Ph.D. Qualifying Exam: Continuum Mechanics

Department of Mechanical Engineering University of Utah

**Exam Description:**

This exam will cover concepts of continuum mechanics. The reference textbooks and course material that serve as a basis for this exam are taken from ME EN 6530 Continuum Mechanics. Students are expected to be able to:

* Perform vector and tensor manipulations in Cartesian coordinate systems
* Formulate and solve basic problems using the language and methods of continuum mechanics
* Describe motion, deformation, and forces in a continuum
* Derive equations of motion and conservation laws for a continuum
* Articulate basic principles and equations applicable to all constitutive models
* Set up and solve simple boundary value problems
* Articulate the applicability limits of continuum mechanics

**Recommended References:**

* Lai, Rubin, & Krempl, *Introduction to Continuum Mechanics*, 3rd Ed., ISBN 0750628944. [a digital version is provided via Canvas free of charge]
* J.N. Reddy, *An Introduction to Continuum Mechanics*, ISBN-13: 978-0521870443.
* <http://www.continuummechanics.org/>
* G.E. Mase, *Schaum’s Outline of Continuum Mechanics*, ISBN-10: 07-040663-4.
* Essence of Linear Algebra (YouTube channel): <https://www.youtube.com/playlist?list=PLZHQObOWTQDPD3MizzM2xVFitgF8hE_ab>

**Exam Materials:**

TBD

**Topics:**

Topics that will be covered by the exam include:

* Vector and tensor algebra
* Vector and tensor calculus
* Kinematics of continuum deformation
* Derivation of field equations using conservation laws for mass, momentum, and energy
* Constitutive equations
* Methods for solving linearized problems in elasticity