NPS-CS-08-XXX

NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THE NEW NPS LaTeX REPORT AND THESIS FORMAT

by

Micky Mouse

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14. ABSTRACT

This paper presents improvements to the NPS LaTeXtemplates used to produce both a masters' thesis and a technical report.

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Abstract

This paper presents improvements to the NPS LaTeXtemplates used to produce both a masters' thesis and a technical report.

Introduction to LaTeX LaTeX is a text formatting system that dates back to the 1980s. With LaTeX you create your document by editing a text input file using a program such as EMACS, `vi`, or another editor. You then give this input file to LaTeX (or, more accurately, to a program called `pdflatex`). This program then literally *compiles* your input file into a PDF file.

There are many reasons that you may wish to use LaTeX for preparing a technical report, journal article, or master's thesis:

- LaTeX allows you to directly include other files at the time that the PDF is created. This makes it easy to automatically incorporate the results of experiments or graphing programs directly into your final document, without having to retype anything.
- Because the LaTeX input file is plain ASCII, you can store your document using a source code control system such as Subversion [**?**]. This allows multiple people to work on the same document at the same time; Subversion automatically merges the changes together.
- The Bibtex bibliography system automatically maintains your citations and bibliography. The citation format is maintained separately from the citation contents, allowing you to easily change citation styles when submitting to different conferences or journals.
- Unlike Word, LaTeX gives you precise control over the placement of the text on the page. You can easily make global changes to your document and have them reflected everywhere.
- LaTeX is free software and runs on PCs, Macs, and Unix systems. This means that you can produce your documents on practically every computer you have, without having to purchase anything else.

There are many good reference books and online tutorials for LaTeXout there. The purpose of this document is not to duplicate that work, but to provide you with the minimum amount of information that you require to use LaTeX to produce a master's thesis or technical report at NPS.

1 Installation

Before you can use LaTeX, you will need to install two critical pieces of software:

1. The LaTeXenvironment itself.
2. A program for editing the —.tex— input files.

Here once again there are many options that you have. For both LaTeXand text editors there are both Free Open Source and commercial distributions. This document makes specific recommendations that were known to work as of the document's date of publication. You are free to explore on your own as well.

1.1 Installation on MacOS 10.5 and above

There are many ways to get LaTeXrunning on the Mac. The most common are:

1. Download a working installer for the most recent distribution from `http://www.tug.org/mactex`.
2. Install it from sources using `http://www.macports.org`.
3. Install it using the *i-Installer*.

1.1.1 Installing from TuG

TUG's MacTeX distribution will install LaTeXin the —/usr/texbin/pdflatex— directory and will update your startup files to include this directory in your path. If you chose this strategy, be sure to click "Customize" in the installer and select that all of the optional packages be installed:

1.1.2 Installing with MacPorts

MacPorts will download and compile the LaTeXdistribution from sources and then install it in the —/usr/local/bin— directory. This approach involes more work on your part to get going, but less work in the long run, as you can use the MacPorts system to automatically install many other open source software that might be of interest, and you can easily upgrade the installation at a later point in time.

MacPorts also requires that the Apple XCode system be installed. You should really have this installed anyway, since you need XCode to compile programs.

1. Verify that XCode is installed by opening a Terminal and typing —gcc—.

   If you see something that looks like this, you are good to go:

   ```
   $ gcc
   i686-apple-darwin10-gcc-4.2.1: no input files
   $
   ```

   If you see a "command not found" error, you need to install XCode:

   ```
   $ gcc
   -bash: gcc: command not found
   $
   ```

   You can install from your installation CD or download it from `http://developer.apple.com` (you will need to create an Apple Developer account to perform the download.)

2. Visit `http://www.macports.org` and click the Download button, which you will find in the upper-right hand corner of the website.

3. Select to download the —dmg— file.

4. Open the —dmg— file. Run and install the MacPorts package. You will need to type your password.

5. Now you need to "update" the MacPorts library, and then install the —teTeX— distribution (which includes LaTeXand several other tools). Open a Terminal window and type this command:

   ```
   # sudo port selfupdate
   # sudo port install teTeX
   ```

   You are free to download and install a tool for editing the —.tex— and —.bib— files. However, you can also edit these files using EMACS, an editor that is built-in to MacOS.

