

**FAIRFIELD UNIVERSITY**  
**School of Engineering**

**Title**

A Thesis

By

**Name**

Department of Electrical and Computer/Mechanical/Software Engineering  
(Use appropriate Department)

Submitted in partial fulfillment of the requirements

for the degree of

Master of Science in Electrical and Computer /Mechanical/Software Engineering  
(Use appropriate Department)

**Fall/Spring 20xx**

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Advisor: Advisors name

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Committee member: Committee member name

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Committee member: Committee member name

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Program Chair/Director: Program Chair/Director name

## **ABSTRACT**

When writing an abstract, bear in mind an abstract is a short descriptive summary of your thesis. The number of words accepted might vary e.g. 200-250 words. An MS thesis abstract need not exceed two pages. Abstracts are typically written last although they are the most important part of the thesis. They should have a compilation of: the background, the scope of your project, the purpose, findings and conclusions. An abstract is neither paragraphed nor cited. It should not be written as a literature review or a discussion of results. In a simplistic manner, your abstract, in a few words, should answer the questions: why should we care about your research; how did you get your results; what did you learn, find, create, invent; and finally what do your results imply?

**\*\*--there is text and instructions throughout that need to be deleted as you add your own text --\*\***

## **ACKNOWLEDGMENTS**

It is customary and good manners to say thank you. Please write a few words to express your gratitude to those who offered their time and effort to make your research better.

# TABLE OF CONTENTS

The table of contents is most easily created automatically using tools within WORD. The chapter titles and section headers should have been set to create a table of contents. It is important that the styles laid out in this template are used to maximize the benefits of the template and MS WORD options. The table of contents can be updated as you revise your thesis by using tools in WORD.

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## LIST OF TABLES

The list of tables is also easily created automatically (!) with REFERENCE tools within WORD. Click on the following sequence: “insert, reference, index and tables, table of figures, (find “caption label” box set as – tables), okay.” This can be updated as you revise your thesis by using right mouse button and clicking on “update field.” With this approach, there is no need to copy and paste or retype your chapter and section titles. You need to also use the table captions within the body of your thesis (see examples below). The insertion of table captions in this manner also helps because word automatically rennumbers the tables within the text when you insert another table in the middle. There is no need for you to renumber the tables manually

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## LIST OF FIGURES

The List of Figures is most easily created automatically (!! ) with REFERENCE tools within WORD. Click on the following sequence: insert, reference, index and tables, table of figures, (find “caption label” box set as – Figures), okay. This can be updated as you revise your thesis by using right mouse button and clicking on “update field.” With this approach, there is no need to copy and paste or retype your chapter and section titles. You need to also use the figure captions within the body of your thesis (see examples below). The insertion of figure captions in this manner also helps because word automatically rennumbers the tables within the text when you insert another table in the middle. There is no need for you to renumber the figures manually

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## CHAPTER I: Introduction

The main goal of your introduction is to identify a problem that is worthy of investigation. It must also provide some idea of your research goals and approach to research. Specific objectives can be introduced in the introduction chapter or they can be saved for later after you've provided additional background on the topic and state of the current research and its gaps. The Introductory chapter often concludes with a summary of the organization of the thesis, including identification of the general content of specific chapters and appendices.

Ideally, chapter one defines the overall importance of the problem areas and provides an introduction into what you did, chapter two is why you did it in the context of what was previously known, three is how you did it, four is what you found and five is what it all means – putting the pieces together, (what's your contribution to the research field).

It should be noted that the objectives of your research define the OUTCOME, i.e. what will be learned. They are not a statement of the approach or tasks that are required to meet these objectives. Some examples of reasonable research objectives:

Determine the effect of Marangoni convection on mixing of molten glasses

Predict the extent of Electrical and Computer degradation of polymers

These both define the resulting outcome (prediction, effect on...) so they are objectives.

The related tasks or research approach could be:

Solve a set of coupled non-linear PDEs...

Perform experiments on...

These define the required steps; they do not define the outcome so they are NOT objectives.

Some theses and dissertations can have some chapters written as manuscripts that can be submitted to peer-reviewed scientific research journals. In that scenario, the grad student should be the principal author of the pending articles. The thesis or dissertation that includes manuscripts as chapters are not exempt from writing an introduction, background/ literature review and overall conclusions and recommendations.

This template uses the MS WORD STYLES extensively to help keep your work in the proper format. These paragraphs use the “thesis-body text” style that is set for Times New Roman, 12 point font with double spaced lines and extra spacing between paragraphs (no need for hard carriage returns). There are also styles for headers, equations, captions and bulleted lists that you can choose to use. See examples throughout this template.

