"Engineering Design" – brief overview

- Senior Design is:
  - Culmination of EE/CpE Education and Training
  - Solving a ( ) or meeting ( )
  - **Design** ***experience*** that requires adequate consideration of
    - ( )
    - ( )
    - ( )
    - ( ) related to the ~~ECE discipline~~
  - ***Process*** to final product
  - Team-based problem solving.
- Senior Design is NOT:
  - Further expansion of a class project
  - Final product only

"Engineering Design" – Full Definition : ABET

- "A ( ) of devising a system, component, or process to ( ) desired needs,"
- which involves "a ( ) process to convert resources optimally to meet the stated needs" by applying ( ), ( ) and ( ),
- with adequate consideration of ( ), ( ), and ( ) in the subject related to the electrical/computer engineering discipline."

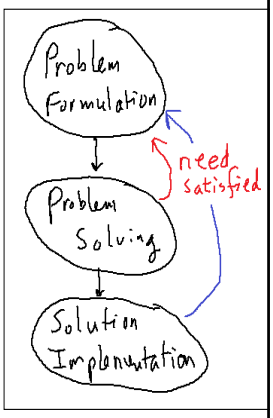
"Engineering Design" – Full Definitions: Industry

- "Determine that a ( ) exists with customers for specific goods or services and how much those customers are able and willing to ( ) for it.
- Then determine if the product or service is ( ) with the competencies of the company and if it can be manufactured at a ( ) that is less than the customers will pay.
- If so, proceed by designing to match the company's ( ) to manufacture,
- Finally, prior to full implementation, prepare a pilot ( )"

"Engineering Design" – graphics

Engineering Design in 3 phases

- **1. Problem Formulation**
  - Recognition of
  - Formulation of
  - Determine the
- **2. Problem Solving**
  - Know the
  - Generate
  - Generate
  - Analyzes
  - Makes Decision
- **3. Solution Implementation**
  - Creates an
  - Follows the
  - Evaluates
  - Agile Development:

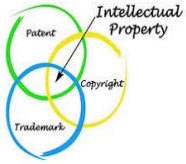


Characteristics of Design

- Design is (rather "Should be"):
  - A (**Process Cycle**) through the 3 phases of
    ( ),
    ( ),
    and ( ).
  - ( ), not trial-and-error
  - ( ), not a recipe (nor a cookbook)
  - ( ), not an event or product
  - ( ), back to earlier phases
  - ( ), to faithfully execute planned activities

Characteristics of Design

- Design should: (Focused on **External Factors**) (cf. Previous page – internal and design itself)
  - ( ) with regulation, codes, rules, standards, etc
  - Work under multiple and sometimes contradictory ( ):
    - Money, time, socio-cultural, etc.
  - **Perform with ( ) behavior** and responsible action
  - Understand and exercise ( ) **Rights**



Elements of *Unsuccessful* Design Projects: Lessons from Past Design Teams

- Same skill sets of team members →
  - Only EE or CpE students in a team
  - No balanced H/W and S/W experience
  - Slow in learning new skills
  - Did not overcome technical difficulties
- Weak Team Dynamics →
  - Failure in Relationship building
  - Leadership Problem
  - Lack of commitment
  - Tasks not achieved
- Frequent Changes in Design →
  - Sought **easier path** for implementation
  - Focused only on each component - Did not consider the entire system - System Integration
  - Frequent design/component change

Timeline and Milestones