1.2 Installing on Ubuntu Linux or Debian Linux

Use this command:

```
% sudo apt-get install texlive-latex3
```

We have noticed that the command occasionally fails. If it does, try it again. If that still doesn't work

1.3 Installation on Windows

2 Running LaTeX

LaTeX is actually a set of programs. For creating a thesis at NPS you will use four programs:

`pdflatex` This program read the input file (*e.g.,* `thesis.tex`) and produces a PDF file (*e.g.,* `thesis.pdf`) as an output. This program also produces a number of intermediate file (`thesis.aux`, `thesis.bbl`, `thesis.toc`, *et. cetera.*)

`bibtex` This program reads the `thesis.bbl` file and produces a bibliography in a file called `thesis.bst` which includes the bibliography. The `thesis.bst` then gets read the next time `pdflatex` is run.

`authorindex.pl` a program in perl that produces the author index from the `thesis.bbl` file. The authorindex is saved in the file `thesis.ain`.

`fixbbl.py` It turns out that there is a bug in BibTeX which causes URLs longer than 53 characters to be improperly split. This program unsplits them.

Normally you would run LaTeX with a three step process:

- `pdflatex thesis`
- `bibtex thesis`
- python fixbbl.py thesis
-
- `pdflatex thesis`
- `pdflatex thesis`

3 Basic LaTeX

Here is a simple document:

```
\documentclass{article}
\begin{document}
Hello World!
\end{document}
```

Normally with LaTeXyou just type text. Leave a blank line between each paragraph. LaTeXthen formats it into beautiful paragraphs. LaTeXwill ignore the space at the beginning of each line.

So if you type this:

```
In December 1951, in a move virtually unparalleled in the history of
academe, the Postgraduate School moved lock, stock and wind tunnel
across the nation, establishing its current campus in Monterey,
Calif. The coast-to-coast move involved 500 students, about 100
faculty and staff and thousands of pounds of books and research
equipment. Rear Adm. Ernest Edward Herrmann supervised the move that
pumped new vitality into the Navy's efforts to advance naval science
and technology.
```

LaTeXwill format it to look like this:

> In December 1951, in a move virtually unparalleled in the history of academe, the Postgraduate School moved lock, stock and wind tunnel across the nation, establishing its current campus in Monterey, Calif. The coast-to-coast move involved 500 students, about 100 faculty and staff and thousands of pounds of books and research equipment. Rear Adm. Ernest Edward Herrmann supervised the move that pumped new vitality into the Navy's efforts to advance naval science and technology.

3.1 Typing Quotes

To type quotes, you should not use the double-quote character. Instad, LaTeXuses the back quote (`) and the forward quote (') to type quotes.

To get this	type this
don't	`don't`
3'2"	`3'2''`
"this"	``this''
'is'	`is'
" 'special' "	``\,`special'\,''

The last one is a bit confusing, but don't worry, everything will make sense in a bit.

3.2 Special Characters

Unlike Microsoft Word and other programs, LaTeXuses special characters embedded in your text to control formatting. The most common of these characters is the backslash (\). To produce each of these characters you must use a special sequence that begins, strangely enough, with a backslash.

The table below shows the ten special characters.

To get this	type this	To get this	type this
$	`\$`	&	`\&`
{	`\{`	}	`\}`
%	`\%`	_	`\_`
#	`\#`	^	`\^{}`
~	`\~{}`	\	`$\backslash$`

The good news is that you typically don't need these characters very much when preparing technical documents.

3.3 Accented Vowels

For the most part LaTeXbuilds accented vowls by combining an accent character with a vowel:

To get this	Type this	To get this	type this
ó	`\'{o}`	õ	`\~{o}`
ó	`\'{o}`	ō	`\={o}`
ô	`\^{o}`	ȯ	`\.{o}`
ö	`\"{o}`	ọ	`\d{o}`
o̧	`\c{o}`	ŏ	`\u{o}`
o̱	`\b{o}`		

However, there are some special accented characters that are just specials:

To get this	Type this		
å	`\aa`	Å	`\AA`

Sometimes you will need to use dotless characters. You can get them with these sequences:

ı	`\i`	ȷ	`\j`
ø	`\o`	Ø	`\O`

These sequences will give you slashes and daggers:

ł	`\l`	Ł	`\L`
†	`\dag`	ß	`\ss`
¶	`\P`	£	`\pounds`

3.4 Special Characters

type this	To get this	type this	To get this
¿	`?` `	©	`\copyright`
œ	`\oe`	Œ	`\OE`
¡	`!` `	§	`\S`
ŏ	`\v{o}`	ő	`\H{o}`
o͡o	`\t{oo}`	æ	`\ae`
Æ	`\AE`	ł	`\l`
†	`\dag`	¶	`\P`
ß	`\ss`	Ł	`\L`
‡	`\ddag`	£	`\pounds`

3.5 Changing font size

Command	Example
`\tiny`	this is 6 point font
`\scriptsize`	8
	10
	11
	12
	14
	17
	20
	25
	25

3.6 Changing font style

Command	Example
Roman	
This is bold	
`This is typewriter`	
THIS IS SMALL CAPITALS	
This is slanted	
Itallics	
This is emphasized	
CALLIGRAPHIC	
BOLDCALIGRAPHICS	

3.7 choosing an arbitrary font

3.8 Controlling Spaces

Use:

`\,` (a slash followed by a comma) to produce a small space. `\ ` (a slash followed by a space) to produce a standard word space `\@` (a slash followed by an at sign) to produce a standard intersentence space.

