

ME280A - Introduction to the Finite Element Method

CONDUCT OF COURSE

Instructor

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Discussion Session

Wednesday 5-6pm, 3107 Etcheverry Hall

Course Website

<http://me.berkeley.edu/ME280A>

Course Objectives

To introduce basic concepts and applications of the finite element method to advanced undergraduate and graduate students of engineering and applied science. Also, to expose students to research-oriented finite element computer software.

Prerequisites

- Math 53 and 54 – Sophomore Mathematics.
- Basic analytical skills.
- Some familiarity with elementary field theories of solid/fluid mechanics and/or thermal science.

Textbook and Reading Assignments

1. **ME280A course reader**, Berkeley, 2009. This reader will be made available online and contains an expanded version of the lecture notes.
2. Selected technical papers will be posted online.

3. Supplementary recommended references:

- (a) **The Finite Element Method: Its Basis and Fundamentals**, by O.C. Zienkiewicz, R.L. Taylor and J.Z. Zhu, 6th edition, Elsevier, Oxford, 2005.
- (b) **An Introduction to the Finite Element Method**, by J.N. Reddy, 3rd edition, McGraw-Hill, New York, 2006.
- (c) **Finite Elements: Theory, Fast Solvers, and Applications in Solid Mechanics**, by D. Braess, 2nd edition, Cambridge University Press, Cambridge, 2001.
- (d) **The Finite Element Method; Linear Static and Dynamic Analysis**, by T.J.R. Hughes, Prentice-Hall, Englewood Cliffs, 1987.
- (e) **The Finite Element Method for Engineers**, by K.H. Huebner, D.L. Dewhurst, D.E. Smith and T.G. Byrom, 4rd edition, Wiley, New York, 2001.

4. **FEAP Version 8.2 manuals**, available online.

Homework

Homework will be assigned at regular time intervals (approximately every week). Problems will involve theoretical, analytical and computational aspects of the finite element method. Computer assignments will focus on modeling, data input, solution strategies, post-processing and result evaluation – no major computer programming is required. Computer accounts will be issued during the seventh week of classes.

To simplify the task of grading, solutions should be preferably submitted on $8\frac{1}{2} \times 11$ in engineering computation paper. Principal results must be clearly identified. Computer output should be cut appropriately so as to conform to the size of the pages. Untidy solutions will not be accepted.

Examinations

There will be one $1\frac{1}{2}$ -hour midterm and a 3-hour final examination. The final examination is scheduled for Tuesday, December 14, 8:00-11:00am.

Grading

Homework: 25%, midterm: 30%, final: 45%.