

# Introduction to Engineering Design™ Topical Outline

## **Unit 1: Design Process**

- Lesson 1.1 Introduction to a Design Process
- Lesson 1.2 Introduction to Technical Sketching and Drawing
- Lesson 1.3 Measurement and Statistics
- Lesson 1.4 Puzzle Cube

## **Unit 2: Design Exercises**

- Lesson 2.1 Geometric Shapes and Solids
- Lesson 2.2 Dimensions and Tolerances
- Lesson 2.3 Advanced Modeling Skills
- Lesson 2.4 Advanced Designs

## **Unit 3: Reverse Engineering**

- Lesson 3.1 Visual Analysis
- Lesson 3.2 Functional Analysis
- Lesson 3.3 Structural Analysis
- Lesson 3.4 Product Improvement By Design

## **Unit 4: Open-Ended Design Problems**

- Lesson 4.1 Marketing and Graphic Design
  - Lesson 4.2 Engineering Design Ethics
  - Lesson 4.3 Design Teams
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# Principles of Engineering™

## **Unit 1: Definition and Types of Engineering**

- Lesson 1.1 Engineers as Problem Solvers
- Lesson 1.2 Engineering Team
- Lesson 1.3 Careers in Engineering

## **Unit 2: Communication and Documentation**

- Lesson 2.1 Sketching
- Lesson 2.2 Technical Writing
- Lesson 2.3 Data Representation and Presentation
- Lesson 2.4 Presentations

## **Unit 3: Design Process**

- Lesson 3.1 Design Process

## **Unit 4: Engineering Systems**

- Lesson 4.1 Mechanisms
- Lesson 4.2 Thermodynamics
- Lesson 4.3 Fluid Systems
- Lesson 4.4 Electrical Systems
- Lesson 4.5 Control Systems

## **Unit 5: Statics and Strength of Materials**

- Lesson 5.1 Statics
- Lesson 5.2 Strength of Materials

## **Unit 6: Materials and Materials Testing in Engineering**

- Lesson 6.1 Categories of Materials
- Lesson 6.2 Properties of Materials
- Lesson 6.3 Production Processes
- Lesson 6.4 Quality Assurance
- Lesson 6.5 Material Testing

## **Unit 7: Engineering for Reliability**

- Lesson 7.1 Reliability
- Lesson 7.2 Case Studies

## **Unit 8: Kinematics**

- Lesson 8.1 Linear Motion
- Lesson 8.2 Trajectory Motion

# Digital Electronics™ Topical Outline

## Unit 1: Fundamentals

- Lesson 1.1 Safety
- Lesson 1.2 Basic Electron Theory
- Lesson 1.3 Prefixes, Engineering Notation
- Lesson 1.4 Resistors
- Lesson 1.5 Laws
- Lesson 1.6 Capacitance
- Lesson 1.7 Analog and Digital Waveforms
- Lesson 1.8 Obtaining Data Sheets

## Unit 2: Number Systems

- Lesson 2.1 Conversions

## Unit 3: Gates

- Lesson 3.1 Logic Gates

## Unit 4: Boolean Algebra

- Lesson 4.1 Boolean Expressions
- Lesson 4.2 Logic Simplifications
- Lesson 4.3 Duality of Logic Functions

## Unit 5: Combinational Circuit Design

- Lesson 5.1 Paradigm for Combinational Logic Problems
- Lesson 5.2 Specific Application MSI Gates
- Lesson 5.3 Programmable Logic Devices (PLD)

## Unit 6: Adding

- Lesson 6.1 Binary Addition

## Unit 7: Flip-Flops

- Lesson 7.1 Introduction to Sequential Logic
- Lesson 7.2 The J-K Flip-Flop

Lesson 7.3 Triggers  
Lesson 7.4 Flip-Flop Timing Considerations  
Lesson 7.5 Elementary Applications of Flip-Flops

## **Unit 8: Shift Registers and Counters**

Lesson 8.1 Shift Registers  
Lesson 8.2 Asynchronous Counters  
Lesson 8.3 Synchronous Counters

## **Unit 9: Families and Specifications**

Lesson 9.1 Logic Families

## **Unit 10: Microprocessors**

Lesson 10.1 Microcontrollers  
Lesson 10.2 Interfacing with Motors

## **Unit 11: Student Directed Study Topic**

Lesson 11.1 Student Directed Study Topic

# Civil Engineering and Architecture – Topical Outline

## **Unit 1: Overview of Civil Engineering and Architecture**

**Lesson 1.1: Civil Engineering and Architecture Overview**

## **Unit 2: Introduction to Projects**

**Lesson 2.1: Overview of Project Design**

**Lesson 2.2: Project Documentation**

## **Unit 3: Project Planning**

**Lesson 3.1: Site Information**

**Lesson 3.2: Development Options, Selection of Project, and Revisiting**

## **Unit 4: Site Planning**

**Lesson 4.1: Description of Property**

**Lesson 4.2: Site Plan Requirements**

**Lesson 4.3: Site Plan Layout**

**Lesson 4.4: Public Ingress and Egress**

**Lesson 4.5: Site Grading**

**Lesson 4.6: Utilities**

**Lesson 4.7: Landscaping**

**Lesson 4.8: Water Supply and Wastewater Management**

## **Unit 5: Architecture**

**Lesson 5.1: Architectural styles**

**Lesson 5.2: Floor Plans**

**Lesson 5.3: Energy Systems**

**Lesson 5.4: Elevations**

**Lesson 5.5 Sections and Details**

**Lesson 5.6: Schedules**

**Lesson 5.7: Mechanical, Electrical, and Protection Systems**

## **Unit 6: Structural Engineering**

**Lesson 6.1: Introduction to Structural Engineering**

**Lesson 6.2: Roof Systems**  
**Lesson 6.3: Columns and Beams**  
**Lesson 6.4: Foundations**

## **Unit 7: Presentations and Reviews**

**Lesson 7.1: Critiques and Reviews**  
**Lesson 7.2: Final Presentations**