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## Final Project Assignment for Materials Science: 57:015

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### The Final Project

For the independent project, you will write a project plan, a proposal, a final report, two progress reports, and give two presentations.

You will propose a study, which involves testing a material for a specific application. Examples from the past include testing golf balls, epees (fencing swords), automotive tires, bumpers, or whatever interests you. However, Dr. Guymon must approve the project. For the independent project you should choose partners and work in teams of three or four, and each team must contain students from at least **two different majors**.

**Group Ethics:** When working in a group, realize that when you accept credit for a group project without doing your fair share, you are representing that you engaged in the researching, synthesizing, problem solving, or other activities the project called for and you are representing that you did so at a level of effort similar to that of other members of the group. If you do not do your fair share but accept credit, that is a misrepresentation, an abuse of the spirit of teamwork, ethically questionable, and in extreme cases could be considered academic misconduct. (This material was used and modified with permission of the author, Dr. Tom Rocklin - the original article appeared in the April 2002 issue of TALK - a newsletter from the Center for Teaching.)

### *First, write a project plan and present your plan:*

Using two or three sentences for each question, answer the following questions:

- Who? – List the team members' names and majors and the lab section of each member
- What? – What you will test (e.g. strength of different brands of wrenches)
- Where? – Will you be doing all tests in the Mat Sci lab or will you need special testing facilities or will you test in your apartment and/or garage? List all places where you may be testing.
- When? – When will you obtain your materials for testing?
- Why? – Justify your project. Why is this important?
- How? – How will you accomplish the "what"? Which tests will you use?

You will use the answers to these questions in the development of your proposal. Dr. Guymon will return this assignment after your two-minute presentation. Keep a copy to use for your presentation. You will give a very brief presentation in your lab section. All group members present approximately an equal amount of time. Use the project summary you wrote as a guide to what information you will present. This is fairly informal and does not require any visual aids.

## **Second, write a proposal:**

- Turn in proposals at the **beginning** of the class on the due date listed in the Laboratory Schedule.

### **General Formatting Instructions**

- Double-space the body of the paper, with 1” margins all around. Times-Roman font, 12-point only.
- Use a **Cover Sheet**. Label each section with the titles listed here: **Project Summary, Research Plan, Specific Aims, Background and Significance, Research Design and Methods, and References**. Section titles should begin at the left-hand margin. Double space after the title.
- Laser print and staple the entire proposal. Do not use plastic covers or other binders. We will provide manila file folders to store the reports and other writing assignments.

**Keep all drafts, the writing evaluation sheet, and the Hanson CTC Contact Report slips in the folder provided. Submit your folder with each report and the final project.**

### **The Writing Process — what you need to do.**

Proposals address clients’ needs and offer solutions to their problems. You must present the material in a coherent manner so that clients can see answers to their questions about the soundness of your project and your ability to complete it. The proposal also offers a roadmap to the project. To that end, organize your proposals by sections in the following manner: **Cover Sheet, Project Summary, Research Plan, Specific Aims, Background and Significance, Research Design and Methods, References**.

#### **Cover Sheet**

*Includes distinct project title (maximum of 80 characters, including spaces), names of team members, and a brief (2-3 sentences) biographical sketch of each team member. The bio should include the year and major of the researcher. **Who** will be conducting the research?*

#### **Project Summary**

*Use a maximum of 250 words. Number this as page 1 of the proposal, with this and each succeeding page number centered at the bottom of the page.*

