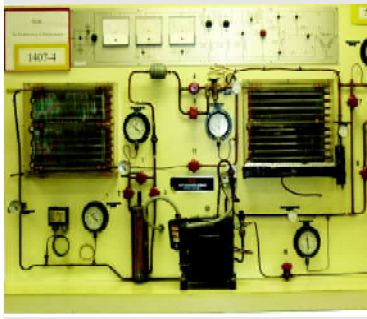
16ME404 REFRIGERATION AND AIR CONDITIONING



Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	6	-

Course Description and Objectives:

This course deals with the fundamentals of refrigeration and air conditioning. It also covers the various components and working of refrigeration and air conditioning units. The objective of this course is to enable the students to use different refrigeration systems to increase the shelf life of products and estimation of different loads after harvesting of crops and use of air-conditioning system to minimize it.

Course Outcomes:

The student will be able to:

- understand the difference between refrigeration and air conditioning.
- describe the methods of lowering the temperature of material.
- identify and describe the methods of heat transfer.
- understand the types of refrigeration systems available.
- understand the reasons of phase change of matter.

SKILLS:

- ✓ *Assess the industrial air conditioning and requirements.*
- ✓ *Examine the effect of sub cooling and super heating - cycle analysis.*
- ✓ *Calculate COP for various air conditioning systems.*

ACTIVITIES:

- *Design of cold storage for given capacity.*
- *Assessment of cooling load for small scale dairy plant.*

UNIT - 1 **L-09**

INTRODUCTION TO AIR REFRIGERATION AND REFRIGERANTS: Refrigeration - Unit of refrigeration, Reversed carnot cycle, Bell-coleman refrigeration system, Actual air refrigeration system - Refrigeration needs of Aircrafts, Adoption of Air refrigeration, Justification, Types of air refrigeration systems, Problems. Desirable and undesirable properties, Common refrigerants used and their nomenclature, Environmental effects of refrigerants.

UNIT - 2 **L-09**

VAPOUR COMPRESSION REFRIGERATION SYSTEM: Compression System, Wet Compression, Dry Compression, Superheated Compression Representation of cycle on T-S, P-H and H-S charts – effect of sub cooling and super heating, cycle analysis, Actual Cycle, Influence of various parameters on system performance, Use of P-H charts, Problems. Compressors, General classification, comparison, Condensers- Classification, Working. Evaporators - Classification, Working, Expansion Devices - Types, Working.

UNIT - 3 **L-09**

VAPOUR ABSORPTION REFRIGERATION SYSTEM: Basic vapour absorption system, Ammonia absorption system, Li - Br system, Electrolux refrigeration system, Calculation of COP, Miscellaneous refrigeration systems- Steam Jet Refrigeration System, Thermoelectric generator and Vortex tube or Hilsch tube – working principles.

UNIT - 4 **L-09**

PSYCHROMETRY: Psychrometric properties and processes, Need for Ventilation, Infiltration, Concepts of RSHF, GSHF, ESHF and ADP, Concept of human comfort and effective temperature, Comfort air-conditioning – Applications, Summer, winter and year round air conditioning systems and load calculations, Industrial air conditioning and requirements.

UNIT - 5 **L-09**

EQUIPMENT OF AIR-CONDITIONING SYSTEMS: Air cleaning and filters, Humidifiers and dehumidifiers, Fans and blowers, Grills and registers. Heat pumps, Different circuits.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **Total hours: 30**

1. Study of vapour compression and vapour absorption systems.
2. Solving problems on refrigeration on vapour absorption system.
3. Experiments with the refrigeration tutor to study various components of refrigeration.
4. Determination of the coefficient of performance of the refrigeration tutor.
5. Experiment on humidifier for the determination of humidifying efficiency.
6. Experiment on dehumidifier for the determination of dehumidifying efficiency.
7. Experiment on the cooling efficiency of a domestic refrigerator.
8. Experiments on working details of a cold storage plant and air conditioning unit.
9. Experiments with air conditioning tutor to study various components.
10. Determination of the coefficient of performance of air conditioning tutor.
11. Estimation of refrigeration load; Estimation of cooling load for air conditioner.
12. Design of complete cold storage system.

TEXT BOOKS:

1. S.C. Arora and Domkundwar, “A Course in Refrigeration and Air Conditioning”, 2nd edition, Dhanpatrai and Sons, 2009.
2. J. D. Roy, “Principles of Refrigeration”, 2nd edition, Wiley Eastern, 2006.

REFERENCE BOOKS:

1. Manohar Prasad, “Refrigeration and Air Conditioning”, 2nd edition, New Age International, 2002.
2. C.P. Arora, “Refrigeration and Air Conditioning”, 3rd edition, Tata McGraw-Hill, 2009.

WEB LINKS:

1. http://nptel.ac.in/courses/112105129/
2. http://nptel.ac.in/courses/112105128/