ME 280A: Introduction to FEM

Fall Semester 2018

Units: 3

Lectures: Tu/Th 5:00-6:30 LeConte 2

Instructor: Prof. Tarek I. Zohdi, 6117 Etcheverry Hall, zohdi@berkeley.edu

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Discussion sessions: TBA

Office hours: TBA

Text: Zohdi, T. I. (*Book*) A finite element primer for beginners. Second Edition. Springer-Verlag.

The pdf version of this text is available for free here: https://www.springer.com/us/book/9783319704272

Grading: The course grade will be based on the following scheme:

$6-8$ *homework projects* 50%
Final exam : 50%

There is no required programming language. However, you are encouraged to use Matlab.

Tentative topics to be covered

- 1 Weighted residuals and Galerkins method for a generic 1-D problem
- 1.1 Introduction: Weighted Residual Methods
- 1.2 Galerkins method
- 1.3 An overall framework
- 2 A model problem: 1-D elastostatics
- 2.1 Introduction: a model problem
- 2.2 Weak formulations in one-dimension
- 2.3 An example
- 2.4 Some restrictions
- 2.5 Remarks on nonlinear problems
- 3 A finite element implementation in one dimension
- 3.1 Introduction
- 3.2 Weak Formulation
- 3.3 FEM approximation
- 3.4 Construction of FEM basis functions
- 3.5 Integration and Gaussian quadrature
- 3.5.1 An example
- 3.6 Global/local transformations
- 3.7 Differential properties of shape functions
- 3.8 Post processing
- 3.9 A detailed example
- 3.9.1 Weak form
- 3.9.2 Formation of the discrete system