

## Engineering Design and Development -- Core

### Overview

The primary intent of the course is to provide the student with the skills necessary to understand and interpret engineering drawings and working sketches. Also the student will learn to construct 3D models and engineering drawings using computer-aided design, CAD. In addition to working on developing spatial reasoning and technical drawing skills, students will develop technical writing skills and certain soft skills through journal article reflections, work ethic lessons, and oral presentations on various topics throughout the semester. The course will culminate with a 6-8 week long final project where students will work on teams to identify a problem, design a unique solution, create a prototype, then test the solution.

### Objectives

- Understanding the engineering design process
- Using graphics to accurately communicate information and design
- Sectioning and dimensioning multi-view drawings
- Visualizing in three dimensions
- Designing solid models.
- Creating and interpreting engineering drawings

### Assessment

Students will be assessed using homework assignments, quizzes, and exam as well as a final project.

### Course Essentials

Equipment	Cost/Unit
3D Printers (Makerbot Replicator)	<u>Reusable</u> : \$5,000 each, <u>Consumable</u> : filament (\$500 per year)
Solidworks 3D Modeling Software	\$3,500 (60 seats), \$1000 per year update
Computers to Run Software (Lenovo i7, NVIDIA Graphics card)	\$1,500 each (1 per student, 15 sets), \$0 if computer lab already established

### First Semester Course Outline

<b>Unit 1: Introduction to Design</b>	Engineering design process, Safety, Sketching
<b>Unit 2: Multi-views and Visualization</b>	Introduction to multi-views, Isometric view, Visualization in 2D and 3D
<b>Unit 3: Section Views</b>	Defining section views, Understanding the importance of section views
<b>Unit 4: Dimensioning</b>	Rules of dimensioning, Dimensioning non-standard views and holes
<b>Unit 5: Technical Communication</b>	Project design and engineering notebooks, Writing a good problem statement, Gantt charts, Scholarly journal article review, Professionalism and ethics, Work ethic, Grant writing, Patents
<b>Unit 6: Fundamentals of 3D printing</b>	Additive vs subtractive manufacturing, applications for 3D printing

### Second Semester Course Outline

<b>Unit 7: SolidWorks - Basics</b>	The basics of 3D modeling, sketches versus features
<b>Unit 8: SolidWorks – Editing and Mirroring</b>	Parametric modeling dimensions, Mirroring sketches and features
<b>Unit 9: SolidWorks – Advanced Modeling</b>	Linear and Circular Patterns, Revolved features and Shells, Lofts and Sweeps
<b>Unit 10: SolidWorks – Engineering Drawings</b>	Title Blocks, multi-views, sectional views, dimensioning
<b>Unit 11: SolidWorks - Assemblies</b>	Mating parts, inserting BOM, inserting balloons and part names
<b>Unit 12: Final Project</b>	Define, Research, Design, and Prototype Solution, 3D print and test solution, Present final solution