

REFRIGERATION AND AIR CONDITIONING

VII Semester: ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AME017	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45		Tutorial Classes: 15		Practical Classes: Nil			Total Classes: 60	
<p>COURSE OBJECTIVES: The student will try to learn:</p> <ul style="list-style-type: none"> I The principles of thermodynamics in refrigeration and air conditioning, analyze the methods of refrigeration, recognize the necessity and ideal cycle of refrigeration. II The nomenclature of refrigerants, realize the desirable properties of refrigerants to probe their ozone depleting and global warming potential. III The working principles, limitations, maintenance of refrigeration and air conditioning equipment and study their impact on the performance of the system. IV The psychrometric relations, processes, utilize their principles to resolve cooling load calculations and design of air conditioning systems. <p>COURSE OUTCOMES: At the end of the course students are able to:</p> <ul style="list-style-type: none"> CO 1 Relate the performance of a vapour compression refrigeration cycles under specified inlet and outlet conditions. CO 2 Identify the modifications required in an impossible reversed Carnot cycle to convert it into practical cycle for refrigeration applications. CO 3 Demonstrate the working principle and coefficient of performance of a heat pump, heat engine and refrigerator. CO 4 Illustrate the working principles, limitations of practical aqua ammonia, LiBr-Water and Electrolux vapour absorption refrigeration systems. CO 5 Analyze theoretical and practical steam jet refrigeration cycles with T-S and P-h charts by stating merits, limitations, etc. CO 6 Discuss the measures to protect the ozone layer through global control, eventually elimination of production and utilization of ozone depleting substances. CO 7 Classify the equipment used for the refrigeration, air conditioning purposes with suitable materials and refrigerant pairs. CO 8 Construct the sensible heat factor lines, locate alignment circle and SHF scale on a psychrometric chart for the cooling load calculations of air conditioning systems. CO 9 Explain thermal comfort conditions with respect to effective temperature, relative humidity, etc. and their impact on human comfort, productivity and health. CO 10 Distinguish the equipment required for air conditioning systems, study the operating principles, safety controls employed in air conditioning systems. CO 11 Assess the principles of psychrometry to calculate and design the air conditioning systems for particular purpose. CO 12 Compare the various heat pump circuits for heating, cooling purposes with suitable industrial applications. 								

UNIT-I	INTRODUCTION TO REFRIGERATION	Classes: 12
Basic concepts: unit of refrigeration and COP, refrigerators, heat pump, Carnot refrigerator, applications of refrigerators, air refrigeration: Bell-Coleman cycle, open and dense air system, ideal and actual refrigeration, applications, vapor compression refrigeration, ideal cycle, effect of sub cooling of liquid, super heating of vapor, deviations of practical (actual cycle) from ideal cycle, construction and use of p-h chart problems.		
UNIT-II	VAPOUR ABSORPTION REFRIGERATION AND AIR REFRIGERATION	Classes: 12
Vapor absorption refrigeration: description, working of NH ₃ -Water, Li Br–water system, calculation of HCOP, Principle and operation of three fluid vapor absorption refrigeration systems. Steam jet refrigeration system, working principle, basic operation; Refrigerants: Properties, nomenclature selection of refrigerants, effects of refrigerants on global warming, alternate refrigerants.		
UNIT-III	REFRIGERATOR COMPONENTS	Classes: 12
Compressors: classification, working, advantages and disadvantages; Condensers: classification, working Principles. Evaporators: classification, working Principles; Expansion devices: types, working principles.		
UNIT-IV	INTRODUCTION TO AIR CONDITIONING	Classes: 12
Psychometric properties and processes, sensible and latent heat loads, characterization, need for ventilation, consideration of Infiltration, load concepts of RSHF, ASHF, ESHF and ADP; concept of human comfort and effective temperature, comfort air conditioning, industrial air conditioning and requirements, air conditioning load calculations.		
UNIT-V	AIR CONDITIONING SYSTEMS	Classes: 12
Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers, heat pump, heat sources, different heat pump circuits, applications.		
Text Books:		
<ol style="list-style-type: none"> 1. Manohar Prasad, “Refrigeration and Air Conditioning” New Age International, 3rd Edition, 2015 2. S. C. Arora, Domkundwar, A Course in Refrigeration and Air-conditioning, Dhanpatrai Publications, Edition 2014. 3. S. N. Sapali, “Refrigeration and Air-conditioning”, PHI Learning, 2nd Edition, 2011. 		
Reference Books:		
<ol style="list-style-type: none"> 1. C. P. Arora, Refrigeration and Air Conditioning” Tata McGraw-Hill, 17th Edition, 2006. 2. Ananthanarayanan, Basic Refrigeration and Air Conditioning”, Tata McGraw-Hill, 2015. 3. R.K.Rajput, A text of Refrigeration and Air Conditioning” S. K. Kataria & Sons, 3rd Edition, 2009. 4. P. L. Ballaney, Refrigeration and Air Conditioning” Khanna Publishers, 16th Edition, 2015. 		
Web References:		
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/112105128/ 2. https://nptel.ac.in/courses/112107208/ 		
E-Text Books:		
<ol style="list-style-type: none"> 1. https://www.brijrbedu.org/Brij20Data/Refrigeration20and20Air Conditioning/ Book/ A20 Text book 20of20 2. https://www.pdfdrive.com/refrigeration-and-air-conditioning-fourth-edition-e34330234.html 		