Begin typing or pasting the rest of your chapter 1 text here. (And then deleting above text)

## CHAPTER II: Background and Literature Review

The background and literature review section needs to provide sufficient fundamental background information about the subject to support your objectives, hypothesis (or research questions) and methods, and review the pertinent literature related to the specific problem / hypothesis you are addressing. In Johnson (1991), some of the questions that he listed that the literature review should be to answer include:

- what are the fundamental science, math, engineering concepts related to your research (scope),

- what part of your research work has ever been investigated before and what has not, (some of this may have been included in the introduction)

- how does your research work relate to that done by others,

- how have others defined/measured/identified the key concepts of your research,

- what data sources have you used or have other researchers used in developing general explanations for observed variations in a behavior or phenomenon in a concept in your thesis etc.

The lit review (~20 pages or more) should not be limited to the above questions only.

Ingeniousness and creativity is expected of a grad student.

Bullets can be single spaced. The above bullets are in the style “thesis-bullets.” When you type bulleted text, highlight the bulleted text and then select “thesis-bullets” from under the format, style menu to automatically change their formatting as above.

### ***Section header***

Given the length of each chapter, it is required to use headers and sub headers (possibly sub-sub headers). These can be numbered or one can just rely on different formats. The section headers in this document are labeled “heading 2” (“heading 1” was used for

chapter titles). The heading styles formats should be consistent throughout the document as it helps significantly in creating the automatic table of contents.

### **Sub heading (heading 3)**

The subheadings here have a different format (“heading 3”) than the section headers.

#### *Sub-sub heading (heading 4)*

You can even get to another level of headers, defined here as “heading 4.” The table of contents, however, is currently set up to just include three levels of headers.

### **Equations**

Equations can be created in MS WORD equation editor or they can be created with other software. Equations should be numbered. They can be numbered within each chapter (e.g., 2.1, 2.2) or they can be numbered sequentially throughout the entire thesis. Equations should be indented or centered with the equation number to the right. The example below and associated “thesis-eqn” style can be used for all your equations.

$$root = \frac{-b \pm \sqrt{4ac}}{2a} \quad [1]$$

This equation was written with the equation editor. Found through “insert, object, and equation editor 3.0. The equation editor can also be found through “tools, customize, commands”, and in categories, look for insert and in the commands section, look for equation editor, drag and drop the icon onto the toolbar. This editor is fine for relatively simple equations, other options are available for more complex equations.

## Tables

Tables should have meaningful information with descriptive headers. You can use the “thesis-table caption” style to define your captions and refer to the table in the text with a “cross reference” (Table 1). MS Word re-numbers table captions automatically when new tables inserted. But you need to right click on any cross references and “update field” if there are changes.

**Table 1: Steps in creating a table**

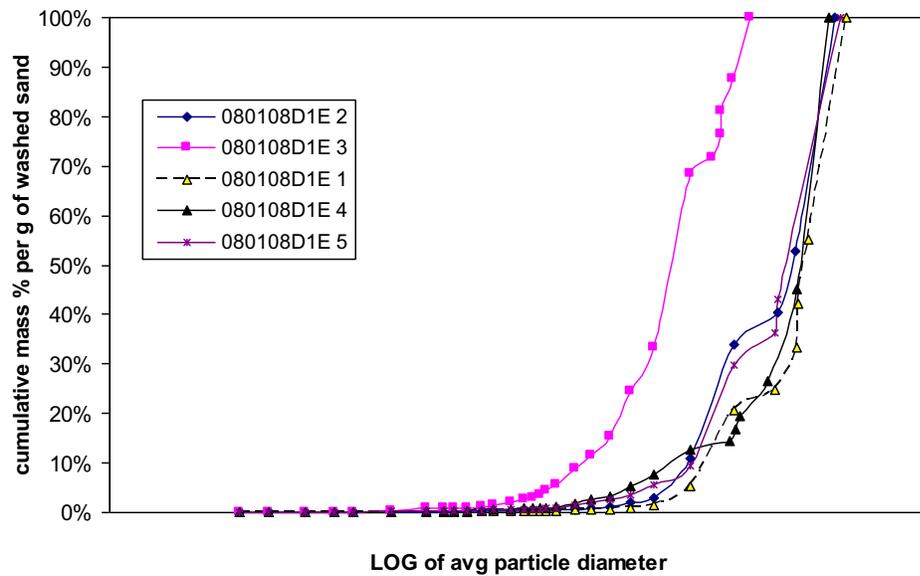
<b>Step #</b>	<b>Instruction</b>
Create table caption	Insert, reference, caption, table
Format the caption	Format, style, “thesis-table-caption”
Create table	Table, insert...
Format the table	The formatting of the table can vary, including use of single space as appropriate. Most journals require that tables are formatted using table style “Table Simple 1” format.
Reference the table from the text	With the cursor at the location you want to cite the table: insert, reference, cross reference, table, label and number only.

