

22BEAS208 THERMODYNAMICS, REFRIGERATION AND AIR CONDITIONING

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basics of heat transfer, gas laws and thermodynamic laws.

COURSE DESCRIPTION AND OBJECTIVES:

The goal of this course is to evaluate thermal efficiency of different heat engine used in engineering field by help of Carnot cycle, Otto cycle, Diesel and Dual cycle. It also helps to investigate the efficiency of refrigeration system by knowledge of T vs. S diagram or Mollier chart. It also acknowledges us to evaluate performance of air conditioning system by help of psychrometric chart.

MODULE-1

UNIT-1

8L+0T+8P=16 Hours

BASICS OF THERMODYNAMICS:

Thermodynamics properties, closed and open system, flow and non-flow processes, gas laws, laws of thermodynamics, internal energy. Carnot cycle, Carnot theorem. Entropy, physical concept of entropy. Principles of refrigeration, - units, terminology. Air refrigeration system. Vapour refrigeration-mechanism. Common refrigerants and their properties.

UNIT-2

8L+0T+P=16 Hours

APPLICATION OF THERMODYNAMICS AND REFRIGERATION:

Application of first law in heating and expansion of gases in non-flow processes. First law applied to steady flow processes. Carnot cycle, Carnot theorem. Change of entropy of gases in thermodynamics process. Otto, diesel and dual cycles. Production of low temperatures, air refrigerators working on reverse Carnot cycle and Bell Coleman cycle. P-V, P-S, P-H diagrams of vapor compression cycles, dry and wet compression, super cooling and sub cooling. Vapour absorption refrigeration system.

PRACTICES:

- Tutorials on thermodynamic air cycles.
- Study and application of P V and T S chart in refrigeration.
- P H chart (or) Mollier diagram in refrigeration.
- Numerical on air refrigeration cycle systems.
- Numerical on vapour compression cycle refrigeration system.
- Study of domestic water cooler.
- Study of domestic household refrigerator.
- Study of absorption type solar refrigeration system.

MODULE-2

UNIT-1

8L+0T+8P=16 Hours

PSYCHROMETRIC CHART:

Cold storage plants. Thermodynamic properties of moist air. Perfect gas relationship for approximate calculation, adiabatic saturation process, wet bulb temperature and its measurement. Air conditioning – principles – Type and functions of air conditioning.



Source: Image source:
http://4.bp.blogspot.com/-z5Gytxyj7oY/VGnj1J-7e_I/AAAAAAAAAw/xCFmS0-kUAw/s1600/heritage_refrigerati_on_0026_air_conditioning_fa37e896_f85a_5d54_5e5b_7d2858cf0004.jpg

SKILLS:

- ✓ Compute and predict thermodynamic state in different system after application of thermodynamic process.
- ✓ Evaluate thermal efficiency of heat engine and heat pump in different thermodynamic gas cycle or vapor cycle.
- ✓ Examine Psychrometric chart thoroughly and predict the condition of air present.
- ✓ Plan and design different air conditioning system required in different climate or season.

UNIT-2**8L+0T+8P=16 Hours****APPLICATION OF AIR CONDITIONING:**

Design calculations for refrigeration system. Psychometric chart and its use, elementary psychometric process. Physiological principles in air conditioning, air distribution and duct design methods, fundamentals of design of complete air conditioning systems – humidifiers and dehumidifiers – cooling load calculations, types of air conditioners – applications.

PRACTICES:

- Study cold storage for fruit and vegetables.
- Freezing load and time calculations for food materials.
- Determination of refrigeration parameters using refrigeration tutor – II.
- Numerical on design of air conditioning systems.
- Study of window air conditioner.
- Study on repair and maintenance of refrigeration and air-conditioning systems.
- Visit to chilling or ice making and cold storage plants.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Illustrate knowledge of basic gas laws and thermodynamic laws in home or in industry.	Apply	1	1, 2, 3, 4
2	Apply the knowledge of psychrometric process to design humidifiers or dehumidifiers.	Apply	2	1, 2, 3, 4, 5, 7, 11
3	Analyze knowledge of Bell Coleman Cycle or Reversed Carnot Cycle to evaluate COP of VCRS and VARS system.	Analyze	1	1, 2, 3, 4, 5
4	Examine different thermal applications in food processing operations by the help of psychrometric chart.	Evaluate	2	1, 2, 3, 4, 6, 7
5	Evaluate cooling load required in cold storage plant or in any industries.	Evaluate	2	1, 2, 3, 4

TEXT BOOKS:

1. R. K. Rajput, "Heat and Mass Transfer", S. Chand and Company Pvt. Ltd., 2015.
2. R. C. Sachdeva, "Fundamentals of Engineering Heat and Mass Transfer", 7th edition, New Age International, 2013.

REFERENCE BOOKS:

1. S. C. Arora and S. Domkundwar, "A Course in Heat & Mass Transfer", 8th edition, Dhanpat Rai and Sons, Delhi, 2010.
2. C.J. Geankoplis "Transport Processes and UNIT Operations", 4th edition, Prentice Hall of India, New Delhi, 2013.
3. P. K. Nag, "Heat and Mass Transfer", 3rd edition, Tata McGraw Hill, 2017.