, split, ductable AC, etc.

Introduction to central air conditioning systems.

Understanding 2 pipe & 4 Pipe CV and VAV systems. Chilled Air and Water systems, Spatial requirement of HVAC plants and duct layout.

### **Module 5**

Design of Air-conditioning system for a building as decided by the subject teacher.

### **References**

1. Bovay, H. E. (1981). Handbook of Mechanical & Electrical systems for Buildings. McGraw-Hill Higher Education.