Students: Remember This

- When printing from a pdf from Adobe, you **must select the option "Page scaling: None."** otherwise Adobe will be "helpful" and mess up the margins.
- This document uses features only availables to PDFs, so pdfLaTeX or some other pdf-first compiler is prefered. If you use XeLaTeX or LuaLaTeX you will likely need to change some of the packages loaded in `LA_Tech.cls` and in `thesis.tex`.
- Check for "widows," "orphans," and words that spill into the margin. These should be the most common formatting errors that LaTeX does not fix automatically.
- Format checkers will mark English mistakes if they happen to see them, but they are not proofreaders. So passing the format check does not mean your spelling and grammar are correct, and mistakes that were not caught in one format check may be caught in another. (The goal for using this template is to pass the format check on the first try, though.)
- Remove this page, but keep the next page on top of all drafts submitted for format and English checks.
- Remove this page and the next one from the final version that is submitted for binding.

Good advice for feedback from proofreaders in general: When the format for a certain type of entry, say a section heading, is marked as "to be corrected" (long section headings are supposed to be in inverted pyramid form), it is best to check the format of *all* these entries, as the format needs to be consistent overall.

Notes for Proofreading and Format Checking

We appreciate the services provided by proofreaders and format checkers to assure uniformly high quality of documents produced at Louisiana Tech University. Because of the differences between mathematical documents and other documents, we request that the following be kept in mind.

- This document was typeset using Louisiana Tech's approved LaTeX template. Therefore most formatting should be a non-issue.
- Issues that should not require correction, except as indicated below.
  - Global margins, order of sections, page numbering, title page, format of headings, table of contents, list of figures, list of tables. (All approved when the template was created.)
  - LaTeX is *the* professional standard for mathematical typesetting. Equations are typeset with the LaTeX default options, which should not be adjusted.
  - Some built in font sizes cannot be changed. Font sizes for headings, etc., were approved, even if they may look a little different than in WORD documents.
- Issues that require attention. There are some situations in which LaTeX' automatic formatting is less than optimal.
  - Margin infractions on individual lines. The global margins have been approved, but if the program does not know how to split a long term, it can spill into the margin. This is especially likely in typeset equations and can and should be fixed.
  - Widows and orphans. Linebreaking is automatic and sometimes leaves the first line of a paragraph on the preceding page or puts the last line on the next page.
  - English spelling, grammar, punctuation, etc.
  - *Gross* infractions on the placement and spacing of figures. Because of the way LaTeX imports and creates images, the distance between a figure and its caption can vary slightly. Large white spaces should be flagged, though.
- Please mark *all* recommended changes in the first pass through.

THESIS TITLE GOES HERE IN CAPITAL LETTERS, SPLIT FOR INVERTED PYRAMID FORM; <3 LINES: INSERT TWO "\ \ \" BEFORE "A Diss..." PER LINE

by

Your Name, B.S. , M.S., M.Ed., etc. (whichever is applicable)

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy/Master of Science (pick which)

COLLEGE OF ENGINEERING AND SCIENCE
LOUISIANA TECH UNIVERSITY

Month Year (of award)

Replace this page with the Signature Page.

ABSTRACT

Put your abstract here. This LaTeX template for MS and Ph.D. theses automatically takes care of most formatting requirements for theses submitted at Louisiana Tech University. A short tutorial on LaTeX as well as an indication of issues that must be handled on a case-by-case basis is included.

If the abstract splits over two pages, LaTeX will take care of the page numbering.

Replace this page with the approval for scholarly dissemination form.

DEDICATION

Place dedication here, if a dedication is desired. Otherwise, comment out the line `\include{tex/dedication}` in `thesis.tex`.

TABLE OF CONTENTS

LIST OF TABLES

So the entries above would need to be fixed by rewording to eliminate the spills. (And entries like this one are not permissible.) Also note that to shrink the gap between the dotted line and the end of the entry, you should put the closing parenthesis `}` of the caption command right after the last work of the caption, not on the next line. Compare the entries for Table 3.1 (bad) and for Figure 3.3 on the next page.

Also, you shouldn't forget to delete this note from `tex/contents.tex`.

LIST OF FIGURES

ACKNOWLEDGMENTS

Place acknowledgements here, if acknowledgements are desired. For an example, see below.

