

Branch Name:	Automobile Engineering
Program Code:	ET408
Course Title:	Automotive Heating & Air Conditioning
Course Code:	2ET4080402
Pre-requisite Course:	-----

Course Objectives:

1. To identify different refrigerants, characteristics and properties.
2. To understand components of automotive air conditioning system.
3. To understand components of Automotive Heating System.
4. To understand Leak Detection Test of A.C System
5. To Perform Servicing of Air Conditioning System with safety.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	60	40	20	30	150

Course Contents:

Unit No	Topic	Total Hours	Weightage (%)
1	Fundamental of Air conditioning System. • Requirement of Air conditioning system. • Air conditioning system basic terminology: I. Refrigeration cooling load, Cooling capacity and 1 ton of refrigerant. II. Air Conditioning III. Dry bulb Temperature, Wet Bulb Temperature and Dew point temperature. IV. Humidity and Relative Humidity. V. Latent Heat of Condensation & Latent Heat of Evaporation. VI. Modes of heat transfer. VII. Moist air, saturated air and unsaturated air. • Types and properties of air conditioning refrigerant and Refrigerant Oil. • Effect of air conditioning refrigerants on the environment. • Concept of eco-friendly refrigerants.	06	20
2	Automotive Cooling System. • Basic working cycle of Automotive cooling system • Major components automotive cooling system: Magnetic clutch. Types of compressors. Condensers. Receiver Drier and Filter. Accumulator. Expansion valves and heat sensing tube. Orifice tube. Evaporator. • Trouble shooting of automotive cooling system.	05	20
3	Automotive Heating & HVAC Ventilation System. • Explain working cycle of automotive heating system. • Describe Constructional and functional details of Automotive heating system Components. • Explain working of electric heating system.. • Describe functions of various components of ventilation system of automotive A/C.	06	30

	- Describe various types of automotive A/C unit. - Identify cause and suggest remedial measures for various troubles in automotive heating system.		
4	Various controls and Automatic climate control. - Describe Different controls used in automotive A/C system. - Explain working of semi-Automatic temperature Control System & its input sensors. - Explain working of Automatic temperature Control System & its input sensors. - Explain working of automatic climate Control System. - Demonstrate Safe operation while working with Automotive A/C system.	06	15
5	HVAC Maintenance, Servicing and Repairing. - Carry out inspection of automotive A/C system by various methods. - Carry out refrigerant leak test with the help of various technics. - Carry out routine service of automotive A/C system. - Carry out discharging, and charging of automotive A/C system. - Carry out servicing of A/C compressor, evaporator, condenser, heater core and hoses of automotive A/C system.	05	15

List of Practical:

1. Prepare list of different refrigerants, discuss major characteristics and property.
2. Identify components of automotive air conditioning system and Explain Function of each Component.
3. Identify and Explain components of Automotive Heating System.
4. Locate and Explain parts of ventilation system of Automotive Air Conditioning.
5. Interpret working of Automatic Climate Control system of the given vehicle.
6. Perform Lubrication & Recharging of refrigerant in A.C System with safety.
7. Perform Servicing of Air Conditioning System with safety.

Reference Books:

1. Automotive Air Conditioning and Climate control Systems. Steven Daly Butterworth-Heinemann publications.
2. Automobile Engineering (Volume – VI) Anil Chhikara Satya Prakashan.
3. Automotive Airconditioning William H. Carouse & Donald L. Anglin Tata McGraw-Hill Co., Ltd., New Delhi.
4. Automotive heating and air conditioning Mark Schnubel Cengage Publication.

List of Open-Source Software/learning website:

1. <https://www.howacarworks.com>
2. <https://swayam.gov.in>
3. <http://nptel.ac.in/courses/112105129/pdf/R&AC>
4. <https://tinyurl.com/57mv2hct> for video link
5. <https://tinyurl.com/yysu44b6> for web link

Course Learning Outcomes (CLO):

1. Explain Fundamental of Air conditioning System.
2. Demonstrate trouble shooting of Automotive cooling system with safety.
3. Demonstrate trouble shooting of Automotive heating system with safety.
4. Explain various HVAC controls and automatic climate control system.
5. Perform Automotive HVAC system maintenance, servicing and repair work with safety.

Mapping of CLO with PO and PSO

Course	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	M	L		L	L				L			L	L		M	
CLO2	L	L	L	M	L								L	M	L	
CLO3	L	L		M	L				L				M		L	
CLO4	L		M	M	M		M							L	M	
CLO5			M	M	M				L				M	L	M	

H: High, M: Medium, L: Low