

UNIVERSITY OF SOUTHAMPTON

Faculty of Engineering and Physical Science
School of Electronics and Computer Science

How to use the University of Southampton LaTeX template

by

Edward Longman

ORCID: 0000-0002-1825-0097

*A thesis for the degree of
Doctor of Philosophy*

March 2019

University of Southampton

Abstract

Faculty of Engineering and Physical Science
School of Electronics and Computer Science

Doctor of Philosophy

How to use the University of Southampton LaTeX template

by Edward Longman

This introduction the University of Southampton Thesis template should get you started with this template as quick as possible. Whilst knowledge of \LaTeX in advance is helpful this guide should be friendly enough to get started without it. This guide has been produced in the style of a thesis, with some front sections omitted.

Contents

Acknowledgements	vii
1 Introduction	1
1.1 Getting Started with this Template	1
1.2 Learning L ^A T _E X	2
1.2.1 A (not so short) Introduction to L ^A T _E X	2
1.2.2 A Short Math Guide for L ^A T _E X	2
1.2.3 Common L ^A T _E X Math Symbols	3
1.3 Prerequisites	3
1.3.1 L ^A T _E X on a Mac	3
1.3.2 TeXlive GUI Installer (Windows and Unix)	3
2 Getting Started	5
2.1 File Structure	6
2.2 Changes and additions	7
2.2.1 University Organizational information	7
2.2.2 Fonts	7
2.2.3 Add a Glossary or Index	7
2.2.4 Multi-Volume Works	8
3 Rebuilding the Templates	9
3.1 The Build Process	9
3.2 The Source File	10
4 Conclusions	11
4.1 About this Template	11
4.1.1 Some example figures	11
Appendix A Stuff	15
References	17

Acknowledgements

Sincere thanks must go to all those who worked on this before me. This template is the cumulative effort of a number of people, of whom I am just the most recent. The template relies on the work of [Gunn \(2001\)](#) who started this work and [Lovell \(2011\)](#) who textually updated some parts. This guide is an extension of the work of [Vel \(at latextemplates.com\)](#), and [Sunil Patel](#) who kindly gave permission for me to use their instructions ([Patel and Gayevskiy, 2017](#)) as a base.

To ...

Chapter 1

Introduction

Welcome to this L^AT_EX Thesis Template, a beautiful and easy to use template for writing a thesis using the L^AT_EX typesetting system¹.

If you are writing a thesis (or will be in the future) and its subject is technical or mathematical (though it doesn't have to be), then creating it in L^AT_EX is highly recommended as a way to make sure you can just get down to the essential writing without having to worry over formatting or wasting time arguing with your word processor.

L^AT_EX is easily able to professionally typeset documents that run to hundreds or thousands of pages long. With simple mark-up commands, it *automatically* sets out the table of contents, margins, page headers and footers and keeps the formatting consistent and beautiful. One of its main strengths is the way it can easily typeset mathematics, even *heavy* mathematics. Even if those equations are the most horribly twisted and most difficult mathematical problems that can only be solved on a super-computer, you can at least count on L^AT_EX to make them look stunning.

1.1 Getting Started with this Template

If you are new to L^AT_EX it is recommended that you carry on reading through the rest of the information in this chapter. Otherwise check Prerequisites in Section 1.3, and install the class in your texmf folder.

This template complies with the style for the University of Southampton. You should ensure that its style complies with the thesis style guidelines imposed by your institution if you are not at the University of Southampton. To see how to change this template see Section 3.

¹Chapter modified from Help Guide by [Patel and Gayevskiy \(2017\)](#).

1.2 Learning L^AT_EX

L^AT_EX is not a WYSIWYG (What You See is What You Get) program, unlike word processors such as Microsoft Word or Apple's Pages. Instead, a document written for L^AT_EX is actually a simple, plain text file that contains *no formatting*. You tell L^AT_EX how you want the formatting in the finished document by writing in simple commands amongst the text, for example, if I want to use *italic text for emphasis*, I write the `\emph{text}` command and put the text I want in italics in between the curly braces. This means that L^AT_EX is a “mark-up” language, very much like HTML.

