

Introduction to Engineering Design-PLTW

Course Syllabus 2015-2016

COURSE DESCRIPTION

Are you someone who wishes things were designed better, worked better, or were just easier to use? Have you ever had an idea that you think would make life easier? Do you like puzzles and challenges or seeing how things work? Are you a creative problem solver? If you can answer yes to any of these questions, then this is the class for you.

IED is the first course in the Pre-Engineering Program at the Walker Career Center. This course focuses on taking a need and finding (engineering) a solution to it. You will learn how to use a 3D modeling software package to bring your ideas to life. This software will allow you to present and animate your design just like a professional engineer. You will have the opportunity to work on a wide variety of real life scenarios as you enter the exciting world of design and engineering. Students who take this course will have the opportunity to earn dual college credits.

COURSE OBJECTIVES

Upon the successful completion of this course, the student will be able to:

- Apply engineering notebook standards and protocols when documenting student work.
- Identify and apply group brainstorming techniques and the rules associated with brainstorming.
- Research a product's history, develop a PowerPoint presentation, list chronologically the major innovations to a product, and present findings to a group.
- Identify the design process steps used in given scenarios and be able to list the steps, if any are missing.
- Identify, sketch, and explain the function of points, construction lines, object lines, and hidden lines.
- Sketch an isometric view of simple geometric solids.
- Sketch one, two, and three-point perspectives and multiview drawings of simple geometric solids.
- Convert linear distance measurements from inches to millimeters and vice versa.
- Brainstorm and sketch possible solutions to an existing design problem.
- Select an approach that meets or satisfies the constraints given in a design brief.
- Create simple extruded solid Computer Aided Design (CAD) models from dimensioned sketches.
- Generate dimensioned multiview drawings from simple CAD models.
- Measure and Fabricate parts for a functional prototype from the CAD multiview drawings.
- Apply geometric and numeric constraints to assemble the product using the CAD modeling software.
- Test and evaluate the prototype and record results.
- Calculate the area of simple geometric shapes.
- Calculate the surface area and volume of simple geometric forms.
- Identify algebraic relationships between the dimensional values of a given object.
- Brainstorm and sketch possible solutions to an existing design problem.
- Create a decision making matrix.
- Explain the concept of fluid power, and the difference between hydraulic and pneumatic power systems
- Identify visual design principles & explain how they were used to manipulate design elements within a given object.
- Explain what aesthetics is, and how it contributes to a design's commercial success.
- Identify the reasons why engineers perform reverse engineering on products.
- Describe the function of a given manufactured object as a sequence of operations through visual analysis and inspection (prior to dissection).
- Describe the differences between joinery, fasteners, and adhesives.

- Use dial calipers to precisely measure outside and inside diameter, hole depth, and object thickness.
- Assign a density value to a material, and apply it to a given solid CAD model.
- Perform computer analysis to determine mass, volume, and surface area of a given object.
- Identify the five steps of a product's lifecycle and investigate and propose recyclable uses for the material once the lifecycle of the product is complete.
- Explain why teams of people are used to solve problems.
- Identify group norms that allow a virtual design team to function efficiently.
- Establish file management and file revision protocols to ensure the integrity of current information.
- Identify strategies for addressing and solving conflicts that occur between team members.
- Create a Gantt chart to manage the various phases of their design challenge.

REQUIRED TEXT & MATERIALS

Engineering Design: An Introduction, 2nd Edition, 2012. Cengage. ISBN: 13: 9781111645823

EVALUATION CRITERIA

- Notebook – 25 points per week
- Daily assignments – 50 points
- Projects / Activities – 100 points per week of work
- Quizzes – 100 points
- Tests – 200 points
- Final Exam – 30% of Semester Grade

MSD Warren Township Grade Scale

100-92.5=A
 92.4-89.5=A-
 89.4-86.5=B+
 86.4-82.5=B
 82.4-79.5=B-
 79.4-76.5=C+
 76.4-72.5=C
 72.4-69.5=C-
 69.4-66.5=D+
 66.4-62.5=D
 62.4-59.5=D-
 Below 59.5=F

COURSE OUTLINE

Unit 1 Introduction to Design

- Intro to a Design Process
- Intro to Technical Sketching
- Measurement and Statistics
- Puzzle Cube Design

Unit 3 Reverse Engineering

- Visual Analysis
- Functional Analysis
- Structural Analysis

Unit 5 Simple Machines & Structures

- Intro to Simple Machines
- Intro to Structures

Unit 2 Design Solutions

- Geometric Shapes and Solids
- Dimensions and Tolerances
- Advanced Modeling Skills
- Advanced Designs

Unit 4 Design Problems

- Engineering Design Ethics
- Design Teams

Unit 6 Control Systems

- Intro to Inputs and Outputs
- Intro to Basic Programming