ME170 Computer Aided Design
Course Outline/Syllabus

1. Course Description

This course teaches the primary methods and principles used by engineers today to define and describe the geometry and topology of engineered components. For centuries the principal method of communication between engineers and manufacturing has been the engineering drawing. Over recent times computer aided design/drafting (CAD) has evolved from a tool to aid in the preparation of drawings (2D CAD), to a method of fully defining and specifying a component, or assembly of components, in a mathematically robust geometric fully associative database (3D CAD or solid modeling). In this course, the students learn how to create these fully defined engineering models and how to correctly present them in standard 2D blueprint form (aka Engineering Drawings), 3D wireframe, 3D cosmetically shaded presentations and animations, meshed topologies for engineering analysis, and toolpath generation for component manufacture. PTC's Creo 3D CAD software is used throughout the course.

2. Course Specifics

Prerequisites:	None
Lecture:	Two 1 hr lectures per week.
Lab Section:	One 2 hr lab section per week
Computer Lab:	Engineering Workstation labs
Computer Software:	Creo 5.0
Course Book:	"Creo Parametric 5.0 Basic Design" by Steven G. Smith, publisher: CADquest

3. Course Topics

1. Design Process: Human Centered Design (HCD), 2D/3D freehand concept sketching, Product Design Specification (PDS), Concept Selection (Pugh), Rapid Prototyping/3D printing, Design for Manufacture (aPriori cost analysis)

2. CAD: 2D CAD, 3D wireframe, and 3D solids and surfaces

3. Basic Part modeling: setting up datum planes, defining the coordinate systems, feature selection, parent/child relationships, dimension driven 3D sketching (include. protrusions, revolving. extruding etc), visualization (hidden lines, shaded, and perspective views)

4. Complex Parts and Surfaces: Curved surfaces and blends, shelled/molded parts, adding ribs and bosses, creating parametric designs (include. variables, equations, forms and tables)

5. Detailing and Blueprint Creation: Orthographic projections, line and text forms, coordinate dimensioning and tolerancing principles and standards, geometric dimensioning and tolerancing (GD&T), section and part-section views, compliance with ANSI and ISO standards.

6. Assembly: Assembly constraints (mating planes and coordinates, aligning, orienting etc), exploded views, creating a Bill of Materials (BOM), interference and clearance checking, orthographic assembly drawings.

7. Engineering Property and File Creation: mass/volume properties, plot/print files, web file creation (jpg, VRML), data exchange (IGES, STL, DXF), Mesh files (FEA output), and Cutter Location Files (toolpath generation).

8. Introduction to Kinematics: Creo Mechanism Analysis (angular position and velocity plots); Creating Animations; simulating multi-axis joints, springs, servo and force motors.

9. Design Project: Design a small product or sub-assembly. Create part models for each part. Assembly models with exploded views, Bill of Materials (BOM), a full set of blueprints / engineering drawings and a physical prototype of one key part (on 3D printers).

Develop and give a computer presentation, and write a design project report.