MECH 322 Instrumentation

Laboratory Guidelines

Instructions for each laboratory experience will be available on the course website. The instructions generally have a lab preparation homework problem. Please read the instruction and complete the problem for homework before coming to lab.

Students will work in groups of two or three individuals assigned by the instructor. A portion of the lab grade is based on an individual’s participation and another portion is based on a group lab report. All group members will receive the same lab grade unless the instructor believes some other distribution is appropriate. Students who do not attend the laboratory period will receive no credit for the lab.

Laboratory Period
During the three-hour laboratory period, the group will perform the measurements, analyze the result, if necessary take new measurements, and complete the lab report. Students should plan to spend the full three hours in lab to complete this work. If a group cannot complete its report by the end of the period, the lab instructor may give it permission to turn in the report the following day by 9 am. No late lab reports will be accepted.

Laboratory Participation
In order to receive full participation credit, students must arrive on time, be prepared to perform the lab (this may involve bringing a completed Excel spreadsheet and/or LabVIEW vi that is assigned as homework), follow the lab instructor directions, act professionally, perform the lab conscientiously, and leave the lab station in the same condition they find it. Please disassemble any equipment you assemble, put equipment and materials away neatly, do not leave anything you brought. Food and drinks are not allowed in the laboratory. You may take a short break during lab, but please be sure you have enough time to complete your work.

The lab instructors will assist you in conducting the lab but will not do it for you. Be sure to save your data frequently, restart computers that “freeze up,” and attempt to troubleshoot problems yourself. Lab instructors will assist you in troubleshooting Excel spreadsheets up to Lab 7 but not afterward. They will assist you in developing LabVIEW programs after that.

Report Contents
Students will prepare reports using Microsoft Excel and PowerPoint. Upload the spreadsheet, spreadsheet, LabVIEW VI, and other relevant files to WebCampus, e-mail them to yourself, and turn in a paper copy of the report. A portion of the grade will be based on the report appearance and format. The following three sections must be included in the listed order. Do not include a section on the experimental setup or its procedures.

Title Slide
Include the experiment number and title, and the date it was performed. Below that give the group number and member names, and then the instructors’ names.

Abstract
On the second slide, give concise descriptions of the objective, methods and main conclusions of the experiment. Also include any recommendation you have on how to improve the experiment. The abstract may be broken into these three or four sections, or given in one continuous paragraph. The abstract should be written so that the reader can quickly understand what you
have done and what you have found. Write the abstract after the rest of the report has been completed. The abstract must be checked for both spelling and grammar, and written using the third person.

Results and Discussion
The lab instructions will give specific direction regarding the information that must be presented in this section. Be sure to follow these directions closely since they serve as the basis for grading.

In this section, we concentrate on engineering data presentation using tables and figures with short verbal bullets tied directly to these items. All plots and tables must be numbered (i.e. Table 1, Fig. 5) and descriptively titled. The bullets should describe what the plot or table shows and what you conclude from it. You may wish to comment on comparisons with relevant theory or sample data provided by the instructor, and/or the quality and accuracy of your results. If you believe some of your results are incorrect or inconsistent with your expectations then explain the inconsistency. It may be useful to compose the written bullets based on the way you would describe the item in a short verbal presentation. Your conclusions must be based on your data, not the sample data.

Only one plot or table should be placed on a slide. Its number and title should be place above it in bold typeface (18 point font) and its bullets should be placed below it. If the verbal bullets require an additional slide, do not place another plot on that slide.

Plots Plot axes must be located at the lower and left-hand edges of the figure (16 point font if possible). These axes must be labeled with the appropriate variable symbol and its units in square brackets. A short verbal description of the quantity may also be given, for example: Stress, \( \sigma \) [Pa] (use 16 point font). When creating a plot in Excel avoid an extra frame around the plot.

If there is more than one data set on a plot then all curves and data points must be labeled directly on the figure or using a legend (16 point font). Experimental data must be presented with discrete point symbols (e.g. \( \bullet \), o, \( \Delta \)) unless they represent a time dependent measurement. Theoretical results or data fit curves must be represented with continuous or dashed lines. Error bars indicating the uncertainty of measurements must be used when appropriate.

The printer in the lab is black and white. As a result, do not use colors as the only way to distinguish different data. Shaded plot backgrounds may also be problematic (you may want to use white backgrounds). Please inspect a printed copy of your report before turning it in to avoid unexpected surprises.

Tables All tables must use a white background and have an appropriate grid. Column and row headings must contain symbols and units. The heading may also contain a short verbal description of the variable, such as “Quad Area, A [ft²].”

Answers to Questions The laboratory instructions may contain specific questions. Include the answers to these questions in the bulleted statements or on separate slides at the end of the results section.

Significant Figures Use an appropriate number of significant digits when reporting numerical results in the text. For example, do not report uncertainties to more than two significant figures. Do not report the measured values using more significant digits than the uncertainty (ok: \( x = 141.3 \pm 1.1 \) cm, not ok: \( x = 141.31 \pm 1.13 \) cm or \( x = 141.312 \pm 1.1 \) cm).