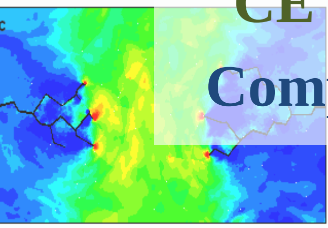
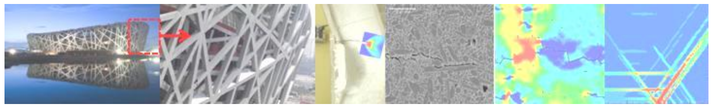
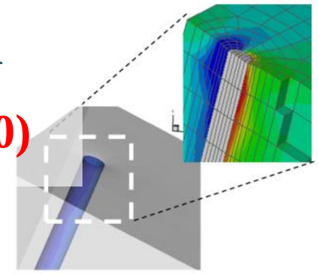


CE 597: Advanced topics in Classical and Computational Solid Mechanics (Spring 2010)





Description:

This is an introductory graduate course in advanced solid mechanics for those students who are interested in learning more about non-linear finite element methods and fundamentals concepts of material deformation and failure modeling. The course is intended for students who want to improve their knowledge and background needed to solve problems using computational methods to better understand the fundamental principles on which computer simulations are based. For those who either need to develop and implement their own material constitutive models for deformation and failure or simply are interested in using commercially available finite element codes more effectively. (Sem. 2, class 3, cr. 3)

Course Objectives:

- Introduce the student to the classical solid mechanics for engineering problem-solving.
- Familiarize the student with advanced finite element codes for nonlinear modeling of material deformation and failure.
- Identify the key ingredients required to solve solid mechanics problems (e.g., what to model, geometry, initial and boundary conditions, constitutive models, failure modes and what physics must be included).
- Some topics: linear and non-elasticity, small strain plasticity models, contact and failure models for material interfaces. Dimensional analysis framework and some advanced topics on dynamic and non-linear finite element algorithms.
- Most of the problems will be oriented towards micromechanics of heterogeneous materials (e.g, polycrystalline materials, composite materials, material interfaces).

Students learn how to formulate and solve computational problems arising in the deformation and failure of materials at the more relevant length-scale levels. Students are expected to communicate their work graphically, orally and in writing. Teamwork and oral communications are sometimes emphasized, depending on enrollment.

We will make use of commercial finite element codes available on campus such as Abaqus, Ansys and Ls-dyna, and research codes (e.g., Feap, Dyna3D). Demonstration of some constitutive material models will also be presented for Matlab.

References: [1] A. F. Bower, Applied Mechanics of Solids, CRC Press, 2009 [2] T. Belytschko, W.K. Liu, B. Moran, Nonlinear Finite Elements for Continua and Structures, Willey, 2001.

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Schedule: MWF 9:30-10:20am, CIVL 2102