I (B. Schröder) thank Dr. Lisa Kuhn for letting me use her dissertation's source code as the basis for this template. The hard work was done by her. I only inserted hints and a tutorial on LaTeX that I had on hand.

If no acknowledgements are desired, comment out the line `\include{tex/acknowledgements}` in `thesis.tex`.

Note that the above is an example of a margin violation that would need to be fixed manually. LaTeX usually does a good job splitting words correctly between two lines. Issues only arise with words from other languages or with math expressions, verbatim text, and other combinations which normally don't allow line breaks.

PREFACE

Place preface here, if a preface is desired. (Many CAM and MS theses do not have a preface, because the introduction serves the purpose that a preface would in a book.)

Otherwise, comment out the line `\include{tex/preface}` in `thesis.tex`.

CHAPTER 1

INTRODUCTION

Put your introduction here.

Typesetting in LaTeX is *the* way to communicate mathematics (journal articles, books, MS theses, doctoral dissertations), and LaTeX is also popular in other disciplines, such as physics or computer science. This template should make the formatting of your thesis easier. It is set up so that, unless there are some really wide equations or figures, all margins should automatically be correct. Similarly, all parts are in the order required by the graduate school and the required tables (listing contents, figures, tables) are created automatically in the required format. The template is compiled by running LaTeX on the file `thesis.tex`. The only parts of `thesis.tex` that you should change are

- `\include{...}` commands: Add more to accommodate all the parts of your thesis and comment out those that do not apply.
- `\usepackage{...}` commands: to import commands and environments that other people have created.

For the actual software,

- MikTeX [1] is a standard LaTeX distribution for Windows and WinEdt [2] is a standard front end. WinEdt asks for a registration fee. The similar TeXnicCenter [3] is free.
- MacTeX [4] is the standard MacOS distribution. It comes with the TeXShop editor.
- TeX Live [5] is the standard Linux distribution.
- Overleaf [6] is a convenient web app for hosting and editing your TeX projects.

A more thorough introduction to contemporary LaTeX can be found in the LaTeX Wikibook [7].

This document has been configured to use BibLaTeX [8] to automatically typeset your bibliography. All you need to do is use `\cite{...}` with a given key from `bib.bib`, and everything will be taken care of. There are a variety of bibliography managers you might use rather than directly editing your bib file. Bibdesk comes with MacTeX, but most distributions don't include a manager. Consult `en.wikipedia.org/wiki/Comparison_of_reference_management_software` for a suitable application

I set the bibliography to use IEEE style, but it supports a variety of needs. You only need to change the options in `\usepackage[...]{biblatex}` in `thesis.tex` to suit most formatting options.

CHAPTER 2

TYPESETTING IN LaTeX

You can see how the various types of environments are created by looking at the corresponding source code.

2.1 Section Title

Theorem 2.1. *Let's say this is our first theorem.*

Proof. Type proofs as regular paragraphs. LaTeX will treat them as regular paragraphs and automatically format them consistently.

Definition 2.2. *Let's say this is our first definition.*

Here's how mathematics can be displayed. Note that a one-line "paragraph" before an itemized or enumerated list can look a bit funny, because the indentations don't match up.

- In-text math mode: $\int_0^1 x^2 dx = \frac{1}{3}$.
- Display math mode: *To assure the proper spacing, the* `$$...$$` *environment must start on the line* **immediately** *after the preceding text.*

$$\int_0^1 x^2 dx = \frac{1}{3}$$

- Display within text math mode: $\displaystyle\int_0^1 x^2 dx = \frac{1}{3}$

- And here is how we line up equalities. *To assure the proper spacing, the* `\begin{align*}` *must be on the line* **immediately** *after the preceding text.*

$$\begin{aligned}\int_0^1 x^2 dx &= \frac{1}{3}x^2\Big|_0^1 \\ &= \frac{1}{3}\end{aligned}$$

Note that delimiters like braces can be automatically adjusted to the right size by using the `\left` and `\right` commands. The above shows that the delimiters themselves need not match in shape and that a period gives an unprinted dummy delimiter.

