COMMENTS ON LABORATORY REPORTS

Put **heading** (Bold) on each section of the report to help the reader easily find the items he/she is looking for. Also, each section should start on a new paper. Do not use the back page. Remember, your grade is important to you and may be affected if things are not clear and easy to find.

TITLE: Make the title descriptive!

GRADING RUBRIC

Make sure to check the grading rubric at the beginning of the experiment description to see what is expected from you

ABSTRACT: Stands alone! (300 – 350 words!)

- **First** briefly state "what was done": This is the opening statement for the abstract that can be combined with a statement of the technique used (3 – 4 lines max). Also, here, technique IS NOT procedure! A procedure is a series/set of actions conducted in a certain order or manner with definite start and end points. A technique is a particular practical method, skill, or art derived from knowledge in a particular subject (Thermodynamics, dynamics, etc.) and applied to a particular task.

Always be specific as possible, by succinctly communicating and emphasizing **what was actually done** and not what the purpose of the experiment was, providing specific information. Remember, you did not just calibrate any transducer; you calibrated a specific transducer, for example the PX 309 pressure gage transducer. This is very important to mention as well as the excitation voltage and standard used!

- **Then** state "what you learned": These are the topic sentences for your 5 main findings in your "conclusions" section.

Make them quantitative! Include key summary statistics, important parameter values from your analyses, including uncertainty analysis results.

In calibration, the most important results to share are the calibration curve and its Full – Scale Output (FSO). Tell the reader what he needs to know about the transducer characteristics such as the static sensitivity, the zero offset, the linearity and hysteresis errors, etc.

- Avoid a detailed description of the experimental procedure in the abstract.
- Avoid imprecise phrases and statements such as:

Large error small error almost perfect nearly linear not very linear linear and positively correlated good accuracy poor accuracy high precision data calibration was off data was accurately following a straight line data was very nearly linear the calibration was fairly accurate the data has low error the data was slightly skewed output voltage followed a consistent trend small degree of uncertainty error there was high variability in the Bourdon tube gage very little difference in the data.

These expressions can be made precise by making them quantitative: **Quantify**! Do not use qualitative words such as very, pretty, near, large, etc. For example, instead of saying "nearly linear", state the maximum deviation from linearity as percent of output span (FSO).

- Avoid general statements expressing what everyone knows: They take up valuable space without telling the reader anything new, and only serve to make the report longer, such as:
    a. The error of the measuring instrument has an effect on the measurement.
    b. Many devices are only as accurate as the calibration done on the device
    c. The calibration must be done first before any data can be taken
    d. These errors show that once again, accuracy is very important in an experiment and error analysis can determine how good the outcome of an experiment is.
    e. From this experiment it was easy to see that sensitivity, hysteresis, and linearity are subject to change with each individual system as set up error and irregularities within the components of each setup affect the final output and error of a system
- The team should examine each sentence for clarity and correctness. The following sentences are inaccurate, lack clarity and correctness:
    a. The deadweight tester 4703 was used to calculate the pressure output from the Omega PX309 pressure transducer…
    b. The transducer was measured using a deadweight tester
    c. The lab provided measurements…
    d. The output produced a calibration curve….
    e. The hysteresis error for the deadweight tester is….

Sentences should say what they mean: For example, it is technically incorrect to write “The static sensitivity of the calibration curve” or “The calibration curve of the deadweight tester”! It is the static sensitivity of the transducer.

- A brief personal conclusion can be included if necessary (2 sentences max)

RESULTS

- When stating a result in percent, always state percent of what value: Linearity and hysteresis errors are expressed as percent of output span: 1.06 % FSO
- To make an equation useful to the reader, always include units, especially when you provide an equation that contains a constant. This can be done either within the equation {y = (0.997 [mV/psig]) x – 0.21 [mV]}, or specify the units of the parameter values involved in a follow – up describing sentence.
- Remember significant figures: Present results with an appropriate number of significant digits. The number of decimals should always reflect the accuracy of the data: The following calibration equation has too many digits y = 1.01339861 x – 0.459437 (and misses units!)
- Do not connect discrete data points with lines.
- For the calibration curve, regress data
- Do not just place figures, tables, equations in the results sections: Use them to develop your 5 main findings
- Correctly format your figures and tables.

CONCLUSIONS

Make sure you are 100 % confident what the five major findings are, i.e., helpful things your boss or reader need to know. Each main finding will have its own paragraph! Here is some advice on how to write great conclusions:

- Do not miss the obvious: A major conclusion will be related to the purpose of the laboratory work, that is answering the question that motivated the laboratory experiment.
- Looking at what you were asked to do in the calculations or analysis of the data, such as calculating errors, will help you come up with some conclusions.
- Ask yourself why did you check out the influence of something you were asked to check out
- Were you asked to compare your measured values with those from a concomitant technique? In most of our labs, we use LabVIEW to provide a concomitant check on the measured parameter values, and we used two or more different techniques to measure the same variable.
- Important reasons why we calibrate are:
    1. To establish the relationship between the input and output of a measurement system
    2. Over time, transducers may potentially fallen out of manufacture's specifications, and that the calibration may have changed since the time it was done by the manufacturer: This can also be used as a conclusion when compared to manufacture's. In this case your main conclusion may be: "The calibration curve from the manufacturer has not significantly changed since the device was purchased or the calibration information given by the manufacturer is no longer valid", then in the follow – up sentences prove it with your results or analyses.
- For each paragraph of a main finding, always start with a topic sentence introducing your main finding: Consider starting with your most important result/conclusion, the calibration curve, providing its equation with units and specifying the standard used. Then you need to convince your reader using your data to provide evidence, proof, or support to your topic sentence by referring the reader to figures, tables, or calculations, other values in the regression analysis output. One important finding may be: "The transducer is not a linear device or the output is not linear with the input". Then support your conclusion with evidence, that is, what you can point to in your worksheet or figures to convince your reader. Your supports can include possible explanations from physical principles/laws (equations), and theory validating the experiment
- Watch your language and wrong words, and avoid too many unnecessary wording.
- When your main conclusion involve calculated results, if necessary you may briefly need to convince your reader that they were correctly determined.
- Include all information from the worksheet, including date, personnel, equipment, etc.

WORKSHEET: Preferably one page (Landscape)

- Work on developing worksheets that are easier to follow by formatting the text correctly (Not too small or too big). The worksheet along with the sample calculations where you convince your instructor that you know what you are doing. They make it easy to follow the progression of your calculations, especially when calculations are more complicated.
- Include the output of your linear regression

SAMPLE CALCULATIONS

Make sure that every calculation you performed has a sample calculation in this section.

DATASHEET: Must be complete (see requirements!)