

**Department:** Civil Engineering  
**Number:** CE 5307  
**Title:** Theory of Finite Element Analysis

**Class Schedule:** TR 1:30 – 2:50 p.m.

**Instructor:** Cesar Carrasco Ph.D.  
Department of Civil Engineering  
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Office Hours: Open

**Catalog Description:** Finite elements of structural mechanics problems, virtual work principle, plane trusses and frames, axial elements, beam bending, plane stress and plane strain, axisymmetric stress analysis, three-dimensional stress analysis, isoparametric finite elements, finite element computer project, and use of several finite element software to solve typical problems.

**Prerequisite:** Instructor approval

**Textbook:** Fundamental Finite Element Analysis and Applications: with Mathematica and Matlab Computations, M. Asghar Bhatti, Wiley 2005

**Course Objectives:** This course seeks to familiarize the student with the theory of the finite element method of analysis. At the end of the course the student should be able to formulate the finite element representation of truss, beam and isoparametric elements. The student should be able to apply the finite element method to the analysis of 2D and 3D trusses and frames as well as the analysis of plane stress and plane strain problems. At the end of the course the student will have developed a finite element code for the analysis of plane strain and plane stress problems using the isoparametric formulation.

**Topics Covered:**

1. Fundamental concepts.
2. Two and three-dimensional truss elements.
3. Two and three-dimensional beam elements.
4. Formulation techniques.
5. Isoparametric elements and basic programming concepts.
6. Plane stress and plane strain elements.
7. Finite element programming.

**Grades:**

Your grade for this course will be assessed based on your performance in mid-term exams and projects (60%), homework and quizzes (10%) and final project (30%). There will be no final exam.