Report guidelines
William Bailey, APAM / MSE

Due date: Fri Mar 29, 5pm at the APAM office.

1. **Paper copy, printed**
2. **Electronic copy, PDF format only, to web54@columbia.edu**

I would like you to write a report about your measurements of the Young's modulus and yield stress on the electric guitar. You will turn in one report per group (typically of three people).

I will read and grade the reports. To prevent my despair, please follow these guidelines. The writing, formatting, and research skills you show in the paper are nearly as important to me as the experimental data themselves.

Format

In any experimental report, there should be the following sections:

- Title and authors: Print the title first, authors second. Give authors in alphabetical order. List your UNIs in a footnote.

- Abstract: The abstract is a very short paragraph communicating your most important findings. Be as specific and quantitative as possible.

- Introduction / Motivation. The introduction makes a case for why you took the trouble to do the experiment and the reader should take the trouble to read it. *Every assertion needs a citation.* It is painful to have to add citations for claims you think are obvious, but if you can't find it in print somewhere, it's not a scientific fact.
  This is an artificial exercise here-- I know the reason you're writing it and I'm reading it is because I required it-- but be creative. What's important or interesting about guitars, or elastic vibrations, or steel? You can write just a short paragraph here, but back it up with references. Three references are enough. (see below what constitutes a reference)

- Theory / Background You should review basic principles of the following: 1) elastic waves in the guitar string, 2) signal transduction in the pickup, 3) Fourier analysis of the signal by the computer, 4) elastic and plastic deformation in the string. You don't need to go into greater detail than what you use to take or analyze your data. Tell it to me *in your own words* and show me how much you got out of the lecture sections and handouts. Equations you will use to fit the data need to be introduced here. Define every quantity in an equation and give SI units and an order of magnitude for every quantity.

- Experimental Method Be specific: you plugged what into what, measured what, and did what with it? You need to give a block diagram for your experimental apparatus. It is *fine* with me if you draw it (neatly) and scan it in. Making a nice drawing with a drawing package (e.g. Libre Office Draw / Impress, or similar) is an extra-credit situation.

- Experimental results The most important part of your report will be the figure showing your measurement of stress vs. strain on the guitar, both for the elastic case and the plastic case

(loading to failure). Please show these data sets on the same axes. *Follow the graph guidelines distributed before.* For extra credit, attach your matlab script plotting the data.

- Discussion Compare your experimental results with expected behavior. If your results deviate strongly, a good discussion of error can make up a lot of the difference. What might have gone wrong in the experiment? How precise are the various measurements? If your results are too far off, you might need to retake your data.

- Conclusion This can be very short.

- Bibliography Entries must include title, author, publication name, publisher, pages, year. (If you want to type something in starting with http://... , think again; see below)

Lazy things which you should not ever do at Columbia:

No figures copied and pasted from the internet may be included in your reports or any other written work, whether cited or not. Violating this will cost you a letter grade.

It is also bad practice to include technical figures copied and pasted from the internet in presentations, even with citation. (Photographs are OK with citation). Rule: *If you didn't draw it, you probably don't understand it.*

No text copied and pasted from the internet, or from somebody else's document, may be included in your reports whether cited or not. This rule should be obvious.

One lazy thing which you may not do in my class:

No internet references. The only citations I regard as valid ones are publications: journal publications or books. It is not acceptable to cite a URL. Columbia has very nice libraries; get some practice using them. If you'd like to use their electronic resources, that's fine; they can be cited as regular publications.

Grading rubric / checklist

- Both paper copy and PDF copy are received on time.
- **Yes, I will take points off** for grammatical errors, spelling errors, or unusually awkward constructions.

Abstract / title

- Title is short, to the point, and accurate.
- Abstract communicates specific values of measured quantities.
- All reported values of quantities include units.
- Text is in passive voice (“the Young's modulus has been measured”) or active voice (“We have measured the Young's modulus”) but not mixed.

Introduction

- Intrinsic interest of the topic is described. (Make it up-- I will not take off for something far-fetched as long as you back it up with citations.)

- At least three references for facts about the intrinsic interest of the topic are provided.

Theory

- All relevant theory / background is included.
- All relevant theory is presented correctly.
- Physics are described in your own words. (Hint: argument by analogy is sometimes useful.)
- A very short description of the physical content of an equation is given with each equation, along with some notes on its origin. (Don't rederive everything.)
- Each symbol of an equation is defined with its introduction.
- Units and an order of magnitude are given for symbols as they are introduced.
- Equations are broken out of the text, with a number, if you use them for data fitting.

Extra credit: format your mathematical equations using an equation editor of some kind.
Extra extra credit: *use LaTeX for your report.*

Experimental method

- Includes a good diagram, annotated accurately, with a caption.
- Diagram is accurate.
- **Extra credit:** draw your diagram using a computer program.

Experimental results

- Experiment is carried out correctly.
- Experiment is interpreted correctly (measured values are reasonable).
- Data figure adheres to guidelines distributed earlier
- **Extra credit:** greek symbols in your figure.
- **Extra credit:** matlab script included for your figure.

Discussion

- Measured values of yield stress and Young's modulus are compared with published, cited values. (You need to find these through a literature search!)
- Serious discussion of any possible experimental error. Further reading is welcome here. Why might your wire be brittle? You may speculate.

Conclusion – say something, but don't go on too long.

Bibliography: Citations need to be real (not URL), covering relevant material.