

BEGINNER'S LATEX GUIDE

This guide should be used as a starting point for learning Latex (pronounced “lay-tek”), but is in no way a full manual. There is an enormous amount of documentation on Latex online. In particular, the wikibooks guide is very useful (<http://en.wikibooks.org/wiki/LaTeX/Introduction>) and contains nearly all the information needed for a beginner. Consult these resources for further examples and lists of useful commands.

1 Installation

Windows

For TeXnicCenter, go to the link: <http://miktex.org/2.8/setup>. Download and install the Basic MiKTeX 2.8 Installer. Download and install the TexnicCenter Installer at <http://www.texniccenter.org/resources/downloads/29>. When you run TexnicCenter a setup window will ask you for the directory of the executable files. These files are typically located in C:/Program Files/Miktex2.8/miktex/bin. There are also many other good latex editors for Windows.

Ubuntu

In the terminal:

```
$ sudo apt-get install texlive-full
```

```
$ sudo apt-get install gedit-latex-plugin
```

This will install a Latex plugin to the text editor gedit. Alternatively, you can use Emacs.

Mac

TexShop is a popular, lightweight software. <http://www.uoregon.edu/~koch/texshop/obtaining.html>.

2 Getting started

The latex code consists of two general parts:

The preamble consists of the parameters for the document, i.e. the margins, the font, the spacing, the document type, supplementary packages, etc. Some Latex commands require the use of a package defined in the preamble.

The body contains the text, figures, tables, etc.

A basic latex document would look like

```
\documentclass[12pt]{article}
\usepackage[left=2cm,top=1cm,right=3cm,bottom=1cm]{geometry}
\usepackage{amsmath}
\usepackage{graphicx}

\begin{document}
```

```
This is some text about Latex. Latex is great for writing
physics and math.
```

```
Here is a new paragraph. Notice the double space between
the paragraphs.
```

%This line is a comment since it has a percent sign at the
%beginning. None of this text will be read by the program.

```
Here is an equation
\begin{equation}
\vec{F} = m \vec{a}
\end{equation}
```

The above equation uses the command `\vec{}` to put an arrow over the force and acceleration.

```
...tables
...more text
...figures
```

```
\end{document}
```

The `\documentclass[12pt]{article}` specifies the type of document. In most cases, the article class is used. Other options include report and book. See a L^AT_EX manual for explanations of these other options.

The **geometry** package is a useful package for specifying the margin widths. The left, right, top, and bottom margins can be specified in centimeters (cm) or inches (in). There are other options which can be added to this package. For further documentation see <ftp://ftp.tex.ac.uk/tex-archive/macros/latex/contrib/geometry/geometry.pdf>.

The **amsmath** package is needed to improve the appearance of mathematical formulas.

The **graphicx** package is needed for including figures in a document.

The body of the document is sandwiched between `\begin{document}` and `\end{document}`. The body contains all the text, figures, tables, etc. of the document.

Notice that all commands in Latex begin with a backslash.

3 Adding text

In the body of the document, the text can be written exactly as it should appear in the compiled document. A double space between paragraphs in the code will produce a paragraph with an indent and no space between lines in the compiled document. To manually change the vertical spacing between lines add the command `\vspace{x cm}`, where x is the amount of spacing in centimeters. Similarly, for horizontal spacing use `\hspace{x cm}`.

Size

The size of the font can be adjusted as such

```
{\Large This text will be very large}
{\tiny This text will be very small}
```

The choice in sizes are

1. `\tiny`
2. `\scriptsize`
3. `\footnotesize`
4. `\small`
5. `\normalsize`
6. `\large`
7. `\Large`
8. `\LARGE`

- 9. `\huge`
- 10. `\Huge`

Font

The font can be adjusted one of two ways:

```
\textrm{...}
{\rmfamily ...}
```

Both ways will produce text with roman font. Other options for fonts include

Command	Alternative	Output
<code>\textsf{...}</code>	<code>{\sffamily ...}</code>	Sans serif font
<code>\texttt{...}</code>	<code>{\ttfamily ...}</code>	Teletype font
<code>\textit{...}</code>	<code>{\itshape ...}</code>	<i>Italic</i>
<code>\textsc{...}</code>	<code>{\scshape ...}</code>	SMALL CAPITALS
<code>\textbf{...}</code>	<code>{\bfseries ...}</code>	Bold font

Comments

To comment a section of text use the `%` symbol before the text. For block comments use the package `\usepackage{verbatim}`, with the command

```
\begin{comment}
...
\end{comment}
```

Spacing

Define the lines spacing in the preamble with the package `\usepackage{setspace}`. Use the command

```
\begin{doublespace/onehalfspace/singlespace}
...
\end{double space/onehalfspace/singlespace}
```

The default setting is `singlespace`. For a space between lines use `\\`.