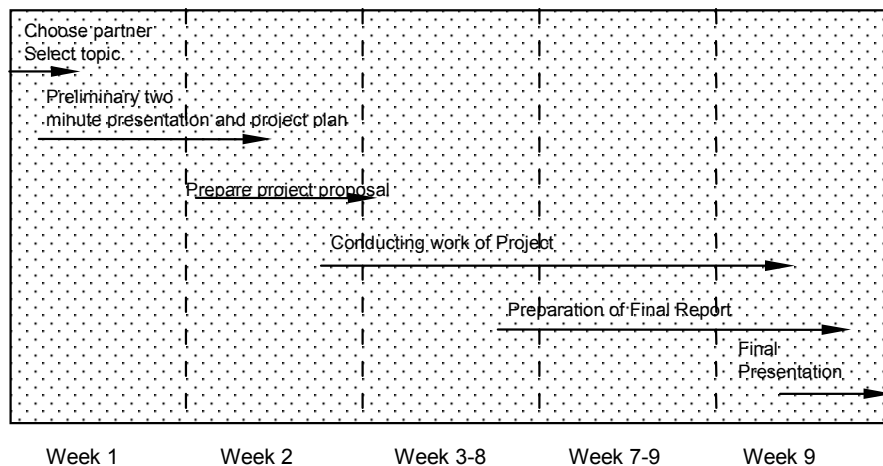
## Research Plan

The research plan should answer the following questions. **What** do you intend to do (Specific Aims)? **Why** is the work important (Background and Significance)? What has already been done (Background and Significance)? **How** are you going to do the work, **what** tests do you intend to conduct, and **where** will you conduct them (Research Design and Methods)? The only question remaining is **when**. This is covered by your Gantt chart (Proposed timetable in Research Design and Methods).

1. **Specific Aims.** You should have 2 to 3 specific aims. Specifically what information do you hope to gain from the tests and how do you plan to use the results? Include only what you can actually do (i.e. do not include long term objectives but only aims of your immediate project.)
2. **Background and Significance.** Summary of relevant literature and justification of research (i.e., why is the work important?). **You will need to cite all references used.** Why is this study important? Include theory here. What do you know about the material(s) you have chosen to study (i.e. fatigue strength, yield strength, composition, etc). Equations will go in this section - be sure you use an equation editor (like Equation 3.0 in Word). You should also include longer-term objectives - goals that you won't be able to complete but would be important if someone were to continue with your study.
3. **Research Design and Methods.** This section should relate to the specific aims, i.e., the first 4 subsections given below should be written for each specific aim. Give very specific information here and give me as much information as you possibly can.
  - **Experimental Design.** This should briefly discuss the strategy behind the experiments that will be conducted to address the specific aim in question. This is an overview of **what** tests you will do. For example, for each specific aim you might briefly discuss what tests you will conduct with details provided in the following sections.
  - **Procedures.** Include standard method number and specifications. This is only for standard procedures. Address *New Methodology* in the next section. Spell out EXACTLY **what** you will do. How many times you will do each test, how many samples you'll have, etc. If you are doing a test that you did in the lab (e.g. Hardness test) you do not need to repeat all of the steps; just indicate that you will do hardness tests using the Rockwell hardness testers in the MS lab. If you are using a standard test (e.g., concrete tests are very specific), list the test number and specifications. Include **where** the equipment you will be using is located.
  - **New Methodology.** Where there is no available standard test, give proposed procedures you plan to use. Be as detailed as you can, with the understanding that once you begin the experiments, you may have to modify the procedures.

The nature of the materials you choose to study will determine the length of this section. If you need to modify how your sample goes in the tensometer, describe here **HOW** you would do this. If you're testing the corrosion resistance of a material, you will have to develop your own methodology and you will need to describe that here as well.

- Data Interpretation and Expected Results. **How** will you analyze the data and **what** results do you expect to obtain? Be specific. Exactly **what** information will you get from your tensile test (UTS, toughness, Young's modulus, etc) and **WHY** did you choose those particular variables instead of others. You will most likely want to look at the actual use of the items you will be testing and consider **what** stresses and conditions they will undergo in everyday use and choose relevant measurements.
- Potential Problems. **What** potential problems could arise by following the proposed plan, i.e., what could go wrong? Should briefly discuss alternative approaches for those cases where potential problems could arise.
- Hazards. Don't just tell me you are going to avoid these. Tell me **what** they might be and **HOW** you plan to neutralize these potential hazards.
- Proposed Timetable: You must include a Gantt chart (**When** the project will be conducted). A simple example is given below. Your chart needs to be much more detailed than the one shown. DO NOT just list "conducting work of Project" - break it down into each of the tests you plan to do. Do not use "week 1", etc but use specific dates.



