**Instructions and Template for 747 Group Lab Reports, 2017**

***INTRODUCTION***

The following template, including the title page, has been prepared to guide the students for writing good experimental group lab reports in mechanical engineering lab courses. The students are advised to note the following rules regarding the labs and lab reports:

* The posted safety rules in the labs must be strictly observed.
* Must come to the lab on time.
* Must be prepared prior to the lab by reading the lab write-up and completing all assigned pre-lab work for the experiments.
* Unless otherwise stated, all reports are 100 points.
* Unless otherwise instructed, lab reports are due in MyCourses (electronically) by 10 pm, two weeks from the date the experiment is performed.
* Late submission of lab reports will be penalized by 5% per day.
* No final lab grade will be assigned unless all reports are submitted.

**GROUP REPORTS**

* Follow the given template when writing group lab reports (internal and external).
* For each lab report, a *peer effort* should list all group membersand their percentage of effort in the lab report. The total percentage must total 100%. All group members must sign (initial) next to their name to signify that they agree with the decided allocation of effort. **Note: No lab report will be graded without this, and the lab report will be considered incomplete (and late) until this page is submitted.**

**REPORT STRUCTURE AND GRADING**

* Title page (2 pts)
* Table of contents (3 pts)
* Objectives (5 pts)
* Executive summary (10 pts)
* Theory and experimental methods (15 pts)
* Results and discussion (40 pts)
* Conclusions (10 pts)
* References (3 pts)
* Appendices (7 pts)
* Peer effort (required for grading)
* Report quality (5pts)

The overall quality of the report will have an impact on the report grade. This includes grammar, paragraph and sentence organization and structure, clarity, etc. Up to 5 points can be directly lost for a poorly written and poorly organized report. Obviously, poorly written reports will lose additional points in other sections of the report.

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***TITLE PAGE OF LAB REPORT* (2 points)**

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| --- | --- |
| **Course Number and Name:** | |
| **Semester and Year:** | **Name of Lab Instructor:** |
| **Lab Section and Meeting Time:** | **Report Type:**  **(e.g., internal group)** |
| **Title of Experiment:** | |
| **Date Experiment Performed:** | **Date Report Submitted:** |
| **Names of Group Members:** | **Grader's Comments:** |
| **Grade:** |

**\*\*\* EXTERNAL REPORT ONLY \*\*\*\*\*\***

**COVER LETTER** – Include a letter to your “customer” that provides a description of the problem, objectives, the work performed, and a summary of results that are significant corresponding to the objectives.

**TABLE OF CONTENTS (3 points)**

Include a table of contents that gives the page number of each major section of the report. You should also include a list of figures and a list of tables.

**OBJECTIVES (5 points)**

A few sentences should be sufficient to describe the laboratory work as a technical task, and not as an educational task. Writing a good statement of the objectives requires a compromise between the desire to be concise and the need to give sufficient detail so as to make clear exactly what was done. Thus, the statement “The objective was to test a force-measuring device” is concise but too vague to allow the reader to judge the significance of the report’s contents. (From E.O. Doebelin lab manual)

The objectives should address the following:

* What is the objective of the experiment?
* Why is this objective significant?
* A brief description of the experiment to achieve the objectives.

***TIPS***

Treat the laboratory work as a technical task, not an educational task.

**Educational Task (NO)**: "The objective of the experiment was to calibrate a spring scale against standard weights over the range 0 to 5 lb ".

**Technical Task (YES)**: "The Model 93 strain-gage force transducer was statically calibrated over its full range of 0 to 5 lbf. Sensitivity, nonlinearity and hysteresis were determined."

***Your audience:***

Most engineering reports are written for supervisory personnel who oversee several projects and wish to be brought up-to-date on a particular phase or aspect of the work in the most efficient manner. This explains the general organization of most reports into "summary" type sections appearing at the beginning and then progressing into details toward the end. A busy manager should be able to quickly scan the first few pages of a report and determine whether he/she needs to read further into the details. Details (such as raw data sheets) are always necessary (to check for mistakes in calculation, for example) but may be put in appendices at the end of the report where they do not obscure the main issues.

**EXECUTIVE SUMMARY (10 points)**

Emphasis is on results that are significant. Immediately following the statement of objectives, it is often appropriate to summarize the most significant results corresponding to those objectives. Since the complete results appear in a later section, it requires some judgment as to which of these are most significant and thus worthy of inclusion in the summary. The Executive Summary should be on a separate page from the objectives. (from E.O. Doebelin lab manual)

Typically, the Executive Summary of results consists of tabular data, along with a few sentences that summarize the results and conclusions.

The summary should answer the following questions:

* What are the major results of the experiment?
* What conclusions can be made from these results?