Special Characters

Certain characters are used within the Latex code for various commands and therefore can not simply be used in text. These include

```
# $ % & ~ _ ^ \ { }
```

To use these symbols put a backslash in front. For example `\$` will create a `$`. A backslash can be made with the `\backslash` command. Quotes can be made by using `“ ... ”`

where the first symbols are two open quote symbols (on the key with the tilde) and the second symbols are two single quote marks.

4 Figures

To insert a figure (often called a float) use the command

```
\begin{figure}[h!]
\centering
\includegraphics[width=4in]{C:/path/figure.pdf}
\caption[This is the caption to the figure. By including this command
```

```

latex will automatically keep track of the numbering of the figures
and will place the label "Figure 1, 2 ...".}
\
\end{figure}

```

`\centering` will place the figure in the center of the page. Use `\flushleft` or `\flushright` for figures on the left and right side of the page.

The `[h]` is the placement specifier which selects where Latex should place the figure. `h` = here, `t` = top of page, `b` = bottom of page, `p` = special floats page, and `!` can be added to override the internal Latex parameters for determining where to place the figure. To place the figure exactly where the figure appears in the code, use `H` with the package `\usepackage{float}`. The placement of figures is often one of the most difficult parts of a Latex document, and it requires some manipulation to produce the desired results.

The `\includegraphics[options]{path}` command can take several options, including the width of the figure, cropping, and rotations. Be sure that you do not use backslashes in the path name.

The caption is an optional command which will add a caption and numbering below the figure.

There are many more options for manipulating figures, including wrapping figures around text and placing figures next to each other. See the “Floats, Figures and Captions” and “Importing Graphics” sections of the Wikibooks guide for a reference.

5 Tables

A simple 3×4 table can be created with the tabular environment

```

\begin{center}
\begin{tabular}{| 1 | 1 | 1 | 1 |}
\hline
Trial & Temp & & Frequency [Hz] \\ \hline
1 & 11C & & 2 \\ \hline
2 & 15C & & 10 \\ \hline
3 & 22C & & 21 \\ \hline
\end{tabular}
\end{center}

```

The tabular environment is defined with `\begin{tabular}{specifications of table}`. The specifications can include

<code>l</code>	left-justified column
<code>c</code>	centered column
<code>r</code>	right-justified column
<code>p{width}</code>	paragraph column with text vertically aligned at the top
<code>m{width}</code>	paragraph column with text vertically aligned in the middle (requires array package)
<code>b{width}</code>	paragraph column with text vertically aligned at the bottom (requires array package)
<code> </code>	vertical line
<code> </code>	double vertical line

The argument of the tabular function is therefore a combination of these commands in the order they should be drawn for one row. `\hline` creates a horizontal line. The text for each row is added in the order it should appear. Use `&` to separate columns. Be sure to include a new line, `\\` and `\hline` after each column. There are numerous other modifications for tables in Latex. See the “Tables” sections of the Wikibook page for further information.

6 Math

Perhaps the most important function of Latex is its ability to easily print equations. An example equation which will produce Maxwell’s equations is

```

\begin{equation}
\nabla \cdot \vec{E} = \frac{\rho}{\epsilon_0}
\end{equation}

\begin{eqnarray}
\nabla \cdot \vec{B} &= 0 & \text{\nonumber} \\
\nabla \times \vec{E} &= - \frac{\partial B}{\partial t} & \text{\nonumber} \\
\nabla \times \vec{B} &= \mu_0 \vec{J} + & \\
\mu_0 \epsilon_0 \frac{\partial E}{\partial t} & & 
\end{eqnarray}

```

The `\begin{equation}` begin the equation environment in which the equation is written. The equation will automatically be numbered. For non-numbered equations use `\begin{equation*}`. All mathematical symbols can be found on Latex symbols tables online (<http://omega.albany.edu:8008/Symbols.html> is fairly complete). Greek letters are written as `\nameOfGreekLetter`. Capitalize the first letter of the Greek name for the capital greek letter. To create a multiline equation use the `\begin{eqnarray}` environment with `\\` between each line. Place `&...&` around the character where the equations should line up. That is, in this case the three equal signs will be aligned. The `\nonumber` command will remove the numbering for any of the lines. For fractions use `\frac{numerator}{denominator}`. For subscripts and superscripts use `x_{2}` and `x^{2}` respectively. For inline math, put `$.. $` around the equation. Be sure that any time you write a mathematical symbol, you place `$... $` around it. See references online for further examples and tips.

7 Sections

To create a numbered section use `\section{Name of Section}`. All text below this command will be indented inside this section, and the section will be properly numbered. For non-numbered sections, use `\section*{Name}`. For subsections, use `\subsection{Name}`.

8 Further topics not covered

These are many topics not covered in this manual. Below are a few which may be useful to read about.

1. **Bibtex** is a very useful way of citing references.
2. **Labels** can be added to figures and tables so they can easily be cited in the text. For figures it is implemented with `\label{fig:animals}`.
3. **Colors** can be added with the `colors` package.