

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

A. Course Objective:

The course should enable the student to:

- 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.

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 | 5 | 4 | 3 | 70 | 30 | 20 | 30 | 150 |

C. Detailed Syllabus:

| Unit No. | Details |
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| 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. |

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| 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. |

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| 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

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| 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:

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| 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:

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| 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:

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| 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 |