Insert your title here

Your Name Here

***Abstract*— Insert your abstract here. Maximum 250 words. The abstract should be a concise description of your entire paper. Describe the goal of the paper, why it is important, the methods you used to achieve the goal, and the conclusions you made. Do not refer to any figures or tables in your abstract. Do not include any references in your abstract.**

- **-1 point for an incorrect abstract.**

I. Introduction

The number one most important thing to remember is to not freak out on your grade when you first receive your papers back. Even top students tend to receive what would be considered D's and F's their first time around. Writing papers is an iterative process, and to achieve a B or A, you will typically have to rewrite your paper several times. Try not to be discouraged.

The introduction generally gives the motivation for your work and some background. For the projects in this class, the background information will probably not be that important. Introduce your design (with a figure), in the introduction. Something like: "For the second project in MMAE 232, we designed a trebuchet that launched a water-filled ping-pong ball 13.2m (see Fig. 1)."

- -1 point if you do not introduce the final design in the introduction.
- -1 point for not including the functional requirements.

II. Concept Generation and Evaluation

Include your methodology for concept generation and evaluation. Keep it short.

- -1 point for missing Pugh Chart.
- -1 point for a Pugh Chart that does not illustrate the different conceptual designs. That is, you must show the drawings of each conceptual design and reference them in the Pugh Chart.
- -2 points for missing discussion on use of computer program to identify proper parameters for the trebuchet project.

III. Analysis

The analysis is the heart of your project and your paper. I realize it is possible to complete the projects without doing the analysis, but that is not what this class or being and engineer is about. Even if you were able to skip some of the analysis, I want you to be able to understand *why* your design works and what someone would need to change about your design if the functional requirements changed. For example, if I were to change the trebuchet's functional requirements to include a 10 kg counterweight, I want to know the exact steps someone would need to take to ensure that the trigger would still work.

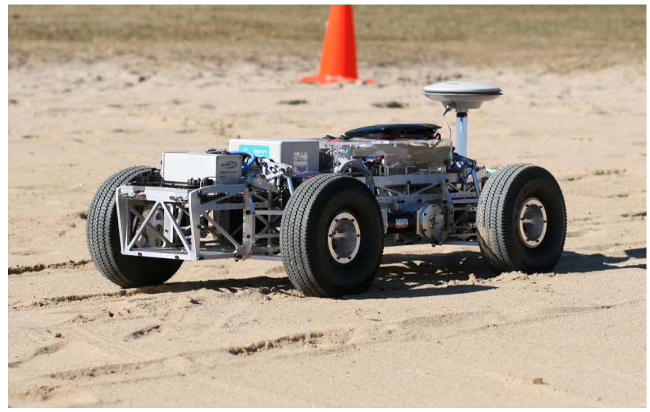

Fig. 1. In LaTeX figures are best rendered when they are .pdfs, but .jpgs also work. In Word, use .eps if possible. They will not look good on the screen, but they print great. If the figure is on the first page, be sure it is at the top of the second column.

A. Sustainable Chair

- -2 points for failure to include the correct lines of force on your chair.
- -1 point for failure to identify stress concentrations due to the lines of force.
- -2 points for failure to include a proper finite element analysis of your chair.
- -1 point for superfluous analysis that does not tell me anything about your particular design.

B. Trebuchet

- -2 points for missing/incorrect free body diagram that identifies the force (load) acting on your trigger mechanism from the trebuchet.
- -2 points for missing/incorrect free body diagram that identifies the force acting on your servo from the trigger mechanism.
- -2 points for missing/incorrect free body diagram that translates the force acting on your servo to the torque acting on your servo.
- -2 points for missing/incorrect analysis that identifies the force (load) acting on your trigger mechanism from the trebuchet.
- -2 points for missing/incorrect analysis that identifies the force acting on your servo from the trigger mechanism.
- -2 points for missing/incorrect analysis that translates the force acting on your servo to the torque acting on your servo.
- -1 point for superfluous analysis that does not tell me

anything about your particular design.

C. Bio-inspired Design

- -2 points missing/incorrect gait plot.
- -2 points missing/incorrect convex contact polygon description.
- -4 points for missing/incorrect free body diagram that identifies the minimum necessary torque needed to make your system statically stable at all times in the gait cycle.
- -4 points for missing/incorrect analysis that identifies the minimum necessary torque needed to make your system statically stable at all times in the gait cycle.
- -1 point for superfluous analysis that does not tell me anything about your particular design.

IV. Experimental Results

Describe the experimental results. Identify if you went through multiple prototypes. What did you learn from those prototypes?

