

B.E Semester: 6 Automobile Engineering
Subject Name: Automotive Air Conditioning (AE605-N-E)
[Dept. Elect.-2]

A. Course Objective:

<p>The course should enable the student to:</p> <ul style="list-style-type: none"> • Understand the fundamental knowledge of types of refrigeration and refrigeration cycles. • Know about the different refrigerants and behavior under various conditions. • Know about the different air conditioning terms and load calculation. • Know about the components of air distribution system.
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B. Teaching / Examination Scheme:

Teaching Scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
3	0	2	6	4	3	70	30	20	30	150

C. Detailed Syllabus:

Unit No.	Details
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, Common controls such as thermostats, humidistat, control dampers, pressure cutouts, relays, Automotive heaters, manually controlled and automatically controlled air conditioner and heater system, automatic temperature control
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.

Total hours (Theory):48
Total hours (Practical):32
Total hours:80

D. Lesson Planning:

Sr. No.	Date/Week	Unit	Weight age	Topic No
1	1 st ,2 nd ,3 rd	Unit 1	20%	1,2,
2	4 th .5 th ,6 th	Unit 2	20%	3,4
3	7 th , 8 th ,9 th	Unit 3	20%	5,6
4	10 th .11 th . 12 th	Unit 4	20%	7
5	13 th , 14 th ,15 th ,16 th	Unit 5	20%	8

E. Instructional Method & Pedagogy

1	At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
2	Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal Weight age should be given to all topics while teaching and conduction of all examinations.
3	Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
4	One/Two internal exams may be conducted and total/average/best of the same may be converted toequivalent of 30 marks as a part of internal theory evaluation.
5	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.
6	Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overallinternal evaluation.
7	The course includes a laboratory, where students have an opportunity to build an appreciation for theconcept being taught in lectures. Suggested list of experiment is given below

F. List of Practical:

1	To find COP of Refrigeration test rig
2	To find COP of air conditioning test rig.
3	To study various refrigerants used currently in R&AC systems.
4	To calculate COP of domestic Electrolux refrigerator.
5	To study various components of refrigeration and air conditioning system.
6	To study various power saving technologies in recent air conditioning systems.

G. Students Learning Outcomes:

1	The student can identify different areas of Refrigeration and Air Conditioning.
2	Can find the applications of all the areas in day to day life.

H. Text Books & Reference Books:

1	Roy.JDossat, "Principles of Refrigeration", Pearson Education 2009
2	Arora. C.P., Refrigeration and Air Conditioning, McGraw-Hill New Delhi, 1988
3	Manohar Prasad, "Refrigeration and Air Conditioning", Wiley Eastern Ltd., 1983
4	W.F.Stocker and J.W.Jones, "Refrigeration and Air Conditioning", McGraw-Hill, 2009.
5	S.S Thispee Refrigeration and air-conditioning , Jaico Publications, 2009
6	ASHRAE Handbook (Fundamental), 2013