



Sustainable Engineering Design

CSE 5408 – California State University, San Bernardino – CSUSB

Review:

Computer Engineering Design
Process

Lab Schedule

Activities

➤ This Week

- Introduction, Syllabus, recap (Chapter 1-5) and expectations
- Team-Instructor meetings on Wednesday, Jan. 26th

Due dates:

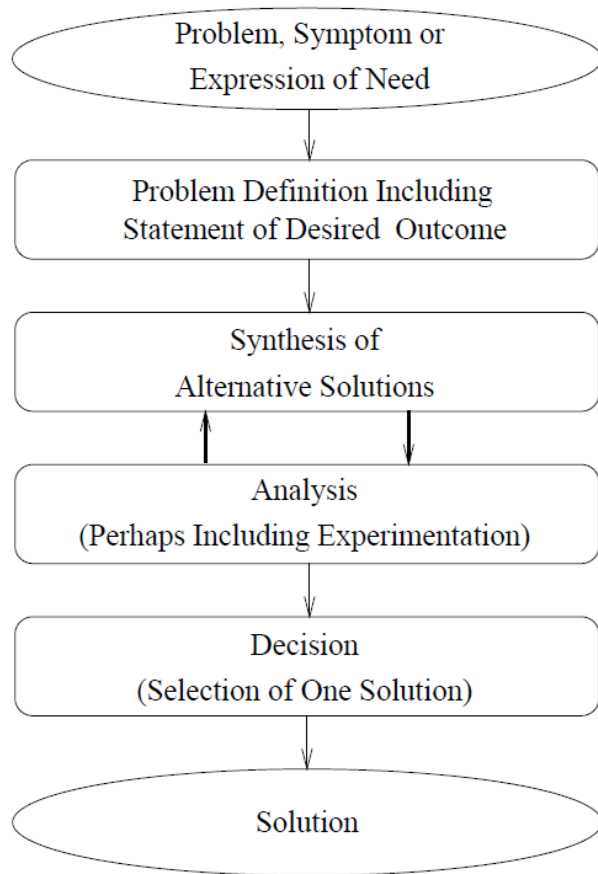
Video Demo
Final Presentations
Final Report

Assignments Due

➤ No Lab this week

May 8th
May 9th and 11th
May 11th

Engineering Design: The Process – Ch2



Synthesis:



Putting together of parts or elements so as to form a whole



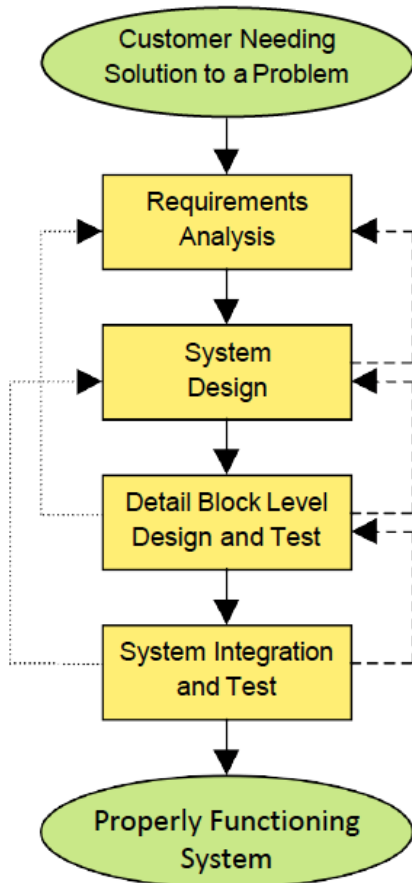
Analysis:



A separating or breaking up of any whole into its parts, especially with an examination of these parts to find out their nature, proportion, function, interrelationship, etc.