Type this	To get this
``` ``One Way'' ```	"One Way"

3.9 Controlling Line Breaks

You can force a blank line with: `\\`

Like this:

This is
a test

You can insert an arbitrary amount of space with the optional argument:

This is

a test

You can add or remove space on a page with `\enlargethispage`. For example, to squeeze a second line, try this:

```
\enlargethispage{1pc}
```

You can insert verticale or horizontal space (or take it away) with

`\vspace{1in} \hspace{1in}`

You can draw a box around text with:

`\framebox[width]{textstring}`

The width is optional.

Centering:

This is centered.

3.10 Lists

There are three kinds of lists that you may wish to make:

description lists are used for definitions (like this).

enumerated lists are lists where each item is numbered and the ordering is relevant, like the steps of a recipe.

itemized lists are lists where each item is of equal importance.

Lists are implemented as LaTeXenvironments, which means that they begin with a `\begin{`*listname*`}` and end with an `\end{`*listname*`}`.

```
\begin{enumerate}
\item Wake up.
\item Go to work.
\item Go home.
\item Go to sleep.
\item Repeat.
\end{enumerate}
```

1. Wake up.
2. Go to work.
3. Go home.
4. Go to sleep.
5. Repeat.

3.11 Tables

3.12 Math

3.13 Graphics

This section briefly describes graphics and LaTeX. For alternative treatments we recommend Höppner's "Strategies for including graphics in LaTeXdocuments" [**?**], and the book TK.

There are many graphic file formats and practically all of them can be embedded within a LaTeXdocument. Unfortunately, including graphics is complicated by the fact that there are two flavors of LaTeXand they both require different graphic file inputs.

There are two kinds graphics that you can include in a LaTeXdocument: vector graphics and bitmaps:

Vector graphics are graphical objects that contain commands for rendering an illustration—the graphic describes *how* something is to be drawn. Typical examples of vector graphics are text and

4 BiBTeX

5 Getting LaTeX

Get a copy of the `npsthesis.tar.gz` distribution from `http://faculty.nps.edu/slgarfin/npsthesis.tar.gz`. Unpack this into a directory on your computer; Table 1 shows the important files that you will fine.

`Makefile`	The Makefile to make the thesis
`authorindex.*`	The LaTeXauthorindex package, for making the Referenced Authors page.
`chngcntr.sty`	The `chngcntr` package, for changing the way that LaTeXdisplays its counters.
`fixbbl.py`	A python program that removes the breaks in the `.bbl` file inserted by BibTex.
`nps-plain.bst`	A BibTex style file that makes references in a style that is acceptable to NPS.
`nps-plain-unsorted.bst`	A BibTex style file that makes references in a style that is acceptable to NPS.
`nps-plain-classified.bst`	A BibTex style file that makes references in a style that is acceptable to NPS.
`nps-plain-classified-unsorted.bst`	A BibTex style file that makes references in a style that is acceptable to NPS.
`nps_logo_3clr_cymk.pdf`	NPS Logo, 3 color
`nps_logo_black_cymk.pdf`	NPS Logo, black and white
`thesis.bib`	Your thesis bibliography file
`thesis.tex`	Your thesis LaTeXsource

Table 1: Files included with your distribution.

To create your thesis, start with the file `thesis.tex`. `thesis.bib`

6 Tables and Figures

Tables and figures are floating objects that LaTeXmoves around as necessary to make your thesis look better. Tables are inserted with the `\begin{table}` command while figures are inserted with `\begin{figure}`. Here are some rules to consider:

- Every table and figure should have a caption, created with the `\caption{text}` command.
- Every table and figure should have a unique label, created with the `\label{marker}` command.
- Every table and figure should be referred to in the main body of your text. LaTeXprovides a command called `\ref{marker}`; this template provides additional commands `\tabref{marker}`

`\chapref`	Chapter reference that formats as “Chapter 3”
`\chapvref`	Chapter reference that formats as “Chapter 3 on page 4”
`\secref`	Section reference that formats as “Section 3.” You can use this for sections, subsections, and so on.
`\secvref`	Section reference that formats as “Section 3 on page 4”
