ENME 470 Finite Element Analysis
Fall 2013

Course Description Basic concepts of the theory of the finite element methods. Applications in solid mechanics and heat transfer. Four (4) software systems will be used to complete the homework assignments and team projects. They are Creo Simulation, SolidWorks Simulation, Autdodesk Inventor Simulation, and ANSYS. These software systems are widely used by industry and by the research community. The participating students will gain a good understanding of the science-based computational modeling methodology, and learn the skills essential to obtain numerical solutions to a variety of engineering problems.

Prerequisite:	Senior Standing
Class Information:	MWF: 12:00 pm – 12:50 pm, Rm. 2111, King Engineering Building
Course Instructor:	Guangming Zhang, zhang@umd.edu Room 2104A, Engineering Classroom Building, 301-405-6617
Office Hours:	MWF: 10:00 am – 11:30 am, Rm. 2104A Engr. Classroom Building
Textbook:	Engineering Analysis with Pro/Mechanica and ANSYS, Guangming Zhang, College House Enterprises, LLC., 2011 **ISBN:978-1-935673-03-3**
References:	Finite Element Analysis, Theory and Applications with ANSYS, Moaveni, Prentice Hall, 1999

Specific Goals: The main objectives are to provide students with a conceptual understanding of the principles of finite element analysis systems, the implementation of these principles, and its connections to CAD and design optimization. The main software systems used in teaching/learning are Creo Simulation, SolidWorks Simulation, Autodesk Simulation, NX Simulation and ANSYS.

(1) Ability to apply knowledge of mathematics, science, and engineering.
(2) Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
(3) Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
(4) Recognition of the need for, and an ability to engage in life-long learning.

Topics Covered:

- Introduction to Finite Element Analysis
- Concept of Constitutive Equations and Stiffness Matrix
- Material Properties and Basic Types of Elements
- Structural Idealizations: Beams (trusses) and Shells
- Modeling using 3D Elements and Mesh Generation
- Error Analysis and Criteria of Convergence
- Modeling of Constraints and Loads
- FEA with Components and Assemblies
- Buckling Analysis and Thermal Analysis
- Simulation-Driven Design Optimization

Grading Policy:	Attendance:	5%
	Homework Assignments:	25%
	Two Mid-Term Exams:	40%
	Final Exam:	30%

Attendance:

Attendance and active participation are essential to learning in this course. The students are expected to attend the entirety of each class. Attendance will be taken for each class, and will be accounted as 5% of the grade.

Homework Assignments

There will be 12 homework assignments. Hard copies of FEA plots prepared by the software systems are required. No email submission. There is no late homework unless permission is granted from the instructor.

Textbook and Solution to HW

To understand the concepts of engineering analyses and the concepts of FEA methods, reading the material presented in the textbook is important. 70% of homework problems are taken from the textbook. As a result, the students should bring your textbooks with you when coming to class. The other 30% of homework problems are not included in the textbook. Lecture notes to assist the students in completing them will be distributed or posted on CANVAS.

Important Dates

09/03/13	First day of class (Tuesday)
09/16/13	Last Day of Schedule Adjustments
11/11/13	Last day to Drop with a "W"
11/28-12/01	Thanksgiving Recess
12/13/13	Last Day of Class
12/14/13	Reading day
12/20/13	Final examination, Friday, 10:30 am – 12:30 pm

Academic Integrity:

The University is an academic community. Its fundamental purpose is the pursuit of knowledge. Like all other communities, the University can function properly only if its members adhere to clearly established goals and values. Essential to the fundamental purpose of the University is the commitment to the principles of truth and academic honesty. Accordingly, The Code of Academic Integrity is designed to ensure that the principle of academic honesty is upheld. While all members of the University share this responsibility, The Code of Academic Integrity is designed so that special responsibility for upholding the principle of academic honesty lies with the students. Read the detailed information on Academic Integrity on the university home page.