Figure 2.1: The general engineering process

Engineering Design: The Process – Ch2



- In Chapter 2, the design methodology lists ***Requirement Analysis*** as the first step.
- When errors are uncovered you can jump back one stage to rework and solve the issue(s). However, Jumping back two stages is also possible, but it will be more costly

IDEAL design flow: High Quality with Limited Resources

Engineering Design: Requirement Analysis – Ch3

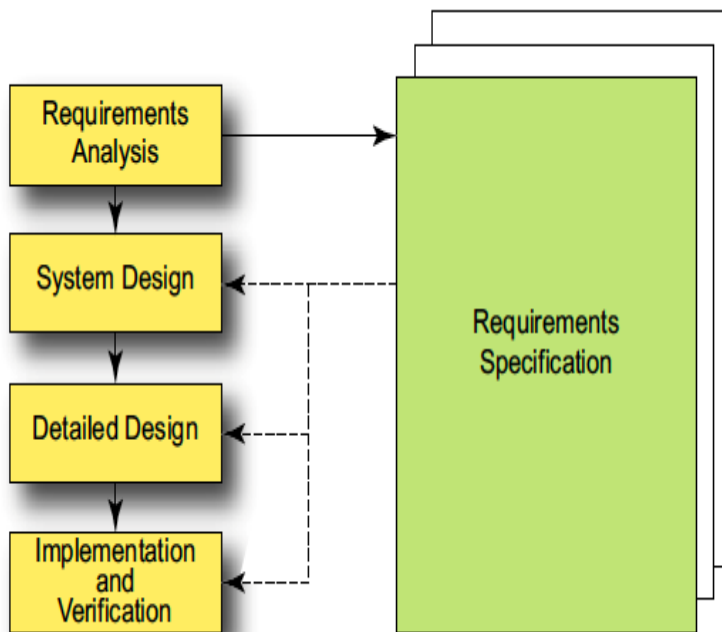


Fig. 3.1: Requirements Analysis: First Stage in Design Methodology

- **Requirements Specification document** is the output of this chapter.
- A contract between you and the customer, which specifies:
 - What exactly is the design to accomplish. **What is the problem we are trying to solve ?**
 - How will everyone with a stake in the design know when its done?

A Two-Stage Approach to Developing the Requirements Specification-Ch3

- Stage1: Assesses the needs and organize them into a problem statement. The language of the customer should be used, likely non-technical and non-quantifiable

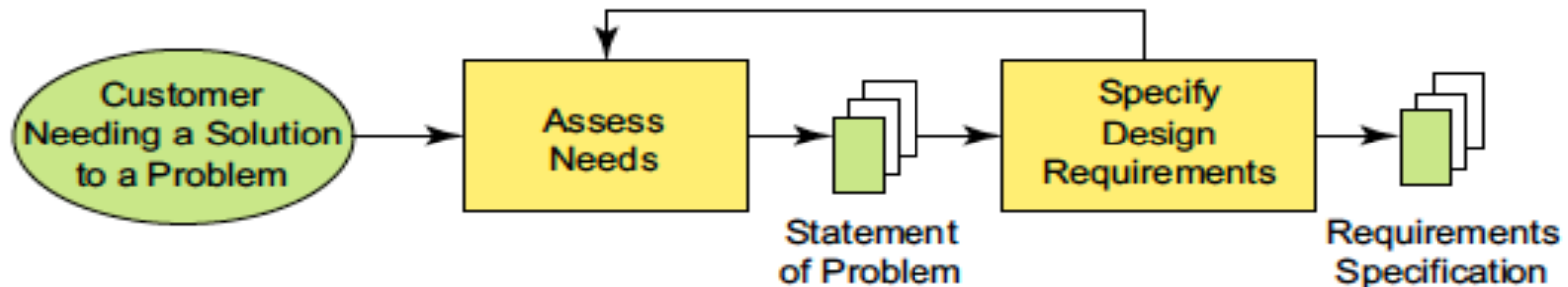


Fig. 3.4: **Two-Stage Approach** for Developing a Requirements Specification

A Two-Stage Approach to Developing the Requirements Specification-Ch3

➤ Stage2:

- turn the problem statement into a technical, quantified specification
- establish criteria for judging the acceptability of the design alternatives

