REPORTS
January 22, 2003

The reports should be concise and to the point. The limit on each report is three pages (plus one for the Declaration) including title, abstract, text, graphs, figures and references. Everything should fit into this and no appendices are allowed. The text must be double spaced with 12 point font and suitable margins all around. Remember that equations, graphs and figures are main communication tools of the engineer. The objective is not to fill pages, but describe very briefly what you have done and what you have learned from the experiment. The writing should conform to current technical practice. Further information is in Professor Joseph Powers’s Webpage though it must be noted that there are some differences between Spring 2002 and this semester.

Structure of report
The report should have the following structure.

- **Abstract:** This is a brief paragraph to summarize the results of the experiment, giving the main conclusions of your work. Take a look at some journal papers to see how abstracts are usually written.

- **Introduction:** Here you can briefly give some details and background on the experiment. Be very concise. Use figures only if necessary. You don’t have to repeat what is already mentioned in the handouts; you can reference what is there. Details of experimental procedures are not necessary but only what is not in the handouts like, for example, if you took some extra precautions or steps that were not there. You may provide equations that you used for analysis of the data if not in the handouts, otherwise refer to them by number. Don’t simply copy passages.

- **Results:** This section should have the results of your observations and graphs. Raw data are not to be included; they have to be processed first. Graphs are preferred. Analysis of the errors should be included here.

- **Discussion:** An itemized discussion section is required. The comments should reflect your understanding of the experiment and subject matter. It should inform the reader of what was learned about fluid mechanics from the experiments. The quality of your comments and discussion is more important than the quantity.

- **References:** This is a list of materials cited within the text.
Data and calculations

- A reasonable amount of data should be recorded during the experiment to show meaningful results. During experimentation spread the data out as much as you can so that it covers the entire range of the equipment. A uniform distribution of points on a graph looks good. Bear in mind that more data points are usually required where the curvature of a curve is large. Avoid trying to get by with the least amount of data. Data should be measured as accurately as possible.

- Do not present raw data unless required, and then only if it means something.

- An important question is when do a regression analysis on the data and when not to. With polynomial fits so easy to do, there is a tendency to misuse this tool. There are two main reasons for curve fitting. One is if the fit is simple, e.g. power law, exponential, straight line or parabola, the conclusion is that there is some reason behind the nice result, whether we know it or not, and whether current theory can predict it or not. In some cases, the data should be fit in pieces: one part of the data may be linear while the rest may be parabolic, for example. Another reason arises when the calibration of the device will be used by someone else. That is, if we determine $y = f(x)$ where $f$ is a complicated function, then perhaps this device could be used to determine $y$ by measuring $x$. Having the best fit equation can be very useful for a person using this device. There may be other related reasons also, but it would be wrong to curve fit all experimental data simply because it is easy to do. Some should be and others shouldn’t. In any case, remember that it is not just having the graph that counts, but what you say about it. So if the curve fit does not enable you to say anything more about the data, it probably should not be done.

- Use Matlab, C or Fortran to do your calculations.

Writing

- Use formal, technical rather than conversational language. Assume that the reader is an engineer.

- Do not write anything by hand. The only exception is in the Declaration page.

- Do not simply describe what can obviously be seen in the graphs.

- In the Results the calculations and formulas used should be clearly outlined.

- In the Discussion compare what you have obtained with what the literature says, and comment on it. Say what you have learned from the experiments from the perspective of fluid mechanics.
• Put a space before the units. That is, write 2 kg instead of 2kg. Units should not be in italics.

• Do not write equations such as

\[ \text{Force} = 3.28 \times \text{Voltage} \]

but

\[ F = 3.28V \]

where \( F \) is the force in Newtons, and \( V \) is the voltage in Volts. Variables should be in italics. Do not use \( * \) as a multiplication sign.

• Put the Declaration (“By signing this I declare the following . . .”) as a last page. Fill in the name of the student who took the data with you, and sign it.

Graphs, tables and figures

• Plot data as points and then by regression best fit a curve through the data to show a trend, if necessary. In most cases simply joining the data points is not recommended. The data points should be clearly marked in the graph.

• If you generate the graph in Matlab, you can save it in Postscript and then open using IslandDraw to make modifications. Matlab can also be used to put subscripts and Greek letters. The axes that Matlab selects by default are usually not acceptable. If possible the origin of each axis should begin at zero. Matlab titles should not be put on the graph since the title will be in the caption.

• Do not show raw voltage readings that you read off a meter. Convert to physically meaningful quantities before plotting.

• Be careful with units in your calculations. Indicate appropriate units in your graphs and be consistent between graphs. SI is recommended. Make sure the axes are labeled with correct units.

• Graphs and figures should be embedded within the text and not attached at the end of the reports.

• Graphs should be numbered and captioned properly. If you have more than one curve on the graph make sure you identify them. Put the least amount of text on the graph and more in the caption.

• The lettering in graphs should also be at least 12 point font.

• Every graph or picture you put in should have a reason to be there and should be referred to by number explicitly in the text.
• Sometimes tables are necessary, though most of the times they are not. If used they should be clear with headings on each column and/or row. They should also be numbered and captioned. Information in a table should not be repeated in a graph.

**Grading**

The following items will be considered.

• **Instructions (10%)**: It is important that the report conform to all the instructions given here.

• **Effort (10%)**: A reasonable amount of data should be recorded during the experiment from which meaningful inferences can be made, i.e. minimum effort = minimum grade. Sloppy measurements are not acceptable.

• **English (10%)**: Grammar, spelling (please spell check your text), and the proper use of technical language will be graded.

• **Presentation (10%)**: \LaTeX{} is the best processor for producing technical reports; Microsoft Word is barely acceptable. \LaTeX{} is not required for the first six experiments but is required for the last six.

• **Graphs, tables and figures (20%)**: They should conform to accepted practice including numbering, captions and font size in the lettering.

• **Results (20%)**: The data obtained should be as good as the equipment will allow. Accuracy in the results counts.

• **Discussion (20%)**: Creativity in interpreting the results (what do the data mean?) and your correct understanding of the instruments and basic fluid mechanics are important here.