

GUIDE FOR ECE 498 – SENIOR DESIGN PROJECT



Please read this report cover-to-cover. If you fail to adhere to the guidelines grade penalties will certainly (200%) apply.

Summer 2002

Prepared by

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Professor

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Some General Guidelines for Successful Design Projects

- Manage your time wisely. This is the pitfall of most groups that fail to finish their project. You are given two semesters and you have very little excuse for not finishing your project. You get into trouble by assuming that you can take all the heavy courses during the first semester and then work on your project during the second term. This is a **fatal mistake** and you should avoid it altogether. You will be given a letter grade for the work done during the first semester. If your team did not accomplish anything significant during the first term, don't be surprised to see a poor grade.
- Meet with your faculty advisor once a week. Set up a schedule and stick to it. You can put off your advisor if you are late or do not bother to show up regularly.
- **Document your discussion with your advisor by entering the information in the progress report form.** Get the form signed by your advisor and give it to the ECE 498 coordinator promptly. It will be a mistake to wait until the end and have a whole bunch of progress reports signed on one day. The coordinator will not accept these reports and there are grade penalties associated with this activity.
- Plan your project properly. Sometimes you may have to order components, software etc. and they may not be delivered in time, causing delays. These are issues that must be addressed early on. Have a back up plan for any eventuality.
- If any of your team members does not participate properly, bring it to the attention of the coordinator immediately. Such issues should be tackled right away; otherwise you will pay dearly at the end.
- Some students assume that scheduled project classes are just a waste of time. Sorry, this is a flawed assumption. Students often come out with good ideas and suggestions after they listen to your presentation. Also, the coordinator expects you to attend all project sessions.
- **Keep a logbook to record your activities and meetings with your advisor. This is a MUST.** The coordinator will ask to see the logbook at any time and you should be prepared to show it.

ECE 498 SENIOR ENGINEERING DESIGN
PROPOSAL WRITING GUIDE (Don't include this in your proposal!!)
Summer 2002

NAME:

DATE:

TITLE: Select a title that describes your design project

ADVISOR: Give the name of the faculty advisor.

DESCRIBE BRIEFLY AIMS AND GOALS OF THE PROJECT:

Give a clear description of what this design project is intended to accomplish.

Why is this project important or useful or interesting? List potential applications or enhancements to existing applications. Or you have found a more economical way of designing some product that makes this design experience worthwhile.

DESCRIBE RELEVANT PRIOR WORK:

You may have access to reports, textbooks or some other references on the project you are proposing. A professor may have suggested this project or the company you are working for wants this project carried out. In any case you should be able to find some relevant literature on the subject. List them at the end of the proposal. Here you provide a concise description of existing work in the area of your design project. Also list the ECE courses that have given you the background to tackle this work. *If you undertake a project involving wireless communications and no one in your group has taken ECE 450 or ECE 471, the project may not be approved. The same goes for other topic areas like control systems, computer networks or computer hardware. In other words, the group collectively must have appropriate background (through proper course work) in the topic area of the project.*

PRELIMINARY IDEAS AND METHODS:

You have only about 24 weeks to finish this project. Hence it is important that you have a clear idea of what needs to be designed, what design techniques you plan on using etc. If you are a team, then you should think about who is doing what and in what fashion. I am deliberately using a conversational format here to make you comfortable. REMEMBER that each member of the team must be involved in the design process. You cannot say that X did the design, Y did the implementation and Z did the testing. That is simply not acceptable. What I am expecting from you is: X will design, build and test subsystem 1, Y will do the same for subsystem 2 and so on. Finally the team will come together in integrating the different subsystems to create the final system which must then be tested for proper performance. This subsection is the heart of your

proposal. Put your best effort here. Design necessarily involves making choices, using appropriate performance criteria to guide the design process. Performance criteria include cost, complexity, speed, accuracy etc.

COST ANALYSIS: This is important because if you expect to buy some component that may be expensive, then you have to ask: Who is paying for this? The department may purchase this component, if it determines that there is some long-term benefit to be gained by purchasing it. So you must think about cost. Right now you only worry about component cost. Don't include salaries etc. In general, the department does not provide financial support for the project.

