REFRIGERATION AND AIR CONDITIONING

Course Code	19ME4601A	**Year**	III	**Semester**	II
Course Category	Program Elective-II	**Branch**	ME	**Course Type**	Theory
Credits	3	**L – T – P**	3 – 0 – 0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		**Levels**
Upon successful completion of the course, the student will be able to		
CO1	Calculate the COP of air refrigeration systems	L2
CO2	Describe various components used in vapour-Compression refrigeration system and Estimate the performance	L1
CO3	Discuss the working principles of vapour absorption, steam jet, thermoelectric and vortex tube refrigeration systems	L1
CO4	Recognize the properties of air, summarize the various Psychometric processes and acquire the knowledge of load estimation	L3
CO5	Evaluate cooling and heating loads in an air conditioning and describe the various components of air conditioning system	L2

	Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	3				1							1	3
CO2	2	3				2							3	3
CO3	2	3				2							3	3
CO4	2	3				2							3	3
CO5	2	3				2							3	3

Syllabus		
Unit No	**Contents**	**Mapped CO s**
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.	CO1
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	CO2

	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	
III	**PERFORMANCE OF VAPOR ABSORPTION REFRIGERATION SYSTEM** Calculation of max COP, description and working of NH3–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.	CO3
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.	CO4
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.	CO5

Learning Recourse(s)

Text Book(s)

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

Reference Book(s)

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

e-Resources & other digital material

1. https://nptel.ac.in/courses/112/105/112105129/
2. https://nptel.ac.in/courses/112/107/112107208/
3. https://nptel.ac.in/courses/112/105/112105128/

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