UNIVERSITY OF LETHBRIDGE THESIS TEMPLATE

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Bachelor of Science, University of British Columbia, 2009
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A Thesis
Submitted to the School of Graduate Studies
of the University of Lethbridge
in Partial Fulfillment of the
Requirements for the Degree

DOCTOR OF PHILOSOPHY

Department of Mathematics and Computer Science
University of Lethbridge
LETHBRIDGE, ALBERTA, CANADA

UNIVERSITY OF LETHBRIDGE THESIS TEMPLATE

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Signature *Date*

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Committee Member: Dr. D

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Chair, Thesis Examination Committee: Dr. E

Dedication

This is where the dedication goes. It is normally quite short. (This is an optional section)

Abstract

This is the University of Lethbridge thesis template for use in LaTeX. Feel free to alter any code you wish. However, make sure that doing so does not affect the thesis regulations. This version of the template passed all stylistic criteria for the 2013–2014 academic year.

Acknowledgments

Write something nice here about how much help everyone has given you. (This is an optional section). Also note that there are two correct spellings of “Acknowledgment”. Choose the spelling that you like better!

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Chapter 1

How To Use This Template

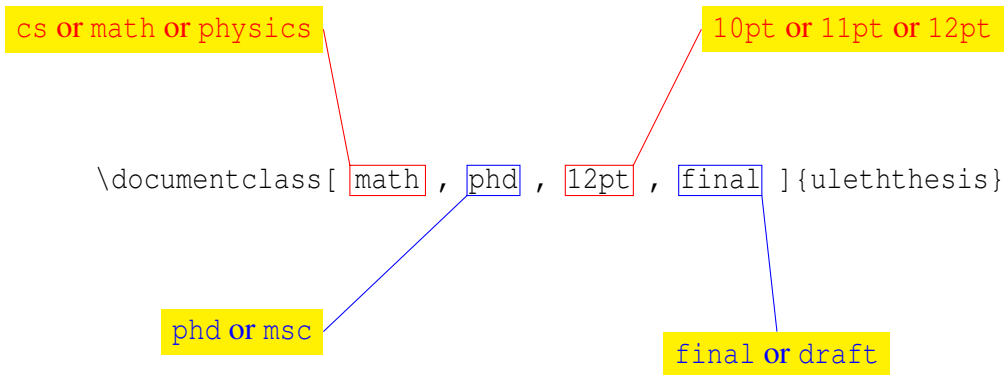
This entire README file is written in the `ulethesis` template. This chapter is a very short summary of how to use this thesis template. Your thesis will be broken up into several files:

- `ulethesis.cls` – This is the actual template. Make sure it is in the current folder when compiling.
- `thesis.tex` – This is the wrapper file for your whole thesis.
- `ch1.tex` – This is where the source code for Chapter 1 belongs.
- `ch2.tex` – This is where the source code for Chapter 2 belongs.
- `ch3.tex` – This is where the source code for Chapter 3 belongs.
- `appA.tex` – This is where the source code for Appendix A belongs.
- `appB.tex` – This is where the source code for Appendix B belongs.
- `appC.tex` – This is where the source code for Appendix C belongs.
- `preamble.tex` – Place any *common* commands in this file.
- `thesis-refs.bib` – A BibTeX file of your references.

The LaTeXcode for an actual thesis which used this template and for this README is located in the `example/` directory.

1.1 thesis.tex

This file is the wrapper file for the entire thesis. You will need to change a few things.

1. 

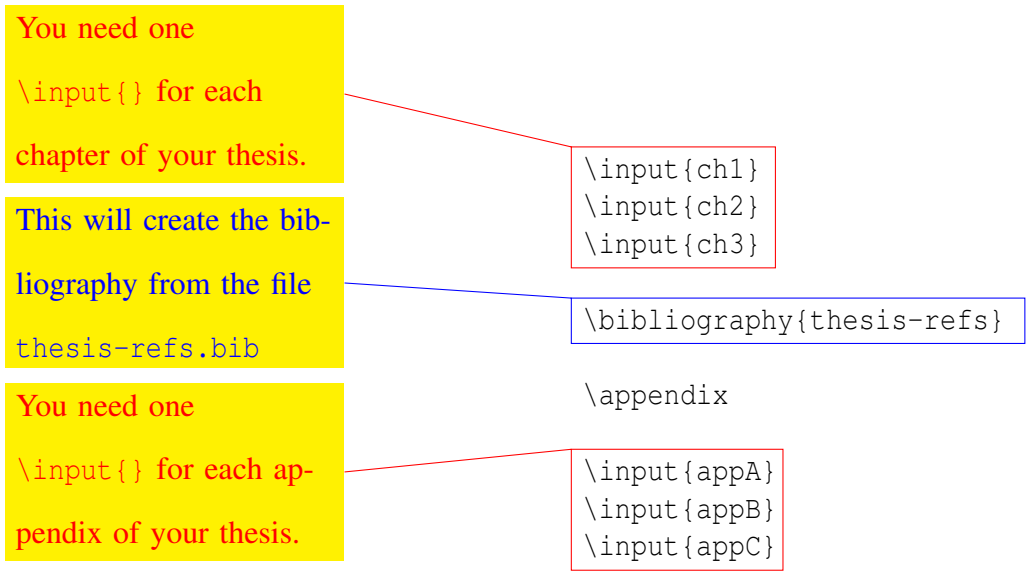
2. Fill in the following information: \title, \author, \degreeyear, \prevdegrees.

