

III Year – II SEMESTER

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**DEPARTMENTAL ELECTIVE – I**

**REFRIGERATION & AIR CONDITIONING**

**(Refrigeration and Psychrometric tables and charts allowed)**

**Course objectives:**

The course is to understand the basic cycles of various refrigerating systems, their performance evaluation along with details of system components and refrigerant properties. The course is also aimed at imparting knowledge of psychrometric properties, processes which are used in airconditioning systems for comfort and industrial applications.

**UNIT – I**

**INTRODUCTION TO REFRIGERATION:** Necessity and applications – unit of refrigeration and C.O.P. – Mechanical refrigeration – types of ideal cycles of refrigeration. air refrigeration: bell coleman cycle - open and dense air systems – refrigeration systems used in air crafts and problems.

**UNIT – II**

**VAPOUR COMPRESSION REFRIGERATION:** Working principle and essential components of the plant – simple vapour compression refrigeration cycle – COP – representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – actual cycle influence of various parameters on system performance – use of p-h charts – numerical problems.

**UNIT III**

**REFRIGERANTS** – Desirable properties – classification - refrigerants used – nomenclature – ozone depletion – global warming.

**VCR SYSTEM COMPONENTS:** Compressors – general classification – comparison – advantages and disadvantages. condensers – classification – working principles evaporators – classification – working principles expansion devices – types – working principles.

**UNIT IV**

**VAPOR ABSORPTION SYSTEM:** Calculation of maximum COP – description and working of  $\text{NH}_3$  – water system and Li Br –water ( Two shell & Four shell) System, principle of operation three fluid absorption system, salient features.

**STEAM JET REFRIGERATION SYSTEM:** Working Principle and basic components. principle and operation of (i) thermoelectric refrigerator (ii) vortex tube.

#### **UNIT – V**

**INTRODUCTION TO AIR CONDITIONING:** Psychometric properties & processes – characterization of sensible and latent heat loads — need for ventilation, consideration of infiltration – load concepts of RSHP, GSHP-problems, concept of ESHF and ADP temperature.

Requirements of human comfort and concept of effective temperature-comfort chart –comfort air conditioning – requirements of industrial air conditioning, air conditioning load calculations.

#### **UNIT – VI**

**AIR CONDITIONING SYSTEMS:** Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, fans and blowers. heat pump – heat sources – different heat pump circuits.

#### **TEXT BOOKS:**

1. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai.
2. Refrigeration and Air Conditioning / CP Arora / TMH.

#### **REFERENCES:**

1. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
2. Principles of Refrigeration - Dossat / Pearson Education.
3. Basic Refrigeration and Air-Conditioning – Ananthanarayanan / TMH

**Course outcomes:** At the end of the course the students should be able to: After undergoing the course the student should be in a position to analyze various refrigerating cycles and evaluate their performance. The student also should be able to perform cooling load calculations and select the appropriate process and equipment for the required comfort and industrial airconditioning.