Subject:BUILDING SERVICES-IV Sem: 6th Subject Code: AM623 (Refrigeration and Air Conditioning)

Objectives: To enable the students to understand the basics of HVAC systems, principles, types & their deployment, issues pertaining to heat exchanges in buildings, calculating cooling loads etc.

Module 1

Definition & Units of Thermodynamic quantities: Specific & Latent heat, Absolute, Gauge & Atmospheric Pressure, Temperature, Volume, Work & Energy. Numericals (3 hours)

States & Properties of Water: PH diagram to explain Latent heat, Sensible heat, Superheat, Sub cooling & Enthalpy, Ice point & Triple point, Degree of Superheat & Dryness Fraction. (2 hours)

Laws of Perfect Gases: Boyle's law, Charles'law, Gay Lussac's law, Universal Gas law (1 hour)

Laws of Thermodynamics: Understanding the basic laws, principle of heat engines, refrigerators & heat pumps, Thermal efficiency & COP with numericals. (3 hours)

Heat Transfer: Conductive heat transfer through composite walls & pipes. Numericals (4 hours)

Module 2

Refrigeration: Definition, Principle, construction & units of Refrigeration. Properties & nomenclature of refrigerants. PH & TS diagram and Working principle of a Vapour Compression Refrigeration System. Numericals (7 hours)

Psychrometry: Definition & units of the various properties of air water vapour mixture such as DBT, WBT, RH, AH, Enthalpy etc. Numericals on Psychrometry. (7 hours)

Module 3

Air Conditioning: Definition, principle, construction & classification of AC's. Summer & Winter AC (Sensible heating & Cooling, Humidification & Dehumidification, Sensible heat factor & Bypass Factor). Thermal comfort conditions & Comfort Chart. Temperature & Humidity measurement and control devices (thermostats & humidistats). Calculation of cooling loads. Numericals using Psychrometric chart. (9 hours)

Air Distribution Systems: classification, types & construction of Supply & Return Duct systems, selection of duct material. (2 hours)

Air Filters: Air pollutants, Classification, types & construction of air filters. (1 hour)

Ventilation: Natural & Mechanical ventilation systems. (1 hour)

Space Heating: Conventional & Unconventional Heating systems, Active & Passive solar space heating, Green heating systems. (2 hours)

Project: HVAC Plan for a shopping mall, Cineplex etc.

References:

1) William H. Severns and Julian R. Fellows. Air conditioning and refrigeration. John Wiley and sons, London

2) Refrigeration and Air Conditioning by Khurmi, Gupta & Arora, S Chand & Co.

3) Carrier handbook of air conditioning system design.

4) NBC manual on Fire Safety, Govt. of India.