3. Add a signature line for every committee member, supervisor and thesis chair using \addsignatureline.

4. Write your dedication inside the \dedication{} section.

5. Write your abstract inside the \begin{abstract} \end{abstract}.

6. Write you acknowledgments inside the \acknowledgments{} section.

7. 

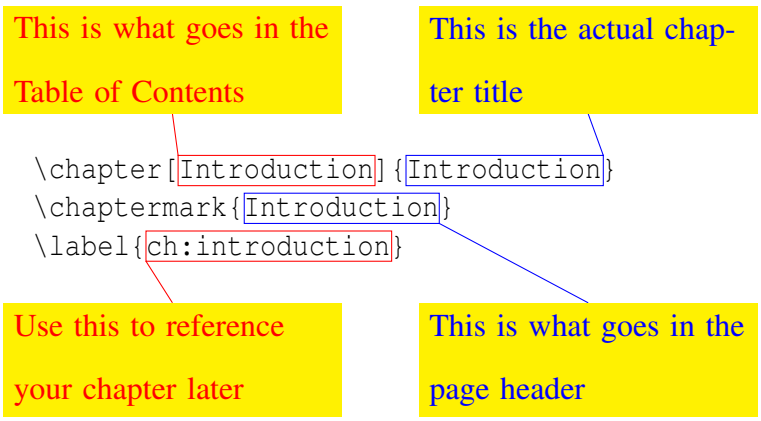
1.2 ch1.tex, ch2.tex, ...

In each of these files, you can write LaTeXas normal. You do NOT put it inside of the usual \begin{document} and \end{document}, just start typing. Here is an example of ch1.tex:

```
\chapter[Introduction]{Introduction}
\chaptermark{Introduction}
\label{ch:introduction}

This thesis is a combination of many novel ideas that have been
   studied in the past few years. The bulk of the study has been
   centred around the idea of biangular line-sets where we impose
   certain conditions in order to obtain specific combinatorial
   objects. The work found within is a combination of published
   work,~\cite{much10,unit-weigh13}, submitted work,~\cite{muwm13
   }, and forthcoming publications.

\section[A Note on Notation]{A Note on Notation}
\sectionmark{Notation}
\label{sec:notation}

Mathematicians are notorious for generating acronyms for subject
   matter. In this thesis, we will refrain from utilizing these
   acronyms as most of them will look too similar and are likely
   to cause headaches (e.g., MUBs, MUHM, MUCH, MUH, MOLS, MSLS,
   MUWM, MUCWM, MUUWM, etc.). With that being said, when these
   objects are introduced, we will specify the acronym for any
   reader who wishes to read other articles within the field where
    these acronyms are used heavily.
```

1.2.1 When You Want A New Chapter

Start every chapter with three lines of code:



1.2.2 When You Want A New Section

Same as a new chapter, but use \section and \sectionmark instead of \chapter and \chaptermark. Example:

```
\section[Table of Contents Name]{Actual Section Name}
\sectionmark{This is what goes in the header}
\label{sec:example}
```

1.2.3 When You Want A New Subsection

Subsections **should not** change the headers on the page, so there is no command called ~~\subsectionmark~~. To start a new subsection, use \subsection and \label (similar usage as \chapter). Example:

```
\subsection[Table of Contents Name]{Actual Subsection Name}
\label{subsec:example}
```

1.2.4 When You Want A New Subsubsection

Subsections **should not** change the page header and **should not** appear in the Table of Contents, so there is no command called ~~\subsubsectionmark~~. To start a new subsubsection, use \subsubsection and \label. Example:

```
\subsubsection{Actual Subsubsection Name}
\label{subsubsec:example}
```

1.3 appA.tex, appB.tex, ...

