B. E. Semester: III
Automobile Engineering
Subject Name: ADVANCED STRENGTH OF MATERIALS (AE305)

Course Objective:

- To present a problem oriented in depth knowledge of ADVANCED STRENGTH OF MATERIALS
- To address the underlying concepts and methods behind ADVANCED STRENGTH OF MATERIALS.

Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
AE305	**ADVANCED STRENGTH OF MATERIALS**	3	0	2	5	4	3	70	30	20	30	150

Detailed Syllabus:

Topic no   **Details**

1.   Strain energy, energy of dilation and distortion, resilience stress due to suddenly applied loads, Castigliano's theorem, Maxwell's theorem of reciprocal deflection.

2.   Theories of Failure: Maximum principal stress theory, maximum shear stress theory, Total strain energy theory, shear strain energy theory, graphical representation and derivation of equation for each and their application to problems relating to two dimensional stress systems only.

3.   Leaf spring, deflection and bending stresses Open coiled helical springs; derivation of formula and application for deflection and rotation of free end under the action of axial load and/or axial couple; flat spiral springs –derivation of formula for strain energy, maximum stress and rotation.

4.   Thick Cylinders: Derivation of Lame's equations, calculation of radial longitudinal and hoop stresses and strains due to internal pressure in thick cylinders, compound cylinders, hub shrunk on solid shafts.

5.   Bending of curved beams : Calculation of stresses in crane or chain hooks, rings of circular section and trapezoidal section and chain links with straight sided.

6.   Shear stress distribution in rectangular, circular,I,T and channel section and the compression with bending stresses, Importance of shear centre

7.   Rotational stresses in discs and rims of uniform thickness; discs of uniform Strength.

Lesson Planning:

Sr.No.	Date/Week	Unit No.	% Weightage	Topic No:
1	1st ,2^{ed} ,3^{ed}	Unit 1	20 % .	1,2
2	4th ,5th ,6th	Unit 2	20 %	3
3	7th ,8th ,9th	Unit 3	20 %	4
4	19th ,11th ,12th	Unit 4	20 %	5
5	13th ,14th ,15th	Unit 5	20 %	6 ,7

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. Suggested list of experiments are as given below.
    1. To study about energy distortion and dilation and Castigliano's theorem, Maxwell's theorem of reciprocal deflection.
    2. To study about theories of failure.
    3. To study about various types of springs.

4. To study about cylinders.
5. To study about rotational stresses in disk and rims of uniform thickness.
6. Performance on the basis of bending stress.
7. Performance on the basis of tensile test.

Students Learning Outcomes:

- The student can identify different areas of ADVANCED STRENGTH OF MATERIALS.
- Can find the applications of all the areas in day to day life.

Recommended Study Materials:

- Reference Books:
1. Elements of Strength of Materials by Timoshenko and Gere
2. Advanced Solid Mechanics by LS Srinath
3. Advanced Mechanics of Materials by Seely and Smith
4. Strength of Materials by GH Ryder
5. Mechanics of Materials-I by EJ Hern; Paragaman, New York
6. Introduction to Mechanics of Solids by Crandell, Dahl and Lardner, McGraw Hill
7. Strength of Materials DS Bedi
8. Mechanics of Materials by Dr.Kirpal Singh, Standard Publishers & Distributors.
9. Strength of Materials by R.S. Lehri, S.K Kataria and Sons