ME 395 : PROJECT REPORT REQUIREMENTS

REQUIRED ELEMENTS

You are writing this report to a person or small group that is somewhat familiar with your topic or project, but not an expert. Therefore, your report should be clear, complete, and adequately explained. The report should contain these elements:

1. Title page
2. Executive summary
3. Table of contents
4. List of figures
5. List of tables (if tables are included)
6. Introduction
7. Design problem definition
8. Current technology
9. Concept generation, evaluation, and selection
10. Final conceptual design
11. (as applicable) detailed design, prototyping and evaluation.
12. (as applicable) modeling and analysis
13. Consideration of cost and (as applicable) Engineering Economics
14. Consideration of risk and liability
15. Consideration of ethical issues
16. Consideration of impact on society
17. Consideration of impact on the environment
18. Future work: recommended next steps for project continuation
19. References
20. Appendix

1.0 Title Page

The report title should be *descriptive*, meaning that the reader should know immediately what the report is about. (Example: Design of a Rubber-Pad Press)

The title page contains the following items, which should be well-balanced and pleasingly arranged on the page:

1. The audience--who will receive the report, the name of the person(s) and/ or the company.
2. The author(s) of the report.
3. The date of submission—month and year are sufficient.

2.0 Executive Summary

The summary gives the essence of the report. It contains few, if any, details and allows the busy reader to glean the main points quickly. The executive summary can also act as an overview of the material which the report will present in detail. The executive summary contains:

- The purpose statement, taken from the Introduction.
- A basic description of the design (maximum of one paragraph) taken from the "Final Conceptual Design" section.
- The design's strong points. Also, if applicable, weak points that could be addressed in future designs may be mentioned.
- The significance of the new design.

The executive summary is usually ½ to 2/3 pages long. The heading is "Executive Summary" or "Summary" or "Abstract" (usually reserved for academic papers). The executive summary resides on its own page!

3.0 Table of Contents

The Table of Contents should include the major headings shown along with the page numbers on which they appear.

4.0 List of Figures

The List of Figures should contain all figure names and numbers along with page numbers.

5.0 List of Tables

All table names and numbers should be shown along with page numbers in the List of Tables.

6.0 Introduction

The introduction consists of the background and purpose.

Background

This should include the situation leading up to the need for a design change or the need for a completely new design. In other words, why are you doing this project? What company is involved (if applicable)? The audience should have a clear picture of how and why this particular design situation came about.

Purpose

This is your objective. Be clear. For example, "The objective of this project is to design (and prototype?) an xxxx. The group is working with XYZ company (if applicable) and is directed by Dr. Jdoe."

7.0 Design Problem Definition

This section should include a need statement and the set of functional requirements and constraints that are to be addressed by the design. You might present a starting set of requirements and constraints, and a modified set, that you arrived at a later point in the design process.

8.0 Current Technology

This section describes the current state-of-the-art in the area of your design. It should include information found from your literature and patent research. Remember that all sources must be cited.

9.0 Concept generation, evaluation, and selection

This section includes design concepts generated, and how they were evaluated. What criteria were used to accept or reject an idea? Explain each concept along with the reason(s) for rejection. Did you end up with several viable concepts? Use Pugh's decision matrix, or other methodology for a systematic selection of a final concept for further consideration. Include sketches either in the text or Appendix. More complete details may appear in the Appendix.

10 Final conceptual design

This is the major focus of your report. It should contain:

1. A brief (usually only one or two paragraphs) technical description. This explains <u>what</u> the design is and <u>how</u> it generally works (cause/ effect usually works well here---"first this happens, then this happens,,,"). Conclude with a list of the major components of the design.

2. Explain each component, in the order given in the tech description. Explain what the component does, why you designed it this way, and any advantages and disadvantages it may have. Include drawings whenever necessary. Do NOT put these diagrams in the Appendix (unless they are supplementary or more detailed renditions). The basic design diagrams are <u>essential</u> and should be included in the report body. Neglecting to do this causes the reader to constantly "flip pages" to see the diagrams.

3. Explain why this was chosen as the final conceptual design.

11. (as applicable) **Deailed design, prototype manufacture, and evaluation**
Include in this section more details about your design as applicable.

12. (as applicable) **Modeling and Analysis**
Describe any modeling and analysis on a system or a sub-system of your design.

13. Economic/ Cost evaluation

An economic evaluation of the final selected concept or a comparison of the economic feasibility of the various generated concepts should be included. It should contain an estimated list of the costs encountered in developing the design and producing a prototype. Explain any unusual cost items (items which cost either significantly less or significantly more than would be expected).

14-17. Consideration of the Broader Context of Design

One of the objectives of this course is to make you aware of the broader context of engineering design. Write at least one paragraph each on issues relating to risk and liability, ethics, societal impact, and environmental impact of your design when viewed from the perspective of its life cycle.

18. Future work: Next Steps for project continuation

Describe the activities necessary and estimated time for completion of the project. Discuss any additional resources that might be necessary.

19. References

Any material you have taken from another source must be referenced! This can be done by using endnotes and reference numbers in the text [1]. The reference number should be placed after the information from that source has been given. For example, the neck is twice as strong in flexion as it is in extension [2], however dummy necks do not accurately show this phenomenon [3]. The numbering should be consecutive in the order in which the source appears. If you refer to the source again, just use the number again [1].

Journal Articles

List the author's last name followed by a comma and the authors first initials. Include the name of the article in quotes and the name of the journal in italics. List the volume and number of the journal, its page numbers, and year of publication. For an example, see reference [1].