Align also works when things get ugly:

$$\begin{aligned}&\int_\Omega |D^\alpha f(x) - D^\alpha f_a(x)|^p \ d\lambda(x) \\ &\quad= \int_\Omega \left| \int_\Omega D^\alpha f(x) g_a(x-z) \ d\lambda(z) - \int_\Omega D^\alpha f(z) g_a(x-z) \ d\lambda(z) \right|^p \ d\lambda(x) \\ &\quad\le \int_\Omega \left(\int_\Omega |D^\alpha f(x) - D^\alpha f(z)| \, g_a(x-z) \ d\lambda(z) \right)^p \ d\lambda(x) \\ &\quad\le \int_\Omega \left(\left(\int_\Omega \left(|D^\alpha f(x) - D^\alpha f(z)| \left(g_a(x-z) \right)^{\frac{1}{p}} \right)^p \ d\lambda(z) \right)^{\frac{1}{p}} \times \right. \\ &\qquad\left. \times \left(\int_\Omega \left(\left(g_a(x-z) \right)^{1-\frac{1}{p}} \right)^q \ d\lambda(z) \right)^{\frac{1}{q}} \right)^p \ d\lambda(x) \\ &\quad= \int_\Omega \int_\Omega |D^\alpha f(x) - D^\alpha f(z)|^p \, g_a(x-z) \ d\lambda(z) \left(\int_\Omega g_a(x-z) \ d\lambda(z) \right)^{\frac{p}{q}} \ d\lambda(x) \\ &\quad\le \int_\Omega \int_{B_a(0)} |D^\alpha f(x) - D^\alpha f(x+y)|^p \, g_a(-y) \ d\lambda(y) \ d\lambda(x) \\ &\quad= \int_{B_a(0)} \int_\Omega |D^\alpha f(x) - D^\alpha f(x+y)|^p \ d\lambda(x) g_a(y) \ d\lambda(y) \\ &\quad< \int_{B_a(0)} \nu g_a(y) \ d\lambda(y) = \nu.\end{aligned}$$

When you need an equation to be numbered, use the `equation` environment

$$F(\omega) = \int_{-\infty}^{\infty} f(t) e^{-i\omega t} dt \tag{2.1}$$

Similarly the `align` environment will number each line. Adding `*` suppresses numbering.

2.2 Next Section Title

Definition 2.3. *Let's say this is our second definition.*

Theorem 2.4. *Let's say this is our second theorem.*

The block at the end of a proof can be generated like this. □

2.3 Enumeration and Itemization

Enumeration is done like this

1. First entry.
2. Second entry.

Bullets are done like this

- First bullet.
- Second bullet.

2.4 Things to Explore

Go ahead and move the theorems, definitions and items around. After compiling twice, the references will be correct.

- The first theorem is Theorem 2.1.
- The second theorem is Theorem 2.4.

- The first definition is Definition 2.2.
- The second definition is Definition 2.3.
- The Fourier Transform is Equation 2.1
- The first enumeration entry is 1.
- The second enumeration entry is 2.
- An entry in the bibliography is [9].
- Another entry in the bibliography is [10].

Note that when referring to a figure with `\ref{}` *or to citations with* `\cite{}`*, it's often appropriate to use a non-breaking space (~) so that your reference to Theorem 2.4 isn't split between lines.*

2.5 Bad Line and Page Breaks

Although LaTeX is designed to produce pages that look good, sometimes it produces a "widow" (first line of a paragraph alone at the end of a page) or an "orphan" (last line of a paragraph alone at the start of a new page). To force a page break, use the `\clearpage` command.

To force a right-justified line break, use the `\linebreak` command. (But don't spread lines as above. You can see that it looks funny.)

2.5.1 Long Subsection Headings Long Subsection Headings Long Subsection Headings

Sometimes a section or subsection heading can be a bit long. To accommodate width requirements for headings, use hard carriage returns (\\) to insert line breaks

in the heading. These hard carriage returns will also be used in the table of contents, but I was told that that is acceptable. Remember to set up the heading in inverted pyramid form (each line is narrower than the previous line).

