THE DEPARTMENT OF AERONAUTICS AND ASTRONAUTICS

AA 430 FINITE ELEMENT ANALYSIS IN AEROSPACE

AUTUMN QUARTER

CREDITS AND CONTACT HOURS: 3 credits, Three 50 minute lectures per week.

COORDINATOR: Keith A. Holsapple, Professor of Aeronautics and Astronautics

TEXTBOOK: A First Course in the Finite Element Method, 5th ed., Daryl L. Logan, PWS, Kent, 2012*

SUPPLEMENTAL MATERIALS: None*

CATALOG DATA: FINITE ELEMENT ANALYSIS IN AEROSPACE, Selective Elective
Introduction to the finite element method and application. One-, two-, and three-dimensional problems including trusses, beams, box beams, plane stress and plane strain analysis, and heat transfer. Use of finite element software. Prerequisite: CEE 220. Offered: A.

PREREQUISITES BY TOPIC:
1) Strength of Materials (CEE/ENGR 220).
2) Matrix Algebra with Applications (Math 308)

OUTCOMES:
1) Students will understand the basic foundations of Finite Element Analysis
2) Students will learn the bases and differences of the principal Finite Element Methods
2) Students will know how FEM is used in the Aerospace Industry.
3) Students will know how to use a commercial FEM Code for the analysis of typical Aerospace Problems of Structural analysis.
4) Students will know how to use a commercial FEM Code for the analysis of Heat Transfer problems.
5) Students will know how to use a commercial FEM Code for the analysis of dynamic problems

RELATIONSHIP TO STUDENT OUTCOMES:
a) An ability to apply knowledge of mathematics, science, and engineering
c) An ability to design a system, component, or process to meet desired needs.
e) An ability to identify, formulate, and solve engineering problems
i) A recognition of the need for and an ability to engage in life-long learning
k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

TOPICS:
1) Introduction
2) Element stiffness and force matrices for a bar (spring)
3) Global equations
4) Minimum potential energy

5) Trusses: bar assemblages in 2- and 3-dimensions
6) Beam bending
7) Frames and grids: beams in 2- and 3-dimensions
8) A design problem: minimum weight truss for a given load
9) Plane stress and plane strain problems
10) Analysis of box beams: assemblages of rods, beams and shear panels
11) Heat conduction and convection
12) Thermal stresses
13) Time dependent problems I: dynamic elasticity
14) Time dependent problems II: transient heat equation