TIME SCHEDULE: As I said earlier, you have about 24 weeks. Efficient utilization of available time is very crucial to the success of your design effort. I want to see a time schedule for completing the various phases of the project.

SIGNATURES: STUDENT ADVISOR COORDINATOR

NOTE: THE PROPOSAL SHOULD BE 700 - 1000 WORDS LONG. THIS GUIDE HAS 476 WORDS

ORAL PRESENTATIONS

Each project team will make at least four presentations over the duration of the project (two semesters). These will consist of

- ***Presentation of project proposal (semester 1)***
- ***Task assignment and description (semester 1)***
- ***Detailed progress report (semester 2)***
- ***Cost Analysis and safety issues (semester 2)***

Note: Each member of the team must participate meaningfully in these presentations.

Progress Report Forms Follow Next

**ECE 498 SENIOR ENGINEERING DESIGN
INDIVIDUAL PROGRESS MONITOR**
_____ Term 20__

DATE:

NAME:

TITLE:

ADVISOR:

DESCRIBE BRIEFLY YOUR PROGRESS TOWARD THE PROJECT:

DESCRIBE PROBLEMS/DIFFICULTIES ENCOUNTERED:

COMMENTS AND SUGGESTIONS FROM ADVISOR :

SIGNATURES: STUDENT

ADVISOR

COORDINATOR

**ECE 498 SENIOR ENGINEERING DESIGN
TEAM PROGRESS MONITOR**
_____ Term 20__

DATE:

NAME:

TITLE:

ADVISOR:

DESCRIBE BRIEFLY OVERALL PROGRESS TOWARD THE PROJECT:

DESCRIBE PROBLEMS/DIFFICULTIES ENCOUNTERED:

COMMENTS AND SUGGESTIONS FROM ADVISOR :

SIGNATURES: STUDENTS

ADVISOR

COORDINATOR

Project Report Guide Follows Next

PLEASE INSERT PROJECT TITLE HERE
(Note: Get covers from the ECE Dept.)



NAME OF STUDENT 1
NAME OF STUDENT 2
NAME OF STUDENT 3

ECE 431 ELECTRICAL ENGINEERING DESIGN
Fall 2003

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
THE UNIVERSITY OF MICHIGAN-DEARBORN
Evergreen Road, Dearborn MI 48128-1491
Tel: (313) 593 - 5420 Fax: (313) 593 - 9967

PLEASE INSERT PROJECT TITLE HERE

ECE 431/432 Electrical Engineering Design

**NAME OF STUDENT 1
NAME OF STUDENT 2
NAME OF STUDENT 3**

Fall 2003

Approved

Project Coordinator

Faculty Advisor

Chair, ECE Department

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ABSTRACT

This section must be included in your report

Please provide a 200-word description of your design project. The abstract should highlight key features of your design and provide a statement on the results achieved.

1 INTRODUCTION (8 pts)

This section must be included in your report

Please provide a two-page introduction to the topic area describing the area, its importance and the many applications. Then lead into the need for the project you have selected.

2 PROBLEM STATEMENT (10 pts)

This section must be included in your report

In this section clearly define the problem to be solved, together with performance specifications and overall objectives. (1 - 2 pages)

2.1 TASKS ASSIGNED TO EACH TEAM MEMBER.

This section must be included in your report

3 DESIGN CHOICES AND PERFORMANCE CRITERIA (7 pts)

In this section, discuss different approaches to solve design problem and describe the criteria (technical performance, size constraints, power limitations, cost etc.) used to select a specific design method. State clearly the reasons that lead to a specific design approach.

Each student in the team should contribute to this section by describing his/her design task, the criteria to be used for making design choices and design methodologies.