When you are creating your appendices, you should use the same commands as in Section 1.2. The only difference will be in the output (different numbering style).

1.4 preamble.tex

In this file, you should place all of your commands that will be used throughout all of your files. To make your code more readable, I recommend placing your \usepackage commands in this file. Moreover, any commands which make life easier for you should

appear here. Here are a few examples (I recommend that you try each of them, they are very useful when you are writing and editing your thesis).

```
\newcommand{\etal}{\emph{et al.}\xspace}
\newcommand{\CITE}{{\bf {\color{red} [CITE]}}\xspace}
\newcommand{\REF}{{\bf {\color{red} [REF]}}\xspace}
\newcommand{\FIGURE}{{\bf {\color{red} [FIG]}}}
```

1.5 thesis-refs.bib

This is where you can store all of your references. I would recommend using BibTeX since it correctly formats and organizes your references.

Chapter 2

Important Comments and Tips

2.1 Tables

When making a table, you should not use the default table look. You should format it nicely. Table 2.1 is an example of a table.

Table 2.1: A nice looking table

Type	Upper Bounds		Examples Found	
	Calderbank	Smallest	Largest Set	Root of Unity
UW(3,2)	5	0	0	–
UW(3,3)	3	3	3	3
UW(4,2)	9	2	2	4
UW(4,3)	9	9	9	6
UW(4,4)	4	4	4	4
UW(5,2)	14	0	0	–
UW(5,3)	14	0	0	–
UW(5,4)	8	5	5	6
UW(5,5)	5	5	5	5
UW(6,2)	20	2	2	4
UW(6,3)	20	3	3	3
UW(6,4)	20	20	20	6
UW(6,5)	$\frac{25}{3}$	8	2	12
UW(6,6)	6	6	2	12
UW(7,2)	27	0	0	–
UW(7,3)	27	3	3	6
UW(7,4)	27	8	8	2
UW(7,5)	15	0	0	–
UW(7,6)	9	9	0	–
UW(7,7)	7	7	7	7

Here is the LaTeXcode for Table 2.1:

```
\definecolor{Gray}{gray}{0.9}

\begin{table}[ht]
\caption{A nice looking table}
\centering
\begin{tabular}[h]{@{}cccllccc@{}}
 \toprule\label{table:bounds}
 Type & & \multicolumn{2}{@{}c@{}}{Upper Bounds} & & \multicolumn
    {2}{@{}c@{}}{Examples Found} \\
\cmidrule{2-4} \cmidrule{6-7}
 & & Calderbank & \multicolumn{1}{@{}c@{}}{Smallest} & & Largest
    Set & Root of Unity \\
 \midrule
 UW(3,2)        && 5               & 0  && 0  & --  \\
 UW(3,3)        && 3               & 3  && 3  &  3  \\
 UW(4,2)        && 9               & 2  && 2  &  4  \\
 UW(4,3)        && 9               & 9  && 9  &  6  \\
 UW(4,4)        && 4               & 4  && 4  &  4  \\
 UW(5,2)        && 14              & 0  && 0  & --  \\
 UW(5,3)        && 14              & 0  && 0  & --  \\
 UW(5,4)        && 8               & 5  && 5  &  6  \\
 UW(5,5)        && 5               & 5  && 5  &  5  \\
 UW(6,2)        && 20              & 2  && 2  &  4  \\
 UW(6,3)        && 20              & 3  && 3  &  3  \\
 UW(6,4)        && 20              & 20 && 20 &  6  \\
 \rowcolor{Gray}
 UW(6,5)        && $\frac{25}{3}$ & 8  && 2  & 12  \\
 \rowcolor{Gray}
 UW(6,6)        && 6               & 6  && 2  & 12  \\
 UW(7,2)        && 27              & 0  && 0  & --  \\
 UW(7,3)        && 27              & 3  && 3  &  6  \\
 UW(7,4)        && 27              & 8  && 8  &  2  \\
 UW(7,5)        && 15              & 0  && 0  & --  \\
 \rowcolor{Gray}
 UW(7,6)        && 9               & 9  && 0  &  -- \\
 UW(7,7)        && 7               & 7  && 7  &  7  \\
 \bottomrule
\end{tabular}
\end{table}
```

