

**MEC 825 &
IND 70A/B**

**DESIGN PROJECT
REPORT GUIDE**

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1. FINAL REPORT PREPARATION

1.1 INTRODUCTION

The purpose of this section is to provide some guidelines for the preparation of final design thesis reports. Students should attempt to follow the format and instructions given; however, rigid adherence may not always be appropriate. The student should discuss any significant changes from the recommended format with her/his faculty advisor.

You are required to hand in two (2) copies of the Design Report.

BINDING: The final reports should be bound in a professional manner. Spiral (Cerlox) binding is widely available and acceptable. Simply stapling the pages or using a three-ring binder is not acceptable.

TYPING: Students are expected to word process as much of the report as possible. Use 1½ spacing for the body of the text. Footnotes or long quotations may be single spaced. Print can be either on one side or both sides of the page.

PAPER: Standard 8½ x 11 inch white bond paper should be used for all text, diagrams, tables etc.

OVERSIZE PAGES: If it is necessary to include a table or illustration that is larger than the standard size, it may be folded carefully into the manuscript. Ensure that the oversize page can be unfolded easily after binding.

TYPEFACE (FONT): The entire report should be in the same type style. Standard Serif type faces such as Times New Roman (what you are reading now) are recommended. Use a font size of 12 points.

MARGINS: Leave at least a 2.5 cm margin from the left-hand, right-hand, top and bottom edges of the paper. To allow for some types of binding, it may be advisable to increase the left-hand margin to 3.75 cm. Ensure that these margins are applied to the text and all illustrative material.

JUSTIFICATION OF MARGINS: The right hand margin should be justified with evenly spaced words (as in this document).

PARAGRAPH STRUCTURE: Indent the first line of each paragraph five spaces from the left hand margin. You may leave a line between paragraphs or not, depending upon the style preferred, but be consistent. Don't start a paragraph at the bottom of a page unless you have at least two lines of text. Also, avoid placing the last line of a paragraph alone on a new page. Both of these problems can be solved automatically in most word processors using "Widow/Orphan Protection".

EQUATIONS: Use of a word processor "equation builder" is preferred. Do not use "computer programming" style representations for equations, e.g.:

Use $Re = \frac{\rho V D}{\mu}$, not $Re = (\text{rho} * V * D) / \mu$

Writing equations in "solidus" form that uses a slanted line (/) for division is acceptable, provided the equation is unambiguous. An example of an equation written in solidus form is:

$$\sigma_x = E (\epsilon_x + \nu \epsilon_y) / (1 - \nu^2) \quad (0.1)$$

Equations should be centered on the page, and numbered sequentially in parentheses within each chapter number (as shown above) so that they can be easily referenced in the text. In the text immediately following the equations, be sure to define any symbols being used for the first time. Also, it may often be helpful to the reader to restate a symbol definition if the symbol has not appeared for many pages. *In addition*, make sure that *all* symbols are defined in the Nomenclature.

ERRORS AND CORRECTIONS: The report should be free of spelling, grammatical and technical errors. The spelling/grammar checkers available in many modern word processors are helpful, but they are not a substitute for proof reading. Careful proof reading is essential. If an error is found after the thesis is printed and bound, it is acceptable to submit a loose sheet of "Errata" at the time of the oral exam.

SPELLING: American or British spelling is acceptable. However, one style of spelling should be applied consistently throughout the report.

UNITS: The use of the International System of Units (metric units) is usually preferred. If desired, a quantity may appear with the equivalent British units in parentheses following the S.I. value, e.g. 746 W (0.707 Btu/s). Be careful not to omit units in tables and graphs. Data are meaningless without the appropriate units. Do not mix different systems of units.

FOOTNOTES: On occasion it is useful to use a footnote¹ in addition to references. A footnote is identified in the text by a superscript Arabic numeral and is placed at the bottom of the page.

WRITING STYLE: The report should be logically structured. Emphasis should be placed on clarity. Avoid the tendency to make a topic overly technical. Meanings can usually be conveyed more powerfully in simple terms. Technical reports should be written in the third person. For example, it is incorrect form to write (in the first person): "I measured the surface temperature using a thermocouple." Instead, one should write, "The surface temperature was measured using a thermocouple."

¹ Footnotes should be used sparingly.

THE WRITING CENTRE: You can get help with writing problems at the Ryerson Writing Centre (Room LIB272A). The centre provides hour-long, one-on-one sessions with a peer tutor. You must book in advance, in person or by phone (ext. 7192). Although the Writing Centre will not proofread, they will point out recurring grammatical problems and teach strategies for improving your writing style. In addition, they have handouts on writing strategies, and on the most common grammar and punctuation mistakes. Regardless of your writing skill level, the Writing Centre can be a very helpful resource.