4 DETAILS OF DESIGN (40 pts)

This section which is the heart of the document must be included in your report

Present complete details of your design, including block diagrams, flow charts, circuit diagrams layout and whatever else is relevant. (4- 5 pages)

4.1 DESIGN TASKS FOR EACH TEAM MEMBER (10 pts)

This section must be included in your report

Each student in the design team must clearly describe the specific design effort undertaken to meet the objectives of the project. (One page each)

4.2 FINAL SYSTEM (15 pts)

This section must be included in your report

How do you go from your prototype design to the final product that can be marketed. Are there fabrication issues. Can VLSI techniques or similar mass production methodologies be used. If your project involves software development, how will you go about getting the final version for eventual use by your customers. Are there guidelines or standards for development of software to meet customer requirements and expectations? (2 pages)

4.3 SOCIO-ECONOMIC ISSUES

In this section, you present cost analysis, product pricing, economic benefits and societal impact. (1 page)

4.3.1 Detailed Cost Analysis (5 pts)

This section must be included in your report

4.3.2 Economic Benefits and Societal Impact and Global Issues (5 pts)

This section must be included in your report

4.4 SAFETY ISSUES (5 pts)

This section must be included in your report

In this section, you discuss safety issues and the consequences of failure of your system or the failure of any component in your system. Also present strategies to maximize safety of your system. (1 page)

5 TEST RESULTS AND DISCUSSION (25 pts)

This section cannot be excluded.

Describe in detail the test results and your interpretation of the results in as far as how well you accomplished your design tasks (2 - 3 pages)

6 CONCLUSIONS (10 pts)

This section must be included in your report

Present in bullet format, salient and relevant conclusions drawn from your design experience.

Even conclusions that are not favorable should nevertheless be included.

6.1 EXECUTIVE SUMMARY FROM EACH TEAM MEMBER

The report will not be accepted if this section is missing.

7 REFERENCES

This section must be included in your report

8 APPENDICES All derivations, intermediate results, detailed circuit diagrams, details of apparatus used, computer programs, photographs etc., that are not immediately relevant to the project should appear under appropriately numbered Appendices.

The design team must include the original proposal, modifications to the proposal (if any), progress reports and the executive summaries of each participating student under a separate Appendix. The final report will not be accepted, if this appendix is missing.

Vita Auctoris: A one page description of each student, his/her educational background, awards,

8.1 APPENDIX 3: GUIDELINES FOR COST ANALYSIS

One of the ABET requirements for a good design course is familiarity with costing. Each student is required to participate in this effort. When you calculate cost, you must include the following:

- 1) Cost of components
- 2) Cost of your time. (Assume that you are worth \$10/hour)
- 3) Facilities rental (When you use lab facilities at the University or elsewhere, you are incurring cost - cost of depreciation, maintenance etc.)
- 4) Use of lab space - rental cost
- 5) Cost of fringe benefits - 30% of your wages

In assigning cost to intangibles like use of space and lab equipment, a good rule of thumb is

- i) Take your wages, add 30% for fringe benefits.
- ii) You must also add your course instructor's cost on a fractional basis. Thus if the class has 10 students and if one course equals one month salary, you should divide this figure by 10 to arrive at advising cost. You may assume faculty advisor cost at \$100/hour (very cheap) for 5 hours/week.

There is one other issue that must be considered: pricing of a product. How does one price a product? Several factors must be considered:

- 1) Are similar products available in the market? If so, the price should be comparable to prices of similar products.
- 2) If the product is new to the market, then the price will be dictated by development cost and return on investment.

Let us say that the development cost of a product is 15,000 dollars. Let us also assume that you expect to sell 500 items in the first year and about 700 in the second year. You should try to recover your development cost in the first two years plus a reasonable return on your investment. Since projected sales is about 1200 items over 24 months, recovery cost is $15,000/1200 = \$13$ approx. Add to this your profit margin which could be about \$13. The cost to the buyer will then be at least \$26. Add to this agent commission, advertisement costs, complimentary gifts etc. Your cost would be around \$30- \$35/item. This is a crude analysis, but it gets you a ball park figure. In any case, the cost of the product should always be higher than the cost of the components!!