V. Discussion

A. Sustainable Chair

Discuss the light-weighting techniques you employed in your design.

- -1 point for missing discussion bio-inspired techniques

B. Trebuchet

Discuss the results. What went wrong? What went right?

C. Bio-inspired Design

Discuss the results. Discuss the bio-inspired design process. What went wrong? What went right?

VI. Conclusions

Put your conclusions here. Do not any new information. Just recap what you discussed in the paper.

VII. Appendix

You do not need a specific appendix section. Just staple your engineering drawings as an appendix.

- -4 for missing engineering drawings
- -1 for missing bill of materials (I will accept an assembly drawing with balloons).
- -1 for each improperly dimensioned engineering drawing. This includes messy drawings, incomplete dimensions, improperly located dimensions, and incomplete title boxes.

VIII. Formatting

A. Equations

When using LaTeX, I suggest you download TexAide. If you are using Microsoft Word, insert an equation. Do not use pictures. Do not write on a piece of paper and then take a picture of that. Seriously, I will not even look at that to see if it is correct.

In LaTeX, in-line equations, such as $\mathbf{F} = m\mathbf{a}$ use dollar signs to isolate them. An example of a numbered equation is given as:

$$\mathbf{F} = m\mathbf{a} \tag{1}$$

If you use TexAide, by default it will give you non-numbered equations such as:

$$\mathbf{F} = m\mathbf{a}$$

All non-inline equations must be numbered.

Number equations consecutively with equation numbers in parentheses flush with the right margin, as in (1). To make your equations more compact you may use the solidus (/), the exp. function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. All vectors and matrices should be in bold font. Use a long dash (–) rather then hyphen (-) for a minus sign. Use parentheses to avoid ambiguities in the denominator. Punctuate equations with commas or periods when they are part of a sentence: $\Gamma_2 a^2 + \Gamma_3 a^3 + \Gamma_4 a^4 + ... = \lambda \Lambda(x)$, where λ is an auxiliary parameter.

Be sure that the symbols in your equation have been defined before the equation appears or immediately following. Use "(1)," not "Eq. (1)" or "Equation (1)," except at the beginning of a sentence: "Equation (1) is ... ."

- -1 point for improperly numbered equations.
- -1 point for improperly formatted equations, including the use of pictures or handwriting.

B. Units

Always use metric units. In particular, the use of the International System of Units (SI Units) is advocated. This system includes a subsystem the MKSA units, which are based on the meter, kilogram, second, and ampere. British units may be used as secondary units (in parenthesis). An exception is when British units are used as identifiers in trade, such as, 3.5 inch disk drive.

- -1 point for missing or non-SI units.

C. Figures and Tables

Figures need to be included in the document and properly captioned and referenced. See Fig. 1 for an example. Position figures and tables at the tops and bottoms of columns. Avoid placing them in the middle of columns. LaTeXwill automatically place figures at the top. Microsoft Word is more difficult.

Large figures and tables may span across both columns. Figure captions should be below the figures; table captions should be above the tables. Avoid placing figures and tables

TABLE I

AN EXAMPLE TABLE

Item	Value
Item 1	40kg
Item 2	13.34kg

before their first mention in the text. Use the abbreviation "Fig. 1", even at the beginning of a sentence.

Figure axis labels are often a source of confusion. Use words rather then symbols. As an example write the quantity "Inductance", or "Inductance L." Put units in parentheses. Do not label axes only with units. In the example, write "Inductance (mH)", or "Inductance L (mH)", not just "mH". Do not label axes with the ratio of quantities and units. For example, write "Temperature (K)", not "Temperature/K".

An example table is given in Table: I

- -1 point for incorrectly formatted figures.
- -1 point for missing captions.

D. Lists

A numbered list looks like:

1) First item
2) Second item
3) Third item

A bulleted list looks like:

- First item
  - First sub-item
  - second sub-item
- Second item
- Third item

E. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title unless they are unavoidable.

F. Column Size, Fonts, Spacing, and Justification

- -1 point for incorrectly formatting column width. LaTeXshould take care of it automatically. For Microsoft Word, see the example file.
- -1 point for incorrect font size. LaTeXshould take care of it automatically. For Microsoft Word, see the example file.
- -1 point for incorrect line spacing. LaTeXshould take care of it automatically. For Microsoft Word, see the example file.
- -1 point for incorrect fonts. LaTeXshould take care of it automatically. For Microsoft Word, see the example file.

IX. GRAMMAR

You may receive -1 – -3 points for incorrect grammar. This is subjective.