MEMORANDUM

October 11, 2012

TO: Students in Experimental Strength of materials

FROM: Panos Tsopelas

RE: Lab Report Writing

In this document I include general comments on the laboratory. Your grade on the lab is a composite score from three components: graphs, analysis, and style. The graphs grade is given based on the clarity and formatting of your stress/strain plots. The analysis grade is given based on your analysis of the material properties that are important for structural design: density, modulus of elasticity, strength, cost, and ductility. All of these properties should be discussed in the memo. Finally, a grade for style is given. You were asked to present your lab report as a short technical memo. Adherence to this format, as well as the formatting of text and tables, contained in the memo, are reflected in this grade. The final grade is weighted as 25% of the graphs and style components and 50% of the analysis component.

Graphs

The graphs should be easy to read. You should choose line styles that are easy to differentiate yet are not "faint" when printed on a laser printer. Obviously, if you have access to color your job is easier here. The use of grid lines is discouraged because they impede the comparison of the curves that are being compared. In most cases we are not trying to use grids so that we can pick out exact values from graphs; the exact values are contained somewhere else in tables. Axis labels and legends should be provided and text size of the labels should be “reasonable”.

Analysis

The memo should contain a concise discussion of the material properties that we investigated in the laboratory. In a laboratory, we could measure the following properties:

- elastic modulus
- strength (both yield strength and ultimate strength)
- density
- ductility, and
- cost.

It is impossible to say which properties are most important unless we define the exact structure that we are designing. In a building structure, the weight of a material is of little importance and the cost is paramount. In an aircraft structure, weight is of primary

importance and cost is still important. In a space station, weight is critical and cost is not really an issue. In all cases, the stiffness (or modulus) of the material and the strength of the material are important. Ductility, which is measured by the elongation of a material, is important for structures that may be loaded past their ordinary design level due to, for example, an accident or other unanticipated loading.

Be careful of wild claims like “plastic composites should never be used in a structure because they are brittle”. You are just learning about these materials. If you deal with structural materials in your engineering practice, you will develop an intuition that will help you decide when to use a certain material. If you are unsure, just stick to the facts.

Format

Real documents are almost never printed double-spaced, and memoranda never are. The wanton use of paper resulting from double spacing has driven it out of existence. Though I personally do not like print on both sides of a page, it does help save paper. You should use generous margins (at least one 1 and perhaps 1.25 inches) and 12 point font for memos. Research has shown that it is difficult to read very long lines of text. If I use small fonts, like 10 point or below, I typically break the document up into two columns. Two column format is not appropriate for memos. You should remember to number the pages and to use a descriptive header at the top of each page. The appendices should be numbered and labeled as well. Remember, if your document falls apart, or if you forget to put the staple in, your boss might end up reading only the second page.

I use a blank line to separate paragraphs and typically do not indent the first line of a paragraph. The blank line is a great separator. You know that another paragraph is starting. Indenting is optional. I also use descriptive headings, even in short memos, so that my reader knows exactly what is being discussed. If you are presenting a list of items, it is appropriate to pull them out into a bulleted or numbered list (see previous page). The bulleted list is used when you are presenting a number of items without precedence among the items and without implying that you have listed all of the potential elements of the list. A numbered list implies a precedence or order among the items and further implies that you have included all of the potential members of the list.

Don't include big cover pages or bind your documents in any way (other than with a staple). This only impedes my grading. A formal report does have a cover page and is bound. In a memo, you are wasting paper, time, and money with such frills.

I have not made all of these comments on your individual memos. Rather, I include them in this memo to all of you.