

Senior Design I

- **EECE 401**
 - CRN 86517
 - 3 credit hours
 - W 1:10 – 4 pm
 - LKD 3121
- **Instructor**
 - Dr. Charles Kim
 - (202)806-4821
 - ckim@howard.edu
 - Office Hours
 - M 1:30 – 3:00pm
 - TR 3:00 – 4:30pm
 - F 1:30 – 3:00pm (Scheduled appointment only)
- **TA**
 - TBD
- **Web ---Syllabus, Notes, etc**

Senior Design

- Is
 - Culmination of EE/CpE Education, Training, etc
 - **Design *experiences*** that require adequate consideration of
 - **Knowledge**
 - **standards, and**
 - **constraints**
 - related to the **electrical/computer engineering discipline.**
 - ***Process*** to final product (through Senior Design II)
- Is NOT
 - Further expansion of a class project
 - Final product only

Course Objectives Topics

- Objectives
 - Learn and use design process to meet needs
 - Becoming to be aware of Technology Impact to Society
 - Becoming an effective team member
 - Becoming an effective communicator
 - Enjoy Design Experiences
- Topics of the course
 - Engineering Design Processes
 - Teamwork
 - Communication
 - Professional Skills

“Design” – ABET definition

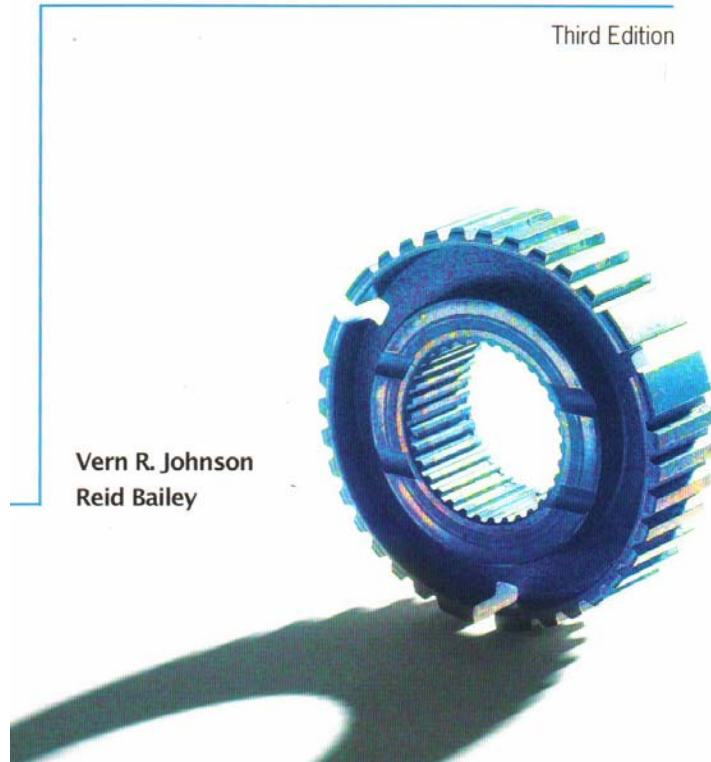
- ABET
 - “The **process** of devising a system, component, or process to meet desired needs.”
 - “A **decision-making** process (often iterative), in which the basic sciences, mathematics and engineering are applied to convert resources optimally to meet the stated needs.”
 - “**The experiences** that require adequate consideration of **knowledge, standards, and constraints** related to the **electrical/computer engineering discipline**.”

“Design” – Industry definition

- Industry
 - (1)“Determine that a need exists with a customer for specific goods or services and how much that customer is able and willing to pay for it. (2)Then determine if the product or service is compatible with the competencies of the company and if it can be manufactured at a cost that is less than the customer will pay. (3)If so, proceed by designing to match the company’s ability to manufacture, rather than basing the design on state-of-the-art technologies. (4)Finally, prior to full implementation prepare a pilot demonstration”

