1.050 Engineering Mechanics

Lecture 17:
Deformation and strain (cont'd)

1.050 – Content overview

I. Dimensional analysis

1. On monsters, mice and mushrooms
2. Similarity relations: Important engineering tools

Lectures 1-3
Sept.

II. Stresses and strength

2. Stresses and equilibrium
3. Strength models (how to design structures, foundations.. against mechanical failure)

Lectures 4-15
Sept./Oct.

III. Deformation and strain

4. How strain gages work?
5. How to measure deformation in a 3D structure/material?

Lectures 16-19
Oct.

IV. Elasticity

5. Elasticity model – link stresses and deformation
6. Variational methods in elasticity

Lectures 20-31
Nov.

V. How things fail – and how to avoid it

7. Elastic instabilities
8. Plasticity (permanent deformation)
9. Fracture mechanics

Lectures 32-37
Dec.

1.050 – Content overview

I. Dimensional analysis

II. Stresses and strength

III. Deformation and strain

Lecture 16: Introduction: Deformation and strain

Lecture 17: Strain tensor

Lecture 18: Simplification for small deformation; Mohr circle in strain space

Lecture 19: Beam deformation

IV. Elasticity

V. How things fail – and how to avoid it

Goals of this lecture

- Review: The main tool – deformation gradient tensor

- Applications to calculation of…
  - Volume change
  - Surface normal and surface area change
  - Length change
  - Angle change