Writing a Thesis with LaTeX

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1 Class Examples (Command by Command)

This handout goes over using TeXnicCenter, TeXShop or iTeXMac to create a thesis using the isuthesis package. The examples are done here on a step-by-step basis. So you if get lost, check this sheet. The LaTeX system and TeXnicCenter front end used here is from the ProTeXt / TexLive CD-Rom which can be downloaded from `www.tug.org`. The TeXShop TeX Mac front end was downloaded from `www.uoregon.edu/~koch/texshop/` and the iTeXMac front end also for the Macintosh was downloaded from `itexmac.sourceforge.net`. The isuthesis package itself and installation notes for that package can be found at: `http://css.ait.iastate.edu/Tex/`.

1.1 Basic Thesis Setup

1. *Create a thesis folder.* On your desktop, create a folder named **Thesis**. This folder will contain all the files related to your thesis.

2. *Copy in the thesis template.* Open a Web browser and go to the following location: `http://css.ait.iastate.edu/Tex/` then click on the **Standard ISUThesis Template** link. Right-click (Windows) or Ctrl-click (Macintosh) each of the template files and copy them to your *Thesis* folder that was created in the previous step.

3. *Start your LaTeX system.* Start TeXnicCenter by going under **Start** → **Programs** → **TeX Applications** → **TeXnicCenter**. On a Macintosh, simply click on the TeXShop or iTeXMac icon.

4. *Open the file- thesis.tex.* Pull down under **File** → **Open** and select the file **thesis.tex**. Take a look and see how this file is organized.

5. *Open the file- titletoc.tex.* Pull down under **File** → **Open** and select the file **titletoc.tex**. This file contains information regarding your thesis title, your full name and additional area/departmental information. Alter this file so that it contains your correct information. Then **close** the *titletoc.tex* file.

6. *Compile your thesis using PDFLaTeX.* Go back to the thesis.tex document. Within TeXnicCenter make sure your *Output Profile* is set to **LaTeX** ⇒ **PDF**, then compile your document by clicking the **Build button**. If you are using TeXShop, click on the **Typeset** button or within iTeXMac pull down under **TeX** → **Typeset**. **Note** that you always compile your thesis.tex file. The thesis template uses a Master file system. The thesis.tex file actually brings in all the other files when it is compiled. If all went well, a PDF file should have been created. If an error message pops up, edit the file which contains the error and then re-compile thesis.tex again with PDFLaTeX.

7. *Take a look at the result.* Within TeXnicCenter, use the **View Output button** to view the current state of your document. Within TeXShop or iTeXMac, a PDF file should automatically appear. **Notice** that your Table of Contents, List of Tables and List of Figures are currently blank. All of these items in LaTeX are always one compilation behind. So if you make a change that effects one of these thesis areas then you need to compile your thesis a second time with PDFLaTeX.

8. *Compile your thesis.tex file again with PDFLaTeX.* Within TeXnicCenter compile your document by clicking the **Build button**. If you are using TeXShop, click on the **Typeset** button or within iTeXMac pull down under **TeX** → **Typeset**.

9. *Take a look at the new results.* Your Table of Contents, List of Tables and List of Figures should now have something in them. For the rest of this class, we will make changes to one chapter or part of the thesis-close that part then return to the *thesis.tex* file to re-compile the thesis and then after that take a look at the result.

1.2 Spell Checking

On a Windows system to check the spelling in your thesis, go under **Start** → **Programs** → **Tex Applications** → **4Spell**. Use the **Select File** button to choose the file to check and then click on the **Check Spelling** to check your spelling.

On a Macintosh system using TeXShop, spelling is automatically checked for you on the fly. TeXShop underlines in red any word that is not a LaTeX command and that is not in its standard English dictionary. You can also do a complete spell check by opening a document to check then pulling down under **Edit** → **Check Spelling**.

On a Macintosh system using iTeXMac, you can check your spelling as you type by pulling down under **Edit** → **Spelling** → **Check Spelling As You Type**. You can also do a complete spell check by opening a document to check then pulling down under **Edit** → **Spelling** → **Spell Checker**.

2 A Typical Thesis Done in LaTeX

Here are some of the important parts from the standard isuthesis template. Included here are the front and back portions of the thesis as well as a few select portions of some of the chapters.