1.2.1 A (not so short) Introduction to L^AT_EX

If you are new to L^AT_EX, there is a very good eBook – freely available online as a PDF file – called, “The Not So Short Introduction to L^AT_EX”. The book's title is typically shortened to just *lshort*. You can download the latest version (as it is occasionally updated) from here: <http://www.ctan.org/tex-archive/info/lshort/english/lshort.pdf>

It is also available in several other languages. Find yours from the list on this page: <http://www.ctan.org/tex-archive/info/lshort/>

It is recommended to take a little time out to learn how to use L^AT_EX by creating several, small ‘test’ documents, or having a close look at several templates on: <http://www.LaTeXTemplates.com>. Making the effort now means you're not stuck learning the system when what you *really* need to be doing is writing your thesis.

For best practice information and how to write a large L^AT_EX document (a thesis perhaps..?) then two excellent sources are [Robert Dale's Writing Advice for Students](#) and [Writing a thesis with L^AT_EX](#) (Ch. 2 and 4 onwards). These are plain to read guides that will cover things you perhaps haven't thought of but probably should. It will help you to achieve *consistency* in your L^AT_EX markup and make sure your documents are *well formatted* and easy to *maintain*.

1.2.2 A Short Math Guide for L^AT_EX

If you are writing a technical or mathematical thesis, then you may want to read the document by the AMS (American Mathematical Society) called, “A Short Math Guide for L^AT_EX”. It can be found online here: <http://www.ams.org/tex/amslatex.html> under the “Additional Documentation” section towards the bottom of the page.

1.2.3 Common L^AT_EX Math Symbols

There are a multitude of mathematical symbols available for L^AT_EX and it would take a great effort to learn the commands for them all. The most common ones you are likely to use are shown on this page: <http://www.sunilpatel.co.uk/latex-type/latex-math-symbols/>

You can use this page as a reference or crib sheet, the symbols are rendered as large, high quality images so you can quickly find the L^AT_EX command for the symbol you need.

1.3 Prerequisites

You should have installed a TeX distribution (MiKTeX or TexLive). How to do so can be found by searching the internet. A medium install of [Tex Live](#) is recommended, see Section 1.3.2. A Full installation is *large* (>4.5GB), a medium is about 2GB. The configuration of a MiKTeX installation is not documented as it was not tested with this.

1.3.1 L^AT_EX on a Mac

The L^AT_EX distribution is available for many systems including Windows, Linux and Mac OS X. The package for OS X is called MacTeX and it contains all the applications you need – bundled together and pre-customized.

MacTeX includes a custom dedicated L^AT_EX editor called TeXShop for writing your .tex files and BibDesk: a program to manage your references and create your bibliography section just as easily as managing songs and creating playlists in iTunes.

1.3.2 TeXlive GUI Installer (Windows and Unix)

The following process can be followed to select the collections required the result of which is shown in Figure 1.1.

- You may need to run the installer as an Administrator (right click>Run as Administrator).
- When running the installer select “Custom Install”.
- Working top to bottom, Choose the scheme (scheme-medium).

- Then choose Installation Collections.
 - Remove any languages you do not need.
 - Remove “ConTeXt”, “MetaPost”, “XeTeX”
 - Add “LaTeX Additional Packages”, “Graphics, Pictures, Diagrams”
- The installation of “TeXworks editor” is optional

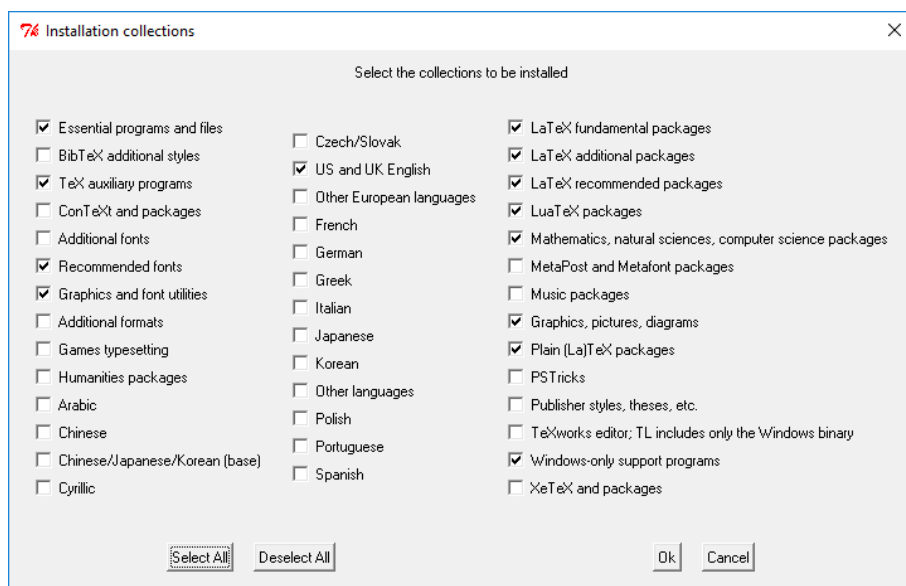


FIGURE 1.1: Required installation collections in Tex Live Windows/Unix Installer

The “Droid” package is needed for the copyright statement. Install this using the “Tex Live Manager” after the main install, as shown in Figure 1.2.

