

ASEN 5007 Introduction to Finite Element Methods

Course Syllabus - Fall 2019

I. FEM Discretization and the Direct Stiffness Method (9 lectures).

Basic concepts of structural modeling
Review of the stiffness method of structural analysis.
Modeling stiffness, loads and displacement boundary conditions.
Advanced modeling: general constraints, substructuring.

II. Formulation of Finite Elements (9 lectures).

Mathematical interpretation of finite elements, variational formulation.
Development of continuum elements, shape functions, consistent loads.
Isoparametric elements for plane stress.
Numerical integration
Convergence requirements.

III. Computer Implementation of the Finite Element Method (8 lectures).

Pre processing: model definition.
Element level calculations.
Equation assembly.
Equation solver.
Post processing: strain and stress recovery.

Textbook: No required books. Instructor supplies Lecture Notes on web site:
<http://caswww.colorado.edu/courses.d/IFEM.d/Home.html> as well as on D2L.

Software: Mathematica 4.0 or higher version (latest version is 11.0). Pseudocode is also used for assignments so that student can convert those into any language.

You can get *Mathematica* it **free** from OIT as a one-year non-transferable license; check <http://www.colorado.edu/OIT/software-hardware/site-licenses>
See also Chapter 4 of Lecture Notes for more details.

If you prefer to have a permanent copy that you can use after leaving CU, order directly from the website of Wolfram Research Inc (WRI); you will need to supply proof of enrollment to get the student discount. *Mathematica* will begin to be used in assignments by early September. Note: *Mathematica for Students*, once sold at the CU Bookstore, has not been available since 2010.