LaTeX Training Course

'Using LaTeX to write a thesis'

UK-TUG Volunteers

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1 An overview of LaTeX

What is LaTeX, and what is TeX?

- TeX is a typesetting application;
- TeX uses *primitives* to determine how to put text on a page;
- For most practical purposes, we need a *format* built on top of TeX, for example:
  - Plain TeX;
  - LaTeX;
  - ConTeXt;
- You can think of LaTeX as an interpreter between you and TeX.

TeX 'engines'

pdfTeX
The standard binary program: we'll be using this today.

XeTeX
A merger of TeX with modern font technology with support for native Unicode input and bidirectional typesetting.

LuaTeX
Also a modern engine: integrates the Lua scripting into TeX.

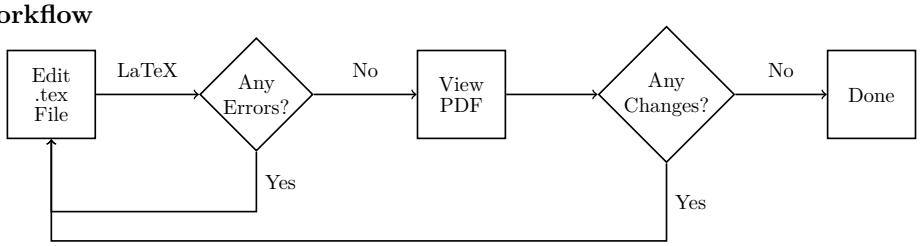
What do we need to use LaTeX?

- A TeX distribution: TeXLive (Windows, Mac, Linux) or MiKTeX (Windows only);
- A text editor, *e.g.* Notepad, TextEdit, Emacs;
- A PDF viewer, for example Adobe Reader.

Usually, we use a specialist editor

- Coloured syntax;
- Buttons or menus to run LaTeX, *etc.*;
- Most include an integrated spell checker.

Workflow



2 Getting started

LaTeX is not a word processor

- LaTeX input is stored as plain text files, usually with the extension `.tex`;
- LaTeX input files contain both the text of the document and *control sequences*;
- Control sequences start with a slash, so look like this: `\example`
- Writing in LaTeX is therefore about *programming* it to produce the document you want.

Special characters

Character	Use	Result
\	\textbackslash	\
{	\{	{
}	\}	}
%	\%	%
~	\textasciitilde	~
&	\&	&
#	\#	#
$	\$	$
^	\textasciicircum	^
_	_	_

Spacing

- LaTeX treats multiple spaces as a single space;
- By default, the space between sentences is slightly larger than the space between words;
- This can be switched off using `\frenchspacing`;
- New line characters are treated as a space;
- Paragraph breaks should be indicated by a blank line;
- LaTeX automatically indents paragraphs, except for the first paragraph after a section heading.

A simple document

Example 1

```
\documentclass[a4paper,12pt]{article}
% A comment in the preamble
\begin{document}
% This is a comment
This is   a simple
document\footnote{with a footnote}.

This is a new paragraph.
\end{document}
```

Exercise 1 *Use the editor of your choice to create the above document. While you can use a specialist editor, start by doing this example in a basic editor such as Notepad. Save the document with a* `.tex` *extension, for example* `exercise1.tex`*, then go to a Terminal/Command Prompt and type:*

```
pdflatex exercise1
```

You can then view the resulting PDF file using a PDF viewer such as Adobe Reader.

3 Document Classes

Document Classes

The *document class* sets up the general layout of the document, for example:

- the format of the headings;
- if the document should have chapters;
- if the title should be on a separate page or above the text on the first page.

Usage

`\documentclass[`⟨*options*⟩`]{`⟨*class-name*⟩`}`

Base classes

article for short documents without chapters;

report for longer documents with chapters, typically single-sided with an abstract;

book for books, typically double-sided with front matter and back matter;

letter for correspondence;

slides for presentations.

Modern classes

KOMA-Script scrartcl, scrreprt and scrbook to replace article, report and book, respectively;

memoir replaces book and report;

beamer or slides (used to create the course material).

Documentation

On your computer
The `texdoc` application will show documentation for material you have installed. From the Command Prompt/Terminal

`texdoc` ⟨*package*⟩

From CTAN
Try the web address

`http://ctan.org/pkg/`⟨*name*⟩

KOMA-Script Example

```
\documentclass{scrreprt}

\usepackage{lipsum}% Provides \lipsum for dummy text

\title{A Sample Document}
\author{Ann Author}

\begin{document}
\maketitle
\tableofcontents

\chapter{Introduction}

This is a sample document with some dummy
text\footnote{and a footnote}.
\lipsum
\end{document}
```

Exercise 2 *Try creating the above document. The KOMA-Script classes have various options that affect the document's appearance. Try experimenting with some of the following:* `chapterprefix`*,* `headings=small`*,* `headings=normal`*,* `headings=big`*,* `numbers=enddot`*,* `numbers=noenddot`*. For example:*

```
\documentclass[chapterprefix]{scrreprt}
```

4 Structure

Title Page
First, you need to give the 'meta-data':

- \title{⟨*title*⟩}
- \author{⟨*author(s)*⟩}
- \date{⟨*date*⟩} (optional)

Then use \maketitle to display the title page.

