

## **ATC 126 - Automobile Air Conditioning**

**(02 credits – 50 marks)**

### **Learning Objectives:**

The course should enable students:

1. Identify various HVAC systems and sub systems.
2. Explain working & construction of HVAC Systems and sub systems.

### **Learning Outcomes:**

After completion of the course, students are expected to be able to:

1. Carry out repair and maintenance of HVAC Systems and sub systems.
2. Carry out retrofitting and alteration of HVAC Systems.
3. Know environmental aspects related to HVAC Systems.

### **Course Content:**

#### **Module –I: Introduction to Automobile Air Conditioning**

**05 hrs**

Environmental and safety aspects in Heating, Ventilation and Air Conditioning (HVAC) systems, Human comfort control, Heat transfer fundamentals, Requirements of HVAC system for light motor vehicle, Heavy goods vehicle, Heavy passenger vehicle, Controlled and uncontrolled ventilation, Case and Duct System, Downstream, upstream, split and hybrid, Rear heating and cooling system

#### **Module –II: Air Conditioning System**

**07 hrs**

General layout of Automotive Air conditioning system, vapour compression cycle, Construction and working of refrigeration sub systems, evaporator, condenser, accumulator, Receiver, driers and accumulator. Reciprocating, scroll and rotary vane compressors, Refrigerant- Properties, types, Packaging and storage, color code and purity test, Metering devices, Thermostatic Expansion valve and fixed orifice tube, Functions of thermostatic expansion valve.

#### **Module –III: System Control Devices**

**06 hrs**

System controls - typical vacuum system and electronic temperature control system, vacuum operated devices i.e. vacuum reserve tank, vacuum restrictor, vacuum motor, check valve and check relays.

Switches - high- Side temperature switch, low-side temperature switch, high pressure switch, low- pressure switch, pressure regulator, ambient switch and superheat switch.

Sensors- sun load sensor, outside temperature sensor and in car temperature sensors.

Controls- Concept of Aspirator, blower clutch control, heater control, and time delay relay for heater control. Block diagram of climate control system and Electronic climate control system.

**Module –IV: Repairs and Maintenance of Air Conditioning System**

**06 hrs**

Maintenance Of A.C. Systems - Visual and acoustic check, side glass, leak test, Temperature test, procedure of charging and discharging. Moisture removal procedure, Service equipments and tools- Vacuum pump, Manifold and gauge i.e. Low side and high side, gauge calibration recovery unit and recycling unit, Halide (Freon) and Fluorescent leak detector, nitrogen leak tester. Symptoms, Faults, causes and remedies, Hoses and connectors - construction of system hoses, charging hose with shut off valve and connectors, Comfort heating system - Function, Construction and working, Maintenance general faults and their remedies

**Module –V: Assignments / seminars / case studies on Module -I to Module - IV**

**06 hrs**

**References:**

1. Automobile Air Conditioning, Boyce H. Dwiggin, Thomson Learning, 8<sup>th</sup> Edition, (2001) ISBN-13: 978-0-7668-0788-4, ISBN: 0-7668-0788-6
2. Automotive Heating and Air Conditioning, John H Haynes and Mike Stubblefield, Haynes Publishing Group, 2nd edition (January 1994), ISBN-10: 1563920719, ISBN-13: 978-1563920714
3. Automotive Mechanics, Crouse, Anglin, Tata McGraw - Hill Career Education ISBN 10: [0028009436](#) ISBN 13: [9780028009438](#)
4. A text book of Refrigeration and Air Conditioning, R. S. Khurmi and J. K. Gupta, S. Chand, (2006), ISBN 10: 8121927811 - ISBN 13: 9788121927819
5. Refrigeration and Air Conditioning, P. N. Ananthanarayanan, Tata McGraw Hill, (2015), ISBN 10: [1259062708](#) / ISBN 13: [9781259062704](#)
6. Principles of Refrigeration, Roy Dossat, Pearson Education, 4<sup>th</sup> Edition, ISBN 10: 8177588818 / ISBN 13: 9788177588811
7. Refrigeration and Air Conditioning, Domkunwar and Arora, Dhanpat Rai & Co.(p) Ltd-Delhi, 6<sup>th</sup> Edition, ISBN-10: 0000229660, ISBN-13: 9780000229663