

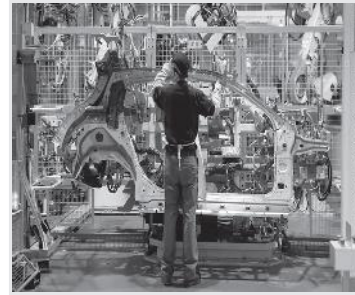
# 19AE202 STRENGTH OF MATERIALS FOR AUTOMOBILES

Hours Per Week :

| L | T | P | C |
|---|---|---|---|
| 3 | - | 2 | 4 |

Total Hours :

| L  | T | P  | CS | WA/RA | SSH | SA | S | BS |
|----|---|----|----|-------|-----|----|---|----|
| 45 | - | 30 | 5  | 5     | 30  | 20 | 5 | 5  |



Source :

<httpswww.ttnews.com>

## COURSE DESCRIPTION AND OBJECTIVES:

This course deals with concepts of mechanics of deformable solids including static equilibrium, geometry of deformation and behavior of materials. The objective of this course is to enable the students to have an exposure to the systematic methods of solving engineering problems in solid mechanics. In addition, it also provides the basic mechanical principles underlying modern approaches for design of various types of structural members subject to axial, torsion, bending, shear, and combined loading.

## COURSE OUTCOMES:

Upon completion of the course, the students will be able to achieve the following outcomes

| COs | Course Outcomes  | POs    |
|-----|--|--------|
| 1   | Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous and isotropic materials.   | 10     |
| 2   | Apply the knowledge to establish the relationship between shear load and shear force and to identify the variation in shear stress-shear strain distribution for various cross sections. | 1,9    |
| 3   | Analyze and calculate the stresses and strains associated with thin-wall spherical and cylindrical pressure vessels.   | 2,10   |
| 4   | Derive flexural formula for simple bending.  | 3,9,10 |
| 5   | Evaluate the deflections and rotations produced by the three fundamental types of loads: axial, torsional, and flexural.   | 4,9,10 |

## SKILLS:

- ✓ Measure tensile and compressive strength of materials using Universal Testing Machine.
- ✓ Measure shear strength of materials.
- ✓ Analyze deflections produced by axial, torsional and flexural loads.

- UNIT-I** **L-9**  
**INTRODUCTION** : Layouts with reference to power plant, Steering location and drive, Frames, Frameless constructional details, Materials, Testing of frames, Integral body construction, Chassis Layout types, Loads acting on chassis, Chassis member selection.
- UNIT-II** **L-9**  
**FRONT AXLE STEERING SYSTEMS:** Front axle type, Rzeepa joint (Constant Velocity joint), Rigid axle and split axle, Constructional Details, Materials, Front wheel geometry viz., Camber, Castor, Kingpin inclination, Toe-in and toe-out. Condition for true rolling motion of road wheels during steering. Steering geometry. Ackerman's and Davi's steering system. Construction details of steering linkages. Different types of steering gear box. Steering linkage layouts for conventional and independent suspensions. Power steering and power assisted steering.
- UNIT - III** **L-9**  
**DRIVE LINE STUDY** : Effect of driving thrust and torque –reaction. Hotchkiss drive, Torque tube drive, radius rod, penhard rod and Propeller shaft. Universal joints, . Final drive- different types. Two speed rear axle. Rear axle construction-full floating, three quarter floating and semi-floating arrangements. Differential-conventional type, Non-slip type, Differential locks and differential housing.
- UNIT-IV** **L-9**  
**SUSPENSION SYSTEM:** Types of suspension, Factors influencing ride comfort, Types of suspension springs - independent suspension - front and rear. Rubber, Pneumatic, Hydro-elastic suspension. Shock absorbers. Types of wheels. Construction of wheel assembly. Types of tyres and constructional details, Air less tyres (flexible spokes). Static and rolling properties of pneumatic tyres, tubed tyres, Tubeless tyres, and aspect ratio.
- UNIT – V** **L-9**  
**BRAKING SYSTEM:** Principles of brakes, Type of brakes, Drum brake, Disc brake, theory and constructional details – materials, braking torque developed by leading and trailing shoes. advantages, Brake actuating systems, minimum stopping distance, Factors affecting brake performance, Forces acting on brakes while applying the brake, Exhaust brakes, Power and power assisted brakes. Testing of brakes.

## LABORATORY EXPERIMENTS

| <b>LIST OF EXPERIMENTS</b>  | <b>TOTAL HOURS : 30</b> |
|---|-------------------------|
| 1. Measurement of the chassis frame of Light duty vehicle frame.                            |                         |
| 2. Measurement of the chassis frame of Heavy duty vehicle frame.                            |                         |
| 3. Dismantling and Assembling of Clutch assembly  |                         |
| 4. Dismantling and Assembling of Gear Box   |                         |
| 5. Dismantling and Assembling of Transfer case  |                         |
| 6. Dismantling and Assembling of Steering systems.  |                         |
| 7. Dismantling and Assembling of Front Axle (Rzeepa Joint, solid and splitaxle)             |                         |
| 8. Dismantling and Assembling of Rear Axle - differential – solid axle.                     |                         |
| 9. Dismantling and Assembling of suspension system (conventional, independent suspension)   |                         |
| 10. Dismantling and Assembling of Braking systems – ( hydraulic, servo-vacuum, air brakes.) |                         |

### TEXT BOOKS:

1. Kirpal Singh, "Automobile Engineering", Standard publishers and Distributors, 13<sup>th</sup> Edition, 2013.
2. R.B. Gupta, "Automobile Engineering", Satya prakashan, New Delhi. Edition 2009.

### REFERENCES BOOKS:

1. Harban Singh Rayat, "The Automobile", S. Chand and Co., 2000
2. G. J. Giles, "Steering Suspension and Tyres", Illiffe Books, 1975.
3. K. Newton, W. Steeds and T. K. Garret, "The Motor Vehicle", 13<sup>th</sup> edition, Butterworth Heinemann, 2004.
4. W. Steed, "Mechanics of Road Vehicles", Illiffe Books, 1992.
5. K.K Ramalingam "Automobile engineering".