| Course Type | Course Code | Name of Course | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DC | MEC 303 | Advanced Solid Mechanics | 3 | 0 | 0 | 9 |

**Course Objective**

To solve problems in solid mechanics which cannot be satisfactorily addressed by the approaches of mechanics of materials. Examples of such problems include plane stress and strain problems, semi-inverse problem solution, fracture problems, plasticity, and problems in which some input or system parameters are uncertain.

**Learning Outcomes**

Students completing this course should be able to:

• formulate and understand the differential equations governing the behavior of two dimensional elastic solids,

• solve the differential equations governing the bending of beam,

• apply concepts of energy conservation to the solution of problems in solid mechanics,

• determine whether a solid will exceed the elastic limit and analyze the post-yield behavior

| Unit No. | Topics to be Covered | Lecture Hours | Learning Outcome |
|---|---|---|---|
| 1 | Continuum concept of stress and strain fields. Generalized Hook's law, equilibrium equation and compatibility conditions. 3-D Mohr's circle representations for stress and strain. Concept of stress function, | 12 | One would have learnt the continuum concept of "stress" and "strain" in addition to revisiting the concept of a "force" and "displacement". |
| 2 | Stresses in a thick cylinder, compound cylinder and a rotating disk. | 7 | Formulate and understand the differential equations for the stress analysis in a cylinder and disk. |
| 3 | Concept and application of energy methods. Unsymmetrical bending of beams, Shear center, shear flow in thin members. | 7 | Knowledge the concept of energy conversion for solving the solid mechanics problem |
| 4 | Failure, yield and fracture, Elements of fracture mechanics. | 6 | Basic knowledge of failure and fracture analysis of engineering materials |
| 5 | Plasticity: yield criteria, hardening rules, flow rules, cyclic loading. | 6 | Understanding the materials behavior beyond elastic limit. |
| 6 | Plastic analysis of beams. | 4 | Understanding the behavior of beam when plastically deformed. |

**Text Books:**

1. Ugural and Fenster, Advanced Strength and Applied Elasticity. 4th ed. Prentice Hall, 2003.

**Reference Books:**

1. L.S. Srinath, Advanced Solid Mechanics, Tata McGraw Hill Publication
2. Arthur P. Boresi and Richard J. Schmidt, Advanced Mechanics of Materials, 6th edition, Wiley, 2009.