

# CE 565: FINITE ELEMENT METHOD

SPRING 2009

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Prerequisites: M 340 and the motivation to learn. And work.

No textbook - they are far too expensive. If you can find one used, I suggest: An Introduction to the Finite Element Method, by J. N. Reddy, McGraw-Hill, 3rd edition. I hope the notes will be sufficient.

Objectives: To understand the mathematical foundations and implement numerical solution techniques for the finite element method for static and dynamic problems in engineering.

I grade using the plus/minus system, with roughly half the class expected to be in the (A/A-) range, half in the (B+/B/B-) range, and a few students below these two groups.

Grading will be based on the following algorithm:

1. Homework: 25 %
2. Midterm exams: 45 (I may try to schedule these for late afternoons) %
3. Final exam (comprehensive): 30 %

## TOPICS

1. Weighted Residuals, Variational Formulations and Weak Forms
2. Finite Element Approximations
3. One-Dimensional Problems:
  - Second-order equations
  - Fourth-order equations
  - Isoparametric elements and numerical integration
  - Computational strategies
4. Two-Dimensional Problems:
  - Second-order single variable equations
  - Isoparametric elements and numerical integration
  - Second-order multivariable equations
  - Computational strategies
5. Time Dependent Problems
6. Eigenvalue Problems

## COMMENTS

1. Do not get behind in study of the notes and the references. I strongly suggest you copy your notes after each class, making sure you understand each step.
2. Completion of the homework is a critical part of this class. Use any resource available to you but make sure the work you turn in is understood and is yours.
3. We will likely be programming in MATLAB. From past experience, this can be a steep learning curve for some students who have either never used it or have not used it for some time. I will try to help with this, up to almost writing our code in class.