

B.E Semester: VIII
Automobile Engineering
Subject Name: Vehicle Performance (AE802)

Course Objective:

- To present a problem oriented in depth knowledge of Vehicle Performance.
- To address the underlying concepts and methods behind Vehicle Performance.

Teaching / Examination Scheme:

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
CODE	NAME	L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
		Hrs	Hrs	Hrs	Hrs	Hrs	Marks	Marks	Marks	Marks		
AE802	Vehicle performance	3	1	0	4	4	3	70	30	20	-	120

Detailed Syllabus:

Topic no	Details
1	Introduction Assumptions to be made in designing a vehicle, Range of values for Gross Vehicle Weight, Frontal Area, maximum speed, maximum acceleration, gradability in different gears, Basics of Automobile Design.
2	Dynamics of engine component: Connecting rod length to Crank Radius Ratio, Plotting of Piston Velocity and Acceleration against Crank Angle, Plotting Gas force, inertia force and Resultant force against Crank Angle, Turning Moment and Side Thrust against Crank Angle, effective driving force for piston effort.
3	Engine Performance Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different vehicle speeds, Interpolation of Pressure – Volume diagram, Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and Stroke Length.
4	VEHICLE PERFORMANCE Resistance to the motion of vehicle, road performance curve, Resistances at various vehicle speeds, traction and tractive effort, Acceleration, gradability, drawbarpull, power required for propulsion of vehicle, gear ratio for maximum acceleration, distribution of weight, calculation of maximum acceleration, maximum tractive effort and reaction for different drive
5	Gear Ratios Determination of Gear Ratios, Acceleration and Gradability, Typical Problems on Vehicle performance
6	Braking system: Braking fundamentals, Energy of motion and frictional force, brake balance, stopping distance, brake fade, brake torque, work done during braking, braking efficiency numerical, Braking of vehicle, brakes applied to the rear wheels, front wheels, all four wheel and numerical, braking of vehicle moving in a curved path, internal expanding (drum)brake with explanation of leading and

trailing shoe and numerical, concept of self energizing, disc brake principle.
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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 %	5,6

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 tutorial, where students have an opportunity to build an appreciation for the concept being taught in lectures.
 1. Define different types of resistance. Find out R_a , R_r and R_t for different vehicle speed, and draw curves vehicle speed Vs resistance.
 2. Derive vehicle speed in terms of Engine speed and show relation between vehicle speed and engine speed on graph.
 3. Find out mechanical efficiency for different vehicle speed and show relation between them on graph.
 4. Find out torque for different vehicle speed and show relation between them on graph.
 5. Find out brake power, indicated power and frictional power for different vehicle speed and show relation between them on graph.
 6. Find out acceleration and velocity for different crank angle and show relation on graph.
 7. The following details are given for Piston, during Expansion stroke:

Crank angle θ	0	15	30	45	60	75	90	105	120	135	150	165	180
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Gas pressure kgf/cm ²	52.5	52.5	35.5	21.7	12.5	9	7	5.5	4.8	4.5	4	3.5	2.5
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Find the gas force, inertia force and resultant force. Assume bore area as 49 cm² and stroke length as 79mm and n=4

8. Draw velocity and acceleration diagram for a piston from 0 degree to 360 degree crank angle. Assume the stroke length as 76mm , connecting rod length= 152mm and the engine speed as 4000 rpm.
9. Derive the Expression for velocity and acceleration of the piston in terms of crank angle.

Students Learning Outcomes:

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

Recommended Study Materials:

Text & Reference Books:

1. Automotive mechanics by Crouse, TMH
2. "Auto design" by R. B. Gupta
3. K.M.Gupta vol-1-Automobile Engineering-umesh publications.
4. Automobile technology by Dr.N.k.giri
5. Gupta. R.B., "Automobile Engineering", Sathya Prakashan, 2013.

