**ELEN 4150 - Applied Finite Elements in Electromagnetics**

**Class Schedule:** 3 Credit course, meeting the equivalent of 3-50 minute class periods per week.

**Course Coordinator**: J. Richie

**Course Materials:**

**Required:** Class Notes by N.A.O. Demerdash

**Course Description:**

Introduction to finite element (FE) analysis as applied to linear and static electromagnetic field problems. Review of basic field formulations using Maxwell’s electromagnetic field equations, solution of boundary value problems using the finite difference methods, FE formulations, assembly of elemental and global matrices, pre-processing, post-processing. Application of the FE method using one-dimensional and two-dimensional elements, magnetostatic and electrostatic analysis, and the use of commercially available software packages.

**Prerequisites**: ELEN 3110 or equivalent

**Selected Elective** in the Electromagnetic Fields and Communication area.

**Contribution to Professional Component**:

Engineering Science 67%

Engineering Design 33%

**Course Goals:**

To enable the student to get a good understanding of Finite Element Analysis and to apply it for the analysis and design of magnetostatic and electrostatic problems using a commercially available software package.

**Course Objectives:**

*By the end of this course, you should be able to....*

1. Explain Finite Element Analysis (FEA)
2. Apply FEA to linear and static electromagnetic field problems using one dimensional and two dimensional elements
3. Explain FE formulations, including assembly of elemental and global matrices
4. Apply pre-processing to setup a problem and post-processing to obtain needed results
5. Apply FE method using a commercially available software packages in analysis and design of magnetostatic and electrostatic problems.

**Contribution to Program Objectives**: Partial fulfillment of Criterion 3 objectives A, B, C, E, G, K

**Course Topics:**

1. Review of basic field formulations using Maxwell's electromagnetic field equations 10%
2. Solution of boundary value problems using the finite difference method 10%
3. Introduction of FE analysis as applied to linear and static electromagnetic field problems 15%
4. FE formulations 10%
5. Assembly of elemental and global matrices 5%
6. Pre-processing and Post-processing. 10%
7. Application of FE method using one dimensional and two dimensional elements 10%
8. Application of FE analysis for magnetostatic and electrostatic problems 20%
9. Use of a commercially available software packages 10%

Last modified: January 24, 2017