Course Information

Time & Location:	Section A1 (Tuesday) & A2 (Thursday) 3:30-5:15 in EMB125 Section A3 (Tuesday) & A4 (Thursday) 6:30-8:15 in EMB125
Professor:	Scott Morris
Office hours:	Tuesday & Thursday 5:30-6:00 and by appointment
Contact:	semorris@bu.edu
Book (Required):	None

Software for Class:

- Solidworks Software access via Citrix, ME Computer Lab, personal Windows computer or personal Mac computer with Parallels
- Three Button Mouse with scroll wheel

Course Description

Focus on engineering modeling in 3D and technical drawing in 2D using advanced CAD tools. Hands-on course work will allow students to ideate and model mechanisms. Course will focus on design tools for subsequent classes and industrial best practices. Topics will include ideation, design of machine components, and introduction to design for prototyping, machining, manufacture, assembly and repair. 2 credits.

Prerequisites by topic: none

Course Goal

- Develop the ability to create three-dimensional engineering models and two-dimensional drawings using CAD
- Use dimensioning and tolerancing techniques to create manufacturable parts
- Conduct motion analysis of a mechanism
- Understand the connections between CAD design with prototyping, machining, manufacture, assembly, and repair

Course Learning Outcomes

Upon completing this course, students will be able to:

- Convey ideas through sketches and other graphical means
- Create and analyze solutions to design problems in accordance to professional standards
- Create two dimensional drawings incorporating basic conventions of geometric dimensioning and tolerancing of components and mechanisms using CAD
- Create three dimensional models of components and mechanisms using CAD
- Conduct a motion analysis of a mechanism
- Understand CAD practices that facilitate iteration and change
- Document and communicate a design process in written and oral form

Summary of Course Topics

1. **Design Process:** ideation, concept selection and sketching
2. **Basic Part modeling in CAD:** setting up datum planes, defining the coordinate systems, feature selection, parent/child relationships, dimension driven 3D sketching (*e.g.* protrusions, revolving and fillets etc), and visualization (*e.g.* hidden lines, shaded, and perspective views)
3. **Complex Parts and Surfaces:** Curved surfaces and blends, shelled/molded parts, adding ribs and bosses, and apply threads to holes
4. **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

5. **Assembly:** Assembly constraints (*e.g.* mating planes and coordinates, aligning, orienting etc), exploded views, creating a Bill of Materials (BOM), interference and clearance checking, and orthographic assembly drawings
6. **Engineering Documentation:** export/import of files, rendering, document control, and drawing printing
7. **Introduction to Kinematics:** Mechanism Analysis using CAD (*e.g.* angular position and velocity plots) and creating animations
8. **Introduction of Design for X:** Connection between design and prototyping, machining, manufacture, assembly and repair using BOM for costing analysis of a mechanism.

Course Assessment

- Grading (Total 100%)
  - Quizzes 40%
  - Project Assignments 50%
  - Class Participation 10%

Project Assignments

- Three project assignments will be given, and details will be discussed as they are assigned
- All assignments will be submitted via Blackboard
- Video of an assignment may be required to validate its operation
- Student solutions should be original; plagiarism will not be tolerated

Quizzes

- All quizzes will be given on Blackboard and will have the same deadline for all sections
- All Blackboard quizzes will offer two attempts
- Some quizzes may require the submission of a video

Drawings & Prints (For On-Campus Students only)

- Printed mechanical drawings may be required for class or the EPIC machine shop.
- For class, prints should be no smaller than a B size (11x17") paper. The BU print service, MyPrint, does not print B size paper. Do NOT tape together prints.
- B sized Prints or larger can be printed at FedEx Office Print & Ship Center, Boston University, 115 Cummington Mall, Boston, MA 02215 US https://local.fedex.com/ma/boston/office-5012/ B-size prints are self-serve and cost normal print charges (~0.50). Larger prints take longer and are more costly (~$5).

Class Participation

- Class participation is based on each student's professional, active and constructive participation in the solution of the example problems in class, responses to general questions and regular attendance of the class lectures. Remote students can show their attendance by actively participating on discussion boards.
- Each student MUST act in a professional manner to all students while in the classroom and for all group projects. Class discussions can be passionate and opinionated but should never make other students feel poorly. Bullying or belittling will not be tolerated. Attack the idea, not the person. Being able to take and give criticism is a skill and it will be developed in this class.
- BU's academic Conduct Code: http://www.bu.edu/academics/policies/academic-conduct-code

Course Schedule

Week	Tue	Thr	Topic	Solidworks Tutorials	Pro Tips & Videos	Quizzes	Assignments
0		09/03	NO CLASS				
1	09/08	09/10	**Design Process**	• Intro to Solidworks (1 hr)	• General Tips		
2	09/15	09/17	**Basic CAD Modeling 1**	• Lesson 1: Parts (30 min) • Fillet (45 min)	• Displaying weights • Changing units • Roll Back • Measuring distances • Creating axis	Quiz 1	
3	09/22	09/24	**Basic CAD Modeling 2**	• Revolves & Sweeps (30 min) • Lesson 3: Drawings (15 min) • Patterning Features (30 min)	• BU Drawing Templates • Patterning/Mirroring Parts • Hole Wizard	Quiz 2	
4	09/29	10/01	**Assembly 1**	• Lesson 2: Assemblies (45 min) • Toolbox (30 min)	• Patterning in Assembly	Quiz 3	
5	10/06	10/08	**Assembly 2**	• Assembly Mates (60 min)	• Pack&Go	Quiz 4	Project Part 1 Given
Columbus Day (Thursday becomes first class of the week)							
6	10/20	10/15	**Detailing & Blueprints 1**		• Section & Detailed Views • BOM		
7	10/27	10/22	**Detailing & Blueprints 2**	• Sheetmetal (20 min)	• Exploded Views • Ordinate Dimensions	Quiz 5	Project Part 1 Due Project Part 2 Given
8	11/03	10/29	**Complex Parts & Surfaces 1**	• PhotoView360 and Appearances (30 min)	• Materials & Appearance • Adv. Blend & Sweep • View Cross-X in Assembly	Quiz 6	
9	11/10	11/05	**Complex Parts & Surfaces 2**	• Lofts (30 min)		Quiz 7	
10	11/17	11/12	**Kinematics 1**	• Animation (30 min)		Quiz 8	Project Part 2 Due Project Part 3 Given
11	11/24	11/19	**Kinematics 2**			Quiz 9	
Thanksgiving (Begin remote classes & Tuesday becomes first class of the week)							
12	12/01	12/03	**Engineering Documentation**	• Import/Export (45 min)			
13	12/08	12/10	**Design**	• Project Part 3 due			Project Part 3 Due