`\figref`	Figure reference that formats as “Figure 3”
`\figvref`	Figure reference that formats as “Figure 3 on page 4”
`\tabref`	Table reference that formats as “Table 3”
`\tabvref`	Table reference that formats as “Table 3 on page 4”
`\appref`	Appendix reference that formats as “Appendix 3”
`\appvref`	Appendix reference that formats as “Appendix 3 on page 4”

Table 2: Reference commands included in the `thesis.tex` demo file.

Figure 1: Banner from the top of the NPS web site

and `\figref{marker}`. All of the reference commands are shown in Table 2 on the following page.

- Do not assume that figures will be on the same text as your page. Always refer to the

7 Including Photos and Figures

This section shows how you can easily include photos.

Using the `\sgraphic{filename}{caption}` command you bring in a photo from a given filename and give it a caption. The filename is then automatically set up as LaTeXcross-reference. Use the `\figref{tag}` command to get an in-paragraph reference. Figure 1 shows an example of this.

The `\twofigures{width1}{image1}{caption1}{width2}{image2}{caption2}` macro allows you to have two figures side-by-side, as shown in Figure 2 and Figure **??**.

There are a large number of these layout macros at the end of`npsthesis.cls` — give them a look!

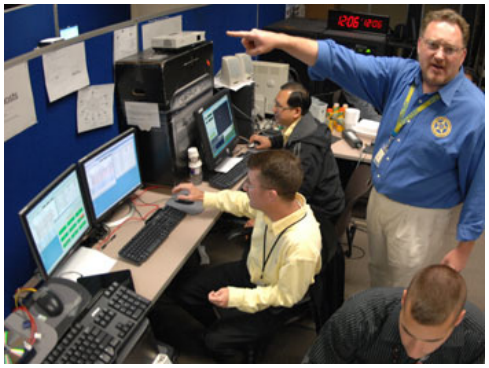

Figure 2: A photo from the NPS web site

Figure 3: A second photo from the NPS web site.

8 Going Further

If you are interested, feel free to review the file `npsthesis.cls`. A great deal of effort has gone into making this file both readable and understandable. You will find additional commands in this file and you may even have thoughts on changes to make. Please let us know what you come up with!

You may find the following packages useful:

`multirow` – Allows a single table cell to extend to multiple rows. `ifthen` — allows you to put conditions in your thesis. It's a bit easier than using the `if` that's built in to TEX.

9 Things to Remember When Writing Your Report or Thesis

1. Punctuation (periods and commas) go inside quotation marks.

2. Use the LaTeX `\begin{figure}` and `\begin{table}` environment to create floating figures and tables. Use the `\caption` command to create your captions. Label your captions with the `\label{foo}` command inside the caption itself. Reference these figures and tables with the `\ref{foo}` reference command.

3. When using *i.e., e.g.,* or *etc.*, always put a comma before and after, *e.g.*, like this.

4. Do not split text around a figure or table.

5. Master's degree has an apostrophe and Postgraduate is one word.

6. If you use "however," make sure there's a comma before and after, unless you start a sentence with it. However, it's best not to start a sentence with "however." And while we're on the subject, you should try to avoid starting a sentence with "and" or "because."

7. When typing a date, do not use "st" or "th." Instead, just note the date: July 4, 1776, is Independence Day. Commas go after Month/date, year. No comma between month/yr.

8. Spell out numbers 1 through 9.

9. Use automatic numbering and lettering.

10. Capitalize C in Chapter, F in Figure and T in Table when referring to chapters, figures or tables in the text. Better yet, use the `\chapref`, `\figref` and `\tabref` commands in the NPS report template.

11. When there is more than one reference, put them both into the `\cite` command: `\cite{john1,john2`

12. Avoid writing in the first person!

13. Make sure there's at least one and a half lines of text at the top of the page—if LaTeXgives you a hard time, you may need to add or remove text so that everything works out properly.

14. (omitted)

15. Footnote numbers go outside the punctuation.

16. When typing equations in text and use "where" or "if." Use Math Mode.

17. When inserting symbols, use Math Mode.

Initial Distribution List

1. Defense Technical Information Center
   Ft. Belvoir, Virginia

2. Dudly Knox Library
   Naval Postgraduate School
   Monterey, California

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all major sections/chapters will begin on an odd page number

* List of References and/or Bibliography may appear here or before the Appendix