

The slide features a dark blue background with several overlapping gears of varying sizes and shades of blue. On the left side, there is a vertical strip with a colorful, abstract pattern of orange, yellow, and brown, resembling a gear or a mechanical part.

# Engineering Design

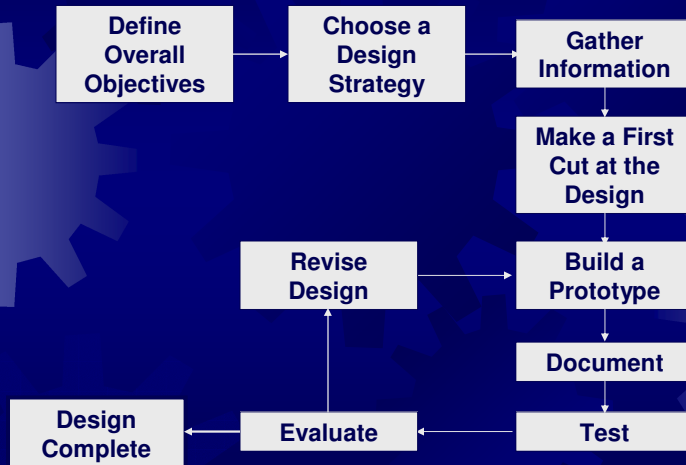
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## What is Design?

- Design: the arrangement of parts, details, form, color, etc. so as to produce a skillful invention
- Engineers make designs of
  - Devices
  - Structures
  - Systems

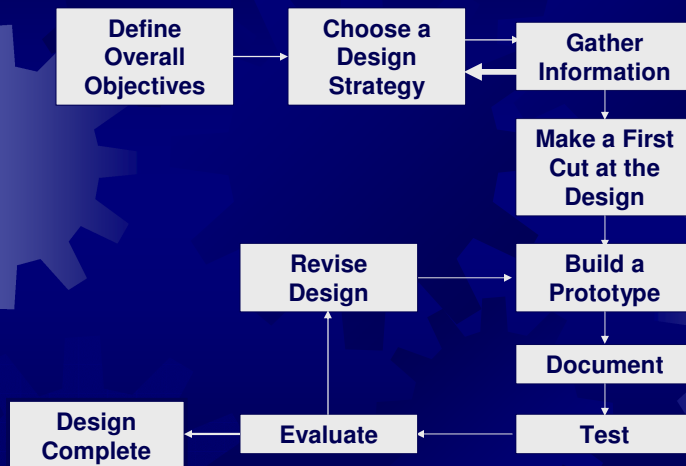
...Functional things

# Design Cycle



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# Design Cycle



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## Define Overall Objectives

*What are we trying to accomplish?*

- ☀ Describe Problem
  - Consider customers' needs
  - Be specific

*How will we know if we have achieved our goal?*

- ☀ Performance Measures
  - Quantitative
  - Relevant

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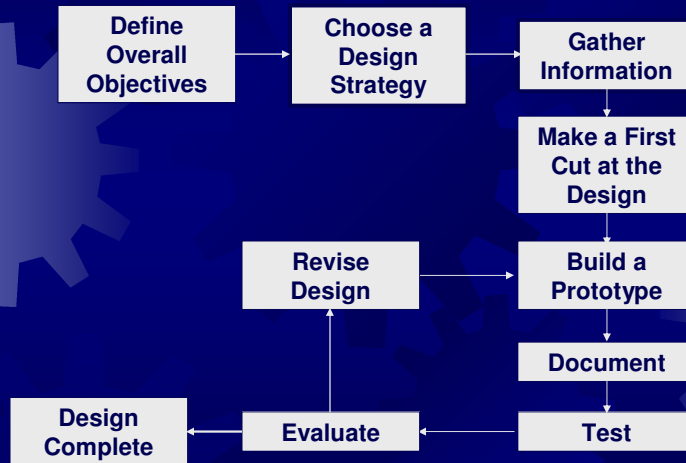
## General Design Objectives

Completed design should:

- Work reliably
- Meet technical requirements
- Meet cost requirements
- Require minimal maintenance
- Be safe
- Be ethical

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# Design Cycle



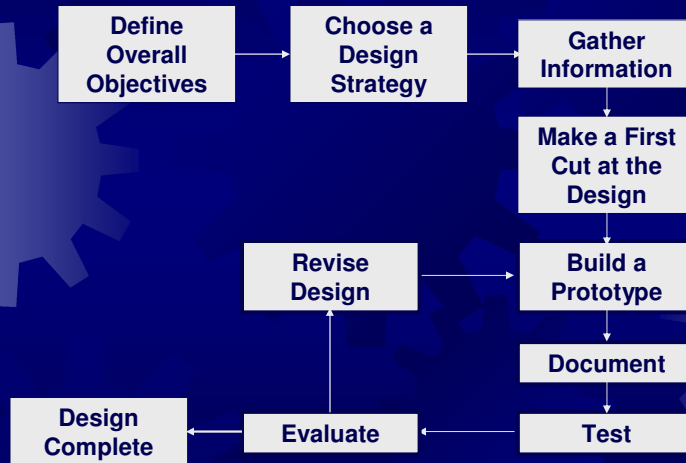
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# Preliminary Design

- ☀ Choose a Strategy
  - List all possible solutions
    - Brainstorm
    - Quantity of ideas, not quality
  - Decide on best approach
    - Most likely to meet objectives
- ☀ Gather Information
  - Options
  - Performance
  - Costs

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# Design Cycle



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# Analysis and Testing

## ☀ Analysis

- Application of science, physics, & technology
- Use formulas to demonstrate design's feasibility

## ☀ Build a Prototype

- Physical Model
- Computer Model

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# Design Documentation

- ☀ Documents
  - Block Diagrams
  - Specifications
  - Flowcharts
  - Commented Code
  - Testing Procedures
  - Change-Order Log
  - Schematics
  - Bill-of-Materials

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# Testing and Evaluation

- ☀ Testing
  - Operate under actual conditions
  - Record data about performance
- ☀ Evaluate
  - Compare to objectives
  - Identify weaknesses

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## Revising

- Need to eliminate weaknesses
  - Change design
  - New prototype
  - Retest
  - Re-evaluate
- Repeat until design is satisfactory

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