

1152AU121

AUTOMOTIVE HVAC

L T P C

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**1. Preamble**

Students undergoing this course are expected to understand the air-conditioning systems used in automotive applications.

**2. Pre-requisite**

1151AU102 Basic Engineering Thermodynamics

**3. Links to Other Courses**

NIL

**4. Course Educational Objectives**

Students undergoing this course are expect to

- To provide introduction to students the fundamentals of refrigerant, refrigeration systems and air conditioning controls to automobile applications.
- To teach students the principle of psychometry.
- To enable the students to understand heating and cooling load calculations.
- To develop the knowledge about air distribution systems.
- To introduces the general servicing of automotive air conditioning systems.

**5. Course Outcomes**

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
C01	Generalize types of refrigeration systems and its applications	K2
C02	Apply the concept of psychometry to estimating the heating and cooling load for automobiles	K3
C03	Design and implement refrigeration and air conditioning systems using standards	K3
C04	Explain the air distribution system and its control	K2
C05	Diagnose and correct air-conditioning system	K3

**6. Correlation of COs with Programme Outcomes**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H	H	H	M	L		L	L		M	L	L	L
CO2	H	H	H	H	M	L		L	L		M	L	L	M
CO3	H	H	H	H	M	L		L	L		M	L	L	M
CO4	H	H	H	H	M	L		L	L		M	L	L	L
CO5	H	H	H	H	M	L		L	L		M	L	M	L

H- Strong; M-Medium; L-Low

## **7. Course content**

### **UNIT I REFRIGERATION**

**L-9**

Introduction - Methods of Refrigeration - Air Refrigeration System and its Applications - Vapour Compression Refrigeration System - Vapor Absorption Refrigeration System - Applications of Refrigeration & Air Conditioning - Automobile Air Conditioning - Air Conditioning for Passengers, Isolated Vehicles and Transport Vehicles - Applications Related with Very Low Temperatures. Classification, Properties and Selection Criteria - Commonly Used Refrigerants - Alternative Refrigerants - Eco-Friendly Refrigerants - Applications of Refrigerants - Refrigerants Used in Automobile Air Conditioning

### **UNIT II PSYCHOMETRY**

**L-9**

Psychometric Properties, Tables, Charts - Psychometric Processes - Comfort Charts - Factor Affecting Comfort - Effective Temperature - Ventilation Requirements

### **UNIT III AIR CONDITIONING SYSTEMS AND LOAD ANALYSIS**

**L-9**

Classification and Layouts - Central / Unitary Air Conditioning Systems - Components Like Compressors, Evaporators, Condensers, Expansion Devices, Fan Blowers, Heating Systems Etc. Load Analysis - Outside & Inside Design Consideration - Factors Forming the Load on Refrigeration & Air Conditioning Systems - Cooling & Heating Load Calculations - Load Calculations for Automobiles - Effect of Air Conditioning Load on Engine Performance

### **UNIT IV AIR DISTRIBUTION SYSTEMS**

**L-9**

Distribution Duct System, Sizing, Supply / Return Ducts - Types of Grills, Diffusers, Ventilation, Air Noise Level - Layout of Duct Systems for Automobiles and their Impact on Load Calculations. Air Routine & Temperature Control - Objectives - Evaporator Care Air Flow - Through the Dash Recirculating Unit - Automatic Temperature Control - Controlling Flow - Control of Air Handling Systems

### **UNIT V AIR CONDITIONING SERVICE AND CONTROL**

**L-9**

Air Conditioner Maintenance & Service - Servicing Heater System - Removing & Replacing Components - Trouble Shooting of Air Conditioning System - Compressor Service, Methods of Dehydration, Charging & Testing. Air Conditioning Control - Common Control Such as Thermostats- Humidistat Us - Control Dampers - Pressure Cutouts and Relays

## **8. Text Books**

1. Refrigeration and Air-Conditioning - W.F. Stoecker and J.W. Jones, Tata McGraw Hill Pub.
2. Paul Lung, "Automotive Air Conditioning", C.B.S. Publisher & Distributor, Delhi

## **9. References**

1. Modern Air-Conditioning Practice - Norman C. Harris, Principles of Refrigeration - R.J. Dessat, Wiley Eastern Pub.
2. Refrigeration and Air-Conditioning - C.P. Arora, Tata McGraw Hill Pub
3. Refrigeration and Air-Conditioning – S.S.Thipse, Jaico
4. Automotive air conditioning by Crouse
5. Harris, "Modern Air Conditioning"