The next phase for you to consider is socio-economic factors. What is the impact of your design effort. Who does it benefit? Who will lose out? Will your product pollute the environment: chemicals, noise etc. Will your product have any risks (safety, catastrophic failure etc.). Recently a software glitch in AT & T's telephone network caused a blackout of New York for several hours. This type of software failure can have serious consequences both economically and in terms of providing essential and critical services. There were also reports of a software controlled radiation unit that caused patients to be exposed to dangerous levels of x-rays. The above examples clearly indicate the need to be aware of safety issues in any development effort, whether it involves software or hardware.

Every project will have some form of impact on the environment. The term "environment" is used in a very broad sense.

Guide lines for preparation of detailed progress report at the end of first term

PREPARATION OF DETAILED PROGRESS REPORT AT THE END OF FIRST TERM

Please follow the instructions carefully to avoid grade penalties.

The detailed progress report should consist of the following information organized properly:

- Original Proposal
- Revisions made to the original proposal during the term with reasons for the change and detailed description of the changes
- Problem Statement – here you get technical and essentially translate goals into specific problems and associated tasks including quantitative specifications, performance criteria etc.
- Task Assignment – here you divide up the work among your team members. You must ensure that each team member takes responsibility for a specific design task (ABET mandated)
- Progress Made – This is a **critical part of your progress report**. You must describe the work done, equipment, components and software acquired or developed tests conducted and current state of the project.
- Tasks Remaining – Describe work that remains to be done during the second term and include a time line for finishing up the project.
- References – Include a set of references cited in your report.

The total length of the report should be about 10 pages.

Poster Presentation Template follows next

POSTER PRESENTATION TEMPLATE

DESIGN OF ELECTRIC SOMETHING



John White, Allison McDermott, William Smith

ECE 498 - Winter 2001

Department of Electrical and Computer Engineering

University of Michigan – Dearborn

<p>1</p> <p>The first poster sheet must give a brief description of the project and some of its key features</p> <p>List in bullet style, some of your achievements and also include some limitations</p>	<p>4</p> <p>Identify the subsystems that must be designed. Describe these clearly. Also assign to each team member responsibility for some critical aspect of design</p>	<p>7</p> <p>Present design details. This could include design of filters, amplifiers, software, digital hardware etc.</p>	<p>10</p> <p>Include acknowledgements. You must acknowledge help received from companies, different faculty, fellow students and shop technologists</p>
<p>2</p> <p>The second poster must define the problem technically and list all the design requirements (typically your wish list)</p>	<p>5</p> <p>List Design Criteria (Minimum error, minimum cost, highest accuracy, minimum time, low power, high bandwidth etc.)</p> <p>List also constraints like cost, size, time, availability of resources etc.</p>	<p>8</p> <p>Include test results for each subsystem. Describe ove</p>	

Preparation for Submission of Final Report

Please read carefully. There are grade penalties for incorrect submission

Submit draft report directly to your faculty advisor on the day of your poster presentation.

1. After you receive the corrected report from your advisor (within 2-3 days), collect all progress reports from the project coordinator (Shridhar).
2. Make the appropriate corrections to your report. Collect front and back covers from the ECE office. The front cover should list the title of the project in bold (font size 24) at the top, followed by the UMD logo. Below the logo enter the names of your group members in alphabetical order (one name per line). Below the group names, enter the semester and year (Winter 2002 for example). At the bottom, list the following in bold with a font size of 12:

Procedure for submitting the final design project report



**Joe Peterson
Alicia McPherson
Sameer Beydoun**

Winter 2002

**Department of Electrical and Computer Engineering
University of Michigan-Dearborn
Dearborn, Michigan 48128**

8.3 Tel: 313-593-5420 Fax: 313-593-9967

3. Collect the proposal, the detailed progress report (submitted at the end of semester 1) and the weekly progress reports you collected from the Project Coordinator. Insert these as appendices with appropriate headings.
4. Take the compiled final report (together with front and back covers and all appendices) to the copy center (or Kinko's) and get it spiral-bound.
5. Submit at least one copy to the department (it will not be returned), **along with the draft report**, which was corrected by your faculty advisor.

NOTE: There will be a grade penalty, if you don't follow the above instructions. Also your final grade will be released only if you have successfully passed the ethics part of the course offered by Prof. Sullivan (or an alternate)