AE409: Computer Aided Vehicle Design and Safety										
L	**T**	**P**	Credit	Area		**CWS**	**PRS**	**MTE**	**ETE**	**PRE**
3	0/1	2/0	4	DEC		15/25	25/-	20/25	40/50	-

Objectives: To enable the students to understand the basics of Vehicle design process, design parameters and some relevant software. To understand the need for vehicle safety and the basic components of vehicle safety. To be familiarize with the existing and latest safety systems

AE409: Computer Aided Vehicle Design and Safety		Contact Hours
Unit-1	Introduction: Study and Selection of a Vehicle; Specifications – Choice of Cycle, Fuel, Speed, Cylinder Arrangement, Number of Cylinders, Method of Cooling, Material, Design Variables and Operating Variables Affecting Performance and Emission of a vehicle. Performance Curves: vehicle Residence, Power and Torque Curve, Driving Force Against Vehicle Speed-Acceleration and Gradability in Different Gears for A Typical Car Or Truck Plotted From Specifications	**8**
Unit-2	Vehicle Body Details: Types: Saloon, Convertibles, Limousine, Estate Car, Racing and Sports Car. Visibility: Regulations, Driver's Visibility, Test for Visibility, Methods of Improving Visibility and Space in Cars. Safety Design, Safety Equipments for Cars. Car Body Construction; Design Criteria, Prototype Making,	**6**
Unit-3	Vehicle Aerodynamics: Objectives. Vehicle Drag and Types: Various Types of Forces and Moments, Effects of Forces and Moments, Side Wind Effects on Forces and Moments, Various Body Optimization Techniques for Minimum Drag, Wind Tunnel Testing: Flow Visualization Techniques, Scale Model Testing, Component Balance to Measure Forces and Moments. Gear Ratios Determination of Gear Ratios, Acceleration and Gradability	**6**
Unit-4	Engine Design: Pressure Volume Diagram, Frictional Mean Effective Pressure, Engine Capacity, Calculation of Bore and Stroke Length, Velocity and Acceleration, Gas Force, Inertia and Resultant Force At Various Crank Angles – Side Thrust on Cylinder Walls.	**8**
Unit-5	Indian and International Vehicle safety standards, requirement, various crash test methods, Initial Tests, Crash Tests on Full Scale Model, Dummies and Instrumentation, their computer aided simulations and applications.	**8**
Unit-6	Testing for Emissions: Various emission standards, standard test procedure, assessment of various emission control technologies, case studies	**6**
	Total	**42**

Reference Books:

1	I C Engines by Lichty, Kogakusha Co., Ltd. Tokyo, 1991, ISBN-1-56091-563-3
2	Body Construction and Design by Giles. J.C., Liiffe Books Butterworth & Co, ISBN Number: 0-7680-0708-9
3	Vehicle Body Layout and Analysis by John Fenton– Mechanical Engg. Publication Ltd., London, ISBN, 0852984456
4	Vehicle Body Building and Drawing by Braithwaite.J.B.– Heinemann Educational Books Ltd., London, ISBN-13: 9781846289941

Course Outcomes

CO1	To understand Specifications of a Vehicle with its performance curves.
CO2	To understand Vehicle Body Details, Safety Design and Prototype Making.
CO3	To understand Vehicle Aerodynamics Wind Tunnel Testing
CO4	To understand Engine Design with its all parameters.
CO5	To understand Indian and International Vehicle safety standards with Crash Tests on Full Scale Model.
CO6	To understand Testing for Emissions with case studies.

CO-PO/PSOMatrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	0	0	0	0	0	0	2	2	1	1
CO2	3	3	2	3	1	0	0	0	0	0	0	1	2	1	1
CO3	3	3	3	3	1	0	0	0	0	0	0	2	3	3	2
CO4	3	3	3	3	1	0	0	0	0	0	0	1	3	3	2
CO5	2	2	2	2	2	0	0	0	0	0	0	1	2	2	2