

## ME 3225 – Computer-Aided Design, Modeling & Graphics

**Credits and Contact Hours:** 3 Credits. Three 50 minute or two 75 minute lectures per week.

**Instructors:** Horea Ilies

**Textbook:** No formal text required. Class notes and reading material are available on-line during the semester.

### **Specific Course Information:**

- a. Catalog Description: Introduction to computer-aided graphics, modeling and design. Applications of graphics software and hardware with mini- and micro-computer systems. Interactive computer graphic techniques. Extensive laboratory study of wire-frame and raster computer graphics. Static and dynamics graphic presentation methods.
- b. Prerequisites: CSE 1010 or 1100, CE 3110, MATH 2110 and consent of instructor.
- c. Required, Elective or Selected Elective: Elective

### **Specific Goals:**

#### a. Course Outcomes:

After completing ME 3225 students should be able to:

1. Understand and manipulate coordinate systems, views, and transformations
2. Describe an use the main curve representations and determine their differential properties
3. Describe an use the main surface representations and determine their differential properties
4. Construct sketches and place geometric and topologic constraints on them
5. Construct parametric and feature models solid models
6. Perform construction, analysis, and interrogation of CAD models
7. Build assembly models and fits
8. Construct mechanical drawings and annotations
9. Perform basic finite element analysis with Unigraphics

#### b. Relationship of Course Outcomes to Criterion 3 Student Outcomes:

- a) an ability to apply knowledge of mathematics, science, and engineering:  
*This course builds upon the foundations of Mathematics (Linear Algebra and Euclidean Geometry), and engineering mechanics applied to modern engineering design.*
- b) an ability to design and conduct experiments, as well as analyze and interpret data: *not applicable*
- c) an ability to design a system, component, or process to meet desired needs:  
*Students will be able to design a component or system using modern Computer Aided Design techniques, evaluate model validity and take advantage of the significant computational support offered by modern CAD/CAM/CAE systems to refine and optimize their designs.*

- d) an ability to function on multi-disciplinary teams: *not applicable*
- e) an ability to identify, formulate, and solve engineering problems:  
*Students will be able to formulate and solve engineering problems using modern Computer Aided Design techniques.*
- f) an understanding of professional and ethical responsibility: *not applicable*
- g) an ability to communicate effectively:  
*This course requires students to prepare written reports detailing their approach for solving the analytical and practical assignments.*
- h) the broad education necessary to understand the impact of engineering solutions in a global and societal context:  
*Students are exposed to the state-of-the-art product design cycle and tools, from conception and analysis to validation and simulation.*
- i) a recognition of the need for, and an ability to engage in life-long learning:  
*Students recognize the rapid changes in product design, driven by continuously evolving computational infrastructure, which emphasizes the need for continuous learning.*
- j) a knowledge of contemporary issues:  
*During this course the students use state-of-the-art CAD/CAM/CAE software and apply modern computational techniques to the solution of practical problems.*
- k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice:  
*Students are introduced to the latest high-end CAD system and understand how the available tools assist in creating designs in engineering practice.*

**Topics Covered:**

- ◆ Geometric modeling concepts and systems
- ◆ Construction, analysis, and interrogation of models
- ◆ Points, vectors, coordinate systems, views, and transformations
- ◆ Curves: models, representations, and applications
- ◆ Surfaces: models, representations, and applications
- ◆ Sketches, dimensions, and constraints
- ◆ Solids, features, and parametric design
- ◆ Assemblies and fits
- ◆ Drawings and annotations
- ◆ Geometric dimensioning and tolerancing (GD&T)
- ◆ Basic design analysis with Unigraphics