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## Lab Report Guidelines for Materials Science: ENGR:2720

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This and other course materials available on the “Course Support” page of the CTC website: <http://www.engineering.uiowa.edu/hctc/hanson-center-technical-communication/course-support>

**Important:** Although you may do the work of the labs with others, you must write reports on your own. The report measures your individual understanding of the lab. It also measures your own ability to communicate your understanding to others. Copying the written work of others or any collaboration with others on writing the reports may mean that you receive no credit for the lab. In addition, you may be charged with plagiarism and your teacher or the University may take further action. If you have questions about avoiding plagiarism, go to the CTC website for further information or consult the University’s Code of Student Life <https://dos.uiowa.edu/policies/code-of-student-life-16-17/>

**Visit the Hanson CTC:** We strongly advise every student to sign up for appointments to receive suggestions about how to improve your lab reports. The HCTC is located in 2224 SC (in the Student Commons). Starting on **Tuesday, August 30, 2016**, we will be open **Monday through Friday, 1:00 to 4:30 p.m. (Sunday hours – 4:00 to 6:00 p.m.)**

## The Lab Report

- Materials Science requires five traditional experiments. (See the Materials Science web page for descriptions of each experiment.) <http://css.engineering.uiowa.edu/~matsci/>
- Turn in lab reports at the **beginning** of the lab period on the due date listed in the Laboratory Schedule.
- Only use Materials Science laboratory equipment when a TA is present (for your safety and that of the equipment) and only **during scheduled laboratory hours**. TAs will not be available at other hours for these studies.

## General Formatting Instructions

- Double-space the body of the paper, with 1” margins all around. Times-Roman font, 12-point only. NUMBER YOUR PAGES.
- Label each section with the titles listed here: **Abstract, Introduction and Background, Experimental Methods, Results and Discussion, Conclusion, References, and Appendices**. Section titles should begin at the left-hand margin. Double space after the title.
- Laser print and staple the entire report. Do not use plastic covers or other binders. **Important:** Be sure to put your lab section on all reports.

## The Writing Process — How to write each section of the lab report

Clear writing is an essential engineering skill. You must write lab reports that colleagues and supervisors can easily understand, and present the material in a coherent manner so that any engineering colleague can easily duplicate the experiment. To that end, organize your lab report by sections: **Abstract, Introduction and Background, Experimental Methods, Results and Discussion, Conclusion, References, Appendices.**

### Abstract

A good abstract summarizes the report in one paragraph and generally answers the following questions:

- What was the purpose of the lab?
- For whom did researchers conduct the lab?
- What materials did the researchers use?
- What tests did the researchers perform?
- What result(s) did they find, and what are the implications of those results?

The abstract belongs on a separate page after the title page but before the rest of the report.

Note: The **Abstract** is your report in miniature. Although it appears *first*, common sense dictates that you must write it *last*. Read our CTC handout "Writing an Abstract" on: [http://www.engineering.uiowa.edu/sites/www.engineering.uiowa.edu/files/hctc/files/writing\\_an\\_abstract.pdf](http://www.engineering.uiowa.edu/sites/www.engineering.uiowa.edu/files/hctc/files/writing_an_abstract.pdf)

### Introduction and Background

An **Introduction** gives the reader a "first impression" and should generate interest. In this section introduce the subject of the lab and describe the problem the experiment wishes to solve. The introduction should also include definitions of technical terminology, and may discuss who conducted the experiment, where they conducted it, and when.

The **Background** section should include any relevant contextual material that is necessary for the reader to understand the experiments you performed. This includes theoretical values for material properties such as tensile strength, hardness, coefficient of expansion, etc. You also need to specify the materials tested, including specific alloy composition and/or polymer type. Relevant equations go in this section. Use a format similar to that in the textbook - briefly describe the equation before showing it, label it and define its terms/variables. Use the equation editor in Word (Go to the "Insert" menu, choose "Object..." and scroll down to select Microsoft Equation 3.0").