2.1 Thesis.tex

This is the main **thesis.tex** file. A line that starts with a % is a comment line. Comment lines which are commands can be uncommented to add or alter thesis options.

```
% Template file for a standard thesis
\documentclass[11pt]{report}
\usepackage{isuthesis}
\usepackage[pdftex]{graphicx}
% Standard, old-style thesis
\usepackage{traditional}
\chaptertitle
% Old-style, thesis numbering down to subsubsection
\alternate
% The next line is only used to get a sideways table/figure.
\usepackage{rotating}
% Bibliography without numbers or labels
\usepackage{natbib}
\bibliographystyle{isuapalike}
%\includeonly{titletoc,chapter1}
%Optional Package to add PDF bookmarks and hypertext links
%If used, uncomment phantomsection commands to get LOT/LOF hyperlinks in correct plac
%\usepackage[pdftex,hypertexnames=false,linktocpage=true]{hyperref}
%\hypersetup{colorlinks=true,linkcolor=blue,anchorcolor=blue,citecolor=blue,filecolor
```

```
\begin{document}
\DeclareGraphicsExtensions{.jpg,.pdf,.mps,.png}
\include{titletoc}
% Optional thesis dedication
\include{dedication}
%\pdfbookmark[1]{TABLE OF CONTENTS}{table}
\tableofcontents
\addtocontents{toc}{\def\protect\@chapapp{}}
\cleardoublepage
%\phantomsection
\addcontentsline{toc}{chapter}{LIST OF TABLES}
\listoftables
\cleardoublepage
%\phantomsection
\addcontentsline{toc}{chapter}{LIST OF FIGURES}
\listoffigures
% Comment out the next line if NOT using chaptertitle
\addtocontents{toc}{\def\protect\@chapapp{CHAPTER\ }}
%Optional Acknowledgements
%\include{acknowl}
%Optional thesis abstract
%\include{abstract}
\newpage
\pagenumbering{arabic}
\include{chapter1}
\include{chapter2}
\include{chapter3}
\include{chapter4}
\include{chapter5}
\include{appendix1}
\include{appendix2}
\include{biblio}
\end{document}
```

2.2 Titletoc.tex

The **titletoc.tex** file contains title page and related information. You should update this to contain your thesis title and departmental information. Again a line that starts with a % is a comment line. Comment lines which are commands can be uncommented to add or alter thesis options.

```
% Template Titlepage File
\title{This is the title of a thesis
submitted to Iowa State University\\
Note that only the first letter of
the first word and proper names
are capitalized}
\author{Wilbur Terrance Johnson}
\degree{MASTER OF SCIENCE}
\major{Human Development and Family Studies}
\level{master's}
\mprof{Susan D. Ross}
\members{Mary Jones \\ Bjork Petersen}
\notice
% Add these additional lines for a Doctoral Dissertation
%\degree{DOCTOR OF PHILOSOPHY}
%\level{doctoral}
%\format{dissertation}
%\committee{4}
%\members{Mary Jones \\ Bjork Petersen \\ Sam Anders \\ Harold Jones}
% Add these additional lines for a Creative Component
% - also comment out the \maketitle command
%\format{Creative Component}
%\submit{the graduate faculty}
\maketitle
```

2.3 Chapter1.tex

The **chapter1.tex** file is the first real chapter of your thesis. It normally contains an overview of how your thesis fits into the full spectrum of academic work. All the example shows is how a chapter can be divided into sections, subsections, subsubsections and beyond. Remember that like a topic outline, you should always have at least two of a subdivision for that subdivision to occur.

```
% Chapter 1 of the Thesis Template File
\chapter{OVERVIEW}

This is the opening paragraph to my thesis which
explains in general terms the concepts and hypothesis
which will be used in my thesis.
```

```
\section{Introduction}

Here initial concepts and conditions are explained and
several hypothesis are mentioned in brief.

\subsection{Hypothesis}

Here one particular hypothesis is explained in depth
and is examined in the light of current literature.

\subsubsection{Parts of the hypothesis}

Here one particular part of the hypothesis that is
currently being explained is examined and particular
elements of that part are given careful scrutiny.
```

2.4 Chapter2.tex

The **chapter2.tex** file is normally a "Review of Literature". The only thing really interesting in this sample chapter is that the `\cite` command is used to cite information that is contained in the bibliography. Just like the Table of Contents, List of Tables and List of Figures- cited references take an extra compilation to correctly connect with the bibliography.

By the way, if you change a chapter title make sure that it remains all in caps. So if you decide to use "Research Review" as your second chapter title then the command would be `\chapter{RESEARCH REVIEW}`. The isuthesis style file does not do this automatically for you.

```
\chapter{REVIEW OF LITERATURE}

This is the opening paragraph to my thesis which
explains in general terms the concepts and hypothesis
which will be used in my thesis.

\section{Introduction}

Here initial concepts and conditions are explained.
\cite{allen}, \cite{bruner} and \cite{cox}
did the initial work in this area. But in Bruner's
work~[\cite{bruner}] the definitive model is seen.
```

2.5 Chapter3.tex

The **chapter3.tex** file contains a simple table and a simple figure without any contents in the table or figure. Table and figures are floating objects in LaTeX which means they can float from page to page until they find enough room for placement. The standard placement options are **tbp** for **t - top, b - bottom** and **p - page**. In a thesis, the placement options that you normally want are **h!tb** for **h - here, t - top** and **b - bottom**. Generally speaking in a thesis, you want a table or figure to occur right away. The **!** option behind the **h** means that LaTeX can cheat the page a little bit to get the table or figure onto the current page. The `\label` command that follows the `\isucaption` commands allows you to use the `\ref` command in your text in order to reference a table or figure without knowing the table or figure number.

```
\chapter{METHODS AND PROCEDURES}

This is the opening paragraph to my thesis which
explains in general terms the concepts and hypothesis
which will be used in my thesis.

Here initial concepts and conditions are explained.
As can be seen in Table~\ref{nothing} it is truly
obvious what I am saying is true.

\begin{table}[h!tb] \centering
\isucaption{This table shows a standard empty table}
\label{nothing}

\vspace{ 2 in}
\end{table}

This can also be seen in Figure~\ref{moon} that the
rest is obvious.

\begin{figure}[h!tb] \centering

\vspace{ 2 in}
\isucaption{This table shows a standard empty figure}
\label{moon}
\end{figure}
```

