EM 4123/ 6123 Introduction to the Finite Element Method
Spring 2009

Instructor: Thomas E. Lacy, Ph.D., P.E.
Office: Walker 316c **Office Hours:** T-TH 9:30-11:00 or by appt. **Help Sessions:** TBD
Phone: MSU 662-325-2754 **E-mail:** Lacy@AE.MsState.edu
Prerequisite: Consent of instructor

Required Text:
Reddy, J.N., 2005, An Introduction to the Finite Element Method, 3rd Edition, McGraw-Hill.

Supplemental References:
Bathe, K.-J., 1996, Finite Element Procedures, Prentice-Hall.
Buchanan, G.R., 1995, Schaum's Outline: Finite Element Analysis, McGraw-Hill.
Cook, R.D., Malkus, D.S., and Plesha, M.E., 1989, Concepts and Applications of Finite Element Analysis, 3rd Edition, Wiley.
Huebner, K.H., Thornton, E.A., Byrom, T.G., 1995, The Finite Element Method for Engineers, 3rd Edition, Wiley.
Zienkiewicz, O.C., and Taylor, R.L., 1994, The Finite Element Method, Volume 1, Basic Formulations and Linear Problems, McGraw-Hill.

Grading:

Homework/Quizzes	15%
Project	10%
Exam #1	25%
Exam #2	25%
Final	25%

∀ **Course Objectives:** This course will provide advanced treatment of the theoretical concepts and principles necessary for the application of the finite element method in the solution of differential equations in engineering.

Tentative Course Topics:
1) Integral Formulations and Variational Methods: Introduction to the "weak" formulation of boundary value problems; variational methods of approximation; Raleigh-Ritz method; and the method of weighted residuals.
2) Basic Steps of Finite Element Analysis (FEA): Discretization of the domain, derivation of element equations, connectivity of elements, imposition of boundary conditions, solution of equations, and post-processing of results
3) FEA of One-Dimensional Problems: Second-order boundary value problems in heat transfer, fluid mechanics, and solid mechanics; bending of beams.
4) Numerical Integration and Computer Implementation: Isoparametric formulation using natural coordinates; selection of interpolation functions for "master" rectangular, triangular, and serendipity elements; numerical integration/quadrature (coordinate transformations & integration over master elements); modeling considerations.
5) FEA of Two-Dimensional Problems: Solutions to boundary value problems from heat transfer, fluid mechanics, solid mechanics, and plane elasticity.
6) Finite Element Error Analysis: Measures of error, accuracy and convergence of solution.

MSU Honor Code/ Academic Honesty: "As a Mississippi State University student I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do." www.msstate.edu/dept/audit/1207a.html

Email Policy: Class e-mail will be used as an official means of communication. Be sure to check your e-mail frequently.