

EML 5526 Finite Element Analysis and Applications Spring 2009 syllabus

Basic Information

Catalog Information: Credits 3, Pre-requisites: None for graduate students, EML4500 for UG

Instructor: Dr. Ashok V. Kumar, Associate Professor, Department of Mechanical and Aerospace Engineering. Office: MAE-C 106, Phone: 392-0816, Email: akumar@ufl.edu.

Class time and location: MWF 7th period (1:55 PM -2:45 PM) in NEB-102

Office hours: Instructor MWF 3:00-4:00 PM

Text book: "A first course in the Finite Element Method", Daryl L. Logan, Thomson Publishers (www.thomsonlearning.com), ISBN: 978-0-534-55298-5

Course objectives and outcomes

Catalog description: Fundamentals of finite element analysis including, discrete system analysis, static and dynamic analysis of structures, steady state and transient heat transfer analysis. Modeling, analysis and design using FEA software.

The objective of the course is to teach the fundamentals of finite element method with emphasize on the underlying theory and implementation issues as well as providing hands on experience using finite element software to model, analyze and design systems of relevance to mechanical engineers. The outline of the course is as follows:

1. Background
 - a) Introduction and notations
 - b) Discrete systems and direct stiffness method
 - c) Solution of linear simultaneous equations
2. 1-D problems
 - a) Heat conduction example
 - b) Truss elements
 - c) Beam Elements
3. 2D problems
 - a) Heat conduction
 - b) Linear elasticity (Structural Analysis)
 - i) Review of linear elasticity
 - ii) 2D models (Plane stress, Plane strain, Axi-symmetric)
 - iii) Linear and higher order 2D elements
4. 3D elements and modeling issues
 - a) 3D elements
 - b) Mesh generation and element selection issues
 - c) Brief introduction to: Plate and Shell elements
5. Transient Heat transfer and Fluid flow analysis
6. Dynamic analysis of structures including vibrations

- a) Newmark method for analysis of second order systems
- b) Modal superposition method

Course assessment

Examinations: There will be in-class examinations worth 60% of the final grade.

Graded Homework: Homework will be posted online and they include some analysis problems involving the use of finite element software.

Final Project: The final project will represent 3-4 weeks of effort. These can involve implementation of software or application of commercial software for some detailed analysis or design.

Grading: Examinations: 60%, Hwk & Mini-projects: 20%, Final Project: 20%.

Academic Honesty:

All students admitted to the University of Florida have signed a statement of academic honesty committing them to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action.

This statement is a reminder to uphold your obligation as a student at the University of Florida and to be honest in all work submitted and exams taken in this class and all others.

Other course information

Reference books:

- a) "A first course in finite elements" by Fish and Belytschko, Wiley Publications.
- b) "The Finite Element Method: Linear Static and Dynamic Finite Element Analysis", by Thomas J. R. Hughes, Dover Publications.
- c) "Finite Element Procedures in Engineering Analysis", by K. J. Bathe, Prentice-Hall.
- d) "The Finite Element Method using MATLAB", by Young W. Kwon and Hyochoong Bang, 2nd edition, CRC Press.

Attendance: is very important since some of the material covered in class is not in the textbooks. If you have to miss a class, make sure you watch the lecture online.

Assignments: must be submitted on time in class. EDGE students have to submit online or by mail and will get some extra time. Late assignments submitted by the next class will receive 80% credit. Assignments and projects received later than that will not be accepted without medical or other valid reasons.