## Figures

Figures and illustrations are a necessary means of communicating technical information. Resolution of figures is often a problem in theses. Resolution should be >300 dpi, preferably 600dpi (Figure 1). You should note that saving images as jpeg files is a sure way to lower the resolution to an unacceptable extent. From experience, a good way is to copy your graphic (for example from PowerPoint or excel) and when pasting it into word, use the “paste special” “as an “enhanced metafile” (Figure 2). This also substantially reduces the resulting file size in comparison with pasting graphs in as excel graphics.



**Figure 1: Example photo with high resolution. Caption created with “insert, reference, caption, and figure” and the style changed to “thesis-figure caption.”**



**Figure 2: Example of high resolution graphic inserted with “paste special, as enhanced metafile”**

## CHAPTER III: DESIGN METHODOLOGY

In addition to the detailed methods, you need to provide specific objectives and an overview of your approach if they have not already been presented in the introductory chapters. The best place to put those items can vary among theses. Sometimes the background and lit review is really necessary to justify and substantiate the specific objectives and approach and, therefore, it is best to save those details for the beginning of this chapter. You can add an implementation section if you wished.

These paragraphs are in “thesis-body text.” Other styles including captions, headers etc. can be used as presented in the previous chapter. **Table 2** summarizes all of the styles that can be used with this template.

**Table 2: Styles used in this template**

Style name	When used
Heading 1	Chapter titles
Heading 2	Primary headers
Heading 3	Sub headers
Heading4	Sub-sub headers
Thesis-body text	All paragraphs
Thesis-bullets	Bullets
Thesis Figure caption	All figure captions.
Thesis table caption	All table captions
Thesis-eqn	equations
Thesis-reference	Reference list at end of thesis

## **CHAPTER IV: RESULTS**

Results, findings, discussion of results OR manuscripts. It is best to also reiterate information in your literature review to help substantiate the findings of your research.

This template is best used for directly typing in your content.

## **CHAPTER V: CONCLUSION**

This chapter could also be called “Conclusions and Recommendations” or “Conclusions and Implications.” In general, there should be no new information presented here. It should be a synthesis of information that you’ve already discussed.

## REFERENCES

Includes all references: articles, media facts, books, reports, regulations, internet articles, papers that you referenced from the text. You can include the citations in the text as a number [1] to present your references numerically. The MS WORD tools – “insert, reference, footnote, endnote” (or “cross reference” if you refer to the same reference more than once) should be used to help you organize and manage your references.

References can be written in single space with extra space between references as in the format below. There are many different ways to arrange the information and punctuation in a reference listing. The most important thing is to make sure all references are complete and that the format of your references is consistent throughout. Journals of the IEEE Transactions use the following reference format. Various types of references are listed below with examples and may be used appropriately.

### *Basic format for books:*

J. K. Author, “Title of chapter in the book,” in *Title of His Published Book*, xth ed. City of Publisher, (only U.S. State), Country: Abbrev. of Publisher, year, ch. x, sec. x, pp. xxx–xxx.

### *Examples:*

- [1] G. O. Young, “Synthetic structure of industrial plastics,” in *Plastics*, 2nd ed., vol. 3, J. Peters, Ed. New York, NY, USA: McGraw-Hill, 1964, pp. 15–64.
- [2] W.-K. Chen, *Linear Networks and Systems*. Belmont, CA, USA: Wadsworth, 1993, pp. 123–135.

### *Basic format for periodicals:*

J. K. Author, “Name of paper,” *Abbrev. Title of Periodical*, vol. x, no. x, pp. xxx-xxx, Abbrev. Month, year, DOI. 10.1109.XXX.123456.

### *Examples:*

- [3] J. U. Duncombe, "Infrared navigation—Part I: An assessment of feasibility," *IEEE Trans. Electron Devices*, vol. ED-11, no. 1, pp. 34–39, Jan. 1959, 10.1109/TED.2016.2628402.
- [4] E. P. Wigner, "Theory of traveling-wave optical laser," *Phys. Rev.*, vol. 134, pp. A635–A646, Dec. 1965.
- [5] E. H. Miller, "A note on reflector arrays," *IEEE Trans. Antennas Propagat.*, to be published.