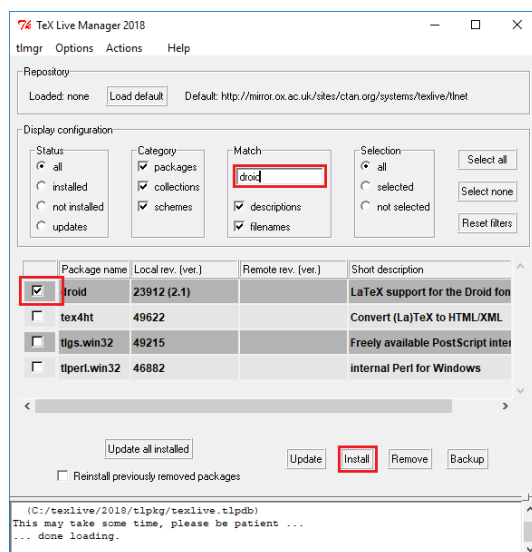


FIGURE 1.2: Required installation collections in Tex Live Windows/Unix Installer

Chapter 2

Getting Started

You probably have downloaded the templates as a zip file. This zip file should be *extracted to the texmf* folder that will either need to be created in your user directory or will be near your installation directory. For TeXLive this defaults to `<userdirectory>\texlive` on Windows. It can be found by running the command `kpsewhich -var-value=TEXMFHOME`. For MiKTeX see <https://miktex.org/kb/texmf-roots>.

The structure of this folder should look like this.

```

+-texmf
  +-bibtex
  |   +-bib
  |   |   +-uosdocs
  |   +-bst
  |       +-uosdocs
  +-doc
  |   +-latex
  |       +-uosdocs
  +-templates
  |   +-latex
  |       +-uosdocs
  +-tex
  |   +-latex
  |       +-uosdocs
  +-source
  |   +-docstrip
  |       +-uosdocs

```

LISTING 2.1: Folder Structure of the texmf folder

On some L^AT_EX systems, the directory look-up tables will need to be refreshed after making additions or deletions to the system files. For TeXlive systems this is accomplished via executing `texhash` as root. MikTeX users can run `initexmf -u` to accomplish the same thing.

The `templates/latex/uosdocs` folder contains the files to get you started. The base file is `Thesis.tex` for a thesis and `Progress.tex` for a progress report.

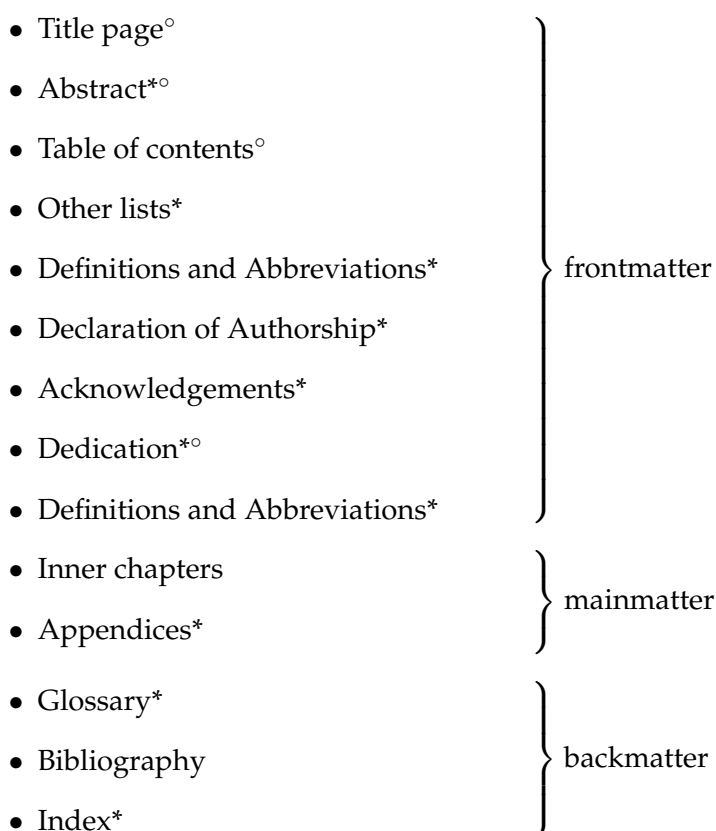
The base files have dependancies for the sections and the figures. These files are: `Definitions.tex`, `Introduction.tex`, `Conclusion.tex`, `AppendixA.tex`, `figure.eps`, `UOS.bib`(in the bibtex base folder). To start using the templates, copy the base file and the dependancies into your working directory.

