

# Advanced Mechanics Of Solids

**Course No** ME321A

**Instructor** Basant Lal Sharma

**Department** Mechanical Engineering

**Units** (L-T-P-D-[C]) 2-0-1-7

**Slot** LEC: MTh 11:00-12:00 L4; LAB: MTTh 14:00-17:00 Experimental Stress Analysis Lab;

**URL** [http://home.iitk.ac.in/~b1s/Homepage/ME321\\_2014.html](http://home.iitk.ac.in/~b1s/Homepage/ME321_2014.html)

**Prerequisite** ESO202A

## Course content (approx. # Lectures)

- Quick review: Vector space, linear algebra, vector calculus, indicial notation (3)
- Stress: derivation, force equilibrium and moment equilibrium, principal stresses and directions (3)
- Deformation of a body, concept of strain, small strain, strain compatibility (3)
- Constitutive equations: generalized Hooke's relation including thermoelasticity, anisotropy (3)
- Boundary value problems in linear elasticity including concepts of uniqueness and superposition (2)
- Plane stress and plane strain, problems using cylindrical and spherical coordinates, axisymmetric problems (examples) (8)
- Three dimensional problems by method of potential functions (2), energy methods (3)

In addition to the lectures, the course is associated with a laboratory session that will be carried out in Experimental Stress Analysis Laboratory (details in a separate handout).

## Text and References

1. Mase and Mase, *Continuum Mechanics for Engineers*, Second Edition 1999. (Textbook).
2. Fung, *Foundations of Solid Mechanics*, 1965.
3. Timoshenko and Goodier, *Theory of Elasticity*, McGraw Hill Publishing Company, 1970.
4. Gurtin, *The Linear Theory of Elasticity*, Handbuch der Physik Vol. VIa/2, 1972, pp. 1–295.

## Grading

Theory (85%): Homework (Practice) Problems: 5%, 4 In-class Quizzes (5 min, open notes): 4%, 2 Quizzes (40 min): 16%, MidSem (2 hr): 25%, EndSem (3 hr): 35%.

Lab (15%): Lab reports: 7%, 2 Quizzes (20 min, same slot as theory quiz): 8%.

## Policy

No make up for homeworks/quizzes/midsem. Average marks assigned on submission of medical certificate stating strong reason for absence. Late submission of homework, outside the time slot announced in lectures, is not accepted.

## Remarks

Textbook is prescribed for “easy” reading only. Lectures are not based on any particular book. Individual experiment total: 100 marks – Preliminary report (submitted before starting the experiment): 15 marks, observations (a copy submitted after experiment): 30 marks, calculations: 40 marks, conclusions+analysis: 15 marks.