*Basic format for reports:*

J. K. Author, "Title of report," Abbrev. Name of Co., City of Co., Abbrev. State, Country, Rep. xxx, year.

*Examples:*

- [6] E. E. Reber, R. L. Michell, and C. J. Carter, "Oxygen absorption in the earth's atmosphere," Aerospace Corp., Los Angeles, CA, USA, Tech. Rep. TR-0200 (4230-46)-3, Nov. 1988.
- [7] J. H. Davis and J. R. Cogdell, "Calibration program for the 16-foot antenna," Elect. Eng. Res. Lab., Univ. Texas, Austin, TX, USA, Tech. Memo. NGL-006-69-3, Nov. 15, 1987.

*Basic format for handbooks:*

*Name of Manual/Handbook*, x ed., Abbrev. Name of Co., City of Co., Abbrev. State, Country, year, pp. xxx-xxx.

*Examples:*

- [8] *Transmission Systems for Communications*, 3rd ed., Western Electric Co., Winston-Salem, NC, USA, 1985, pp. 44–60.
- [9] *Motorola Semiconductor Data Manual*, Motorola Semiconductor Products Inc., Phoenix, AZ, USA, 1989.

*Basic format for books (when available online):*

J. K. Author, "Title of chapter in the book," in *Title of Published Book*, xth ed. City of Publisher, State, Country: Abbrev. of Publisher, year, ch. x, sec. x, pp. xxx–xxx. [Online]. Available: <http://www.web.com>

*Examples:*

- [1] G. O. Young, "Synthetic structure of industrial plastics," in *Plastics*, vol. 3, *Polymers of Hexadromicon*, J. Peters, Ed., 2nd ed. New York, NY, USA: McGraw-Hill, 1964, pp. 15-64. [Online]. Available: <http://www.bookref.com>.
- [2] *The Founders' Constitution*, Philip B. Kurland and Ralph Lerner, eds., Chicago, IL, USA: Univ. Chicago Press, 1987. [Online]. Available: <http://press-pubs.uchicago.edu/founders/>
- [3] The Terahertz Wave eBook. ZOmega Terahertz Corp., 2014. [Online]. Available: [http://dl.z-thz.com/eBook/zomega\\_ebook\\_pdf\\_1206\\_sr.pdf](http://dl.z-thz.com/eBook/zomega_ebook_pdf_1206_sr.pdf). Accessed on: May 19, 2014.
- [4] Philip B. Kurland and Ralph Lerner, eds., *The Founders' Constitution*. Chicago, IL, USA: Univ. of Chicago Press, 1987, Accessed on: Feb. 28, 2010, [Online] Available: <http://press-pubs.uchicago.edu/founders/>

*Basic format for journals (when available online):*

J. K. Author, "Name of paper," *Abbrev. Title of Periodical*, vol. *x*, no. *x*, pp. *xxx-xxx*, *Abbrev. Month*, year. Accessed on: Month, Day, year, DOI: 10.1109.XXX.123456, [Online].

*Examples:*

- [5] J. S. Turner, "New directions in communications," *IEEE J. Sel. Areas Commun.*, vol. 13, no. 1, pp. 11-23, Jan. 1995.
- [6] W. P. Risk, G. S. Kino, and H. J. Shaw, "Fiber-optic frequency shifter using a surface acoustic wave incident at an oblique angle," *Opt. Lett.*, vol. 11, no. 2, pp. 115–117, Feb. 1986.
- [7] P. Kopyt *et al.*, "Electric properties of graphene-based conductive layers from DC up to terahertz range," *IEEE THz Sci. Technol.*, to be published. DOI: 10.1109/TTHZ.2016.2544142.

*Basic format for papers presented at conferences (when available online):*

J.K. Author. (year, month). Title. presented at abbrev. conference title. [Type of Medium]. Available: site/path/file

*Example:*

- [8] PROCESS Corporation, Boston, MA, USA. Intranets: Internet technologies deployed behind the firewall for corporate productivity. Presented at INET96 Annual Meeting. [Online]. Available: <http://home.process.com/Intranets/wp2.htm>

*Basic format for reports and handbooks (when available online):*

J. K. Author. "Title of report," Company. City, State, Country. Rep. no., (optional: vol./issue), Date. [Online] Available: site/path/file

*Examples:*

[9] R. J. Hijmans and J. van Etten, "Raster: Geographic analysis and modeling with raster data," R Package Version 2.0-12, Jan. 12, 2012. [Online]. Available: <http://CRAN.R-project.org/package=raster>

[10] Teralyzer. Lytera UG, Kirchhain, Germany [Online]. Available: [http://www.lytera.de/Terahertz\\_THz\\_Spectroscopy.php?id=home](http://www.lytera.de/Terahertz_THz_Spectroscopy.php?id=home), Accessed on: Jun. 5, 2014

*Basic format for computer programs and electronic documents (when available online):*

Legislative body. Number of Congress, Session. (year, month day). *Number of bill or resolution, Title*. [Type of medium]. Available: site/path/file

**NOTE:** ISO recommends that capitalization follow the accepted practice for the language or script in which the information is given.