These files are designed as a starting point for the structure of your thesis. If you are familiar with \LaTeX , go and explore the template and use it. Maybe start with putting your info in the section *THESIS/DOC INFORMATION* block of the `Thesis.tex` or `Progress.tex` file. You can then modify the rest of this file to your unique specifications based on your degree/university. If you are new to \LaTeX then read about the file structure below.

2.1 File Structure

The `Thesis.tex` file is composed of three main parts: `frontmatter`, `mainmatter` and `backmatter` as in Figure 2.1

FIGURE 2.1: Separation of document content within thesis. Modified from Mori (2008, p. 5). The symbol * indicates optional sections and \circ indicates sections that should not be in the table of contents.



It is advisable to write each chapter (and possibly section) in a separate file to keep each file of a manageable size. They are included into the main file with an `\include{Filename}` statement. Also keep the Appendix and Listings files separate if possible.

2.2 Changes and additions

2.2.1 University Organizational information

The template assumes that you are in the Cyber Physical Systems Group, School of Electronics and Computer Science, Faculty of Engineering and Physical Science at the [University of Southampton](http://www.soton.ac.uk). This can be easily changed at the top of your `Thesis.tex` file by redefinition of the variables. These commands are:

```

\university    {\texorpdfstring{\href{http://www.soton.ac.uk}
                        {University of Southampton}}
                {University of Southampton}}
\UNIVERSITY    {\MakeUppercase{\univname}}
\department    {}
\DEPARTMENT    {\MakeUppercase{\deptname}}
\group         {}
\GROUP         {\MakeUppercase{\groupname}}
\faculty       {}
\FACULTY       {\MakeUppercase{\facname}}

```

The all caps command version must be run after changing the normal case command for it to change the default. The university example here also has a link embedded.

More detail can be found in the class docs file. Found in `doc\latex\uosdocs` of the `texmf` directory discussed in Section 2.

The other common commands already exist in the top level template file.

2.2.2 Fonts

It is very easy to change the default font of the document. Fonts in \LaTeX come as packages, so `\usepackage{fontname}` before your `\begin{document}` directive.

2.2.3 Add a Glossary or Index

Both Indexes and Glossaries involve an extra build step so you will need to read the manual before inserting these. They should be put after a `\cleartoeven` as is convention for indexes to start on the left. Some people may want to have an index or prefer Glossary instead of a list of symbols. The [glossaries](#) package can be used. Inserting the

`\printglossaries` command will put the glossary where you want it. The list of symbols command can be removed in this case. Inserting the `\printindex` command will put the glossary where you want it. The recommended index package is `makeidx`.

2.2.4 Multi-Volume Works

This template has space for a volume number tag for multi-volume thesis. This can be used with the `\volume` tag. If volumes are used it is common practice to continue page numbering from one volume to the next. To force the next volume to start at a specific number use the `\setcounter{page}{n}` where n is the first page of this volume. Also you will need to continue the chapter number with `\setcounter{chapter}{m}` where m is the chapter number to start with.

There are more complex automatic follow on number methods, however for the sake of a small number of volumes entering the numbers manually is a small overhead. If you wish to include full contents this is more complicated and will require manual editing of the `.toc` file for each volume. You will not be the first to want to do this and the \LaTeX community should be able to help with this.

Chapter 3

Rebuilding the Templates

In most cases this template style and layout will be suitable. If it is not, it may only require a small change to bring the template in line with your institution's recommendations. Quick modifications will need to be done on the `uosdocs.cls` file in the `tex/latex/uosdocs` folder. Modification of all the templates or major modifications should be made to the original `source/docstrip/uosdocs/uosdocs.dtx`

3.1 The Build Process

To change the templates you should understand how the templates are made. The templates are built using the `docstrip` package. "The package prepares a \LaTeX kernel or package source file for actual use, by removing the documentation and meta-data" ([Mittelbach](#)) It also creates a document containing some documentation for the created files.

