IC242   Continuum Mechanics

Credit: 2.5-0.5-0-3

Prerequisite: Consent of the faculty member

Students intended for: B.Tech

Elective or Core: Core   Semester: Even/Odd

Course objective: To introduce students to the basic fundamental concepts of the mechanics of deformable media (Solid mechanics & Fluid Mechanics). Learn elastic and plastic behavior of materials.

Course content:

- **Introduction**: The Continuum Concept   1 Lecture

- **Tensor Analysis:** Tensor analysis in Cartesian coordinate, Gradient and Divergence, Daid and Daidict algebra, Isotropic Tensor   4 Lectures

- **Stress principles**: Cauchy stress, Principle stresses and principle direction of stress, Deviatoric stresses and their directions.   10 Lectures

- **Fluid Statics:** Pascal's law, hydrostatic pressure, pressure measurement, manometer and micro-manometer, pressure gauge.   3 Lectures

- **Kinematics**: Lagrangean and Eulerian description, Deformation gradient, deformation tensors, strain tensors, velocity gradient, rate of deformation.   4 Lectures

- **Conservation laws**: Conservation of mass, conservation of linear momentum, moment of momentum, conservation of energy, Integral & differential approach and application to the control volume. Clausius- Duhem equality.   8 Lectures

- **Constitutive theories**: Governing equations of a Continuum: Constitutive equations in material description, Elastic materials, Viscous fluids, Thermodynamic considerations   8 Lectures

- **Elasticity**: linear elasticity and hyperelasticity (compressible and incompressible materials)

                                    2 Lectures

- **Plasticity**: Yield criteria, linear plasticity

                                    2 Lectures

References

Continuum Mechanics D. Frederick and T.S. Chang Continuum Mechanics by Philip G. Hodge, JR. Mc. Graw- Book Co.
Mechanics of Continuua by A. C. Eringen. John Wiley & Sons, INC.
Continuum Mechanics, chang, Prentice Hall, 1983.
Continuum Mechanics for Engineers, Thomas, CRC Press, 1999.
Continuum Mechanics for Engineers, T. Mase, G. Mase ,CRC Press, New York 1999,
Introduction to Continuum Mechanics for Engineers, RM Bowen, Plenum Press, New York, 1989