GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering (Electric Vehicle Technology)

Subject Code : 3726405

Subject Name : Automotive Aerodynamics

WEF Academic Year:	2023-24
Semester:	2
Category of the Course:	Program Elective III

Prerequisite : NA

Rationale :

At the end of the course, the students will be able to apply basic principles of aerodynamics to determine drag force and optimize the shape of various vehicle body

Course Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
				Theory		Practical		
L	T	PR	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	Introduction: Flow phenomena related to vehicles, resistance to vehicle motion, vehicle aerodynamic performance, characteristics of aerodynamic forces and moments, SAE aerodynamic axis system	6	15
2	Aerodynamic drag and lift: General concept of drag and lift, sources of drag and lift in vehicles, drag and lift coefficient, drag coefficient of various types of vehicles, afterbody drag, aerodynamic drag and lift reduction in passenger vehicles	12	25
3	Commercial vehicle aerodynamics: Principles of commercial vehicle aerodynamics, effect of rounding sharp front cab body edges, effect of different cab to trailer body heights with both sharp and rounded upper windscreen leading edges, forebody pressure distribution, effect of a cab to trailer body roof height step, commercial vehicle drag-reduction devices, comparison of various devices for vehicle drag reduction, effect of trailer load position on a vehicle's drag resistance	10	25
4	Motorcycle aerodynamics: Airflow, drag and drag coefficient, lift, side wind stability, rider influences, aerodynamic design features of motorcycle	6	15
5	Measurement and testing techniques: Function and features of wind tunnel, classification of wind tunnels, tests with scale models, instrumentation and data acquisition, on-road testing and measurements	8	20
	Total	**42**	**100**

Reference Book:

1. Hucho, W.H., Aerodynamics of Road vehicles, Butterworths Co. Ltd., 1997.
2. Heinz Heisler, Advanced Vehicle Technology, Butterworth Heinemann Co. Ltd., 1989.
3. Pope, A., Wind Tunnel Testing, John Wiley & Sons, 2nd Edn., New York, 1994.
4. Automotive Aerodynamics: Update SP-706, SAE, 1987.
5. Vehicle Aerodynamics, SP-1145, SAE, 1996.
6. Thomas Christian Schuetz, Aerodynamics of Road Vehicles, SAE International, 2016.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level*
01	Gain comprehensive understanding of fundamental aerodynamic principles	UN
02	Analysis and quantify the aerodynamic performance of vehicle	AN
03	Develop skills in acquiring aerodynamic data using measurement tools	EL
04	Define aerodynamic design features of motorcycle	RM

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

1. Study terminologies related to vehicle aerodynamics and SAE vehicle aerodynamic axis.
2. Study effect of vehicle aerodynamic on fuel economy and power consumption.
3. Develop any vehicle scale model for wind tunnel testing using standard procedure.
4. Perform wind tunnel testing for pressure distribution and flow pattern around any small-scale vehicle (car/bus) model.
5. Study the effect of different aerodynamic aids for reduction of vehicle drag and control of lift.
6. Study the drag reduction aids for any commercial vehicle.
7. Study drag measurement using on road testing.

List of Laboratory/Learning Resources Required:

Equipment:

1. Small scale wind tunnel

Learning resources:

1. http://nptel.ac.in/

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