Conference Proceedings

List the author's last name followed by a comma and the authors first initials. Include the name of the article in quotes and the name of the conference proceedings in italics. List the volume and number of the proceedings (if applicable), a paper number (if applicable), its page numbers, and year of publication. For an example, see reference [2].

Web Sites

Give the author's last name and initials (if known) and the date of publication in parentheses. Next, list the full title of the work, the title of the complete work or site (if applicable) in italics, any version or file numbers (enclosed in parentheses), the protocol and address, including the path or directories necessary to access the document, in <http://…>; and finally the date accessed, enclosed in parentheses. For an example, see reference [3].

Personal Communication

List the name of the person; state whether it was personal communication, a telephone conversation, email, or fax; the name of the company the person is affiliated; and the date of the communication. For an example, see reference [4].

Chapter in a Book

List the name of the author; the title of the chapter in quotes; the title of the book in italics; the name of the publisher and location; page numbers that information was from, and year of publication. For an example, see reference [5].

Electronic Publications and Online Databases

List the author's last name and initials; the date of publication, in parentheses; the title of the article or file and, enclosed in parentheses, any identifying file or version numbers or

other identifying information (if applicable); the title of the electronic database, in italics; the name of the online service, in italics, and access information or the protocol and address and any directory paths; and, in parentheses, the date accessed. For an example, see reference [6].

The References page should be on its own page and would look something like this. Do not include a reference unless you have referred to it in the text.

REFERENCES

1. Yogananadan, N., Pintar, F.A., Myklebust, J.B., and Sances, A., Jr. "Stiffness and Strain Energy Criteria to Evaluate the Threshold of Injury to an Intervertebral Joint." *Journal of Biomechanics*, Vol. 22, No. 2, pp. 135-142, 1989.

2. Mertz, H.J., and Patrick, L.M. "Strength and Response of the Human Neck." *15th Stapp Car Crash Conference*, SAE 710855, pp. 207-255, 1972.

3. Smyrka, J. (2000) "Dummies: Past and Present." *First Technology Safety Systems, Inc.* <http://www.cuhi.com/test/ftss2/dummy.htm> (March 2001).

4. Goldner, S.J. Personal Communication. First Technology Safety Systems, Plymouth, MI, July 2000.

5. Hyde, A.S. "Crash Injuries of the Head, Its Face, and the Brain Within." *Crash Injuries: How and Why They Happen: A Primer for Anyone Who Cares about People in Cars*, Hyde Associates, Inc., Key Biscayne, FL, pp. 141-167, 1992.

6. Warren, C. (1996). "Working to Ensure a Secure and Comprehensive Peace in the Middle East" (U.S. Dept. of State Dispatch 7:14). FastDoc. OCLC (File #9606273898). (12 Aug. 1996).

20. Appendix

These are "lettered" A, B, C, etc. and referred to as such in the text. Appendices should include calculations, drawings, tables, and/or other information that is too lengthy to include in the body of the report or is necessary for further explanation.

APPENDIX A: FORMAT INFORMATION

GENERAL FORMAT

- Single space paragraphs; double space between paragraphs.
- Aim for a clear, open format. It should not look crammed, nor should it have excessive white space. Excessive white space indicates that you have tried to make the report appear longer than it actually is. This fools no one.

- Margins should be 1.0" on top, bottom and right, and 1.35" on left to leave room for binding.
- Page numbers should be included on each page (1,2,3…). Pages before the first page of the introduction, starting with the Executive Summary (title page is not numbered), should be numbered (ii, iii, iv…).

TABLES/FIGURES

- Give graphics or diagrams consecutive figure numbers and titles <u>below</u> the diagram.
- Give tables consecutive table numbers and titles <u>above</u> the table.
- Leave at least 0.5" between figures/tables and text.
- Always refer to figures/tables before they are shown. Describe what is shown and draw a conclusion or comment on it. Again, tables/figures must be referenced in the text, they cannot just appear!

EQUATIONS

Indent equations by 0.5" from the left and number them, consecutively, along the right margin. Leave one line of space before and after the equation. Explain the equation before it is shown in the text and always state what the variables represent. For example, the sum of the forces on a particle is equal to the rate of change of the linear momentum of the particle. This is known as Newton's second law of motion, which simply defines the sum of forces acting on a particle as the product of the particle's mass and its acceleration, or

$$\mathbf{F} = m\mathbf{a} \tag{1}$$

where **F** is the force, *m* is mass, and **a** is acceleration.

HEADINGS

Although you may use any heading style you choose, they should be:

- Clear---level 1 should look clearly different from level 2, and so on.
- Consistent---once you have decided on a style of heading (for example, 1st level all caps, bold, underlined), be consistent. Don't change heading appearance in the middle of the report.
- Visible---headings MUST SHOW UP or they don't count. Use bold, underlining, etc. Merely leaving some extra white space around a heading usually won't work. This doesn't make the heading stand out enough.

Here is a sample "Headings" option:

INTRODUCTION (level 1)
CONCEPT GENERATION (level 1)
OPTION 1 (level 2)
Concept Description (level 3)
Reason for Rejection (level 3)
OPTION 2 (level 2)

Concept Description (level 3)
Reason for Rejection (level 3)

FINAL CONCEPTUAL DESIGN OF X (level 1)

GENERAL DESCRIPTION (level 2)
COMPONENTS (level 2)
Component 1 (level 3)
Design (level 4)
Advantages/Disadvantages (level 4) **Etc……**