

M.E Semester: 2 M.E Mechanical (Automobile Engineering)
Subject Name: Automotive air conditioning MEA201

A. Course Objective

- To present a problem oriented in depth knowledge of Automotive air conditioning.
- To address the underlying concepts and methods behind Automotive air conditioning.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
MEA201	Automotive air conditioning	4	0	2	6	5	3	70	30	20	30	150

C. Detailed Syllabus

1. Introduction to Air conditioning & Refrigeration:

Methods of refrigeration. Vapour compression refrigeration system, vapour absorption refrigeration system, applications of refrigeration & air conditioning, Automobile air conditioning, air conditioning for passengers, isolated vehicles, Refrigerated transport vehicles, applications related with very low temperatures.

2. Refrigerants:

Classification, properties, selection criteria, commonly used refrigerants, alternative refrigerants, eco-friendly refrigerants, applications of refrigerants, refrigerants used in automobile air conditioning.

3. Psychrometry:

Psychrometric properties, psychrometric tables/charts, psychrometric processes, comfort charts, factors affecting comfort, effective temperature, ventilation requirements.

4. Air Conditioning Systems:

Classification, layouts, central / unitary air conditioning systems. System components like compressor, evaporator, condenser, expansion devices, Receiver dryer, fan blowers, heating system etc. Switch and electrical wiring circuit.

5. Load Calculations & Analysis:

Design considerations for achieving desired inside/room conditions with respect to prevailing outside/environment conditions. Factors affecting/contributing towards the load on refrigeration & air conditioning systems. Cooling & heating load calculations. Load

calculations for automobiles. Effect of air conditioning load on engine performance in terms of loss of available Peak Torque/Power and Fuel consumption.

6. Air Distribution Systems:

Distribution ducting, sizing, supply / return ducts, type of grills, diffusers, ventilation, air noise level, layout of duct systems for automobiles and their impact on load calculations.

7. Air Routing & Temperature Control:

Objectives of the dashboard re-circulating unit, automatic temperature control, controlling flow, control of air handling systems & air flow through – evaporator care

8. Air Conditioning Service:

Air conditioner maintenance & service - removing & replacing Components. Compressor service. Testing, Diagnosis & trouble shooting of air conditioning system. Refrigerant gas charging procedure &. Servicing of heater system.

9. Air Conditioning Control:

Common controls such as thermostats, humidistat, control dampers, pressure cutouts, relays.

10. Heating Systems:

Automotive heaters, manually controlled and automatically controlled air conditioner and heater system, automatic temperature control

D. Lesson Planning

<u>SR.NO</u>	<u>DATE/WEEK</u>	<u>UNIT NO</u>	<u>%WEITAGE</u>	<u>TOPIC NO</u>
1	1 ST , 2 ND , 3 RD	1	20	1,2
2	4 TH ,5 TH , 6 TH	2	20	3,4
3	7 TH ,8 TH , 9 TH	3	20	5,6
4	10 TH ,11 TH , 12 TH	4	20	7,8
5	13 TH ,14 TH , 15 TH	5	20	9,10

E. Instructional Method & Pedagogy

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.

- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

List of Experiments:

1. Experiment based on air conditioning test rig and plot various processes.
2. Experiment based on air conditioning for automobile.
3. Performance and analysis of air conditioning system.
4. Experiment based on refrigerants used in automobile air conditioning.
5. Experiment based on air distribution system for automobile.
6. Design of air conditioning system and load calculation for automobile.
7. Experiment based on air conditioning system components.
8. Experiments based on air conditioning services for automobile.
9. Experiment based on air conditioning controls.
10. Experiments based on air routing and temperature control.
11. Tutorials.

F. Students Learning Outcomes

- The student can identify different areas of Automobile air conditioning
- Can find the applications of all the areas in day to day life.

G. Recommended Study Materials

• **Text & Reference Books:**

1. "Automotive Air-Conditioning", by Crouse & Anglin – Mc Graw Hill Pub.
2. "Automotive Air-Conditioning", by Paul Weiser – Reston Publishing Co.
3. "Automatic Heating & Air Conditioning Systems" – Mitchell Information Services.
4. "Air Conditioning", by Paul Lang, C.B.S. Publisher & Distributor, Delhi.
5. Principles of Refrigeration by Roy J. Dossat – Pearson Publication.
6. "Modern Air Conditioning", by Harris.
7. "Automobile Engg", by Anil Chhikara - Satya Prakashan.
8. "American Society of Heating, Refrigeration & Air Conditioning – Fundamentals", ASHRAE Handbook – 1985.