

B.E Semester: 7 Automobile Engineering
Subject Name: Theory of Vehicle Dynamics (AE704-N-E)
[Dept. Elect.-4]

Course Objective:

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

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	0	3	3	3	70	30	20	00	120

C. Detailed Syllabus:

Unit No.	Details
1	Forward Vehicle Dynamics 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. Parked car on a level road, Parked car on an inclined road, Accelerating car on a level road, Accelerating car on an inclined road, Parked car on a banked road, Vehicles on crest and dip.
2	Brake Dynamics 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.
3	Tire Mechanics Tire Construction, Size and Load Rating, Terminology and Axis System, Mechanics of Tire, Tractive Properties- Vertical Load, Inflation Pressure, Surface Friction, Speed, Cornering Properties- Slip Angle, Tire Types, Load, Pressure, Size and width, Tread Design, Combined Braking and Cornering, Slip, Skid, Rolling Resistance.
4	Suspensions Mechanics Suspension types, Solid Axles- Hotchkiss, Four link, De-Dion, Independent Suspensions- Trailing Arm, MacPherson, and Trailing arm Rear, Swing Axle Anti-Squat and Anti-Pitch Suspension Geometry, Roll Centre Concept, Active Suspension.
5	The Steering Mechanics Introduction, Steering Geometry, Steering Linkages, Steering Geometry Error, Steering System Forces and Moments, Front wheel Geometry, Steering System Models, Steering System Effects, Mechanics of front wheel drive, Understeer and Oversteer, Effect of Tire Camber and Vehicle Roll, Four wheel Steer.

Total hours (Theory):48
Total hours (Practical):00
Total hours:48

D. Lesson Planning:

Sr. No.	Date/Week	Unit	Weight age	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 ,16 th	Unit 5	20%	5

E. Instructional Method & Pedagogy

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, 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.

F. Students Learning Outcomes:

1	The student can identify different areas of vehicle dynamics.
2	Can find the applications of all the areas in day to day life.

G. Text Books & Reference Books:

1	Thomas D Gillespie, "Fundamentals of Vehicle dynamics", SAE USA 1992.
2	R N Jazar, Vehicle Dynamics: Theory and Application, Springer.
3	Rajesh Rajamani, Vehicle Dynamics & control, Springer
4	R.V. Dukkipati, Vehicle dynamics, Narsova Publications.
5	Wong J Y, "Theory of Ground Vehicles", John Wiley & Sons, New York, 1978
6	Milliken W F and Milliken D L, Race car Vehicle Dynamics, SAE
7	Garrett T K, Newton K and Steeds W, "Motor Vehicle", Butter Worths & Co., Publishers Ltd., New Delhi, 2001
8	Heinz Heister, "Vehicle and Engine Technology", SAE Second Edition, 1999.
9	Vittore Cossalter, Motorcycle Dynamics, 2nd Edition, Publisher: LULU.com
10	Hans Pacejka, Tire and Vehicle Dynamics, Elsevier, 2012.