

3/4 B.Tech. SIXTH SEMESTER

ME6T4

REFRIGERATION & AIR CONDITIONING

Credits: 4

Lecture:- 4 periods/week

Internal assessment: 30marks

Practice: -1 periods/week

Semester end examination: 70 marks

Objectives:

1. Identify necessity, applications of refrigeration and types of ideal cycles
2. Describe the importance of various properties of refrigerants and different refrigeration components
3. Interpret psychometric properties in air conditioning, requirements of comfort air condition and various air conditioning systems

Learning outcomes:

At the end of course the students will have:

1. Explain necessity, applications of refrigeration and types of ideal cycles.
2. Define the working principle of vapor compression refrigeration system
3. Describe the importance of various properties of refrigerants and different components like compressors, condensers, evaporators and expansion devices.
4. Discuss working principle of vapor absorption refrigeration systems and steam jet refrigeration systems
5. List Psychometric Properties in air conditioning and requirements of comfort air conditioning.
6. Differentiate various air conditioning systems.

Pre-Requisite

Basic thermodynamics, IC engines and gas turbines

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 and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system problems – Refrigeration needs of Air crafts.

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

VAPOUR COMPRESSION SYSTEM'S COMPONENTS:

Compressors – General classification – comparison – Advantages and Disadvantages. Condensers – classification – Working Principles Evaporators – classification – Working Principles Expansion devices – Types – Working Principles REFRIGERANTS: Desirable properties – classification refrigerants used – Nomenclature – Ozone Depletion – Global Warming .

UNIT IV

VAPOR ABSORPTION SYSTEM:

Calculation of max COP – description and working of NH₃ – water system and Li Br – water (Two shell & Four shell) System. Principle of operation Three Fluid absorption system, salient features.

UNIT V

STEAM JET REFRIGERATION SYSTEM :

Working Principle and Basic Components.

NON CONVENTIONAL REFRIGERATION METHODS: Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT – VI

INTRODUCTION TO AIR CONDITIONING:

Psychometric Properties & Processes – Characterization of Sensible and latent heat loads — Need for Ventilation, Consideration of Infiltration – Load concepts of RSHF, GSHF- Problems, Concept of ESHF and ADP.

UNIT VII

CONCEPT OF HUMAN COMFORT:

Requirements of human comfort and concept of effective temperature- Comfort chart – Comfort Air conditioning – Requirements of Industrial air conditioning , Air conditioning Load Calculations.

UNIT – VIII

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.

Learning resources

Text books:

1. Refrigeration and air conditioning, by C. P. Arora, TMH,2000
2. Refrigeration and Air conditioning, by Manohar Prasad,,Newage International,2007
3. A course in refrigeration and air conditioning, by S. C. Arora, Domkundwar, Dhanpathi Rai, 2003.

References books:

1. Principles of Refrigeration, by Dossat , Prentice Hall,1997 .
2. Refrigeration and air conditioning, by Stoecker , "", Mc Graw hill Edu.,2004 .
3. Refrigeration and Air conditioning Data book, by Domkundwar&Domkundwar , "" , Dhanpati rai &CO. 2002