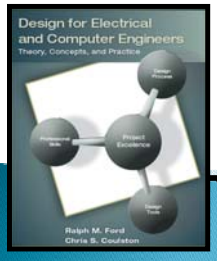
Chapter 1 – The Engineering Design Process



Motivation – Let's fill in the blanks [Source: Ullrich & Eppinger]

	Stanley Screwdriver	HP DeskJet Printer	VW Beetle
Annual Production Volume			
Sales lifetime			
# parts			
Development time			
Development team			
Development cost			
Production investment			

And the answers are …

	Stanley Screwdriver	HP DeskJet Printer	VW Beetle
Annual Production Volume	100,00	4 million	100,000
Sales lifetime	40 years	2 years	6 years
# parts	3	200	10,000
Development time	1 year	1.5 years	3.5 years
Development team	6	175	1,600
Development cost	$150K	$50 million	$400 million
Production investment	$150K	$25 million	$500 million

Chapter 1 – Learning Objectives

By the end of this chapter, you should:

- Understand what is meant by engineering design.
- Understand the phases of the engineering design process.
- Be familiar with the attributes of successful engineers.
- Understand the objectives of this book.

ABET Definition of Engineering Design

Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and engineering sciences are applied to convert resources optimally to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing, and evaluation. [ABET]

1.1 Engineering Design Processes

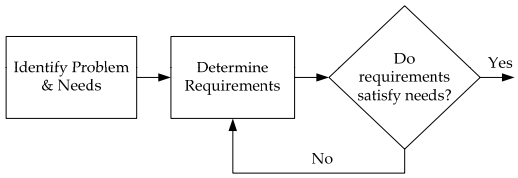
What is a design process?

General types of design processes

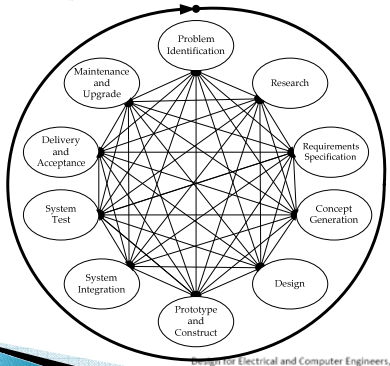
Prescriptive

Descriptive

A Prescriptive Process



A Descriptive Process

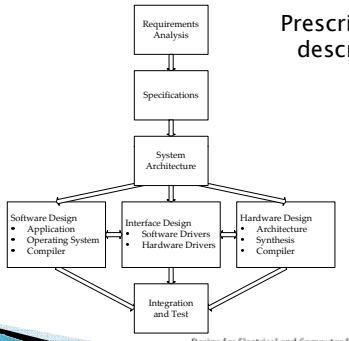


VLSI Design Process

Is this prescriptive or descriptive?

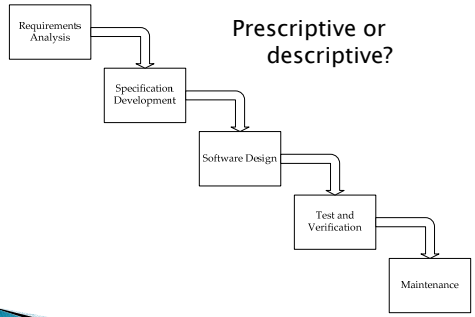
Embedded Systems Design Process

Prescriptive or descriptive?



Waterfall Software Development

Prescriptive or descriptive?

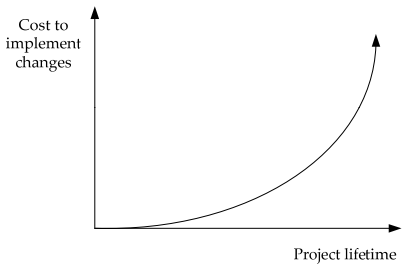


Design Processes – WHO CARES?

What is the value of the design process?

How much does it cost to correct problems as process proceeds?

Cost to Implement Changes



Design Process – this book

- Problem ID & customer needs (Ch 2)
- Research/Problem Analysis (Ch 2)
- Requirements Specification (Ch 3)
- Concept Generation & Evaluation (Ch 4)
- Design Phase (Ch 5, 6, & 8)
- Prototype, Construct, & Test (Ch 7)

Other material in the Chapter

- Penn State World-Class Engineer Description.
- Overview of the book.

1.4 Summary

- Engineering design is an iterative process.
- Design problems are open-ended with many potential solutions.
- Design processes represent best practices for realizing a system.
- Design processes may be prescriptive or descriptive.