COMPUTER PRINTOUTS: Generally, a computer program listing should be given in an appendix. Computer printouts should fit within the standard margins and be dark enough to reproduce well. For high speed line printer output, photo-reduction may be required. Be sure to document the meaning of the variables at the top of your program or in the text.

If desired, long programs can be submitted on a CD-ROM (one for each copy of the report), rather than listing them in an appendix. If appropriate, save the program as an ASCII text file so it can be read easily by any text editor.

SCHEDULING: Don't leave the task of writing the report until the last week before the deadline for submission. Write the individual sections of the report as your project progresses. Also, your advisor *may* be willing to review a "rough draft" of your thesis, if it is prepared well ahead of the deadline. If so, take advantage of this option.

1.2 ILLUSTRATIVE MATERIAL

GENERAL: All illustrative material must be reproduced on 8½ x 11 inch white bond paper. All figures, diagrams, photographs, and graphs must be included in the List of Figures. All tables and figures must be referenced in the text.

TABLES: Number all tables within each chapter and give them a descriptive caption. Keep the caption relatively short, if possible. Centre the caption over or below the table and centre the table between the margins. Table 1.1 is shown as an example. Notice the location of footnotes in the table. Footnotes can be used to point out details of a column of data or an individual item in the table.

FIGURES: The term "figure" applies to diagrams, graphs, charts and photographs. Number all figures and give them a descriptive caption, centred under the figure. Note that figures taken directly from another source must be fully referenced. Figures that are adapted for your purposes should be referenced as follows: "...after Smith and Jones (1992)".

Table 1.1 Sample short table caption

Reading No.	Calibration Pressure (kPa)	Gauge Pressure ^a (kPa)	Temperature (K)
1	100.1	99.9	298.5
2	50	40	300
3	0.01	0.04	305.11
4	60.5	55.5	400.1 ^b

^a Place footnote for a table here

^b Data outside of calibration zone

PLACEMENT OF TABLES AND FIGURES: There are two acceptable options for the placement of figures and tables. Students should ask their advisor which of the following styles is preferred:

i) *Distributed throughout the body of the text.* If you choose to distribute the illustrations throughout the text, place each figure/table on the page immediately following the page on which it is referenced. If this is not possible, place it as close as possible after the reference to the figure. It is also acceptable to "embed" the figures/tables in the text. Many word processors allow "graphics" to be imported and manipulated directly within the body of the text. If this is done, leave two blank lines between the figure/table and the adjacent text.

ii) *Grouped at the end of the report.* If you choose to group the illustrations together, they should be placed at the end of the report, immediately following the last chapter (usually Conclusions and Recommendations) but before the References. The figures should be grouped separately from the tables.

PHOTOGRAPHS: Original photographs may be mounted directly on the page using a glue stick. The use of adhesive tape or staples is not acceptable. Photocopies of photographs are acceptable provided there is not a substantial loss in quality. Photographs are captioned as a figure.

1.3 STRUCTURE OF THE REPORT

As shown in the sample Table of Contents (see Section 2), the recommended order for the sections of a design thesis report is as follows:

- Title Page
- Acknowledgments
- Abstract
- Table of Contents
- Nomenclature
- List of Figures
- List of Tables
- Body of Thesis
- References
- Appendices

Note: Additional "Figures" and "Tables" sections will be needed if the illustrative material is grouped at the end of the report.

TITLE PAGE: The title must be a meaningful, concise description of the content of the report. The required format for the title page is given in Section 2.

ABSTRACT: The abstract is a concise summary of the report that will enable a reader to decide whether or not to read the complete work. The abstract should contain a description of the problem, the methodology used, and a summary of the main results and conclusions. The abstract should be written so that it can be understood when the rest of the report is unavailable. In an abstract, do not use undefined terms or symbols and do not refer to any part of the rest of the report. Normally, abstracts do not exceed three quarters of a page in length. Often it is best to write the abstract last, when you have a clear overview of the entire report.

ACKNOWLEDGMENTS: Acknowledgments should be written in the third person, i.e., "The author would like to thank . . ."

NOMENCLATURE: The nomenclature defines the symbols used in the report. Use standardized symbols whenever possible. List the symbols in alphabetical order, upper case followed by lower case. Use a separate heading for Greek, superscript and subscript characters. A sample nomenclature has been included in Section 2.