Main Text and Resource

Becoming a Technical Professional



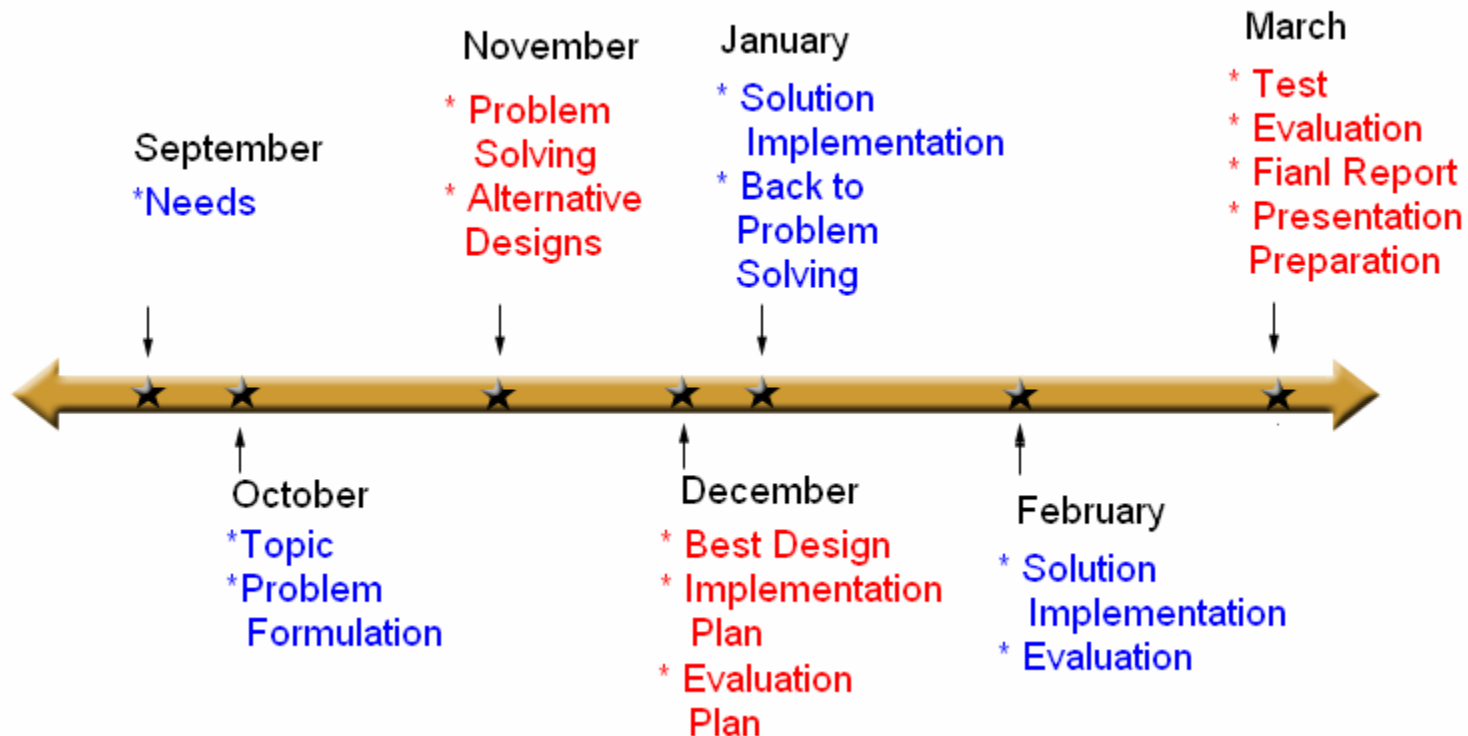
- Becoming a Technical Professional
 - by Vern Johnson and Reid Bailey
 - published by Kendal/Hunt Publishing Co.
 - 3rd Edition
 - ISBN 13:978-0-7575-2765-4
 - Written for first-year engineering students
 - Process/Idea is same for seniors with actual application/implementation of the process/idea.
 - I love this book. Over the summer, amid busy schedule, I read them all.

Course Grading and Expectation

- Expectation
 - Attendance
 - Active Participation
 - Weekly Activities
 - Assignments
 - Actively seeking solutions
 - Active interaction with instructor and advisor
 - Everything counts
 - Professional manner
- Grading
 - **Individual Score (X):30%**
 - Attendance (10%): only on-time arrival counts
 - Presentation + Others (10%)
 - Final Exam (10%)
 - **Group Score (Y): 70%**
 - Class activities + Assignments (30%)
 - Process of Project (30%)
 - Team Presentation (20%)
 - **Peer Evaluation Score (P): 0 – 1.0**
 - **FINAL SCORE (F)**
 - $F = X + Y*[0.6+ 0.4*P]$

Milestone

- Understanding Design Processes: **September**
- **Project Topic Selection: September**
- Team Formation: **September**
- **Problem Formulation: October**
- **Problem Solving and Top Design Selection: November**
- **Design Implementation: Next Semester**



Engineering Design – Topics and Objectives

- Topics
 - Engineering Design Overview
 - Problem Formulation
 - Problem Solving
 - Solution Implementation
 - The Art and Science of Creativity
 - Project Management
- Objectives
 - Understanding an engineering design process
 - Understanding the 3 phases of design and how design is an adaptive, systematic process
 - Applying a design process to meet a set of needs
 - **Design it!**

