ME 538: Introduction to Finite Element Methods and Analysis

Fall 2013

Instructor and Class Information

Instructor: Dr. Harold Park, Associate Professor of Mechanical Engineering
Office: 730 Commonwealth, ENA 212 (this building is directly above CVS).
Email: parkhs@bu.edu
Phone: (617) 353-4208
Office Hours: W 1-2, other times available via appointment (email preferred)
Class Hours: MW 10-12
Classroom: Lectures will be held in SOC B65, Ansys labs will be held in EMB 125 (to get here, go in the 5 St. Mary's entrance and walk all the way down the long hallway)
Prerequisites: ME305, Linear Algebra, Ordinary Differential Equations
Course Website: Blackboard

TA Information

TBD

Course Summary

This class serves as an introduction to the linear finite element method, and its application to static and dynamic problems with an emphasis on solid mechanics. The first half of the course will use the stiffness approach to developing the finite element equations as applied to bars and beams. The second half of the course will focus on developing the finite element method as one that is applicable as a general numerical method for solving ordinary and partial differential equations that arise in solid mechanics. Lab sessions will focus on applying the commercial code Ansys to various problems in solid mechanics.

Textbook (Recommended)

A first course in the finite element method by Daryl L. Logan, fourth edition, Thomson 2006

Reference Books

- *Concepts and applications of finite element analysis* by R.D. Cook, D.S. Malkus, M.E. Plesha and R.J. Witt, fourth edition, Wiley 2002

Class Policies

- Homework not turned in by the end of class (i.e. 12 PM) on the due date will be considered to be late. Late homework will be reduced by 10 percent for each class that goes by without turning it in. Homeworks that are more than 2 classes late will not be accepted.

- One midterm and one final project will be given. There will be no final exam.
- Making up of missed examinations will be permitted only when proof of medical or personal emergency is furnished.
- All complaints related to grading of homework assignments, quizzes, and examinations must be reported to the instructor immediately after the grades are announced.

Approximate List of Topics to be Covered

Stiffness (displacement) method for bars and beams, matrix methods, governing differential equation for solids (strong form), weak form, discretization of weak form using the finite element approximation, shape functions, numerical quadrature, isoparametric elements, dynamic analysis, heat transfer, fluid mechanics, mass transfer, multi-dimensional finite elements.

Grading

- Homeworks: 25%
- Labs: 30%
- Midterm: 25%
- Final project: 20%