Classes such as KOMA-Script add more items, for example \publisher.

Sectioning commands

Article-like classes provide the commands:

- \part[⟨*short title*⟩]{⟨*title*⟩}
- \section[⟨*short title*⟩]{⟨*title*⟩}
- \subsection[⟨*short title*⟩]{⟨*title*⟩}
- \subsubsection[⟨*short title*⟩]{⟨*title*⟩}
- *\paragraph[*⟨short title⟩*]{*⟨title⟩*}*
- \subparagraph[⟨*short title*⟩]{⟨*title*⟩}

Book and report-like classes also provide the command: \chapter[⟨*short title*⟩]{⟨*title*⟩}

Exercise 3 *Try producing the following document.*

```
\documentclass[oneside]{scrbook}

\usepackage{lipsum}% provides \lipsum to produce dummy text

\titlehead{University of East Anglia\\
Norwich\\
NR15 1AJ}
\subject{A thesis submitted for the degree of Doctor of Philosophy}
\title{My Thesis}
\author{Ann Author}
\date{July 2010}
\publishers{Prof.\ My Advisor}

\begin{document}
\maketitle

\frontmatter
```

```
\tableofcontents

\chapter{Foreword}

This is the foreword. It is in an unnumbered chapter.

\mainmatter
\chapter{Introduction}

This is a sample chapter with a reference to Chapter~\ref{ch:method}.

\section{Sample Section}

This is a sample section with some dummy text to pad it out. \lipsum

\chapter{Method}\label{ch:method}

This is another chapter with some more dummy text. \lipsum

\appendix % Switch to appendices

\chapter{A Sample Appendix}\label{apd:sample}

This is an appendix. \lipsum

\chapter{Another Appendix}

This is another appendix with a reference to Appendix~\ref{apd:sample}.
\lipsum
\end{document}
```

Here are some more KOMA-Script class options to try: `appendixprefix`, `toc=flat`, `headsepline`, `footsepline`.

5 Graphics

On packages

The LaTeX kernel is rather limited: to get around that we load *packages*:

```
\usepackage[options]{package}
```

or

```
\usepackage{⟨package1⟩,⟨package2⟩,...}
```

We have already seen the lipsum package!

Documentation for packages is available in exactly the same way as for classes.

Including external images

- Load the graphicx package to include graphics;
- Use `\includegraphics` to actually place the image;
- Image formats: `pdf`, `png`, `jpg`;
- File extension should be omitted.

Graphics can also be 'drawn' in LaTeX using the Ti*k*z package: a course in itself!

Floating figures

A basic figure

```
\begin{figure}[htbp]
\centering
\includegraphics{myimage}
\caption{A Sample Figure}
\end{figure}
```

Exercise 4 *Try producing the following document. (Use an image application, such as paint, to produce a simple picture and save it as* `shapes.png`*.)*

```
\documentclass[oneside,numbers=noenddot]{scrbook}

\usepackage{lipsum}% provides \lipsum to produce dummy text
\usepackage{graphicx}% provides \includegraphics

\titlehead{University of East Anglia\\
Norwich\\
NR15 1AJ}
\subject{A thesis submitted for the degree of Doctor of Philosophy}
\title{My Thesis}
\author{Ann Author}
\date{July 2010}
\publishers{Prof.\ My Advisor}

\begin{document}
\maketitle

\frontmatter
```

```
\tableofcontents
\listoffigures

\chapter{Foreword}

This is the foreword. It is in an unnumbered chapter.

\mainmatter
\chapter{Introduction}

This is a sample chapter with a figure and a reference to Chapter~\ref{ch:method}.

\begin{figure}[htbp]
\centering
\includegraphics{shapes}
\caption{Some Shapes}
\end{figure}

\section{Sample Section}

This is a sample section with some dummy text to pad it out. \lipsum

\chapter{Method}\label{ch:method}

This is another chapter with a reference to Figure~\ref{fig:shapes}
and some more dummy text.

\begin{figure}[htbp]
\centering
\includegraphics[scale=0.5,angle=45]{shapes}
\caption{A Sample Figure}\label{fig:shapes}
\end{figure}

\lipsum

\appendix % Switch to appendices

\chapter{A Sample Appendix}\label{apd:sample}

This is an appendix. \lipsum

\chapter{Another Appendix}

This is another appendix with a reference to Appendix~\ref{apd:sample}. \lipsum
\end{document}
```

Here are some more class options to try that will affect the list of figures: `chapteratlists`, `chapteratlists=0mm`.

