CIVE 662: Foundations of Solid Mechanics

Fall 2015, best time of the day (8 AM)

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Office Hours: MW any time after 12

Topics:

1. The fundamental quantities of solid mechanics: stress and strain, including various measures (the Piola-Kirchhoff stresses, Green-Lagrange and Almansi strains).
2. Constitutive laws for linear and nonlinear solids.
3. Linear elasticity: governing equations and exact solutions.
4. Energy and variational principles, with a focus on virtual work.
5. Computational methods and nonlinear mechanics.

Textbooks (both brilliant and required):

1. *Classical and Computational Solid Mechanics*, by Y. C. Fung and Pin Tong, World Scientific.
2. *Nonlinear Continuum Mechanics for Finite Element Analysis*, by Javier Bonet and Richard Wood, Cambridge, second edition.

We will supplement the first text with handouts and online materials.

Grading:

Homework and notebook: 25%
Exams: 75%

There will be two semester exams and one final.

Additional References:

At times I receive requests for additional reference books that might help the student at various phase of the class. I strongly recommend that you consider obtaining these in the course of your academic career (depending on your seriousness and interest).

1. *Introduction to the Mechanics of a Continuous Medium*, L. E. Malvern, Prentice Hall. A superb text that I have recently obtained in paperback at low cost.
2. *div, grad, curl and all that*, H. M. Shey, Norton. A lighthearted but rigorous and excellent overview of vector and tensor operations. Inexpensive.
3. *Enegry and Variational Methods in Engineering*, J. N. Reddy, Wiley. Few books are better at explaining in clear voice the concepts of virtual work and variational methods of approximation. Expensive.
4. *A Treatise on the Mathematical Theory of Elasticity*, A. E. H. Love, Dover. Anything published by Dover will be classic and inexpensive. This is not a good learning text, but is an outstanding reference, that I still refer to on a yearly (sometimes monthly) basis.
5. *Theoretical Elasticity*, Green and Zerna, Dover. See comments for number 4.