Tips: 1) Give results in tables whenever possible, 2) Briefly discuss major conclusions

**THEORY AND EXPERIMENTAL METHODS (15 points)**

Place your theory and experimental methods here. The theory (in a very succinct form, i.e. not like a text book) should explain all equations, theoretical principles (if needed), and assumptions that are used in the experiment and the analysis. The primary purpose of the theory section is to show how the raw data is manipulated to become results. Relevant equations used are to be presented and described. This section should include diagrams where needed. Define all variables used in the equations. It’s best to write equations using an equation writer in a word processor. Detailed background information should not be included, just refer to a referenced text as appropriate.

The experimental methods should give a concise and brief description in your own words of how YOU accomplished the experimentation. Do not repeat the lab instructions, just write a general summary of the tasks, e.g. a +/- 1 5V step response was used on the filter to find the time constant and the steady-state gain. Put the lab instructions in the appendix and refer to it for more details. Your brief description along with the lab instructions should have sufficient detail so that another experimenter could duplicate your efforts. Any changes to the lab procedures should be noted here.

This section should include equipment used in the experiment. Use sketches, diagrams or photos, to describe the experimental set-up. Label the main components. Provide dimensions and material of test samples where applicable.

The equipment listing in the Appendices is the appropriate place for model numbers and serial numbers.

*Tips: Any information taken from Lab manual or other references should be appropriately referenced, otherwise, it is considered plagiarism.*

**RESULTS AND DISCUSSION (40 points)**

Place your results and discussion here. This is the most important part of the report. Summarize your results in the introductory sentence. Relate your results to your objective. Present the results in the easiest way for your reader to understand: graphs, tables, figures, etc. Spreadsheets are often an ideal tool for organizing the data, analyzing the data, and generating graphs and tables. All tables and figures should be accompanied by comments or discussions in the report text; use a numbering system for identification of each one. All figures and tables must have numbers and captions. While the table captions should be placed over the table, figure captions should be placed below the figure.

Explain the results of the experiment, comment on the shapes of the curves, compare obtained results with expected results, give probable reasons for discrepancies from the theory, answer any questions outlined in the instructions and solve any problems that may have been presented. Tell why things happened, not only that they did happen. Experimental errors should be discussed here.

Common Mistakes to Avoid

1. Calculations and formulas are not presented in this section. Your calculations should be detailed inthe Appendices under SAMPLE CALCULATIONS. Formulas should be discussed in the THEORY section.

2. Do not use this section for discussion of extraneous background material obtained from textbooks and other references.

3. Avoid space consuming zeros. This can often be avoided by using appropriate prefixes; i.e., 0.000167 seconds can be written as 0.167 milliseconds (ms) or 167 microseconds (s).

**CONCLUSIONS (10 points)**

[Name: remember that each person of the lab group must write a separate conclusion]

Place your conclusions here. State your discoveries, judgments and opinions from the results of this experiment. Make recommendations for further study. Suggest ways to improve the results of this experiment.

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Tips: Consider that in the real world, after graduation, upper management is very likely to read only your EXECUTIVE SUMMARY and CONCLUSIONS. Beyond that, the chances are that only your figures will be skimmed. Make the most of these sections

**REFERENCES (3 Points)**

Place your references here. Itemize any books, publication or websites that you referenced in compiling your report. Provide authors, publisher, date of publication, page number, etc.

*Follow standard format for typing a reference:*

[1] Little, P., and Cardenas, M., 2001, “Use of Studio Methods in the Introductory Engineering Design Curriculum,” *Journal of Engineering Education*, Vol. 90, No. 3, pp. 309-318.

[2] Nunally, J., *Psychometric Theory*, 2nd ed., New York, N.Y.: McGraw-Hill, 1978.

[3] Lister, B., “Next Generation Studio: A New Model for Interactive Learning,” [*www.ciue.rpi.edu/pdfs/nextGenStudio.pdf*](http://www.ciue.rpi.edu/pdfs/nextGenStudio.pdf)*.*

**APPENDICES (7 points)**

**A. Data Tables**

Place your data tables here. Data tables are for the convenience of the extremely interested reader. These tables may contain any additional comparisons or calculations that you have prepared. RESULTS may contain only summaries of your work. Data Tables are the place to show everything that you did.

**B. Sample Calculations**

Place your sample calculations here. Demonstrate how you performed the calculations made in the experiment. Include tabular results of computations where such are made. Show the generic calculations to support all your work. Provide any computer or calculator program listings, along with sample input and output. Use equation writer in Microsoft Word or neatly write the equations by hand.

**C. Equipment List**

Place your equipment list here. Every piece of equipment used in the experiment should be listed. Unique identification numbers should be provided, when possible. The accuracy and/or the readability of the instruments should be given. Specimens are not equipment.

**D. Raw Data Sheets**

Attach your raw data sheets to the end of the report. If data was hand recorded in lab, attach photocopies of your lab journal.

**E**. **Lab Instructions**

Include the lab instructions for a complete self contained report such that one could duplicate your results.

**PEER EFFORT**

For each lab experiment, an *effort percentage* should be given for each group member. The total percentage must total 100%. All group members must sign (initial) next to their name to signify that they agree with the decided allocation of effort. **Note: No lab report will be graded without this, and the lab report will be considered incomplete (and late) until this page is submitted**