

3.032.2x Mechanical Behavior of Materials: Stress Transformations, Beams, Columns and Cellular Solids Fall 2015

Professor L J Gibson

Overview:

This course is the second of three in a series of courses to be offered on edX this fall. Taken together, these courses provide similar content to the MIT subject 3.032: Mechanical Behavior of Materials.

The 3.032x series provides an introduction to the mechanical behavior of materials, from both the continuum and atomistic points of view. At the continuum level, we learn how forces and displacements translate into stress and strain distributions within the material. At the atomistic level, we learn the mechanisms that control the mechanical properties of materials. Examples are drawn from metals, ceramics, glasses, polymers, biomaterials, composites and cellular materials.

In *Stress Transformations, Beams, Columns, and Cellular Solids*, 3.032.2x covers stress transformations, beam bending, column buckling, and cellular materials.

Grading:

Problem sets:	25%
Final Quiz	75%

Syllabus:

Week 1 (October 14-21):

- Equivalent stresses for varying orientations
- Principal stresses, maximum shear stress
- Mohr's circles

Week 2 (October 21-28):

- Stresses in beams
- Shear and bending moment diagrams in beams
- Strain energy

Week 3 (October 28-November 4):

- Beam deflection
- Column buckling
- Cellular solids

Week 4 (November 4 – November 11):

- Final Quiz

Additional reading:

Ashby MF and Jones DRH (2012) Engineering Materials I: An introduction to properties, applications and design 4th Edition. Butterworth Heinemann.

Gere JM and Goodno BJ (2009) Mechanics of Materials 8th Edition. Cengage Learning.

Hertzberg RW (1996) Deformation and Fracture Mechanics of Engineering Materials 4th Edition. John Wiley and Sons.