B. E. Semester: 3 Mechanical Engineering  
Subject Name: ADVANCED STRENGTH OF MATERIALS (ME-305)  

A. 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  

B. Teaching / Examination Scheme  

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<tr>
<th>SUBJECT</th>
<th>Teaching Scheme</th>
<th>Total Credit</th>
<th>Evaluation Scheme</th>
<th>Total Marks</th>
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C. Detailed Syllabus  
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 shrinked 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. Rotation stresses in discs and rims of uniform thickness; discs of uniform strength  

D. Lesson Planning  

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Date/Week</th>
<th>Unit No.</th>
<th>% Weightage</th>
<th>Topic No:</th>
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<tr>
<td>2</td>
<td>4th, 5th, 6th</td>
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<td>Unit 3</td>
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<td>4</td>
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<td>13th, 14th, 15th</td>
<td>Unit 5</td>
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E. Instructional Method & Pedagogy  
15. At the start of course, the course delivery pattern , prerequisite of the subject will be discussed  
16. 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.  
17. Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.  
18. 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.  
19. 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.  
20. Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.  
21. 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.

F. **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.

G. **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
  7. Strength of Materials DS Bedi
  9. Strength of Materials by R.S. Lehri, S.K Kataria and Sons