6 Bibliographies

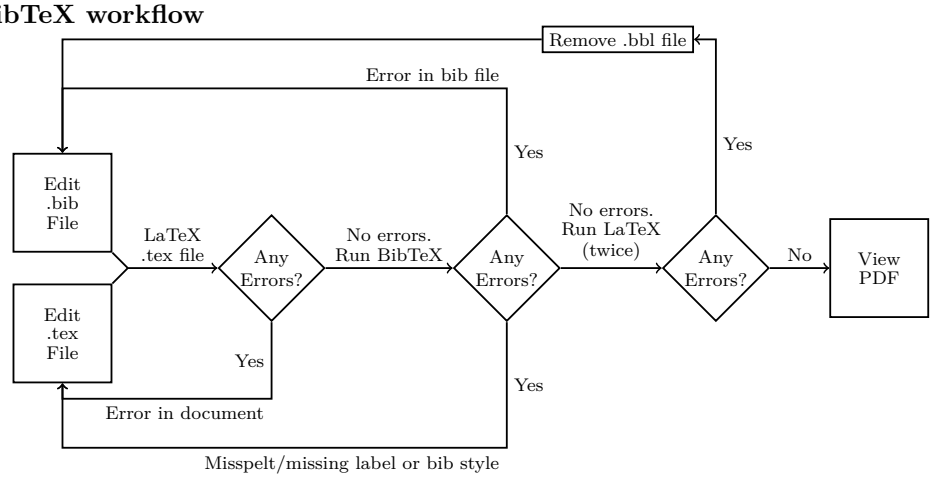
Creating a bibliography

- Entries are stored in a *BibTeX database*;
- Inform LaTeX about it using `\bibliography` command;
- These are cited using `\cite` in the LaTeX file;
- Choose a style using `\bibliographystyle`.

Creating a bibliography The LaTeX basics

```
\documentclass{article}
\usepackage{natbib}
\bibliographystyle{plainnat}
\begin{document}
Some text \cite{key}.
\bibliography{example}
\end{document}
```

BibTeX workflow



The BibTeX file A basic article

Example 2

```
@article{lamport94,
   author    = "Leslie Lamport",
   title     =
     "{\LaTeX}: a document preparation system",
   edition   = "2nd",
   publisher = "Addison--Wesley",
   year      = 1994,
}
```

The BibTeX file Multiple authors

Example 3

```
@inproceedings{smith05,
  author    = "Smith, Jr, John and Jane Lucy Doe
   and and Other, Andrew N. and de Vere, Jo",
  title     = "An example article",
  booktitle = "Proceedings of the Imaginary Society",
  month     = JAN
  year      = 2005
}
```

Citations in LaTeX

- The LaTeX kernel is limited for citations;
- The natbib package is much more powerful;
- A new approach is provided by biblatex.

Citations using natbib

Textual citations

`\citet[⟨note⟩]{⟨key⟩}`

`\citet{lamport1994}` ⇒ Lamport (1994)
`\citet[p.~34]{lamport1994}` ⇒ Lamport (1994, p. 34)

Parenthetical citations

`\citep[⟨prenote⟩][⟨postnote⟩]{⟨key⟩}`

`\citep{lamport94}` ⇒ (Lamport, 1994)
`\citep[p.~34]{lamport94}` ⇒ (Lamport, 1994, p. 34)
`\citep[see][]{lamport94}` ⇒ (see Lamport, 1994)

Exercise 5 *Create a file called* `myrefs.bib` *that contains the following:*

```
@inproceedings{smith05,
  author = "Smith, Jr, John and Jane Lucy Doe and Jo de Vere",
  title = "An example article",
  booktitle = "Proceedings of the Imaginary Society",
  month = JAN,
  year = 2005
}

@book{lamport94,
  author = "Leslie Lamport",
  title = "{\LaTeX} : a document preparation system",
  edition = "2nd",
  publisher = "Addison-Wesley",
  year = 1994
}
```

Then create a file called, say, `example5.tex` *that contains the following:*

```
\documentclass{article}

\usepackage{natbib}
\bibliographystyle{plainnat}

\begin{document}
Main matter with citations such as \citet{lamport94}.

\bibliography{myrefs}
\end{document}
```

If you are using a terminal or command prompt, you will need to use the following commands:

```
pdflatex example5
bibtex example5
pdflatex example5
pdflatex example5
```

There are various options you can pass to the natbib *package that affects the formatting. For example:*

```
\usepackage[numbers,sort&compress]{natbib}
```

Try experimenting with some of these options: `round`, `curly` *and* `numbers`. *With the* `numbers` *option, you can also use:* `super`, `sort` *and* `sort&compress`.

7 Further information

Getting help

- `www.tex.ac.uk/faq`;
- `wwww.latex-community.org`;
- `tex.stackexchange.com`;
- `theoval.cmp.uea.ac.uk/~nlct/latex/`.

Reading

- *Not So Short Introduction to LaTeX2e*, Oetiker;
- *A Guide to LaTeX*, Kopka and Daly;
- *LaTeX Beginners Guide*, Kottwitz.