Engineering Design-Overview

- **Problem Formulation**

- Recognition of a set of **needs**
- **Information** gathering about the needs
- Determine the **requirements** of the project

- **Problem Solving**

- Investigates the available **alternatives** to meet the requirements – **Current State of the Art**
- **Generates and Analyzes and Specifies** alternatives with the requirements
- **Makes Decision** on which alternatives will be implemented
- **Selects** the Top Design

- **Solution Implementation**

- Creates an implementation and test plan
- Follows the plan to **build** the design
- **Evaluates** against the requirements from problem formulation

Characteristics of Design

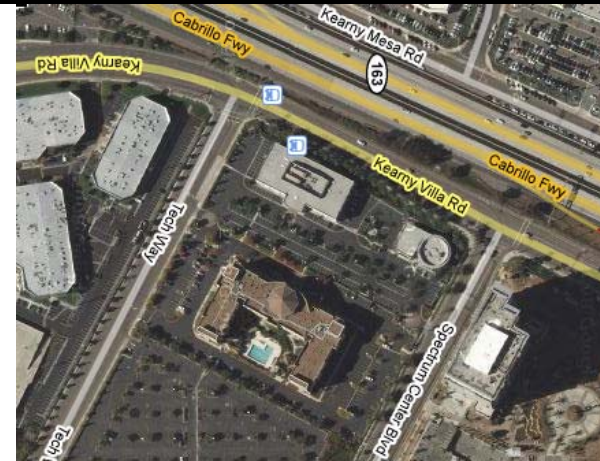
- Process cycles through the 3 phases under constraints, regulations, rules, etc
 - Problem Formulation
 - Problem Solving
 - Solution Implementation
- Design is **systematic**, not trial-and-error
- Design is **adaptive**, not a recipe
- Design is a **process**, not an event or product

Design is a Systematic/Adaptive Process

- Iteration back to earlier phases
- Refinements of the requirements
- Reconsideration of earlier activities
- Multiple phases simultaneously
- Engineering and Scientific Knowledge
- Rigorous Testing
- Execution of Planned Activities
- Regulation, Codes, Rules, Standards, etc

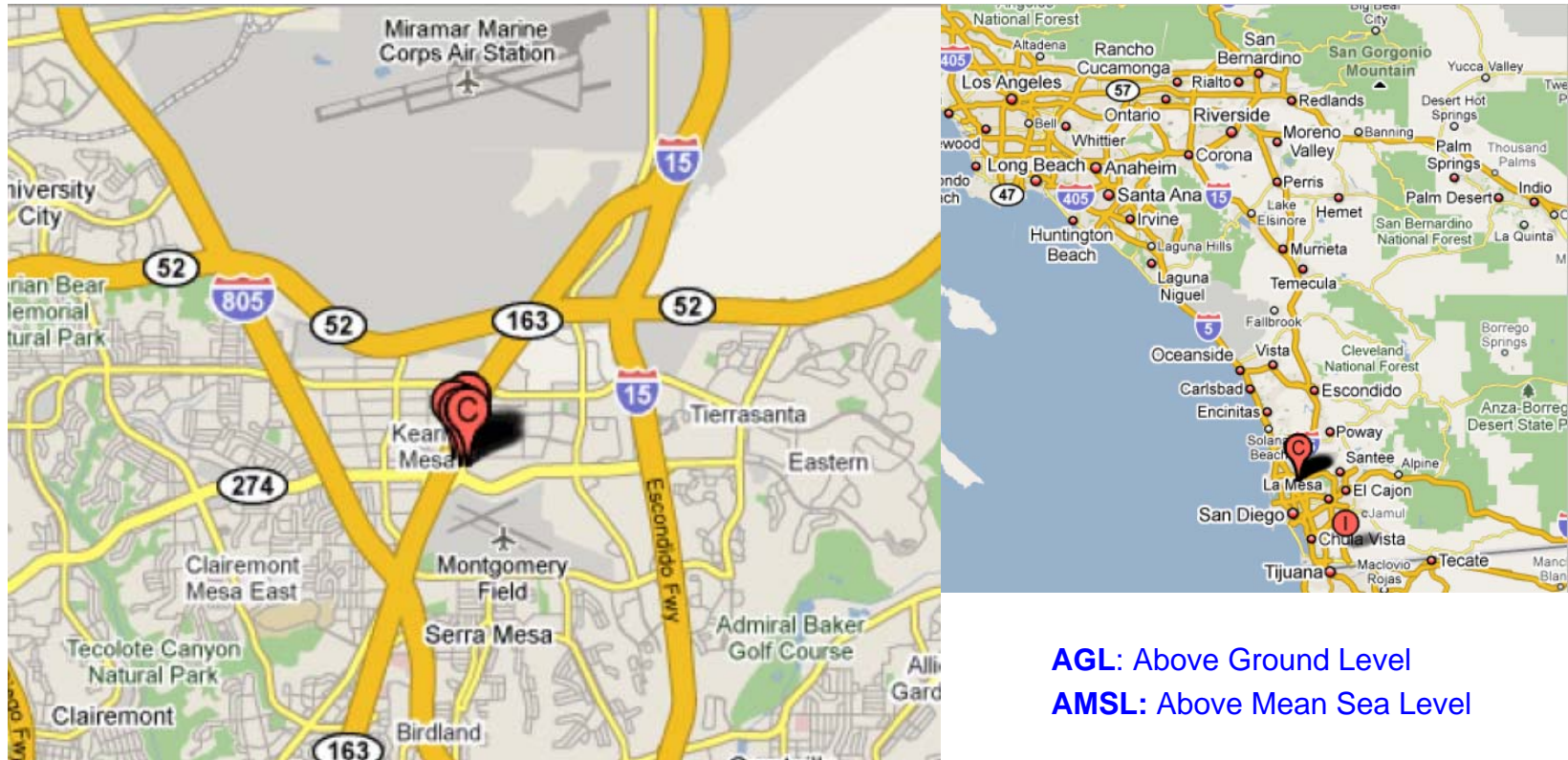
The cost of “Assumptions” and No-Compliance

