

B.E Semester: VIII
Automobile Engineering

Subject Name: Elective-II: Automobile aerodynamics (AE805A)

Course Objective

- To understand the fundamentals of aerodynamics, vehicle body optimization, measuring aerodynamics forces etc
- To understand the design concept of automobile bodies and to determine their drag coefficients and optimize their shapes.

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	
AE805A	Elective-II: Automobile aerodynamics	4	0	0	4	4	3	70	30	20	-	120

Detailed Syllabus:

Topic no	Details
1	Introduction Scope – historical development trends – Fundamentals of fluid mechanics – Flow phenomenon related to vehicles –External & Internal flow problems – Resistance to vehicle motion – Performance – Fuel consumption and performance – Potential of vehicle aerodynamics
2	Aerodynamic Drag of Cabs Car as a bluff body – Flow field around car – Drag force – Types of drag force – analysis of aerodynamic drag –Drag coefficient of cars – Strategies for aerodynamic development – Low drag profiles.
3	Shape Optimization of Cabs Front and modification – front and rear wind shield angle – Boat tailing – Hatch back, fast back and square back –Dust flow patterns at the rear – Effect of gap configuration – Effect of fasteners.
4	Vehicle Handling The origin of force and moments on a vehicle – Side wind problems – Methods to calculate forces and moments –Vehicle dynamics Under side winds – Effects of forces and moments – Characteristics of forces and moments – Dirt accumulation on the vehicle – wind noise – drag reduction in commercial vehicles.
5	Wind Tunnels for Automotive Aerodynamics Introduction – Principles of wind tunnel technology – Limitation of simulation – Stress with scale models – Full scale wind tunnels – Measurement techniques – Equipment and transducers – Road testing methods – Numerical methods.

Lesson planning

SR. NO	DATE/WEEK	UNIT NO	%WEIGHTAGE	TOPIC NO
1	1 st , 2 nd , 3 rd	Unit 1	20%	1
2	4 th , 5 th , 6 th	Unit 2	20%	2
3	7 th , 8 th , 9 th	Unit 3	20%	3
4	10 th , 11 th , 12 th	Unit 4	20%	4
5	13 th , 14 th , 15 th	Unit 5	20%	5

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.

Students Learning Outcomes

- The student can identify different areas of automobile aerodynamics.
- Can find the applications of all the areas in day to day life.

Recommended Demonstrate Materials

- Hucho, W.H., "Aerodynamics of Road vehicles", Butterworths Co. Ltd., 1987.
- Pope, A., "Wind Tunnel Testing", John Wiley & Sons, 2nd Edt, New York, 1974.
- Automotive Aerodynamics: Update SP-706, SAE, 1987.
- Vehicle Aerodynamics, SP-1445, SAE, 1996