Engineering Design and Development

Overview The primary intent of the course is to provide the student with the skills necessary to understand and interpret 3D models and engineering drawings. To do this, the student will learn to apply design intent to construct 3D models using computer-aided design and document their design intent through a design rationale and engineering drawings. In addition to working on developing spatial reasoning and technical drawing skills, students will develop technical writing and oral presentations skills as they discover various topics throughout the semester. The course will culminate with a 6-8 week long final project where students will work in teams to identify a problem, design a unique solution, create a prototype, then test the solution.

Objectives

- Understanding the design intent
- 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.

Equipment	**Cost/Unit**
Inventor 3D Modeling Software	$0 for Educational Use
Computers to run Inventor	$500 each ($0 if you already have computers). Must come with a mouse (not a tracking/touchpad)
Autodesk Inventor Certified User Exam *Advanced Statewide Industry Based Credential*	$80/student
3D Printers (Makerbot Replicator recommended) *Purchase is optional*	Reusable: $3,000 each,purchase 1 per 7-10 students - Less expensive 3D printer options are available Consumable: filament ($500 per year)

First Semester Course Outline

Unit 1: Introduction to Design	Engineering design process, Safety, Sketching
Unit 2: Multiviews	Introduction to multi-views, Isometric view
Unit 3: Visualization	Visualization in 2D and 3D
Unit 4: Inventor – Basics	The basics of 3D modeling, sketches versus features
Unit 5: Inventor – Intermediate Part 1	Parametric modeling dimensions, Mirroring sketches and features
Unit 6: Inventor – Intermediate Part 2	Linear and Circular Patterns, Revolved features and Shells, Machined holes

Second Semester Course Outline

Unit 7: Section Views and Working Drawings (Paper and Inventor)	Defining section views, Understanding the importance of section views, Title Blocks, multi-views, sectional views, dimensioning
Unit 8: Dimensioning (Paper and Inventor)	Rules of dimensioning, Dimensioning non-standard views and holes
Unit 9: Inventor - Advanced Modeling	Lofts, Ribs, and Sweeps
Unit 10: Inventor - Assemblies and Exploded Views	Mating parts, inserting BOM, inserting balloons and part names
Unit 11: Final Project	Define, Research, Design, and Prototype Solution, 3D print and test solution, Present final solution, Project design and engineering notebooks, Writing a good problem statement, Gantt charts, Scholarly journal article review, Professionalism and ethics, Work ethic, Patents

ENGINEERING DESIGN AND DEVELOPMENT

1. Materials
   A desktop or laptop computer, access to 1-to-1 daily, and Internet. Chromebooks will not work.

Hardware/Reusable Material	Recommended Unit	Cost/Unit
3D Printer (Optional)	1 per 5-7 students	Varies*
Software (Each student needs access to a computer)		
Autodesk Inventor (2020 or Latest version)	1 License per student	Free

*There are a variety of 3D printers from $500 up to $5,000. Purchase the one that best suits the needs of your school and students

2. Required software, networking access, and access to LSU servers
   - Teachers will need to be able to share documents via Google drive with instructors.
   - Free software to install on each computer: Autodesk Inventor 2020 or higher
3. Required teacher collaborations
   Teachers will communicate with LSU instructors via email and shared Google Drive folder.
4. Required administration of course content, pre/post test, and research instruments
   All required materials and instruments will be either posted in a Google drive or their location announced via the Google group for this course. Schools will need to coordinate with the Career Tech Education Manager to schedule the Inventor Industry Based Certification Exam issue through Certiport.
5. Other
   As this is a project-based learning class, we strongly suggest that each section of the course be limited to a *maximum* of 20 students. If the course is overloaded with students, they will not receive adequate instruction.