LIST OF FIGURES AND LIST OF TABLES: All tables and figures must be listed. See Section 2 for the recommended format.

BODY OF THESIS: Chapter headings and the structure of the body of the report should be discussed with your faculty advisor. The chapter headings shown in the sample Table of Contents

(see Section 2) are given as an example only. Although the chapter headings will depend on the nature of each project, *typically* the body of the report will include the following:

i) A general introduction to the problem being addressed. The introduction should give the motivation for the current work (i.e. why is the work important/necessary) and what approach will be taken to solving the problem. The introduction should also include an objective statement, clearly indicating the scope of the work.

ii) A literature review. A literature review is a critical evaluation of previously published information directly related to the design thesis topic. This will include information found in text books, journal papers, magazine articles, theses, conference proceedings, etc. The literature review should inform the reader of the current state-of-the-art and convince the reader of the need for the current work.

iii) Description of experimental apparatus and procedures. Depending upon the specific project, descriptions of the apparatus and/or design procedures may appear as a separate chapter. Sufficient information should be given to enable another person with similar knowledge to duplicate your work. This requires clear, detailed descriptions of the apparatus and procedures.

iv) Theoretical and design developments that are central to the thesis topic.

v) Presentation and interpretation of the results.

vi) Summary of the main conclusions and recommendations. The conclusions must be based on the evidence and findings presented and must be related to the stated objective of the project. Do not introduce new ideas in the conclusions. Depending on the nature of your thesis, the recommendations stemming from your report may include such items as:

- Actions to be taken based on your findings.
- Methods to improve the results/design.
- Related areas for future study, i.e. useful extensions of the project.

NUMBERING OF CHAPTER SECTIONS: It is recommended that the chapters be numbered using the decimal numbering scheme shown in the sample Table of Contents (Section 2). For example, note that the first section of Chapter 2 is 2.1 Experimental Apparatus. The subsections of section 2.1, that relate directly to the details of the experimental apparatus, are numbered 2.1.1 and 2.1.2.

APPENDICES: In order to keep the main body of the report concise and readable, some information needed for the completeness may be put into an appendix. Examples of information which *may* be put in appendices are:

- Material that is not central (or essential) to the topic.
- Lengthy material that would break the flow of the document (e.g. a long mathematical derivation that is not central to the topic).
- Tabulated data for graphs in the main body of the report.

- List of instrumentation and calibrations.
- Detailed sample design calculations.
- Computer program listings.
- Detailed design drawings.

REFERENCES: When drawing information from a textbook, article, report, web site, letter or even a conversation, it is absolutely essential to acknowledge the source. This is done using a citation in the text that refers to a source listed in the "References" section. Information presented without a citation will be attributed to the author. Hence, failure to adequately cite your sources constitutes plagiarism.

The style used for citing references varies greatly depending upon the specific field. One of the following procedures is recommended:

Citation Method 1: In the text, refer to the publication using the surname(s) of the author(s). Insert the year of the publication in brackets immediately following the names of the authors. Two examples of usage for this method are:

The effect of tensile forces on the free vibration of thin plates has been studied by Nakamura and Smith (2002). This study showed that ...

Recently, it has been suggested the adequate heat removal may be the limiting factor in the development of future high speed circuits (Incropera (2001)).

If there are more than two authors for a single publication, give the surname of the first author and use "et al." to signify the remaining authors. For example:

In a recent study, Jones et al. (2003) conducted experiments on...

In the "References" section, give the full citation with all of the authors listed. List the sources in alphabetical order by the surname of the first author using the style shown below (underlining may replace italics).

Book:

Deutschman, A.D., Michels, W.J., Wilson, C.E., 1985, *Machine Design: Theory and Practice*, Macmillan Publishing Co., New York.

Periodical:

Incropera, F.P., 1988, "Convection Heat Transfer in Electronic Equipment Cooling," *ASME Journal of Heat Transfer*, vol. 110, pp. 1097-1111.

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Paper in the proceedings of a conference:

Kalita, W., Rodkiewicz, C.M., 1993, "On the Characteristics of Conical Bearings with Grooves," *Proceedings, 14th Canadian Congress of Applied Mechanics*, vol. 2, pp. 657-659.

Report:

Tarasuk, J.D., 1968, "The Theory, Design and Operation of a Mach-Zehnder Interferometer," Technical Report C-3, Mechanical Engineering Department, University of Saskatchewan.