➤ There is a need for **iteration** (the feedback path)

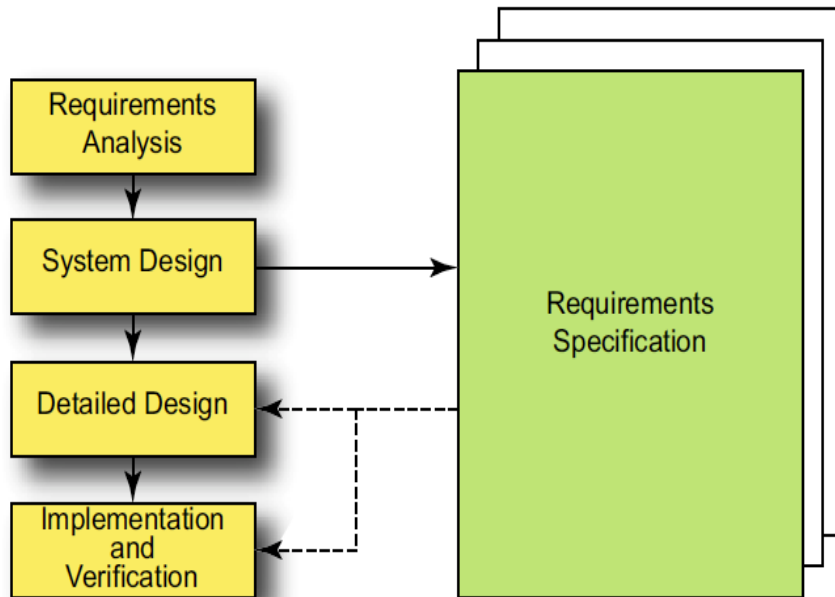
- The customers true needs may be called into question, and subsequently changes may be made, etc.
- The engineer must be free to make decisions and form agreements with the customer

A Two-Stage Approach to Developing the Requirements Specification-Ch3

➤ The Output: ***requirements specification document***

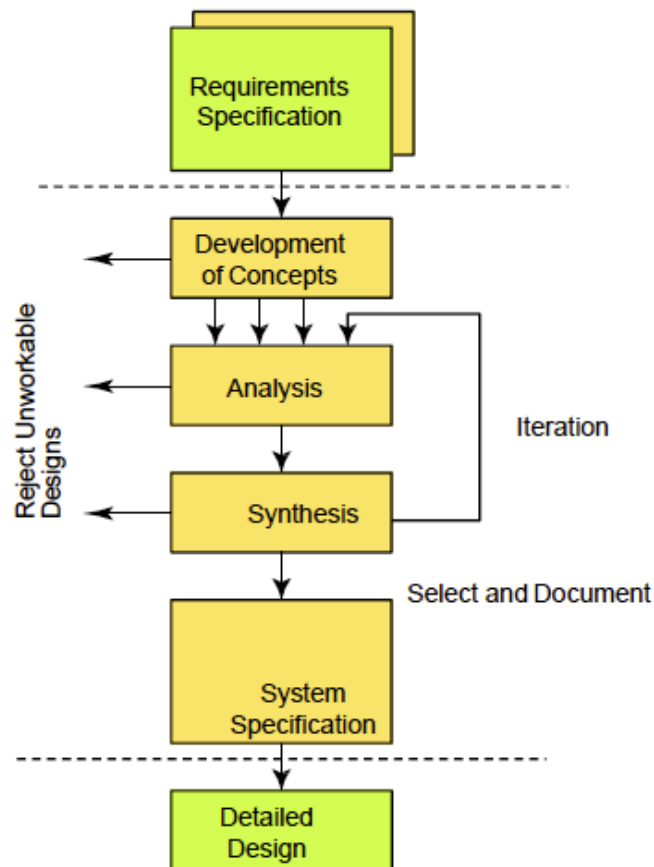
- *A concise statement of what the design will accomplish, and the criteria used to judge the final outcome. (how the finished design will be evaluated)*
- It answers the two earlier questions:
 - What exactly is the design team to do?
 - How will everyone know when the design is done?
- It must receive approval of both the customer and the designer. (contract)