- Difference between two photos of the same building is about \$20M.



FAA Regulation

- 20 ft too tall under FAA regulation for instrument approach (ILS) (180 ft vs. 160 ft)



AGL: Above Ground Level
AMSL: Above Mean Sea Level

You are hereby ordered, pursuant to San Diego Municipal Code Section 121.0312, to restore and mitigate the *structure* and *premises* at 8620 Spectrum Center Boulevard to their lawful and prior condition where all buildings, *structures*, towers and projections on the *premises* remain below 160 feet (160 feet AGL/576 feet AMSL), in compliance with the Federal Aviation Administration (“FAA”) No Hazard Determination, which was issued to Mr. Craig Bachman, Sunroad Enterprises, on June 27, 2006. (Copy enclosed with this order.)

FAA FAR (federal aviation regulation) Part 77 Section 13

§77.13 Construction or alteration requiring notice.

(a) Except as provided in §77.15, each sponsor who proposes any of the following construction or alteration shall notify the Administrator in the form and manner prescribed in §77.17.

(1) Any construction or alteration of more than 200 feet in height above the ground level at its site.

(2) Any construction or alteration of greater height than imaginary surface extending outward and upward at one of the following slopes:

(i) 1 00 to 1 for horizontal distance of 20,000 feet from the nearest point of the nearest runway of each airport specified in paragraph (a)(5) or this section with at least one runway more than 3,200 feet in actual length, excluding heliports.

(ii) 50 to 1 for horizontal distance of 10,000 feet from the nearest point of the nearest runway of each airport specified in paragraph (a)(5) of this section with its longest runway no more than 3,200 feet in actual length, excluding heliports.

(iii) 25 to 1 for a horizontal distance of 5,000 feet from the nearest point of the nearest landing and takeoff area of each heliport specified in paragraph (a)(5) of this section.

(3) Any highway, railroad, or other traverse way for mobile objects, of a height which, if adjusted upward 17 feet for an Interstate Highway that is part of the National System of Military and Interstate Highways where overcrossings are designed for a minimum of 17 feet vertical distance, 16 feet for any other public roadway, 10 feet or the height of the highest mobile object that would normally traverse the road, whichever is greater, for a private road, 23 feet for a railroad, and for a waterway or any other traverse way not previously mentioned, an amount equal to the height of the highest mobile object that would normally traverse it, would exceed a standard of paragraph (a)(1) or (2) of this section.

(4) When requested by the FAA, any construction or alteration that would be in an instrument approach area (defined in the FAA standards governing instrument approach procedures) and available information indicates it might exceed a standard of Subpart C of this part.

Class Activity

- Wireless Guitar Amplification System
- Solve the Problem
 - Problem Formulation
 - Solution Generation
 - Implementation (Plan only)
 - The needs (by today)
 - Requirements (by today)
 - Governing Regulation or Code to comply (by next week)

Assignment (due September 9)

- (1) “Wireless Guitar Amplifier”
 - The Current Status of Art
 - Commercial Product
 - Patent etc
- (2) Find all the regulatory agencies and governing bodies AND their regulations and codes and standards for
 - Producing and selling cell phones
- **Submission Instruction:**
 - Typed Hardcopy (by ???)
 - Electronic Copy via email to ckim@howard.edu (by 5:00pm)