An Introduction to LaTeX for Engineering Postgrads

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Overview

- What is LaTeX?
- Why use LaTeX?
- Creating documents with LaTeX

What is LaTeX?

- LaTeX is a document preparation system
- It is a form of markup language (like HTML)
- You type the *content* of the document, LaTeX formats and typesets.
- It is platform independent, stable and produces device independent output, unlike Word for instance.

Why use LaTeX?

- Device and Version independence
- Let's you concentrate on Content rather than Form
- Excellent treatment of:
  - Graphics
  - Equations
  - Cross-referencing
  - Bibliographies
  - Indexes
  - Tables of Contents ... etc.

Creating Documents with LaTeX

LaTeX interprets text in one of three ways:

1. plain text
2. LaTeX commands (strings of characters beginning with \ )
3. special characters (e.g. {, } ,^ ,% ,~ ,& , \ and #)

Simplest possible LaTeX document is:

```
\documentclass[options]{classname}

\begin{document}

\end{document}
```

This will produce an empty document

Documentclasses

The *documentclass* property of a LaTeX document defines how that document will be formatted and typeset

Common *documentclass*'s include:

- article
- report
- book
- slides
- letter

Though many more are defined.

Packages

Extra commands and formatting environments can be included by using *packages*. Example:

```
\documentclass[a4paper]{article}

\usepackage[eps]{graphicx}

\begin{document}

\includegraphics[scale=0.6]{test-image.eps}

\end{document}
```

This will include the "test-image.eps" graphic in your document.

Document Structure

The basic LaTeX document structure consits of the following:

- `\documentclass` command
- Document Preamble
- *document* environment
- Sections
  - subsections
    - subsubsections ... etc

Sectioning Commands

Sectioning commands include

- `\chapter{title}`
- `\section{title}`
- `\subsection{title}`
- `\subsubsection{title}`

Sections are numbered automatically by LaTeX so you can re-order sections at any time without having to worry about re-numbering

Section Contents

- Paragraphs, which consist of:
  - Words and sentences.
- Environments, which have different formatting rules, e.g.:
  - Lists
  - Equations
  - Figures
  - Tables . . . etc.

Paragraphs

The majority of most LaTeX documents consists of typed text

Words are separated by spaces, paragraphs are separated by blank lines

LaTeX ignores extra spaces/tabs and carraige returns, so there is no point in fiddling with these in order to format your document!

Example

A "simple" test piece of text to show how this works. small space. Big space $\log(x^{y/2\pi})$

```
A ``simple'' test piece of text
to   show how    this
works.\,small space. Big space
$\log(x^{y/{2 \pi}})$
```

Environments

A LaTeX document is entirely composed of plain text.

Some information is best represented in forms other than plain text.

The LaTeX *environments* are the way to tell LaTeX that certain sections of your document are to be treated differently

Format:

```
\begin{envname}
  environment text
\end{envname}
```

Lists

There are three types of list environments:

itemize Which generates bullet points

enumerate Which generates a numbered list

description Which generates a list like this one

List Example

- lions
- tigers
- bears

```
\begin{itemize}
   \item lions
   \item tigers
   \item bears
\end{itemize}
```

Aligning Text

Three common environments for aligning text are:

1. center
2. flushleft
3. flushright

This text
is flushed right

```
\begin{flushright}
   This text\\
   is flushed right\\
\end{flushright}
```

Table

The *table* environment is very commonly used.

It acts as a container for the *tabular* environment

tabular allows text to be lined up in columns

Mon	Tues	Wed
7	12	234

```
\begin{tabular}{|l|c|r|}
   \hline
   Mon & Tues & Wed\\
   \hline\hline
   7 & 12 & 234\\
   \hline
\end{tabular}
```

Equation Environments

The three most common mathematical environments are:

1. *displaymath*: formats text in math mode
2. *equation*: same as above but also numbers the environment
3. *eqnarray*: Like equation, but allows multiple lines of equations

Example: equation

$$\sqrt{y/4\pi} = \zeta^{\frac{3}{2}} \qquad (1)$$

```
\begin{equation}
\label{eqn:ex}
\sqrt{y/{4\pi}} =
     \zeta^{\frac{3}{2}}
\end{equation}
```

Figures

Figures in LaTeX are included as separate files

These files must be in *Encapsulated Postscript* format (eps format)

The *graphicx* package provides LaTeX with the commands it needs to do this:

⋮

```
\usepackage{graphicx}
```

⋮

```
\includegraphics[options]{filename}
```

Figures...cont'd

To add captions and figure numbers the *figure* environment can be used.

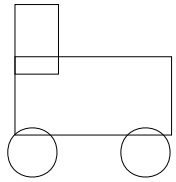

Fig. 1: Appalling Figure

```
\begin{figure}[H]
  \begin{center}
     \includegraphics[scale=0.35]{b
     \caption{Appalling Figure}
     \label{fig:bad}
  \end{center}
\end{figure}
```

LaTeX Commands

Apart from sections and environments LaTeX also provides the user with a large number of useful commands, uses include:

- Cross Referencing
- Bibliographies
- Tables of Contents
- Maths
- Titles

Cross Referencing

This is one of LaTeX most important functions

You do not do *any* numbering with LaTeX , it is all automatic

Any objects that are numbered by LaTeX can be cross referenced:

- Chapters
- Sections
- Equations (remember Equation 1 on Slide 20)
- Tables and Figures (see Fig. 1)

Cross Referencing...How?

This is achieved using two basic commands:

1. `\label{labelname}` to mark a location to be referenced
2. `\ref{labelname}` to reference a labelled location

The `\pageref{labelname}` command can be used to refer to a page number instead of a section number. Ex

Equation 1 is on Slide 20

```
Equation \ref{eqn:ex}
is on Slide \pageref{eqn:ex}
```

Bibliographies

LaTeX provides the following commands for use with bibliographies:

- `\cite{label}` to cite a reference which has been given the label *label*
- `\bibliographystyle{style}` to use a particular format for the bibliography, defined in file *style.bst*
- `\bibliography{bibfile}` to look in the file *bibfile.bib* for a list of citations.

Tables of Contents

This couldn't be easier.

To include a table of contents anywhere in your document simply type:

```
\tableofcontents
```

You can also generate a list of figures using `\listoffigures`, and a list of tables using ....

Normally these are only used for reports, books or theses, and are generally located at the beginning of the document

Maths Commands

LaTeX provides an enormous number of Maths commands. These can be found in good books on LaTeX

Examples:

Command	Code	Format
^	x^2	x^2
_	x_i	x_i
greek	\alpha	α
GREEK	\Pi	Π
\sum	\sum_{i=1}^{\infty}	$\sum_{i=1}^{\infty}$
\frac	\frac{x+y}{e^{\i \pi}}	$\frac{x+y}{e^{1\pi}}$

Titles

Some documentclasses (eg article, book and report) define commands for creating document title pages.

These include:

- `\title{text}`
- `\author{text}` multiple authors separated by `\and` commands
- `\date{text}`
- `\maketitle` takes title information and creates a formatted title page