B.Tech IV Year I Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA 19AME74d- REFRIGERATION AND AIR CONDITIONING

(Professional Elective-III)

L T P C 3 0 0 3

Course Objectives: The objectives of the course are to make the students learn about

- Provides insights in how thermodynamic principles are applied within the refrigeration and air conditioning industry.
- Introduce the students how real systems used in commercial, industrial refrigeration and air conditioning industries are built-up.
- Expose the students on various refrigeration methods like VCR, VAR and latest developments.
- Know the various air conditioning methods like summer, winter and year round air conditioning and to make the student to understand the practical applications of refrigeration and air conditioning systems.

UNIT - 1: Introduction To Refrigeration

10 Hrs

Introduction To Refrigeration: Necessity and Applications, Carnot Refrigerator, First and Second Law Applied to Refrigerating Machines, Unit of Refrigeration, COP, EER, Different Refrigeration Methods.

Air Refrigeration: Bell-Coleman Cycle, Ideal and Actual Cycles, Open and Dense Air Systems - Numerical Problems - Refrigeration Needs of Air Crafts.

Learning Outcomes:

At the end of this unit, the student will be able to

•	Explain the terminologies associated with refrigeration.	L2
•	Describe the first and second law applied to refrigerating machines.	L2
	Demonstrate the Bell-Coleman cycle in air refrigeration.	L2
•	Identify the various refrigeration cycles.	L3

UNIT - II: Vapour Compression Refrigeration

10Hrs

Vapour Compression Refrigeration (VCR) System - Basic Cycle - Working Principle and Essential Components of the Plant - COP - Representation of Cycle On T-S and P-h Charts - Expander Vs. Throttling, Effect of Sub Cooling and Super Heating - Cycle Analysis - Actual Cycle- Influence of Various Parameters on System Performance - Construction and Use of P-h Charts - Numerical Problems. Refrigerants - Desirable Properties - Classification of Refrigerants Used - Nomenclature-Secondary Refrigerants- Lubricants - Ozone Depletion - Global Warming- Newer Refrigerants.

Learning Outcomes:

At the end of this unit, the student will be able to

•	Appraise the importance of vapour compression refrigeration system.	L5
•	Draw the T-S and P-h charts for representation of cycle	L1
•	Classify various refrigerants used in vapour compression refrigeration systems	L1
•	Model the numerical problems on refrigeration cycles.	L3
•	Demonstrate the influence of various parameters on system performance	L2

UNIT - III: Vapor Absorption Refrigeration (VAR) System-

10Hrs

Vapor Absorption Refrigeration (VAR) System- Description and Working of NH3 - Water System and Li Br -Water (Two Shell & Four Shell) System -Calculation of Max COP, Principle of Operation of Three Fluid Absorption System

Steam Jet Refrigeration System: Working Principle and Basic Components-Estimation of Motive Steam Required Principle and Operation of: (I) Thermo-Electric Refrigerator (ii) Vortex Tube or Hilsch Tube.



Learning Outcomes:

At the end of this unit, the student will be able to

	Appraise the importance of vapour absorption refrigeration system.	L5
•	Identify the latest developments of Electrolux, thermo electric vortex tube methods.	L3
•	Illustrate the working of various components of steam jet refrigeration system.	L2
0	Estimate the motive steam required for steam jet refrigeration system	L6
	Describe the working principle of Themo- Electric refrigerator and bortex tube refrigerator	1.2

UNIT - IV: Introduction To Air Conditioning

8 Hrs

Introduction To Air Conditioning: Psychrometric Properties & Processes - Characterization of Sensible and Latent Heat Loads - Need For Ventilation, Consideration of Infiltrated Air - Heat Load Concepts.

Air Conditioning Systems: Air Cooler (Evaporative Cooling) ,Window, Split, Summer , Winter, Year Round, Central Air Conditioning Systems.

Learning Outcomes:

At the end of this unit, the student will be able to

•	Illustrate the psychrometric properties & processes	L2
•	Select the air conditioning systems for different realistic situations	L6
•	Define the terms sensible heat load and latent heat load	L1
•	Draw the psychrometric charts for various air conditioning environments	L1

UNIT – V: Air Conditioning Equipment

8Hrs

Air Conditioning Equipment - Humidifiers - Dehumidifiers - Air Filters, Fans and Blowers.

Human Comfort: Requirements of Temperature, Humidity And Concept of Effective Temperature, Comfort Chart. Heat Pump - Heat Sources - Different Heat Pump Circuits.

Learning Outcomes:

At the end of this unit, the student will be able to

•	Appraise the importance of humidifiers and dehumidifiers.	L5
•	Select the requirements of temperature and humidity for human comfort.	L6
•	Demonstrate the heat pump working and its components.	L2
•	List the various air conditioning equipments.	L1

Text Books:

- 1. Refrigeration and Air Conditioning ,CPArora,TMH, 15th edition, 2013.
- 2. A Course in Refrigeration and Air conditioning, S. CArora & Domkundwar, Dhanpatrai

Reference Books:

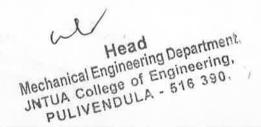
- $1. \ \ Refrigeration\ and\ Air\ Conditioning\ /\ Manohar\ Prasad\ /\ New\ Age,\ 2^{\mbox{nd}}\ edition,\ 2013$
- 2. Principles of Refrigeration Dossat / Pearson Education, 4th edition, 2007
- 3. Refrigeration and Air Conditioning-P.L.Ballaney, 2nd edition, 2012.
- 4. Basic Refrigeration and Air-Conditioning P.N.Ananthanarayanan / TMH, 4th edition, 2013.

NOTE: Tables/Codes: Thermal Engineering Data Book containing refrigerant and Psychrometric property Tables and charts are permitted in Exam

Course Outcomes:

At the end of this Course the student will be able to

Summarize the various refrigeration and air conditioning equipments and it's working
Apply the basic knowledge to operate the refrigeration systems
Evaluate the COP for vapour absorption system



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