

**ME 444**  
**Computer-Aided Design and Prototyping**

**Course Outcomes** [Related ME Program Outcomes in brackets]

1. Understand the fundamental *feature-based parametric solid modeling*. [1]
2. Understand the fundamental *assembly and mechanism modeling*. [1]
3. Understand the fundamental *parametric curve and surface modeling*. [1]
4. Understand the principles of *rapid prototyping*. [1]
5. Understand the fundamental *finite element analysis*. [1]
5. Enhance *problem-solving* and *communication* skills through design projects. [1, 2, 3, 5, 6]

**Part Modeling Techniques (6 wks)**

1. Sketch and constraint system
2. solid modeling
3. feature-based parametric modeling
4. Parametric curves
5. Parametric surfaces
6. Advanced modeling

**Assembly, Mechanism and Rapid Prototyping (6 wks)**

1. Bottom-up assembly modeling
2. Mechanism modeling
3. Top-down skeleton
4. Rapid prototyping techniques
5. Design for rapid prototyping

**Finite Element Analysis (4 wks)**

1. Fundamentals of FEA
2. 1D elements
3. 2D elements
4. Design optimization using FEA

**Laboratory Activities**

- Live demonstrations on various CAD topics
- Hands-on practices with provided tutorials
- Workshop on freehand sketching
- Workshop on microprocessor and programing
- Workshop on mobile control
- A laser cutting project
- A racing car design project
- An action toy design project

**COURSE NUMBER:** ME 444

**COURSE TITLE:** Computer-Aided Design and Prototyping

**REQUIRED COURSE OR ELECTIVE COURSE:** Elective

**TERMS OFFERED:** Fall and Spring

**TEXTBOOK/REQUIRED MATERIAL:**

**PRE-REQUISITES:**

**COORDINATING FACULTY:**

**COURSE DESCRIPTION:** This course combines CAD techniques and strategies with design in teams. Students will design toys using inspiration-ideaation-imagination-iteration-implementation in a new innovation framework.

**COURSE OUTCOMES** [Related ME Program Outcomes in brackets]:

1. Understand the fundamental *feature based solid modeling*. [1]
  2. Understand the fundamental *assembly and mechanism modeling*. [1]
  3. Understand the fundamental *surface modeling*. [1]
  4. Understand the principles of *rapid prototyping*. [1]
  5. Understand the fundamental *finite element analysis*. [1]
5. Enhance *problem-solving* and *communication* skills through design projects.  
[1, 2, 3, 5, 6]

**ASSESSMENTS TOOLS:**

1. Homework assignments.
2. Mini design projects.
3. Quizzes.
4. A final action toy design project.

**NATURE OF DESIGN CONTENT:** The toy design project provides a scaffold for students to learn the machine design process holistically.

**RELATED ME PROGRAM OUTCOMES:**

1. Engineering fundamentals
2. Engineering design
3. Communication skills
4. Ethical/Prof. responsibilities
5. Teamwork skills
6. Experimental skills
7. Knowledge acquisition

**PROFESSIONAL COMPONENT:**

1. Engineering Topics: Engineering Science – 1 credit (40%)  
Engineering Design – 2 credits (60%)

**COMPUTER USAGE:** All the lab activities requir computers.

**COURSE STRUCTURE/SCHEDULE:**

1. Lecture - 1 day per week at 50 minutes
2. Laboratory - 2 days per week at 220 minutes.

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