A. **Course Objective**

- To present a problem oriented in depth knowledge of Automotive design
- To address the underlying concepts and methods behind of Automotive design

B. **Teaching / Examination Scheme**

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	Marks
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
MEA202	Automotive design	3	0	2	5	4	3	70	30	20	30	150

C. **Detailed Syllabus**

1. Introduction to Design Process**:**, Factors – Materials selection direct - Bending and Torsional stress equation - Impact and Shock loading - Stress concentration factor - Size factor - Surface limits factor - Factor of safety - Design stress - Theories of failures – Problems.
2. Engine Components; Material, construction and design aspects of engine components; Determination of engine power; Engine selection-swept volume, stroke, bore & no. of cylinders; Arrangement of cylinders stroke to bore ratio.
3. Design procedure and considerations, material selection & actual design of components; cylinder block deign; Design of Piston; piston assembly; Cylinder, Cylinder liner, Cylinder head, Combustion Chamber, Connecting rod, Crank Shaft, Fly Wheel, valves, valve actuating mechanism, cams, camshaft drives.
4. Fatigue strength and design of springs**:** Variable and cyclic loads – Fatigue strength – S-N curve – Continued cyclic stress – Soderberg and Goodman equations – Design of Helical – Leaf - Disc springs under Constant and Varying loads.
5. Design of Couplings**:** Design and drawings of couplings – Rigid – Flexible – Design and Drawings of Cotter joints - Knuckle joints, Computer aided design of machine elements.

6. Design of Clutches and Gear Boxes: single plate, multiple plates, centrifugal clutch, lining material, lever design, sliding mesh, constant mesh, synchromesh gear box, gear ratio and gear shifting lever, sliding mechanism

7. Design of Drivetrain: Design of propeller shaft and U-joints, Design of propeller shaft, criteria, failure theories-joint design, Design of Final drive and differential, Design of bevel, worm and hypoid type of final drive, differential.

8. Design of axel and Steering: Axle and shaft design, design of fully floating, half floating axle and dead axle, Steering gear and steering mechanism design, geometry for correct steering, linkages

9. Design of brakes and Suspension: Internal expanding shoe brake, braking condition, friction lining material, mechanical and hydraulic braking system, leaf spring, coil spring, materials, suspension system and linkages, independent suspension

10. Automotive Body Structures: Emphasis is on body concept for design using first order modeling of thin walled structural elements. Practical application of solid/structural mechanics is considered to design automotive bodies for global bending, torsion, vibration, crashworthiness, topology, material selection, packaging, and manufacturing constraints.

D. **Lesson Planning**

SR.NO	DATE/WEEK	UNIT NO	%WEITAGE	TOPIC NO
1	1ST , 2ND , 3RD	1	20	1,2
2	4TH , 5TH , 6TH	2	20	3,4
3	7TH , 8TH , 9TH	3	20	5,6
4	10TH , 11TH , 12TH	4	20	7,8
5	13TH , 14TH , 15TH	5	20	9,10

E. **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.
- Experiments shall be performed in the laboratory related to course contents.
  List of experiments:
1. Study of design process and considerations
2. Design aspects of engine component
3. Design of piston
4. Design of leaf and helical spring
5. Drawing of Cotter joints & Knuckle joints
6. Design of clutch
7. Design of Drivetrain
8. Design of axle and steering
9. Design of brake
10. Tutorials

F. **Students Learning Outcomes**

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

G. **Recommended Study Materials**

- **Text & Reference Books:**
1. The Automotive Chassis – Engineering Principle – Reimpell J.
2. Automotive Chassis – Design & Calculation – P. Lukin, G. Gasparyarts,V. Rodionov, MIRPublishing, Moskow
3. Automotive Chassis – P. M. Heldt, Chilton Co. NK
4. Mechanics for Road Vehicles – W. Steed, Illiffe Books Ltd., London
5. Design of Automotive engines, Kolchin and Demodov
6. Automotive design, Jiles. J.G
7. Machine Design, Pandya and Shah
8. Machine Design, Khurmi and Gupta
9. Joseph Edward Shigley and Charles, R. Mischke, (2000), Mechanical Engineering Design, McGraw –Hill International Editions.
10. DTB Donkins, Elements of Motor Vehicles Design, TMH
11. Lukin, Automobile Chasis Design and calculations, Mir Publishers
12. K. M. Agrawal,Autodesign Problems,Satyaprakashan.
    13. N.K.Giri, Automotive Mechanics,Khanna Publishers.