CHAPTER 3

PLACEMENT OF FIGURES IN LaTeX

When creating figures in LaTeX, it is important to realize that different types of figures are imported differently, leading to different margins below the figure. For diagrams, as in Figure 3.1, TeXCAD (see [12]) is recommended since it creates native vector images, and text in it will match the rest of your project. The line in Figure 3.1 is at height $y = 0$ in TeXCAD. The distance between the figure and the caption is supposed to be a double space. Hence your lowest object should be at height $y =$???mm in TeXCAD. A double space should separate the figure from paragraph text above or below it, which is done in Figure 3.1.

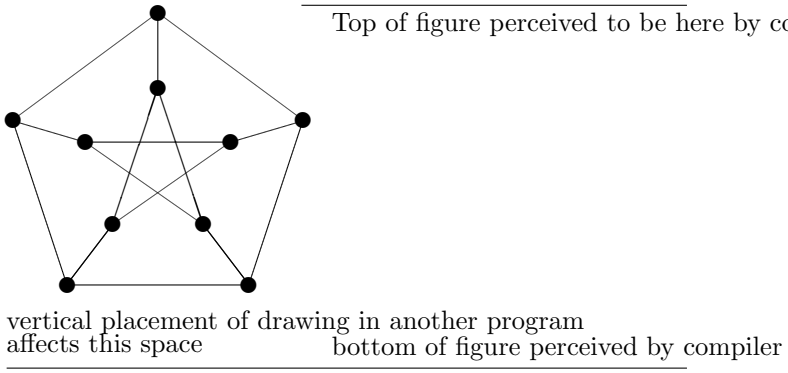

Figure 3.1: The line in the figure above is at height $y = 0$ in TeXCAD. Note that LaTeX automatically typesets captions single-spaced.

There will be more white space between the "bottom" of the figure and the caption if the lowest object is higher than $y = 0$. Figure 3.2 shows how items that

are placed too high can distort the distance between the image and the caption. I've configured the float spacing to get appropriate results — doublespace between the float and surrounding paragraphs — but if you have trouble then use `\vspace{}` to add or subtract vertical space.

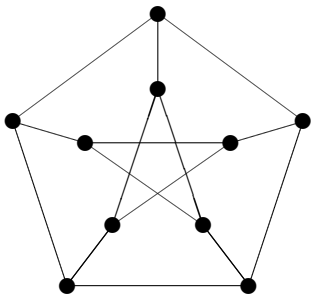

Figure 3.2: If your figure has some white space above the unseen actual border, like this one, only less extreme, please make a note on the printout that goes to the proofreader. Without the line on the bottom and the text, this figure would not be acceptable (too much white space). Disclaimer: This is an example of a **bad** figure with too much white space between content and bounding box.

Because LaTeX treats figures as floating objects, the correct placement of figures is effected with the `[htb]` ("here, top, or bottom") option. Placing your figure after the paragraph that first refers to it and using `[hbt]` will place the figure right there, if possible, and, if not, it will place the figure at bottom of the page, or the top of the next page, which is in accordance with technical writing rules. This is how Figures 3.1 and 3.2 were placed.

Most picture formats can be imported. In Figure 3.3, eps files were used because this template was originally made with output to dvi files in mind, but since it's assumed you'll output straight to pdf you can use any standard image file type.

Figure 3.3: Note how a picture that was created or imported differently has a different space between caption and image than the line drawing in Figure 3.1. (Left) Bat flight is being studied as part of an Air Force Office of Scientific Research Multidisciplinary University Research Initiative project. Image credit: `mime.oregonstate.edu/news/story/2103`, (Right) Morphing gull wings.

Note that imported pictures that have white space on their margins will look as if they are placed incorrectly. For such pictures, make a note on the printout that goes to format checking.

3.1 Tables

Tables pretty much act like figures. Table 3.1 is an example of a small table.

Table 3.1: A sample table. If there are no tables, comment out the `\include{tables}` command in `thesis.tex`. *Note how the "include" spills too far to the right in the list of figures. This type of margin infraction must be corrected manually.*

p	q	$p \Rightarrow q$
F	F	T
F	T	T
T	F	F
T	T	T

For tables, the title is to be placed above the table, which is done by putting the `\caption` command above the table. For professional-looking tables, you'll want to minimize the number of lines used as done in Table 3.2.

