EGG 102 – Introduction to Engineering Design (Spring 2002)

Handout #1: Phases of Design - Mouse Trap Example

Reference: The Engineering Toolkit, Addison-Wesley Select Edition

1. **Problem Statement**
   - Identify the need
   - Establish criteria for success (e.g. cost, safety, aesthetics, performance)
   - State problem clearly and unambiguously

   Example Statement:

   Poor " Design a Mouse Trap"

   Good "Certain rodents such as the common mouse are carriers and transmitters of an often fatal virus, the hantavirus. Conventional mousetraps expose people to this virus as they handle the trap and dispose of the mouse. Design a mouse trap that allows a person to trap and dispose of a mouse without being exposed to any bacterial or viral agents being carried by the mouse."

2. **Getting Information (libraries, Internet, institutional knowledge, etc)**
   - What has been done previously?
   - What is right/wrong with the current design?
   - What companies are involved?
   - What are the economic factors involved?
   - What are the other important factors governing the design?

   Keep track of where you got the information (References)!!

3. **Generating Multiple Solutions**

   CREATIVITY !! RISK TAKING!! BRAINSTORMING !! SKETCHSTORMING!!
   - Creative people are curious and are not afraid of what they don't know.
   - Creative people are open to new experiences
   - Creative people are not afraid of taking risks
   - Creative people can see details and the whole picture
   - Creative people tackle complex problems and work hard on them.
   - Creative people have persistence and tenacity.

4. **Analysis**

   SCIENCE LAWS !! MATHEMATICS!! ---> TECHNICAL KNOWLEDGE
   - Functional Analysis
   - Ergonomics
   - Safety and Liability
   - Economics
   - Strength and Mechanical Analysis
   - Environmental Impact: GREEN ENGINEERING!!!!

5. **Select a Solution**
   QUANTITATIVE ANALYSIS NEEDED!! DECISION MATRIX!!
   • Rank design attributes in order of importance
   • Assign a value factor to each attribute (e.g safety 10, cost 5)
   • Assign a rating factor to each solution (zero to 10)
   • Multiply the rating factor versus the assigned value factor for the attributes and sum up.

6. **Test and Implement the Solution**
   • Prototyping
   • Testing and verification

7. **Communicate your solution**
   • Engineering Drawings
   • Written Communication
   • Oral Communication

Project Management

- Create a schedule of the various tasks
- Design reviews
- Gantt Chart: bar chart showing each task plotted against time.

ONE OF THE THINGS TO LEARN DURING YOUR ENGINEERING EDUCATION IS PUNCTUALITY - DO NOT PROCRASTINATE!