Example of Typical Gantt Chart for Projects

## **References**

Use the APA Documentation Guide, which you can retrieve online by clicking the “APA” link on the College’s Hanson Center (CTC) home page:

<http://www.engineering.uiowa.edu/~ctc>

## **General points**

- Do the project without bias. Do not propose a hypothesis that you will test! You may feel that a cheaper brand will not be of the same quality as the name brand or, conversely, that all you pay for with the name brand is the name, but do not state this in your proposal (or anywhere else)!! Instead, you could say, "Tests will be conducted on a Craftsman and a Wal-Mart wrench to determine if there are any measurable differences in material properties ". **Draw conclusions from factual observations.**
- Obtain the actual samples you are going to test before you write the proposal, or at least be sure you can easily and quickly obtain them.
- You cannot give me an adequate proposal that is only one or two pages long. I appreciate concise writing but it can't be so concise that you leave out half of the information.
- Don't feel that you are bound by your proposal document. Through the course of the project, you may come to realize that you cannot do one of your proposed tests or you have to make significant modifications to one or more of your procedures. Your final paper and presentation will not be graded on the basis of what you put down as your proposed plan of attack.
- Only use Materials Science laboratory equipment with a TA present (for your safety and that of the equipment) and only **during scheduled laboratory hours.**

## **Style Suggestions**

Follow the same suggestions given on **page 5 in the Lab Report Assignment document.**

### ***Proposal Checklist***

Below is a separate page containing a checklist for you to **complete, sign, and attach to your proposal**. This is designed to help ensure you haven't missed any important details and that your work is as complete and error-free as possible.

\_\_\_\_ At least one team member has read the proposal aloud, word for word as it is written, not as you think it is.

\_\_\_\_ The proposal has been checked for spelling/typos. This is more than spellchecking. After you have run Spell Check, you need to read carefully for spelling/typos that Spell Check didn't detect. For example, does your sentence say, "Samples will be purchased form Menards" instead of "Samples will be purchased from Menards"? Reading aloud will also help you catch these types of errors.

\_\_\_\_ The proposal has been checked for incomplete sentences (sentence fragments). Not sure what a sentence fragment is? Check out this web site:

<http://owl.english.purdue.edu/handouts/grammar/index.html>

Reading aloud helps you catch these types of errors as well.

\_\_\_\_ Every group member has read the entire proposal.

\_\_\_\_ The prescribed format has been used, including proper citation of references.

\_\_\_\_ All sources cited in the proposal are included in the References section

\_\_\_\_ All sources listed in the Reference section are cited in the body of the proposal.

Group Members signatures:

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## ***Third, report progress:***

**Two project reports must be submitted before the final project is due.**

Each progress report has a **one-page limit** and must contain the following information:

Project title

Investigators' names and section number(s)

Specific Aims

Past Activities

Current Activities

Future Activities

Each report is worth a total of 20 points. Under the appropriate heading, briefly discuss the activities you have completed, are currently working on, or plan to complete. Include preliminary results of past activities and any problems you encounter.

- DO NOT use first person (i.e. I, we, me, us, etc) in the progress reports.
- Be sure to follow the format listed above — including underlined headings.
- All reports must be typed. Please check for typing and spelling errors. With more than one person per group, there is no excuse for typos.
- Your progress reports do not need to state that you have selected your partner or written your proposal or that you are working on your final report and presentation. Everyone will have done or be doing these things. I want to know what you have done or are doing that is specific to YOUR project.
- Make sure to include any results you have. **Summarize them in tabular form or graphical form** and then you can use the table(s)/graph(s) in your final report. Include these results in an appendix, thus keeping your report to the one-page limit.

## ***Next, write a final report and give a final presentation:***

- Turn in the final report at the **beginning** of the lab period on the due date listed in the Laboratory Schedule.
- You will follow the same format as your lab reports.
- Each group will hand in one report.

### **General Formatting Instructions**

- Center the title page. Double-space the wording and include a descriptive title, writer's name, name of the course, and the date.
- The body of the paper should be double-spaced, with 1" margins all around. Times-Roman font, 12-point only. Number the page at the bottom.
- Label each section with the titles listed here: **Abstract, Introduction and Background, Experimental Methods, Results and Discussion (one section), Conclusion, References, 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. We will provide Manila file folders to store the reports and other writing assignments.