Personal conversation:

Clark, J.A., Nuclear Division, Ontario Hydro, Toronto, Ontario, Private Communication on December 11, 2002

World Wide Web Sites:

To cite files available for viewing or downloading, give the author (or company), the full title of the work and full http address and the date that the web site was visited:

ACME Gadgets, *Online Product Catalogue*, <http://acme.roadrunner.com> (Apr. 1, 1997)

E-mail, Listserv and Newsgroup:

Give the author's name, subject line from the posting, the address of the listserv or newsgroup and the date:

Smith, Bob, *Re: Mechanical Vibration Problem*, sci.engr.mech, Sept. 5, 1997.

Citation Method 2: In the text, refer to each publication using an Arabic numeral in brackets. Three examples of usage for this method are:

The effect of tensile forces on the free vibration of thin plates has been widely studied [1,2,3]. These studies show that...

Recently, it has been suggested the adequate heat removal may be the limiting factor in the development of future high speed circuits [4].

In a recent study, Jones et al. [5] conducted experiments on...

In the "References" section, list and number each publication sequentially in the order in which they are referenced in the body of the report. For books, journal papers, personal conversations, etc., use the same style as given in Citation Method 1.

PAGE NUMBERING: The preliminary section (see Section 2.6) should be numbered using small Roman numerals at the bottom centre of the page. Pagination begins with the Acknowledgments as page number ii. The title page is page i, but is not numbered. Starting with the introductory chapter, the remainder of the report is numbered with Arabic numerals beginning with 1 and running consecutively to the end of the report. Every page in the report must be numbered.

1.4 RECOMMENDED FURTHER READING

The Ryerson Library has several excellent books which focus on Technical Communication. A partial list is shown below. The Ryerson Library Call Number is given in parentheses following each book. These books contain additional information regarding grammar, style and language usage for technical reports. Note that these books are intended only to supplement this guide. Care should be taken to follow the specific instructions for the preparation of thesis reports given in this guide.

1. Zimmerman, D.E., Clark, D.G., *The Random House Guide to Technical and Scientific Communication*, Random House, 1987. (T11.Z56)
2. Collins, C.E., *The Basics of Technical Writing and Speaking*, Prentice-Hall, 1991. (T11.C65)
3. Turner, B.T., *Effective Technical Writing and Speaking*, Business Books Ltd., 1974. (T11.T77)

2. SAMPLE PAGES

To illustrate the recommended style and format, a sample Title Page, Table of Contents, List of Figures and Nomenclature is given on following pages. Note that the sample Table of Contents reflects a thesis which is entirely design oriented.

RYERSON UNIVERSITY
FACULTY OF ENGINEERING AND APPLIED SCIENCE
DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING

TITLE OF PROJECT

Student's Name, Std. No
Student's Name, Std. No
Student's Name, Std. No
Student's Name, Std. No

MEC825 / INE70A/B (as appropriate) – Design Project Report

Submitted in partial fulfillment
of the requirements for the degree of
Bachelor of Engineering (BEng)

Faculty Advisor: Professor J. Smith
Date: April 1, 2004

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2	Lift coefficient versus Reynolds number for aspect ratio $L/W=12.5$, angle of attack $\alpha=5^\circ$.	32

Note: The List of Tables is prepared in a similar fashion.

SAMPLE
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NOMENCLATURE

A	aspect ratio
C	circumference (m)
c	speed of light (m/s)
E	modulus of elasticity (Pa)
g	gravitational acceleration (m/s^2)
k	thermal conductivity (W/mK)
p	pressure (Pa)
Q	volumetric flow rate (m^3/s)
T	temperature (K)
t	time (s)

Greek Symbols

α	thermal diffusivity (m^2/s)
ρ	density (kg/m^3)
σ_h	hoop stress given by equation (5) (Pa)

Subscripts

f	evaluated at the film temperature
i	initial value

3. ORAL PRESENTATION & DEFENSE

3.1. INTRODUCTION

Technical presentations play an important role in the careers of most engineers. The ability to make an effective and persuasive oral presentation to colleagues, managers and clients is often a vital component in the success of a project. To provide training in oral communication skills, each student must make an oral presentation of his/her work as part of the thesis project course. This section outlines some general information for the oral presentations.

3.2. GENERAL INFORMATION

DURATION: Each oral examination will be comprised of an oral presentation by the student(s) followed by a question period. During the question period the student(s) must defend the technical soundness of the report. The time limit of the oral presentation and question period will be specified by your faculty advisor.

QUESTIONS: Questions from the Associate and Principal Examiners will be taken first. Then, if time permits, questions will be taken from other audience members.

