

## **ME-573 Project 2**

**(Total project is worth 300 points with each section weighted equally. Project time is 2.5-3 weeks)**

### **Overview:**

In this individual project a 'real' engineering design will be analyzed using:

- 1) Classical (deterministic) methods
- 2) Nouveau (probabilistic) methods

The results will be compared and discussed in light of the track record of the design and the potential for improvement in engineering efficiency.

### **Project:**

The engineering design will be of your (student's) own choosing but it should be of sufficient complexity to be of engineering interest (however, it should not be so complex to defy analysis using your present (or readily achievable) grasp of deterministic or probabilistic design methods). Some examples are: thin wall pressure vessel, connecting rod for an I.C. engine, engine mount pin, etc.

In conducting this project you will need to determine nominal dimensions (and tolerances), loads, and material properties of interest. In addition, you will need to determine statistics (actual or estimated) for dimensions, loads and material properties of interest. The sources of your information should be credible and easily referenced.

The formal report required at the end of this project should be written for a technical manager. However, it should also contain a management summary at the beginning targeted for upper management. The bulk of the report should be written for an engineering manager who will appreciate technical content. Where appropriate explanatory charts, figures, and plots should be included in the text. Appendices should contain all useful and appropriate information not directly required for the text.

### **1) Deterministic:**

In conducting the deterministic analysis you will need to determine a factor of safety for the engineering design as implemented. You will also need to comment on the appropriateness of this factor of safety for the particular application and whether the design and associated analysis is appropriate for the application. Simplifications of the loading, geometry, etc. for the analysis is acceptable if the assumptions are explained and well documented. Keep in mind that the basis of the analysis will be used in the probabilistic analysis.

### **2) Probabilistic:**

In conducting the probabilistic analysis you will need to determine reliability for the engineering design as implemented. You will also need to use the statistics (determined or estimated) for dimensions, loads and material properties of interest. Where necessary and appropriate, confidence bounds (justified by you) should be applied. for the particular application and whether the design and associated analysis is appropriate for the application.

### **3) Comparison/Evaluation:**

In comparing the two approaches to mechanical design (deterministic vs. probabilistic), compare the results of the two methods. Comment on the appropriateness of each method to your chosen engineering design. What are the specific advantages and disadvantage of each approach? Which approach is more realistic? Which is "safer"? Which would you use in engineering practice?