Keep all drafts, the writing evaluation sheet, and the CTC Contact Report slips in the folder provided. Submit your folder with each assignment in the final project.

### **The Writing Process — what you need to do**

Write final reports that colleagues and supervisors can easily understand. You must 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 in the following manner: **Abstract, Introduction and Background, Experimental Methods, Results and Discussion (one section), Conclusion, References, Appendices**.

Your **Introduction and Background** section should include the purpose of your experiment, theoretical values for material properties such as tensile strength, hardness, coefficient of expansion, etc. You also need to be specific about the materials tested, including specific alloy composition and/or polymer type(s).

Your **Experimental Methods** section should detail all new procedures you developed or any modifications you made to the standard procedures. If you used the procedures outlined in the lab manual, you only need to refer to the manual. Do not detail procedures already listed in the lab manual. Outline any new or adapted procedures in detail — someone should be able to recreate your experiment from your **Experimental Methods** section.

Your **Results and Discussion** section: a major part of the grade for the final report will be based on how you relate the results of tests to each other and to the material properties of the materials. Do your tensile results indicate a harder or more ductile material, and how do those results relate to the hardness test, etc.? Relate results to the theory you've learned in class and discuss how your results compare with what the theory would predict. When presenting data in tabular form, sort the data in increasing or decreasing order of one of the measured or calculated values. For example:

Table I – Aluminum 6061 Test Results

Sample Number	Tensile Strength (MPa)	Hardness (HB)	% Elongation
3	150	45	10
4	200	78	9
1	250	25	8
2	350	75	2

- This makes it easier to spot trends immediately. In the example above, by listing the data in order of increasing tensile strength, it is easy to note that % elongation decreases as tensile strength increases. Hardness exhibits a similar trend with the exception of sample number 1. You would then go on to discuss if the tensile strength-% elongation trend is what you would expect to see based on theory. You would do the same for the tensile strength-hardness trend as well as discuss possible reasons why sample 1 doesn't follow the general trend.
- Don't forget to include statistical analyses or how accurate your results are (confidence limits, etc).

**Important:** Include additional analyses or experiments needed to improve upon your results. Describe any assumptions you made and indicate how these assumptions affected your results.

Your **Conclusion** section offers you an opportunity to provide new perspectives on your experiment. Do not simply repeat information in your introduction. Include a brief (two to three sentences) summary of the report.

### **Style Suggestions**

*Again, be sure to follow the same suggestions given **on page 5 in the Lab Report Assignment document.***

## Preparing a Project Display

Remember that a display appeals through the visual side of the brain. You have to structure the display so as to impart the maximum amount of information in the shortest possible viewing time. Part of your final presentation grade will be based on the visual appeal of your poster. A poster is the only acceptable means of visually presenting your results. No overheads are to be used. You can bring in a sample or samples of the material tested.

## Your Final Project Presentation

This takes no more than 10 minutes. Use your project display as your visual aid when making your presentation. The project team shares the presentation. All team members must do an approximately equal part of the presentation. Explain what your project was supposed to do and how you reached the objectives.

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## Materials Science: 57:015 – Fall 2008 Schedule and Deadline Dates for Final Project

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Due Dates for Final Project
Project plan due by 2 p.m. <u>in 4133 SC</u> , Oct 16.
2-minute presentations, Oct 23-28.
Proposal due by 2 p.m. <u>in 4133 SC</u> , Oct 30.
Progress report #1 due by 2 p.m. <u>in 4133 SC</u> , Nov 6
Progress report #2 due by 2 p.m. <u>in 4133 SC</u> , Nov 20.
Project presentations (with poster), Dec 8-12.
Final report due by 2 p.m. <u>in 4133 SC</u> , Dec 11.

**Note: Members of CTC's professional staff will grade lab report #2, the proposal, and final project report. We encourage you to make at least one CTC appointment for feedback during the lab report writing process. Use the comments and feedback you receive from CTC to guide all the writing you do in this course.**