

ME702PC: REFRIGERATION & AIR CONDITIONING**B.Tech. IV Year, I Sem.**

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Prerequisites: Thermodynamics**Course Objectives:**

- Apply the principles of thermodynamics to analyze different types of refrigeration and HAV
- To understand the functionality of the major components of the refrigeration and HAV
- To apply the knowledge in effective refrigeration and HAV systems for better performances in real context
- Discuss the heating procedure by Air conditioning process
- Explain the requirement of ventilation devices/processes

Course Outcomes:

- Differentiate between different types of refrigeration systems with respect to application as well as conventional & unconventional refrigeration systems.
- Analyse thermodynamically low temperature refrigeration and Vapour absorption refrigeration for evaluation of performance parameters.
- Apply the air refrigeration principles for different types of Air craft refrigeration systems
- Elaborate the principles of psychometrics to design the air conditioning heating /cooling loads for industrial applications.
- explain the requirement of ventilation air, various sources of infiltration air, ventilation and infiltration as a part of cooling load

UNIT– I:

Vapour Compression Refrigeration: Performance of Complete vapor compression system. Actual Vs Ideal cycle - Effect of operating parameters on COP, **Components of Vapor Compression System:** The condensing unit – Evaporators – Expansion valve – Refrigerants – Properties – ODP & GWP - Load balancing of vapor compression Unit.

Compound Compression: Flash inter-cooling – flash chamber – Multi-evaporator & Multistage systems.

UNIT– II:

Production of Low Temperature: Liquefaction system, Liquefaction of gases, Hydrogen and Helium, Cascade System – Applications– Dry ice system.

Vapor absorption system – Simple and modified aqua – ammonia system – Representation on Enthalpy –Concentration diagram.

Lithium – Bromide system Three fluid system – HCOP.

UNIT– III:

Air Refrigeration: Applications – Air Craft Refrigeration -Simple, Bootstrap, Regenerative and Reduced ambient systems – Problems based on different systems.

Steam Jet refrigeration system: Representation on T-s and h-s diagrams – limitations and applications.

Unconventional Refrigeration system – Thermo-electric – Vortex tube & Pulse tube – working principles.

UNIT– IV:

Air Conditioning: Psychometric properties and processes – Construction of Psychometric chart. Requirements of Comfort Air –conditioning – Thermodynamics of human body – Effective temperature and Comfort chart – Parameters influencing the Effective Temperature.

Heating Load Calculations: Summer/ Winter heating load calculation-heat losses through structure-heat losses due to infiltration. Effects of solar radiation and internal heat sources on heating loads. Air Heating System: Classification - gravity warm heating system, forced warm air heating system balancing a warm air heating system, warm air furnaces, air cleaners, humidifiers & De-humidifiers

UNIT– V:

Air Conditioning Systems: All Fresh air, Re-circulated air with and without bypass, with reheat systems – Calculation of Bypass Factor, ADP, RSHF, ESHF and GSHF for different systems.

Ventilation: Ventilation and Infiltration: Requirement of ventilation air, various sources of infiltration air, ventilation and infiltration as a part of cooling load. Fans and Blowers: Types, performance characteristics, series and parallel arrangement, selection procedure. Equipments and Controls: Chillers, Condensing units, Cooling coils, bypass factors, humidifiers, dehumidifiers

TEXT BOOKS:

1. Refrigeration & Air Conditioning by C.P. Arora, TMH.
2. Refrigeration & Air Conditioning by Arora & Domkundwar, Dhanpat Rai.
3. Refrigeration and Air Conditioning by Manohar Prasad

REFERENCE BOOKS:

1. Basic Refrigeration & Air Conditioning by P.N. Ananthanarayanan, McGraw Hill.
2. Refrigeration and Air Conditioning by Stoecker, Mc Graw Hill.
3. Refrigeration and Air Conditioning by Dr. S.S. Thipse, Jaico.
4. Refrigeration and Air Conditioning by Jordan& Preister, Prentice Hall.
5. Refrigeration and Air Conditioning by Dossat, Mc Graw Hill.