Odysseyware®

CURRICULUM OVERVIEW

Engineering and Design

Career and Technical Education Series

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Engineering and Design Course Overview

Engineering and Design is part of the STEM (Science, Technology, Engineering, and Mathematics) education and career path. By building real-world problem-solving and critical thinking skills, students learn how to innovate and design new products and improve existing products. Students are introduced to the engineering design process to build new products and to the reverse engineering process, which enables engineers to adjust any existing product. Students will also address how fluid power is used by engineers to make difficult maneuvers easier, increasing efficiency and minimizing effects on the environment. Students then identify how engineering and design have a direct impact on the sustainability of our environment and the greening of our economy. Finally, students incorporate the engineering design process, environmental life cycle, and green engineering principles to create a decision matrix to learn how to solve environmental issues.

- **Introduction to Engineering and Design and the Design Process**: In this unit, students learn about how design opportunities exist everywhere around them.
- **Fluid Systems: Energy and Power Technologies in Engineering**: This unit demonstrates how engineers use fluid systems to transfer power and force from one location to another.
- **Modeling and Sketching**: This unit demonstrates that engineering design is a process that involves drawing and modeling to develop solutions to problems within given constraints.
- **Reverse Engineering**: This unit introduces the concept of reverse engineering, which is a critical part of the process in the redesign of products.
- **Engineering to Improve Sustainability**: This unit explains the importance of the human and global impact of various engineering designs and products.

Engineering and Design

Unit 1: Introduction to Engineering and Design and the Design Process

Assignments

1. Course Overview
2. Design Opportunities All Around Us
3. Design Improvements
4. Project: Creating a Product Discussion Forum
5. Improvements of Everyday Items
6. Project: Model or Prototype Suggestion Presentation
7. Quiz 1: Introduction to Design Opportunities
8. Basic Engineering Concepts
9. Choosing Materials for Design
10. Project: Researching Materials Designs
11. Application of Materials
12. Project: Designing a Destructive Test
13. Quiz 2: Fundamentals of Engineering
14. Special Project*
15. Test
16. Course Project Part 1: Identifying the Product or Process*
17. Glossary and Credits

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Unit 2: Fluid Systems: Energy and Power Technologies in Engineering

Assignments

1. Fluid Power Systems
2. Fluid Power Devices
3. Project: Researching a Fluid Power System Goal
4. Designing Fluid Power Systems for Future Developments
5. Project: Creating a Fluid Power System for the Future
6. Quiz 1: Introduction to Fluid Power
7. Common Applications for Fluid Power Systems
8. Project: Identifying Fluid Power in Daily Life
9. Efficient Fluid Power Designs
10. Designing a Fluid Power Lifting System
11. Project: Designing a Fluid Power Lift System
12. Quiz 2: Fluid Power Applications and Capabilities
13. Special Project*
14. Test
15. Course Project Part 2: Incorporating a Fluid Power System*
16. Glossary and Credits

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Unit 3: Modeling and Sketching

Assignments

1. Introduction to Technical Sketching and Drawing
2. Project: Interview an Engineer About Sketching
3. Geometric Shapes and Solids in Engineering
4. Drawing to Scale
5. Project: Creating a Technical Sketch of an Everyday Object to Scale
6. Quiz 1: Introduction to Design and Technical Sketches
7. The Applications for Modeling in Engineering
8. Modeling and Prototypes
9. Project: Researching Model Uses in Remote or Dangerous Locations
10. Designing a Sketch Model
11. Project: Presenting a Sketch Model of a Designed Pet Toy
12. Quiz 2: Sketch Modeling
13. Special Project*
14. Test
15. Course Project Part 3: Designing a Sketch Model*
16. Glossary and Credits

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Unit 4: Reverse Engineering

Assignments

1. Reverse Engineering: Visual Analysis
2. Reverse Engineering: Functional Analysis
3. Project: Creating a Function Structure Diagram or Product Teardown Chart
4. Reverse Engineering: Structural Analysis
5. Project: Creating a Morphological Matrix
6. Quiz 1: Introduction to Reverse Engineering
7. Finding the Product: The Reverse Engineering and Design Process Applied
8. Implementing the Procedure: Reverse Engineering a Product
9. Project: Reverse Engineering Documentation and Presentation
10. Calculating the Process: Materials, Time, and Cost for Improvement
11. Project: Researching Materials, Time, and Cost for Product Modifications
12. Quiz 2: Using Reverse Engineering for Product Improvement
13. Special Project*
14. Test
15. Course Project Part 4: Calculating the Process: Materials, Time, and Cost Analyses*
16. Glossary and Credits

Engineering and Design

Unit 5: Engineering to Improve Sustainability

Assignments

1. Environmental Engineering Introduction
2. Project: Researching a Local Sustainability Issue
3. Energy and Air Quality
4. Green Buildings and Green Initiatives
5. Project: LEED Ratings for Building Construction
6. Quiz 1: Introduction to Environmental Engineering
7. Environmental Assessment and Impacts
8. Project: Researching Life Cycles for Assessment
9. Green Design Principles: Systems and Environment
10. Incorporating Green Engineering Principles
11. Project: Creating a Decision Matrix for an Environmental Issue
12. Quiz 2: Environmental Life Cycle and Green Engineering Design
13. Special Project*
14. Test
15. Course Project Part 5: Incorporating Green Engineering Principles*
16. Glossary and Credits

E&D

Unit 6: Course Project, Review, and Exam

Assignments

1. Course Project Part 6: Conducting a Life Cycle Analysis*
2. Review
3. Exam

(*) Indicates alternative assignment