*Example:*

[11] U.S. House. 102nd Congress, 1st Session. (1991, Jan. 11). *H. Con. Res. 1, Sense of the Congress on Approval of Military Action*. [Online]. Available: LEXIS Library: GENFED File: BILLS

*Basic format for patents (when available online):*

Name of the invention, by inventor's name. (year, month day). Patent Number [Type of medium]. Available: site/path/file

*Example:*

Musical toothbrush with mirror, by L.M.R. Brooks. (1992, May 19). Patent D 326 189 [Online]. Available: NEXIS Library: LEXPAT File: DES

*Basic format for conference proceedings (published):*

J. K. Author, "Title of paper," in *Abbreviated Name of Conf.*, City of Conf., Abbrev. State (if given), Country, year, pp. xxxxxx.

*Example:*

[12] D. B. Payne and J. R. Stern, "Wavelength-switched passively coupled single-mode optical network," in *Proc. IOOC-ECOC*, Boston, MA, USA, 1985, pp. 585–590.

*Example for papers presented at conferences (unpublished):*

- [13] D. Ebehard and E. Voges, "Digital single sideband detection for interferometric sensors," presented at the *2nd Int. Conf. Optical Fiber Sensors*, Stuttgart, Germany, Jan. 2-5, 1984.

*Basic format for patents:*

J. K. Author, "Title of patent," U.S. Patent x xxx xxx, Abbrev. Month, day, year.

*Example:*

- [14] G. Brandli and M. Dick, "Alternating current fed power supply," U.S. Patent 4 084 217, Nov. 4, 1978.

*Basic format for theses (M.S.) and dissertations (Ph.D.):*

a) J. K. Author, "Title of thesis," M.S. thesis, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.

b) J. K. Author, "Title of dissertation," Ph.D. dissertation, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.

*Examples:*

- [15] J. O. Williams, "Narrow-band analyzer," Ph.D. dissertation, Dept. Elect. Eng., Harvard Univ., Cambridge, MA, USA, 1993.

- [16] N. Kawasaki, "Parametric study of thermal and chemical nonequilibrium nozzle flow," M.S. thesis, Dept. Electron. Eng., Osaka Univ., Osaka, Japan, 1993.

*Basic format for the most common types of unpublished references:*

a) J. K. Author, private communication, Abbrev. Month, year.

b) J. K. Author, "Title of paper," unpublished.

c) J. K. Author, "Title of paper," to be published.

*Examples:*

- [17] A. Harrison, private communication, May 1995.

- [18] B. Smith, "An approach to graphs of linear forms," unpublished.

- [19] A. Brahms, "Representation error for real numbers in binary computer arithmetic," IEEE Computer Group Repository, Paper R-67-85.

*Basic formats for standards:*

a) *Title of Standard*, Standard number, date.

b) *Title of Standard*, Standard number, Corporate author, location, date.

*Examples:*

[20] IEEE Criteria for Class IE Electric Systems, IEEE Standard 308, 1969.

[21] Letter Symbols for Quantities, ANSI Standard Y10.5-1968.

*Article number in reference examples:*

[22] R. Fardel, M. Nagel, F. Nuesch, T. Lippert, and A. Wokaun, “Fabrication of organic light emitting diode pixels by laser-assisted forward transfer,” *Appl. Phys. Lett.*, vol. 91, no. 6, Aug. 2007, Art. no. 061103.

[23] J. Zhang and N. Tansu, “Optical gain and laser characteristics of InGaN quantum wells on ternary InGaN substrates,” *IEEE Photon. J.*, vol. 5, no. 2, Apr. 2013, Art. no. 2600111

*Example when using et al.:*

[24] S. Azodolmolky *et al.*, Experimental demonstration of an impairment aware network planning and operation tool for transparent/translucent optical networks,” *J. Lightw. Technol.*, vol. 29, no. 4, pp. 439–448, Sep. 2011.

## **Appendix A**

Type or paste your appendices here. Appendices are a place to organize and include all of the “extra” material that is important to your research work but that is too detailed for the main text. Examples can include: specific analytical methods, computer code, spreadsheets of data, details of statistical analyses, etc. But, these materials do not speak for themselves. There should be a reference to these materials from the main chapters (complete details included in Appendix A) and there should be some text at the beginning of each appendix to briefly explain what the information is and means that is included in that appendix.