Table 3.2: Another sample table and another fun rule: Entries in the list of tables/figures should have at least 3 dots in the dotted line between entry and page number. Unless there is an unfortunate spill, which would need to be fixed anyway, LaTeX should do this automatically.

p	q	$p \Rightarrow q$
F	F	T
F	T	T
T	F	F
T	T	T

More advanced tables might have parts than span multiple columns. LaTeX has a command to take care of this with `\multicolumn`, which is used in Table 3.3. The command `\multirow` works similarly and can be accessed with the package `multirow`.

Table 3.3: A table with multicolumn and multirow spans.

Inputs		Output
p	q	$p \Rightarrow q$
F	F	T
F	T	T
T	F	F
T	T	T

3.2 Note on Sections

If a chapter has only one section, omit the sectioning command. So for this chapter, I had the choice to omit the section heading "table" or to explain the reasoning in this short "section."

CHAPTER 4

CONCLUSIONS

Put your conclusions here.

The quick brown fox jumped over the lazy dog. (I'm so tired of animal acts.) The quick brown fox jumped over the lazy dog. (I'm so tired of animal acts.) The quick brown fox jumped over the lazy dog. (I'm so tired of animal acts.) The quick brown fox jumped over the lazy dog. (I'm so tired of animal acts.) The quick brown fox jumped over the lazy dog. (I'm so tired of animal acts.) The quick brown fox jumped over the lazy dog. (I'm so tired of animal acts.) The quick brown fox jumped over the lazy dog. (I'm so tired of animal acts.) The quick brown fox jumped over the lazy dog. (I'm so tired of animal acts.) The quick brown fox jumped over the lazy dog. (I'm so tired of animal acts.)

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APPENDIX A

APPENDICES (IF DESIRED)

Put your appendices here. All codes stay the same, except that the first page of an appendix should only have the headings, so follow `\chapter` with a `\clearpage`. Code in `thesis.tex` take care of naming a `\chapter` an "APPENDIX."

From Louisiana Tech's "GUIDELINES FOR THE PREPARATION AND SUBMISSION OF YOUR THESIS OR DISSERTATION" (see [13])

- Appendices are optional. They must contain extra, relevant material such as questionnaires, surveys, tables, figures, computer data, and letters of permission to reprint copyrighted material. These optional appendices must be listed in the Table of Contents, conforming to the format used there. They must also be formatted in the document in such a way that they are consistent with the other main divisions.
- Appendices must be cited in the Body of the document.
- All material in appendixes must be numbered consecutively, within the required margins, and on the same paper used throughout the document.
- All appendices must have a title page. The title page of each Appendix must have the Arabic page number centered between the left and right margins between 1/2 inch and 1 inch from the bottom edge of the page. Place the Arabic page number at the top right of subsequent pages of each Appendix.
- The Title page must have the word APPENDIX typed in all capital letters 2 inches from the top of the page followed by an informative title in all capital letters. If there is more than one appendix, then label the first title page as

APPENDIX A, the second APPENDIX B, and so on, providing an informative title for each appendix.

BIBLIOGRAPHY

[1] [Online]. Available: http://miktex.org/.

[2] [Online]. Available: http://winedt.com/.

[3] [Online]. Available: http://www.texniccenter.org/.

[4] [Online]. Available: https://tug.org/mactex/mactex-download.html.

[5] [Online]. Available: https://www.tug.org/texlive/.

[6] [Online]. Available: https://www.overleaf.com.

[7] [Online]. Available: https://en.wikibooks.org/wiki/LaTeX.

[8] [Online]. Available: https://ctan.org/pkg/biblatex.

[9] A. A, *An entry in the bibliography*, For bibliographies single space the entries and put a double space between entries.

[10] A. B, *Another entry in the bibliography.*

[11] A. C, *Third entry in the bibliography*, Caution: Use the formatting style that is common in your discipline. *None of the entries in this file should be considered a sample entry.*

[12] [Online]. Available: http://texcad.sourceforge.net/.

[13] *Guidelines for the preparation and submission of your thesis or dissertation*, Louisiana Tech Univervsity. [Online]. Available: http://www.latech.edu/graduate_school/thesis_dissertations/index.shtml.

VITA (IF REQUIRED)

- The Vita is a one-page biographical sketch of the author written in paragraph form and in 3rd person. It is the last item of the document and must appear in the Table of Contents.
- The heading must have identical font, value, size, and position/location in the page as other major headings.