## Experimental Methods

This section describes in detail the test(s) you conducted and the methods you used to set up, calibrate, and run the equipment. Include any pertinent illustrations of the equipment used, and make sure you caption them correctly. Remember that this section should be written in past tense and third person. For example: *“Each container was heated on high power in a common-household microwave oven for three trials, each five minutes in length.”* Your explanations should be as specific as necessary for someone to accurately reproduce your experiment.

## Results and Discussion

This section summarizes the major findings of your lab tests. Include values you calculate and/or measure. When needed, represent your data in a table or a graph. Always introduce your graphs or tables in the text prior to their appearance.

- Label all graphs and figures as Fig. #. Label all tables as “Table #.” Note that graphs are not labeled “Graph.”
- Include important tables and figures in the text of the report and not in the appendix. Raw data and less important figures and tables go in the appendix.
- If you include a table or figure in the body of the report, you must refer to it.
- Figure numbers and captions go under the figures. Example:

Fig. 1: A graph of hardness versus tensile strength of 6061 aluminum

- Table numbers and titles go above the tables (see example Table II).
- Keep all parts of a table together on the same page (see example Table II).

If your results involve “before and after” experiments (e.g., before and after heat treatment), or if you are looking at changes in measured properties, express them as a percentage change as well as listing the magnitude of change. For example:

Table II: Hardness test results of 1018 steel before and after water quench

Hardness before Treatment (HB)	Hardness after Treatment (HB)	% change
45	60	+33.3%
45	42	-6.7%

Having presented the results, you must now explain what your results mean, and examine their implications. Discuss any assumptions you made and indicate how these assumptions affected your results. Include additional analyses or experiments needed to improve upon your results.

## Conclusion

The conclusion offers you an opportunity to provide new perspectives on your experiment. Do not simply repeat the information in your introduction. Include a brief (two to three sentences) summary of the report, but then go on to offer recommendations or discuss future implications.

## References

Use the APA Documentation Guide, which you can retrieve online by clicking the “APA” link on the CTC home page:

<http://www.engineering.uiowa.edu/ess/current-students/academic-support/ctc/course-support>

## Appendices

Material that is somewhat bulky and does not necessarily contribute to the overall presentation of the report is placed in this section. Give the appendices titles; for example, “Appendix A: Tables” or “Appendix C: Example Calculations.” Several items that may be included are:

1. List of Nomenclature and Symbols Used.
2. Tabulated Data: Give the raw data in a neatly tabulated format. Also include any summarized results.
3. Figures: If you choose not to place the figures in the text, you can place them in an appendix, but still list them in the order to which they are referred in your text.
4. List of Equipment.
5. Methods: Discuss in greater detail how the experiment was performed, but do not give a minute by minute presentation.
6. Error Analysis: Estimate the accuracy of all measurements. Give statistically meaningful results.
7. Sample Calculation: Provide a sample calculation including a unit analysis. Insert typical data into calculations.
8. Theory: If possible, attempt to correlate measurements with a theoretical model.
9. Computer Program: When a computer program is utilized, a listing with a representative case should be given.

## Style Suggestions

- Use complete sentences.
- Do not use “bullets.”
- When typing in numbers that are less than zero, precede them with a 0 (e.g. 0.1234, **not** .1234).

- Write in the third person (keep your focus on the subject—don't use "I" or "we").  
**Example:** "The glass shattered when the pressure reached 75 psi."
- Use strong verbs such as "collected," "reported," "observed," "calculated," and "determined."
- Substitute "observed", "measured", "obtained," "determined," or "calculated" results for "results were found."
- Substitute "conduct" or "perform" a study or experiment for "a study or experiment was done."
- Substitute "weight measured" or use the verb "weigh" for "weight taken."
- Substitute "feasible" for "possible."
- Use "investigate" for "experiment."  
**Example:** "The team investigated the tensile strength of aluminum."

**NOTE:**

**We encourage you to make at least one Hanson CTC appointment with our peer consultants for feedback on writing your lab reports.**