

Northland Pines High School

Department: Technology and Engineering Education

Name of Class: Introduction to Engineering Design - IED (www.pltw.org)

Room Number: 1109

Instructor: Mr. Fuller

PLTW Certification: Students must meet the following requirements to receive PLTW certification:

- Completed Portfolio (must have a 3-ring binder)
- Completed Engineering Notebook (must have a spiral notebook)
- Minimum of 80% on class work
- Minimum of 70% on national final exam

Course Description:

Ever tried to design something new or draw up an idea you wanted to share with your friends and wondered how you could communicate your idea? Or, have you wondered how someone designed that new MP3 player or sleek new phone? Then Introduction to Engineering Design™ is the course for you. The major focus of the course is learning how to take an idea through a design process that will eventually be manufactured or produced. As you learn about various aspects of engineering and engineering design, such as how engineers communicate through drawing, you will apply what you learn through various activities, projects, and problems. For example, after learning about the different techniques engineers use in determining how to design a product, you and your teacher will have the flexibility to explore the design and engineering processes to solve problems that are of interest to you. The course covers the following:

- The Role of an Engineer
- The Design Process
- Product Design
- Product Analysis and Improvement
- Designing as an Engineer

In addition, you will use Inventor, which is a state of the art 3-D design software package from AutoDesk, to help you design solutions to different design projects. Working in teams, you will learn about documenting your solutions, solving problems, and communicating your solutions to other students and members of the professional community of engineering and engineering design.

Course Outline:

Unit 1: Design Process

Lesson 1.1 Introduction to a Design Process

- 1.1.1 Basic Design Tools
- 1.1.2 Introduction to Research
- 1.1.3 Modeling

Lesson 1.2 Introduction to Technical Sketching and Drawing

- 1.2.1 Basic Line Conventions
- 1.2.2 Pictorial Sketches
- 1.2.3 Introduction to Multiview Drawings

Lesson 1.3 Measurement and Statistics

- 1.3.1 History of Measurement
- 1.3.2 English and Metric Linear Measurements
- 1.3.3 Dial Caliper Measurement
- 1.3.4 Linear Dimensions
- 1.3.5 Applied Statistics

Lesson 1.4 Puzzle Cube

- 1.4.1 Puzzle Design Challenge
- 1.4.2 Puzzle Part Combinations
- 1.4.3 Packaging Design
- 1.4.4 Marketing

Unit 2: Design Exercises

Lesson 2.1 Geometric Shapes and Solids

- 2.1.1 Geometric Shapes
- 2.1.2 Geometric Solids
- 2.1.3 Calculating Area
- 2.1.4 Calculating Properties
- 2.1.5 CAD Fundamentals
- 2.1.6 Modeling Creation

Lesson 2.2 Dimensions and Tolerances

- 2.2.1 Dimensioning Conventions
- 2.2.2 Tolerancing

Lesson 2.3 Advanced Modeling Skills

- 2.3.1 Parameters
- 2.3.2 Auxiliary Views
- 2.3.3 Section Views
- 2.3.4 Feature-Based Solid Modeling
- 2.3.5 Assembly Modeling
- 2.3.6 Assembly Drawing Standards
- 2.3.7 Exploding Assemblies
- 2.3.8 Assembly Animation

Lesson 2.4 Advanced Designs

- 2.4.1 Advanced Designs
- 2.4.2 Design Process
- 2.4.3 Teamwork
- 2.4.4 Decision Matrix
- 2.4.5 Revision Blocks
- 2.4.6 Assembly Drawing Standards

Unit 3: Reverse Engineering

Lesson 3.1 Visual Analysis

- 3.1.1 Visual Design Elements
- 3.1.2 Visual Design Principles
- 3.1.3 Composition
- 3.1.4 Advertising
- 3.1.5 Graphic Design

Lesson 3.2 Functional Analysis

- 3.2.1 Identifying Subsystems
- 3.2.2 System Analysis

Lesson 3.3 Structural Analysis

- 3.3.1 Structural Connections
- 3.3.2 Precision Measurement

- 3.3.3 Material Analysis
- 3.3.4 Property Analysis

Lesson 3.4 Product Improvement by Design

- 3.4.1 Researching Product History and Evolution
- 3.4.2 Product Innovation
- 3.4.3 Problem Identification
- 3.4.4 Writing a Design Brief
- 3.4.5 Brainstorming
- 3.4.6 Design Critique
- 3.4.7 Technical Report

Unit 4: Open-Ended Design Problems

Lesson 4.1 Engineering Design Ethics

- 4.1.1 Human Impacts
- 4.1.2 Product Lifecycle
- 4.1.3 Recycling
- 4.1.4 Design For Disassembly (DFD)
- 4.1.5 Environmental Protection Agency (EPA)
- 4.1.6 Occupational Safety and Health Administration (OSHA)

Lesson 4.2 Design Teams

- 4.2.1 Teamwork
- 4.2.2 Project Planning
- 4.2.3 Assessment
- 4.2.4 Meetings
- 4.2.5 Virtual Teams

*LATE WORK: Any assignments that are turned in late will lose **50% Credit**. If you have an excused absence, you will be allowed that same amount of time to make up the work for full credit. Ex: If you were gone 2 days, you would have 2 days to make up the work for full credit.

* MUST HAVE: A 2-3" 3-ring binder and a spiral notebook dedicated specifically for class (will need to be turned in periodically).

*3rd Tardy = a detention

❖ Please note: This class is project oriented and grades may not be posted on the parent portal on a weekly basis. In addition dues dates may seem different in relation to other classes. Thank you for your understanding.