

REFRIGERATION AND AIR CONDITIONING

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

Course Outcomes

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

Course Articulation Matrix:

	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

Course Content		Mapped CO s
UNIT-1	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
UNIT-2	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	CO2

	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-3	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.	CO3
UNIT-4	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
UNIT-5	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 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.
E-Resources & other digital Material:	https://nptel.ac.in/courses/112/105/112105129/ https://nptel.ac.in/courses/112/107/112107208/ 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