Lesson 2.4 – Advanced Designs

Concepts

1. Design solutions are created while working in teams and sometimes as an individual.
2. Engineers use design briefs to explain the problem, identify solution expectations, and establish project constraints.
3. Teamwork requires constant communication to achieve the goal at hand.
4. Engineers conduct research to develop their knowledge base, stimulate creative ideas, and make informed decisions.
5. Engineers use a design process to create solutions to existing problems.
6. Engineers use computer-aided design (CAD) modeling systems to quickly generate and annotate working drawings.
7. Fluid Power Concepts could be used to enhance design solutions.
8. The use of fluid power, hydraulics and pneumatics is used as an enhancement to solving problems with electrical control systems.

Performance Objectives

It is expected that students will:

- Brainstorm and sketch possible solutions to an existing design problem.
- Create a decision making matrix.
- Select an approach that meets or satisfies the constraints given in a design brief.
- Create solid computer-aided design (CAD) models of each part from dimensioned sketches using a variety of methods.
- Apply geometric numeric and parametric constraints to form CAD modeled parts.
- Generate dimensioned multiview drawings from simple CAD modeled parts.
- Assemble the product using the CAD modeling software.
- Explain what constraints are and why they are included in a design brief.
- Create a three-fold brochure marketing the designed solution for the chosen problem, such as a consumer product, a dispensing system, a new form of control system, or extend a product design to meet a new requirement.
- Explain the concept of fluid power, and the difference between hydraulic and pneumatic power systems

Essential Questions

1. What is a design brief?
1. Why is a design process so important to follow when creating a solution to a problem?
2. What is the purpose of design constraints?

3. What is a decision matrix and why is it used?
4. What does consensus mean, and how do teams use it to make decisions?
5. How are visual design principles and elements used to capture a consumer's attention?
6. How is the design of a consumer product different then the design of a product used to help a manufacturing process?
7. What is fluid power?
8. What is the difference between hydraulic and pneumatic power systems?
9. How does the use of fluid power aid the use of electronics or other power systems?

Key Terms

Accuracy	**Assembly**	**Assembly Drawing**
Component	**Consensus**	**Constraint**
Decision Matrix	**Design Brief**	**Design Process**
Design Statement	**Designer**	**Fluid Power**
Hydraulics	**Marketing**	**Multiview Drawing**
Pneumatics	**Problem Statement**	**Purpose**
Solid Modeling	**Target Consumer**	**Team**

Instructional Resources

PowerPoint Presentations

- Teamwork
- Fluid Power
- Decision Making Matrix

Word Documents

- **Project 2.4.1 Design Challenge**
- Project 2.4.1 Design Challenge Rubric
- **Lesson 2.4 Key Terms and definitions in Excel**
- Decision Matrix Template in Word
- Decision Matrix Template in Excel
- Isometric graph paper
- Orthographic graph paper

Reference Sources

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