2.6 Chapter4.tex

The **chapter4.tex** file contains a normal table and figure. Normally a *tabular* environments occurs within a table and the `\includegraphics` command occurs within a figure.

The tabular environment makes columns of items in LaTeX. At the start of a tabular environment, you need to specify in braces the number of columns to create by using the following characters where each character will hold a space for one column: **l - left justified column, c - centered column, r - right justified column**. So for instance `{llc}` would create three columns where the first two are left-justified and the last one is centered. Then within the tabular environment, use a & to go from one column to the next and then a `\\` to specify the end of a row. You can also use the `\hline` command to make a horizontal line at the end of a row and add `|` to the column identifiers to create vertical lines going down around your table.

The `\includegraphics` command will take any normal web graphic like a .jpg, .gif or .png file. The PDFLaTeX compiler cannot handle .ps or .eps files so you need to convert those or use the **epstopdf** package to use .ps and .eps files in a PDFLaTeX thesis.

```
\chapter{RESULTS}

This is the opening paragraph to my thesis which
explains in general terms the concepts and hypothesis
which will be used in my thesis.

Of course, data on this as seen in Table~\ref{data}
is few and far between.

\begin{table}[h!tb] \centering
\isucaption{Moon Data}
\label{data}
% Use: \begin{tabular{|lcc|} to put table in a box
\begin{tabular}{lcc} \hline
\textbf{Element} & \textbf{Control} & \textbf{Exp.} \\ \hline
Moon Rings & 1.23 & 3.38 \\
Moon Tides & 2.26 & 3.12 \\
Moon Walk & 3.33 & 9.29 \\ \hline
\end{tabular}
\end{table}
```

```
\subsection{Hypothesis}

Here one particular hypothesis is explained in depth
or graphically as seen in Figure~\ref{mgraph}
it is certain that my hypothesis is true.

\begin{figure}[h!tb] \centering

\includegraphics{dc5.jpg}

\isucaption{Durham Centre}
\label{mgraph}
\end{figure}
```

2.7 Chapter5.tex

The **chapter5.tex** file contains two more unusual tables / figures that you might never actually use but that might be very valuable if you actually need them. This includes a fullpage table which uses the **p!** placement option and a sideways table which produces a sideways page for extra wide tables and figures.

```
\chapter{SUMMARY AND DISCUSSION}

This is the opening paragraph to my thesis which
explains in general terms the concepts and hypothesis
which will be used in my thesis.

\section{Introduction}

Or graphically as seen in Figure~\ref{mgraph2}
it is certain that my hypothesis is true.

\begin{figure}[p!] \centering

\includegraphics{dc5.jpg}

\isucaption{Durham Centre---  Another View}
\label{mgraph2}
\end{figure}
```

```
\subsection{Hypothesis}

Here one particular hypothesis is explained in depth.
As can be seen in Table~\ref{nothingelse} it is
truly obvious what I am saying is true.

\begin{sidewaystable} \centering
\isucaption{This table shows almost nothing but is a
sideways table and takes up a whole page by itself}
\label{nothingelse}
% Use: \begin{tabular{|lcc|} to put the table in a box
\begin{tabular}{lcc} \hline
\textbf{Element} & \textbf{Control} & \textbf{Exp.} \\ \hline
Moon Rings & 1.23 & 3.38 \\
Moon Tides & 2.26 & 3.12 \\
Moon Walk & 3.33 & 9.29 \\ \hline
\end{tabular}
\end{sidewaystable}
```

2.8 Bibliography

The **biblio.tex** file contains a standard Bibliography. The item in brackets after the `\bibitem` is what is returned when an item is cited by a cite call with the label in braces that follows the bracketed item. For instance, if you use the command `\cite{allen}` then LaTeX would reference the bibitem with the *allen* label and return **Allen, B. S. (1984)**.

```
\renewcommand{\bibname}{\centerline{BIBLIOGRAPHY}}
\unappendixtitle
\interlinepenalty=300
\begin{thebibliography}{99}
\addcontentsline{toc}{chapter}{BIBLIOGRAPHY}

\bibitem[Allen, B.~S.~(1984)]{allen}
Allen, B.~S. (1984). System-assigned learning strategies and CBI.
\emph{Journal of Instructional Computing Research},
\emph{1}(1), 3--18.
\filbreak

\end{thebibliography}
```