III B.TECH -II SEMESTER
REFRIGERATION AND AIR CONDITIONING

Course code: ME6T4 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:
The objectives of the course are:

- To make the students understand the concepts of various refrigeration systems
- To estimate the loads for different applications of air conditioning.

COURSE OUTCOMES:
Upon completion of this course the student will be able to:

1. Calculate the COP of air refrigeration systems
2. Describe various components used in vapour-Compression refrigeration system and Estimate the performance
3. Discuss the working principles of vapour absorption, steam jet, thermoelectric and vortex tube refrigeration systems
4. Recognize the properties of air, summarize the various Psychometric processes and acquire the knowledge of load estimation.
5. Evaluate cooling and heating loads in an air conditioning and describe the various components of air conditioning system

Pre-Requisite Basic thermodynamics

UNIT I
INTRODUCTION TO REFRIGERATION:
Necessity of refrigeration and air conditioning, applications, unit of refrigeration
Refrigeration:
Carnot cycle, Bell Coleman cycle and Brayton Cycle, Open and Dense air systems, Actual air refrigeration system –numerical problems.
Refrigeration needs of air craft's, methods of air refrigeration systems

UNIT II
VAPOUR COMPRESSION REFRIGERATION SYSTEM:
Cycles and performance
Simple Vapour compression refrigeration cycle -working principle, essential components, 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 - numerical Problems
Components
Compressors – classification –single stage reciprocating compressors- Working Principle, work done with and without clearance volume, capacity control.
Condensers –classification–Working of evaporative condensers
Evaporators– classification–Working of flooded and dry expansion evaporators
Expansion devices–Types–capillary tube, automatic expansion valve, thermostatic expansion

valve. Refrigerants: Desirable properties–classification refrigerants

UNIT III

Performance of vapor absorption refrigeration system:

Calculation of max COP, description and working of NH_3–water system and Li Br– water (Two shell & Four shell) System. Principle of operation of three fluid absorption system, salient features.

Steam jet refrigeration system:

Working Principle and Basic Components

Nonconventional refrigeration methods:

Principle and operation f(i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT IV

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, ESHF and ADP.

UNIT V

Human comfort and load calculations

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

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

Reference Books:

1. Refrigeration and Air Conditioning by R K Rajput, S K kataria & sons , 2010
2. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
3. Principles of Refrigeration, by Dossat ,Prentice Hall,1997
4. Refrigeration and air conditioning, by Stoecker , Mc Graw hill Edu.,2004
5. Basic refrigeration and air conditioning/PN Ananthanarayanan/Mc Graw hill education

Data Books

1. Refrigeration and Air conditioning Data book, CP Kothandaraman /New age publishers
2. Refrigeration and Air conditioning Data book-Domakundwar & Domakundwar / Dhanpathi rai & CO