Course alpha, number, title: ME 475 Computer Aided Design of Structures

Required or elective: Elective

Course (catalog) description: Computational methods for analysis, design, and optimization of structural components. Basic concepts in geometric modeling, finite element analysis, and structural optimization.

Prerequisite(s): (ME 471 or concurrently)

Textbook(s) and/or other required material: A First Course in the Finite Element Method by, Daryl L Logan. 3rd Edition (recommended)

Class/Lab schedule: Total Credits: 3 Lecture/Laboratory/Discussion Hours: 2/2/0

Topics covered:
- a. Geometric Modeling
- b. Typical Engineering Structures
- c. Finite Element Models
- d. Finite Element Data Structures
- e. Frames and Support Structures
- f. Modeling of Thin Structures
- g. Reinforcements of Thin Struct.
- h. Design Optimization Modeling
- i. Structural Design Variables

Course learning objectives:
1. Understanding of the finite element method and its use in design of simple structures found in typical engineering applications.
2. Ability to use modern computer assisted geometric modeling, analysis, and design with tools used in standard practice in the industry.
3. Ability to use these tools through case studies in design of simple structural components.
4. Ability to communicate technical information through the preparation of technical memoranda, briefs, and reports.
5. Understanding of the theory and practice of optimization of structural components, including optimal sizing of components, and shape and layout design optimization.

Relationship of course to ME program outcomes:
The following measurement standard is used to evaluate the relationship between the course outcomes and the educational-program outcomes:
2 = Strong Emphasis, 1 = Some Emphasis, 0 = Little or No Emphasis.
(a) an ability to apply knowledge of mathematics, science, and engineering—2
(b) an ability to design and conduct experiments, as well as to analyze and interpret data—0
(c) an 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—1
(d) an ability to function on multidisciplinary teams—1
(e) an ability to identify, formulate, and solve engineering problems—1
(f) an understanding of professional and ethical responsibility—1
(g) an ability to communicate effectively—1
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context —0
(i) a recognition of the need for and the ability to engage in life-long learning—0
(j) a knowledge of contemporary issues—0
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice—2
| **Contribution to professional component:** | 33% Engineering Science 67% Engineering Design |
| **Person(s) who prepared this description:** | Ronald Averill |
| **Date of Preparation** | 2010, updated 2014 |