******Ph.D. Qualifying Exam: Theory of Linear FEM**

Department of Mechanical Engineering University of Utah

**Exam Description:**

This exam covers the fundamental theory and application of the linear static finite element methods for continuum mechanics. Students are expected to be able to:

* Describe the theory of the finite element method
* Write their own finite element code
* Analyze various physical problems using FEM
* Verify and Validate (V&V) obtained numerical solution
* List the limitations of the FEMs

**Recommended References:**

* A First Course in Finite Elements by J. Fish and T. Belytschko
* An Introduction to the Finite Element Method by J.N. Reddy
* The Finite Element Method by T.J.R. Hughes

**Exam Materials:**

TBD

**Topics:**

Exam topics include:

* Formulation of finite element equations for one-dimensional problems:
  + Differential equation (strong form)
  + Integral or variational equation (weak form)
* Derive approximation functions and numerical integration
* Error and convergence in FEM
* Two-dimensional problems