The semester-long team project is an exercise in design that will incorporate the various techniques and skills to be learned in this class into a real-world design project. Each team must reverse engineer a design (to be provided by the instructor), assess its capabilities, and redesign the system to improve it according to one or more criteria. This project will have three phases:

**Phase 1 – DUE 10/9/2014:** Reverse engineer the provided machine. You must approximate its performance capabilities, what materials and manufacturing processes were used in its manufacture, and create your own set of professional, toleranced drawings to recreate the machine.

**Phase 2 – DUE 11/6/2014:** Use relevant tools to identify and qualify potential failure modes for the design. Document what failure modes present high levels of failure risk, and recommend design features to mitigate that risk. Refine the models of the machine to describe in detail the performance capabilities and probable locations of failure of the machine.

**Phase 3 – DUE 12/4/2014:** Determine which parts of the system present the most opportunity for improvement of cost and performance through redesign. Justify the scope of your redesign effort, and redesign the system components you deem necessary. You must improve the performance of the system while reducing or maintaining the cost of the original design. Your summary must include the following:

1.) **Rationale for component selection for redesign** – Why did you redesign what you did, and how did you determine they were what should be redesigned?

2.) **Design tools and methodologies used** – How did you redesign the components? What concepts were compared to arrive at your final design, and how were they filtered? What tools did you use to analyze/optimize your new design, and what criteria did you apply?

3.) **System analysis results and comparison** – Use appropriate tools and graphical presentations to demonstrate and quantify the improvement of your design over the original. How did you determine where to apply specific analyses, and what information did they give you? Show specific examples, and be sure to verify your analyses.

4.) **Detail drawings of new components** – Present a drawing package detailing the parts for outside manufacture. Particular attention must be paid to good drafting practice, proper dimensioning, and functional tolerances.

You must prepare and give a 20 minute presentation of these design details during the last week of class.

At the close of each phase of the project, students will be required to submit a memo summarizing their results. This memo should include accompanying drawings and figures inserted or attached as addenda as necessary for the effective communication of the requirements of each phase. Summaries will be graded not only on technical content, but also on style, conciseness and professionalism.