AME 561. Finite Element Analysis.
Syllabus
Fall 2013

The information contained in the course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.

Course instructor

Samy Missoum
AME N729, smissoum@email.arizona.edu
Office hours: Monday 1:30-2:45 pm or by appointment

In every email, please write AME561 in the subject.

Text: Introduction to Finite Elements in Engineering
Author: Tirupathi R. Chandrupatla and Ashok D. Belegundu
Publisher: Pearson

Course objective

This course aims at providing fundamental and practical notions in finite element analysis. The course will present systematic approaches for the derivation of various finite elements. The students will also be introduced to numerical techniques for the solution of the discretized governing equations. Although this course will mostly be based on structural analysis, one of the goals is also to demonstrate the applicability of finite element analysis to other fields. For this purpose, examples from thermal science, acoustics, and fluids will be given.

Practical aspects of finite elements analysis such as mesh generation and choices related to numerical integration will also be presented. In addition, the students will use a commercial finite element analysis package.

Tests

Mid-term exam: date TBA
Final Exam: None. Final project instead.
All exams are CLOSED BOOK. No Cell phone, PDA, or device with a wireless network capability will be used during tests.

Missed tests

If you have to miss any test, a certified medical excuse or prior instructor approval will be required. A miss of any test without a valid excuse results in a zero.

Homework assignments

Homework are due on the date given on the class website at the beginning of the class. It is the responsibility of the student to check the website and, if necessary, scroll down to the due date.
Quizzes

Unannounced quizzes will be given.

Late homework

No late homework will be accepted.

Absence policy and behavior

Class participation is mandatory. If a student is absent, proper documented justification is required.

All holidays or special events observed by organized religions will be honored for those students who show affiliation with that particular religion.

Absences pre-approved by the UA Dean of Students (or Dean's designee) will be honored.

Professional behavior is expected in this course. Pagers, cell phones, PDAs must be turned off.

Students with Disabilities:

If you anticipate issues related to the format or requirements of this course, please meet with me. I would like us to discuss ways to ensure your full participation in the course. If you determine that formal, disability-related accommodations are necessary, it is very important that you be registered with Disability Resources (621-3268; drc.arizona.edu) and notify me of your eligibility for reasonable accommodations. We can then plan how best to coordinate your accommodations.

Policies against threatening behavior by students


Policies against plagiarism

Homework: if there is evidence that a student has copied some solution material (from another student and/or a manual), the grade zero will be assigned to this particular homework.

Exams: if a student is caught taking information or passing information from or to another student during an exam, the grade zero will be assigned to the exam.

In both case, the student will be reported to the University of Arizona honor system for plagiarism.

http://dos.web.arizona.edu/uapolicies

Grading policy

The final grade in percentage will be calculated as follows:

- Homework, mini projects and quizzes: 40% (of which HW and mini projects: 70%, Quizzes: 30%)
- Mid-term exam: 30%
- Final project: 30%
The corresponding letter grade will use the following intervals

88.0 - 100    A
78.0 - 87.9    B
60.0 - 77.9    C
50.0 - 60.9    D
0 - 49.9      E

OUTLINE (Tentative)

The course will cover the following topics:

Chapter I. Introduction
- Review
- Fundamentals of discretization
- Simple examples. Assembly of springs, trusses.

Chapter II. Construction of FE equations.
- Minimization of potential energy
- Rayleigh-Ritz method
- Galerkin method
- Variational approach

Chapter III. One dimensional problems and trusses
- Shape functions
- Assembly
- Boundary conditions
- Stiffness matrix characteristics and numerical solution schemes.

Chapter IV. Beams and Frames

Chapter V. Two-dimensional problems
- Constant strain triangles
- Membranes
- Numerical Integration
- Orthotropic material
- Plates (time allowing)

Chapter VI. Three-dimensional problems
- Hexahedral vs. Tetrahedral elements
- Mesh preparation

Chapter VII. Axisymmetric Problems

Chapter VIII. Dynamic Analysis
- Derivation of the mass matrices
- Computation of eigenvalues and modeshapes

Chapter IX. Other applications of FE analysis:
- Heat transfer
- Acoustics
- Fluids