2.2 Quotes

If you have a long quotation, put it inside the `\begin{quote}` and `\end{quote}`. Here is an example of what it will look like:

> It is India that gave us the ingenious method of expressing all numbers by means of ten symbols, each symbol receiving a value of position as well as an absolute value; a profound and important idea which appears so simple to us now that we ignore its true merit. But its very simplicity and the great ease which it has lent to computations put our arithmetic in the first rank of useful inventions; and we shall appreciate the grandeur of the achievement the more when we remember that it escaped the genius of Archimedes and Apollonius, two of the greatest men produced by antiquity.
>
> –Pierre-Simon Laplace

2.3 Referencing Theorems, Lemmas, etc.

A common error when you are referencing Theorems, Lemmas, etc. in LaTeXis not using the "~".

WRONG:

```
From Theorem \ref{th:hadamard}, we know that Hadamard
   matrices cannot exist for any odd $n>1$.
```

CORRECT:

```
From Theorem~\ref{th:hadamard}, we know that Hadamard
   matrices cannot exist for any odd $n>1$.
```

By placing the ~ between Theorem and \ref, it ensures that the number of the theorem will always be on the same line as the word "Theorem" (a newline will never happen in between these two words).

2.4 Overfull hbox Errors

The thesis committee is very picky about the layout of your thesis – especially about margins. You need to make sure that all of your words fall within the correct margins.

Thankfully, LaTeXprovides errors when it has placed words outside of the margins that you have set. The error that you will receive will look similar to this:

```
Overfull \hbox (26.7289pt too wide) in paragraph
```

You must play around with your wordings until this fits onto the page. Do NOT change the size of the margins in an attempt to fix this mistake.

2.5 How to Make a Bibliography

The easiest way to make a bibliography is to make a BibTeX file. This way, it will format each of your references properly and will also put them in the correct order. Note that if you selected `math` or `cs` as your discipline, then the references will be in alphabetical order. If you selected `physics`, then the references will appear in the same order as they appeared in the thesis.

Here is a couple examples of BibTeX entries (both of these entries can also be found in `thesis-refs.bib`).

```
@ARTICLE{hadamard,
  author = {Best, D. and Kharaghani, H.},
  title = {Unbiased complex {H}adamard matrices and bases},
  journal = {Cryptogr. Commun.},
  year = {2010},
  volume = {2},
  pages = {199--209},
  number = {2}
}

@ARTICLE{golay,
  author = {Craigen, R. and Holzmann, W. and Kharaghani, H.},
  title = {Complex {G}olay sequences: structure and applications},
  journal = {Discrete Math.},
  year = {2002},
  volume = {252},
  pages = {73--89},
  number = {1-3}
}
```

And now, I can reference them: Here is the Golay paper, [2], and here is the Hadamard paper, [1]. If you are in `math` or `cs` mode, then Unbiased complex Hadamard matrices should be [1] (since it is first alphabetically). If you are in `physics` mode, then the Golay seqences should be [1] (since it was referenced first in your article). Note that the order of the references in the `thesis-refs.bib` file does not matter.

I would recommend using a program such as JabRef to maintain your list of references.

2.6 Page Counts, Word Counts, etc.

2.6.1 Page Count

There is **no official minimum or maximum** on the number of pages in your thesis.

2.6.2 Abstract Length

Your abstract can be a **maximum of 150 words**.

2.6.3 Title Length

Your abstract can be a **maximum of 41 characters (letters)**.

2.7 Compiling Your Code

To compile your code into PDF (or PS), you simply need to compile `thesis.tex`. All of the other files are included through the `\input` lines that you added in the `thesis.tex` file.

2.8 Warnings

This thesis template was created to aid graduate students using LaTeX. The template has been used in the past, and has been approved by the School of Graduate Studies. However, it is **your responsibility** to ensure that all criteria for your thesis are met. This template was created for the 2013–2014 standards. In particular, please note that any time you include

a new package into this thesis template, it has the potential to change formatting (fonts, margins, etc.). If you make changes to the thesis template that you feel should be made available to all graduate students, please email the Graduate Student Coordinator of the Mathematics and Computer Science Department.

Bibliography

[1] D. Best and H. Kharaghani. Unbiased complex Hadamard matrices and bases. *Cryptogr. Commun.*, 2(2):199–209, 2010.

[2] R. Craigen, W. Holzmann, and H. Kharaghani. Complex Golay sequences: structure and applications. *Discrete Math.*, 252(1-3):73–89, 2002.

Appendix A

Appendix Example

Here is an example of what your appendices will look like!