CIVIL EN/MECH ENG 768
Introduction to the Finite Element Method

Spring Quarter 2009

Instructor: Ethan Kubatko
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Office Hours: TR 2:30 – 4:30 and by appointment

Class Schedule: MW 2:30 – 4:18, SO 48

Prerequisites:

Civil En 406 or Math 568 or equiv, and En Graph 167 or equiv. Basic knowledge of some programming language (e.g. Fortran, C, C++, Matlab) will be necessary.

Required Text:

There is no required text book for the course. Course material will mainly consist of class notes. There are many text books available on finite element methods—some good, some not so good. Two books that I highly recommend for supplemental reading on the subject:

1. *Finite Elements: An Introduction, Volume I*, by Eric B. Becker, Graham E. Carey and J. Tinsley Oden, Prentice Hall (1981).
2. *An Analysis of the Finite Element Method*, by William Gilbert Strang and George J. Fix, Wellesley-Cambridge Press (1973).

Website:

Class materials, announcements, and grades will be available on Carmen: http://telr.osu.edu/carmen

Course Objectives:

To introduce the basic concepts, formulation and application of finite element methods to solve problems of engineering and scientific interest. The course is designed to be a concise introduction emphasing the salient features of the method with enough detail presented to provide a solid foundation for more advanced courses and/or research in the area of finite element methods.

Homework:

Weekly homework problems will be assigned on Monday (with the exception of weeks 1 and 10) and collected on the following Monday. These problems, along with material covered in lecture, will form the basis for exam problems.

Project:

The course project will mainly consist of implementing the finite element method in a working code. Students may work independently or in groups of two; however, each student is expected to develop and maintain their *own* finite element code. Each group will choose one of several topics that will expand their code beyond the basic implementation of the finite element method. The list of possible topics will be distributed mid-quarter.

Exams:

There will be two, closed-book examinations—a midterm and a final. The final exam will be comprehensive with an emphasis on the material covered after the midterm. No student will be permitted to make up an exam unless *advanced* notice of absence is given to the instructor (preferably) in person.

Final Grade:

Your final course grade will be based on the following weighting:

1) Homework	10 %
2) Project	30 %
3) Midterm exam:	30 %
4) Final exam:	30 %

Academic Misconduct:

Please help maintain an academic environment of mutual respect, fair treatment, and personal growth. Although students are encouraged to work together on homework assignments, students are expected to produce original and independent work for exams. Academic misconduct will not be tolerated and will be dealt with procedurally in accordance with University Rule 3335-31-02. (This policy can be found at http://oaa.osu.edu/procedures/1.0.html.)

E-mail Correspondence:

In order to protect your privacy, all course e-mail correspondence must be done through a valid OSU name.nn account. If you have not activated your OSU email account, you can activate your account at https://acctmgt.service.ohio-state.edu/cgi-bin/KRB1EntryAdd.

Special Accommodations:

All students who feel they may need accommodations based on the impact of a disability should contact the instructor privately to discuss their specific needs. Students with documented disabilities must also contact the Office of Disability Services (ODS) in 150 Pomerene Hall (phone: 292-3307) to coordinate reasonable accommodations for the course. ODS forms must be given to your instructor as early in the quarter as possible to be filled out and returned to you.

Drop date:

The last day to drop a Spring Quarter course without a "W" on your record is April 17.

Tentative Class Schedule

Week #	Lecture #	Day	Date	Topic
1	1	M	03/30	Introduction/Formulation of the basic problems
	2	W	04/01	Strong and weak forms
2	3	M	04/06	The Galerkin method
	4	W	04/08	Finite element basis functions
3	5	M	04/13	Finite element calculations in one-dimension I
	6	W	04/15	Finite element calculations in one-dimension II
4	7	M	04/20	Interpretation and accuracy of finite element solutions
	8	W	04/22	Development of a one-dimensional finite element code
5	9	M	04/27	Two-dimensional problems
	10	W	04/29	EXAM I
6	11	M	05/04	Triangular and quadrilateral elements
	12	W	05/06	Higher-order elements and p-refinement
7	13	M	05/11	Finite element calculations in two-dimensions I
	14	W	05/13	Finite element calculations in two-dimensions II
8	15	M	05/18	Development of a two-dimensional finite element code I
	16	W	05/20	Development of a two-dimensional finite element code II
9	17	M	05/25	Memorial Day — no classes
	18	W	05/27	Advection dominated problems
10	19	M	06/01	Time-dependent problems
	20	W	06/03	Course summary
*** FINAL EXAM Time: Wed June 10, 1:30 pm - 3:18 pm, Place: TBA ***				