Engineering Design: System Design – Ch4



- Answers the question: **How the problem will be solved?**
- System Design involves:
 - Conceptualization, Synthesis & Analysis, selecting the ideas giving the best solution, Refinement And Documentation
- System Design output is a document that:
 - Describes the design at a functional level
 - Describes component parts that form the design
 - Shows through analysis how the design meets the intended objective

The System Design Process-Ch4



- The System specification will contain description of each block in the block diagram.
- It will describe how the blocks work together, and satisfy the requirements specifications
- First conceptualize a solution, synthesis it, analyze it to see if requirements can be met
 - iterate the synthesis/ analysis phase multiple times as needed
- The Question: **Is the Design Necessary?**
 - A commercial-of-the-shelf solution (COTS) may already exist
 - Is the COTS product good enough to meet all requirements, even in the future when the product may need to satisfy additional requirements?
 - Perform a Web search and/or talk with those knowledgeable of the product area

Managing The Design Process-Ch5

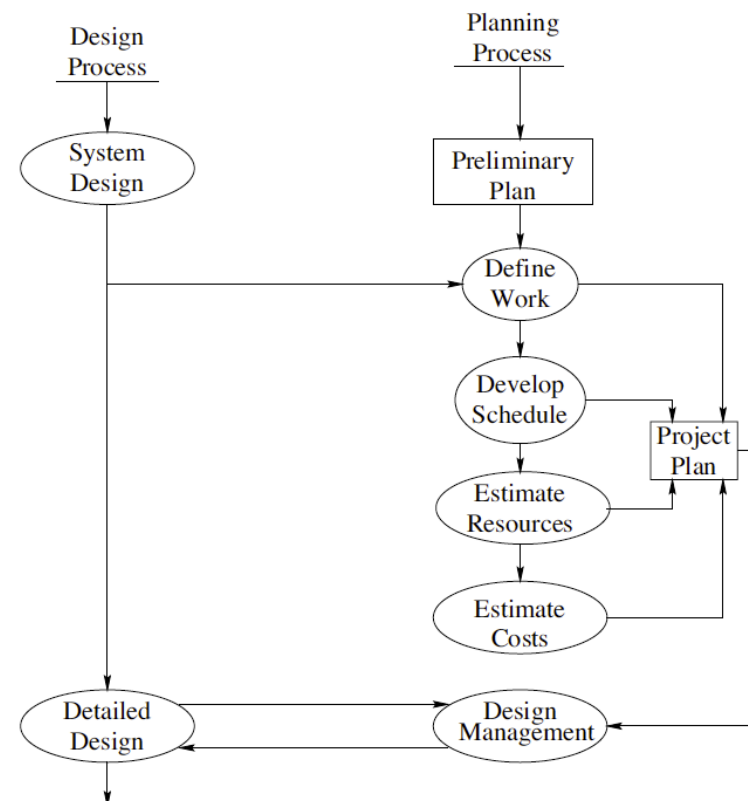
- At this stage we are ALMOST done with the System specifications.
- We need to answer these questions:
 - How much is the design going to cost?
 - When can you deliver?
- Remember: ***We are designing in limited Time and Budget.***
 - ***So we need to properly "Manage" our PROJECT***

The Project Plan-Ch5

- How the project to be **conducted** (**concise statement**)
 - What will it cost?
 - When it will be completed
 - What resources will be needed
- Legal agreement between project team and their client (Legal Contract)
- **TODO:**
 - *You need to start planning a meeting with you client.*

The Project Plan- components-Ch5

- Main components:
- **Definition of the Work:** A breakdown of the various tasks needed to complete the project
 - **Schedule:** Dates and times for completing tasks and subtasks that make up the project
 - **Resource Requirements:** Estimate each engineer's time, materials, equipment, and other support services
 - **Cost Estimate:** An estimate of all costs associated with the project. (**BUDGET**)



The planning process parallels the system design stage