Design Process – Problem Definition

General Description (Framework):

- **Scope** - *Individually*, you are expected to define problems to be addressed for your senior capstone project along with initial conceptual design of how you would solve them.
- **Problem Origination** - Problems should *not* be created simply to solve them, they should already exist and be meaningful to solve.
- **Budget** - The budget for your projects (~$700)
- **Time Size** - The size of your teams 6-7 individual students
- **Knowable Scope** - The level of knowledge/experience of yourself and your team members (senior mechanical engineering students)
- **Timeline** - Timetable (just under two quarters while juggling other classes).

Detailed Description:

- Come up with 5 ideas for problems to solve and initial conceptual design to solve them.
    - 3 Of the ideas should involve “reasonable” solutions. The solutions of these should seem quite doable given the constraints of the project.
    - 2 Of the ideas should involve “pie in the sky” solutions. These solutions of these should seem like a stretch/very challenging (though not impossible) given the constraints of the project.
- Create 5 slides, summarizing each of the problems/proposed solutions (1 slide each). Upload to CCLE by 4PM on 1/29.
- Present your ideas to the class during discussion on 1/29-1/30. Each student will present for 5 minutes – one slide per min.
- Each Problem (per slide) should be addressed using the following guidelines
    - **Explicate the Problem**
        - **Formulate the Problem Precisely** - Describe the problem in a precise but also concise, easily understandable manner.
        - **Position and Justify the Problem** –
            - **Context** - Clarify in which practice the problem appears. Explain why the problem is important and to whom.
            - **Ensure the Problem Is of General Interest** - Make clear that the problem is of interest not only to a local practice.
            - **Ensure the Problem Is Solvable** - Define and analyze the problem so that it becomes small enough to be solved.
        - **Find the Rood Cause** – Perform a root cause analysis using the fish bone diagram using the 5Ms

- **Define Resources**
  - **Specify the Sources of the Problem** - Describe the literature and the stakeholders that have previously identified, studied, and experienced the problem.

- **Define Strategy & Methods**
  - **Describe How the Problem Has Been Explicated** - Explain what has been done to explicate the problem, in particular, how the stakeholders have been involved and how the research literature has been reviewed.
  - **Research Methods** - Among the 10 research methods, specify those that will be useful to address the problem and indicate why.

- **Post Assignment -** Following the individual presentation in class discuss the ideas presented with your team members and select one problem that the team as a whole reached a consensus to work on. You may select another problem presented in by a student who is not part of your team as long as the team of that student is not interested to pursue this problem.