

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE IV Year (Mechanical Engineering)					
Subject Code & Name		Instruction Hours per Week			Marks				
<b>4ME103, REFRIGERATION AND AIR-CONDITIONING</b>	L	T	P		TH	CW	SW	PR	Total
	4	-	2	Max	100	50	50	50	250
	Duration of Theory Paper: <b>3 Hours</b>			Min	35	25	25	25	110

### Objective and Pre requisites

The basic objective of the subject is to introduce the processes involved in the refrigeration and air-conditioning to the students and the various systems used for the purpose. The Pre requisites are Thermodynamics, Heat transfer and Fluid mechanics

## COURSE CONTENT

### UNIT-1

#### Introduction and Air Refrigeration Systems

Introduction: Review of reversed Carnot Cycle, Coefficient of Performance, Types of Refrigeration Systems, Bell-Coleman cycle, Air-Refrigeration Cycles, systems for aircraft, Boot-strap type and simple evaporative systems, Applications of refrigeration systems.

### UNIT-2

#### Vapour Compression Refrigeration (VCR) Systems

Thermodynamic Cycle, T-s and P-h diagrams, Analysis, effect of under-cooling and suction superheat, Limitations of VCR systems; Refrigerants: Classification, Properties and nomenclature, primary and secondary refrigerants, eco-friendly Refrigerants.

### UNIT-3

#### Unconventional Refrigeration Systems and Future Trends

Vapor Absorption Systems: absorption cycle, Lithium-bromide system, heat-exchangers, analyzer and diffusers; The Electrolux system; Steam-Jet Refrigeration, Thermo-Electric Refrigeration. Low-temperature refrigeration: Cascade systems, Joule-Thompson effect, liquefaction of gases, application areas

### UNIT-4

#### Psychrometry and Load Estimation

Psychrometry: Psychrometric Chart, Psychrometric properties and Processes; Psychrometers. Air-conditioning Load Estimation: Heat Transfer fundamentals; Cooling and heating load estimation, Heat transfer across the building envelope, thermal insulation, metabolism and heat exchange by the human body, thermal comfort, comfort charts; Solar Heat Gain, ventilation and infiltration. Sensible heat factors.

### UNIT-5

#### Air Conditioning System

Air conditioning Systems: Types and selection, Air Systems, Water Systems, Room Air Conditioners – Window Type, Package Type, Split Type, Central Units. Air Supply Systems: Fans and Blowers, performance characteristics, heating and cooling coils, By-pass factors, Flow through Ducts, Losses, Duct Design Methods. Air Distribution and control Devices.

**Note :** Refrigerant tables, Refrigeration and Air-conditioning Data Book and certified data tables are allowed in the examination hall.

### BOOKS RECOMMENDED:

- [1] Stoeker and Jones, *Refrigeration and Air-conditioning*, McGraw-Hill Co, 2008
- [2] Arora C.P., *Refrigeration and Air-conditioning*, TataMcGraw Hill, 2008.
- [3] Prasad M, *Refrigeration and Air-conditioning*. New Age Publishers, 9e, 2008
- [4] Ballaney P.L, *Refrigeration and Air-conditioning*, Khanna Publishers, 2008.
- [5] Ameen Ahmadul, *Refrigeration and AirConditioning*, Prentice-Hall of India, 2006

**LABORATORY EXPERIMENTS:**

1. To find the coefficient of performance of Vapour compression Refrigeration (VCR) system
2. To find the Refrigeration effect of Vapour compression Refrigeration (VCR) system
3. To find coefficient of performance of Air-conditioner Trainer system
4. To find Refrigeration effect of Air-conditioner Trainer system
5. To find various psychrometric properties of Air
6. Evaluate the various performance parameters of A Cooling Tower
7. Evaluate the various performance parameters of Evaporative cooler
8. To prove the relation between the coefficient of performance of a Heat Pump and a Refrigerator.