AUDIENCE: As a minimum, oral presentations will be made to the faculty supervisor and an associate examiner. Normally, the oral presentations will be open to all members of the Ryerson community.

GRADING: The assigned grade will be based on oral communication effectiveness. Factors such as clarity and style of presentation, as well as the student's ability to respond to questions, will be used to assign the grade. The student should also keep in mind that an inadequate defense of the technical aspects of the report during the question period can significantly affect the mark assigned to the final report.

3.3. SUGGESTIONS ORAL PRESENTATIONS

STRUCTURE AND CLARITY: Your presentation should be made in a logical order that makes it clear and easily understood. Although the specific content will depend on the individual project, it is recommended that the presentation include the following:

- A title overhead (or slide).
- An introduction, including a statement of the particular problem being addressed, and an explanation of the motivation for the work.
- A description of the approach and methodology used.
- Presentation and interpretation of the results.
- A summary of the main conclusions and recommendations.

CONTENT: Students are to emphasize their own contributions. Do not dwell excessively on the work of others or textbook material. Students are to assume that the audience is technically literate and that some members of the audience are familiar with the thesis document, while others are not.

CONCISENESS: Don't get bogged down in details. For example, in order to present a relatively large body of work in twenty minutes, the discussion should be restricted to only the main points. Remember that an interested listener can read the thesis report later for the details.

VISUAL AIDS: The use of overhead transparencies is recommended. An overhead projector will be in the room. If other equipment is needed (e.g. 35mm slide projector) it is the student's responsibility to make the appropriate arrangements with the media centre.

In designing overheads (or slides), keep the amount of information on each individual overhead to a minimum; the audience cannot read several paragraphs of information *and* listen to the speaker at the same time. Use large print. If your word processor or printer doesn't have a large font, neatly hand print your overheads.

Wherever possible, use graphic illustrations to reinforce the message of your presentation. Drawings, block diagrams, photographs, simple sketches, graphs, etc. can be particularly useful for explaining complex ideas.

PREPARE YOUR DELIVERY: As Mark Twain once said, "It takes three weeks to prepare a good ad-lib speech." Being well prepared is also the best way to combat the anxiety associated with public speaking. The more you sweat in advance, the less you'll sweat during the actual presentation. Practice delivering your presentation several times, either alone or in front of friends. Time your presentation and check that it does not exceed the allotted time. Don't be fooled; it takes longer to *deliver* a presentation than to read it.

When practicing alone, give the entire presentation *as if the audience were present*. For example, instead of looking at the title overhead and saying, "Now I'll tell them the title," say, "The title of this presentation is...". This may seem strange at first, but it will help the words flow more easily during the actual presentation. As a result you will be more confident and your presentation will be more professional.

Don't read your presentation from a prepared script. It is always better to talk naturally. Try to learn your presentation point by point, rather than word by word. If necessary, write the main points on cue cards or on the overhead transparencies. For example, some speakers use inexpensive cardboard overhead frames (which cost about ten cents each). The frames have a wide space around the outside for writing inconspicuous "cue cards" (and they make the overheads easier to handle).

QUESTIONS: When responding to questions, keep your answers simple and direct. If the questioner wants a more detailed answer, a further question can be asked. If you are unsure of the answer, *be honest!* Also, try to anticipate the questions that are likely to be asked and be prepared to answer them.

SEMINARS: Whenever possible, try to attend technical seminars and presentations. Much can be learned from watching others. Third year students should try to attend at least one fourth year thesis oral presentation. Also, during the term, try to attend the talks in the Department of Mechanical Engineering Seminar Series. Posters for these technical presentations will be displayed outside the Mechanical Engineering office.

MORE INFORMATION: The Ryerson Library has several excellent books which focus on Technical Communication. Students are encouraged to refer to one of the books listed below for a more complete discussion of the art of making technical presentations. For convenience, the Ryerson Library Call Number is given in parentheses following each book.

3.4. RECOMMENDED READING

1. Zimmerman, D.E., Clark, D.G., *The Random House Guide to Technical and Scientific Communication*, Random House, 1987. (T11.Z56)
2. Collins, C.E., *The Basics of Technical Writing and Speaking*, Prentice-Hall, 1991. (T11.C65)
3. Turner, B.T., *Effective Technical Writing and Speaking*, Business Books Ltd., 1974. (T11.T77)
4. Powers, J.H., *Public Speaking: The Lively Art*, Wadsworth Publishing, 1987. (PN4121.P647)