

Introduction to Engineering Design Topical Outline

Unit 1: Design Process (10 weeks)

Lesson 1.1 Introduction to a Design Process (11 days)

- 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 (11 days)

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

Lesson 1.3 Measurement and Statistics (10 days)

- 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 (17 days)

- 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 (10 weeks)

Lesson 2.1 Geometric Shapes and Solids (10 days)

- 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 (9 days)

2.2.1 Dimensioning Conventions

2.2.2 Tolerancing

Lesson 2.3 Advanced Modeling Skills (19 days)

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 (12 days)

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 (9 weeks)

Lesson 3.1 Visual Analysis (8 days)

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 (4 days)

3.2.1 Identifying Subsystems

3.2.2 System Analysis

Lesson 3.3 Structural Analysis **(15 days)**

- 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 **(16 days)**

- 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 (7 weeks)

Lesson 4.1 Engineering Design Ethics (8 days)

- 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 (25 days)

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