The `docstrip` utility comes as a latex package so when the main file (`.dtx`) is run with the command `$(LATEX) uosdocs.ins` it creates all the class files plus the example templates. When this tool is run it creates lots of auxiliary files. To help with managing these auxiliary files GNU Make is used. "GNU Make is a tool which controls the generation of executables and other non-source files of a program from the program's source files." ([Free Software Foundation, Inc.](#)).

The `make` command can be run in several different configurations. `make all` creates all of the class, template, bibliography and figure files from the source files. `make install` moves all of the created files into the users `texmf` directory ready for use.

3.2 The Source File

The source file `uosdocs.dtx` results in the several different class (`.cls`) files as well as the template (`.tex`) files. "The installer is the `uosdocs.ins` file. An installer file extracts the code from a `.dtx` file, uses `DocStrip` to strip off the comments and documentation, and outputs the `.cls` files."() It also creates the figure files and the chapter files. Whilst this creates a mess of files all in one folder the `make install` command is designed to clean them up into a folder structure described in Listing 2.1. The `dtx` file is designed to ensure continuity across different classes: names, font, department page styling and other formats. It largely self documents into the folder labelled `doc`.

As the work done in rebuilding this was for the purpose of improving the PhD Thesis and Progress report templates the others have not been tested.

Chapter 4

Conclusions

It is impossible to explain even a small proportion of what *you* want to show in your thesis. This guide can only realistically explain the structure of the Template. To find out how to do anything particular ask the L^AT_EX community. <http://tex.stackexchange.com> is a very good place to search for and ask questions.

4.1 About this Template

The L^AT_EX templates are based off a L^AT_EX class from Steve Gunn at the University of Southampton. The original is no longer available.

4.1.1 Some example figures

Here are some of the nice things you can do with the template.

Training Error	Testing Error
0	∞

TABLE 4.1: The Results

Figure 4.1 shows why this is the case.

This page shows you a subfigure example in Figure 4.2.

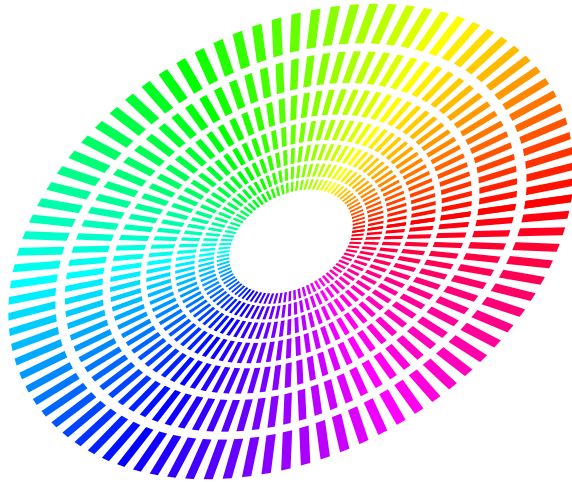
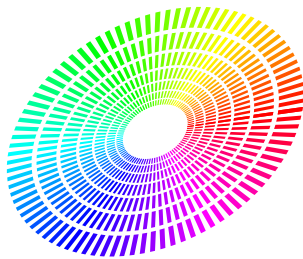
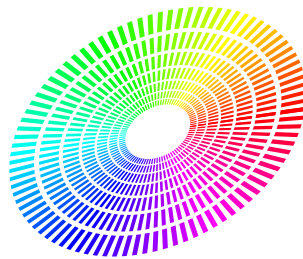


FIGURE 4.1: A colourful picture.



(A) The left caption



(B) The right caption

FIGURE 4.2: A doubly colourful picture.

```
This is a test listing
```

```
It has several lines  
That  
say not much at all
```

LISTING 4.1: Without a title it doesn't appear in the table

Appendix A

Stuff

The following gets in the way of the text....

References

Free Software Foundation, Inc. [Gnu make](#).

S.R. Gunn. [Pdflatex instructions](#), 2001.

C. J. Lovell. Updated templates, 2011.

Frank Mittelbach. [docstrip – remove comments from file](#).

Lapo F. Mori. [Writing a thesis with latex](#), December 2008.

Sunil Patel and Velimir Gayevskiy. [Help guide to the latex template](#), August 2017.