

L^AT_EX minicourse

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What it is

What is \LaTeX ?

- a typesetting system for creating high-quality documents
- allows you to create complex-looking output from a simple text file
- tags used to describe logical structure of document

Why learn \LaTeX ?

- looks much cooler than Word, HTML or Framemaker
- “easier”: instead of dictating exactly how document should be laid out, only describe its logical structure
- “faster”: text-based instead of GUI-based
- more powerful
- *it's like coding your essays!*

How it works

L^AT_EX is not a WYSIWYG editor. You first type your “code” in your favorite editor (`vi`, `emacs`...) and then L^AT_EX processes the file and creates a `.dvi`. You can view this file using `xdvi`:

```
xemacs foo.tex
latex foo.tex
xdvi foo.dvi
```

If you want to print the file to a Postscript file, use `dvips`, eg.

```
dvips -o foo.ps foo.dvi
```

If you want to print the file to a PDF file, use `pdflatex`, eg.

```
pdflatex foo.dvi
```

This creates `foo.pdf`.

Work with me here

Skeleton documents are available in

`/pro/consult/Minicourses/latex/examples`

<code>sample.tex</code>	your basic skeleton \LaTeX document
<code>paper.tex</code>	skeleton document for writing an essay
<code>graphics.tex</code>	example of including graphics in \LaTeX
<code>hw.tex</code>	skeleton document for doing theory/math homeworks

Work along and try out the examples as we go!

Basic syntax

Here's an example of a simple \LaTeX file:

```
% This is a comment.
\documentclass[12pt]{article}    %REQUIRED. 12pt is the size of the font
                                %article is probably what you want
\begin{document}                %REQUIRED
Hello, this is a sample file.
As you          can see,
spaces don't matter, it'll all be
formatted by \LaTeX\ so you can
type it        however you want it.

An empty line creates a new paragraph.
\end{document}                  %REQUIRED
```

Here's the \LaTeX output:

Hello, this is a sample file. As you can see, spaces don't matter, it'll all be formatted by \LaTeX so you can type it however you want it.

An empty line creates a new paragraph.

As you might notice, the "code" has \LaTeX commands in it which all start with a `\`.

These commands can take arguments using `{}` and `[]`.

Some commands also create environments to work on. They usually look like something like `\begin{env}...\end{env}`.

Formatting

\LaTeX makes it easy for you to organize your document into logical sections. At the top of your document, define a title and author, and then in your document tell \LaTeX to make the title:

```
\documentclass[12pt]{article}
\title{\LaTeX\ minicourse} %Defines the document title
\author{Mike Coglianesse \\\ %Defines the document authors
        Thomas Crulli}

\begin{document}           %Document begins
\maketitle                 %Make the title here
...
```

Sections can be used to create logical divisions in your document. For the article class, use `\section{...}`, `\subsection{...}`, and additional subdivisions.

```
...
\begin{document}           %Document begins
\section{Why \LaTeX\ is great}
\subsection{Coolness Factor}
...
\section{\LaTeX\ Web Sites}
...
```

Fonts

There are many different font sizes and styles that you can use. \LaTeX defines these in simple tags:

<code>\tiny</code>	<code>\Large</code>
<code>\small</code>	<code>\LARGE</code>
<code>\normalsize</code>	<code>\huge</code>
<code>\large</code>	<code>\Huge</code>

<code>\textnormal</code>	<code>\emph</code>
<code>\textbf</code>	<code>\textsl</code>
<code>\texttt</code>	<code>\textit</code>

For example, this sentence *looks* like this:

For example, `{\Large this sentence} \emph{\textbf{\LARGE looks}} {\small like this}`:

To have your paragraph outputted exactly as it appears (without processing \LaTeX tags), use `\begin{verbatim}`.

Spacing

You can align your text using `\begin{flushleft}`, `\begin{flushright}`, `\begin{center}`.

As with HTML, consecutive blank spaces and tabs are treated as one “space”. An exception is that a blank line starts a new paragraph.

There are ways to increase spacing:

<code>\<space></code>	Space
<code>\,</code>	Thin space
<code>\;</code>	Thick space
<code>\quad</code>	Quad
<code>\qquad</code>	Double Quad

There are additional commands to set more precise spacing. `\vspace{...}` increases space between paragraphs, and `\hspace{...}` sets the spacing between words.

Lists

To create a list, use the `\begin{itemize}` environment. Then use `\item` to create a list item. For example:

```
\begin{itemize}
\item This is a list item.
\item[-] This is a list item with a dash.
\end{itemize}
```

This gives the \LaTeX output:

- This is a list item.
 - This is a list item with a dash.
-

Use `\begin{enumerate}` to make an ordered list.

Tables

Tables are created using `\begin{tabular}`. Cells are delimited with an `&` character, and rows in the column end with `\\`.

Here's an example:

```
\begin{tabular}{|l|r|}      %Two columns, first is left-aligned and
                           %second is right-aligned. There are two
                           %vertical bars at each side and one in
                           %the middle
\hline                    %A horizontal line
Apples & 2.19 \\           %Cell one has Apples, cell two has $2.19
Fruit Loops & 3.25 \\
Crunch and Munch & 1.99 \\
\hline                    %A horizontal line
\end{tabular}             %Ends the table
```

Apples	2.19
Fruit Loops	3.25
Crunch and Munch	1.99

Math rocks!

What's really cool about \LaTeX is that you can very easily embed equations. To write math, you switch to math mode using \dots , which puts the equation right in the paragraph, or using \dots , which centers the equation on a new line.

For example, $\text{\texttt{\$}\texttt{\sum_{i=1}\^{\infty}\frac{1}{i}}\texttt{\$}}$ is displayed as $\sum_{i=1}^{\infty} \frac{1}{i}$, whereas $\text{\texttt{\$}\texttt{\sum_{i=1}\^{\infty}\frac{1}{i}}\texttt{\$}}$ is displayed as

$$\sum_{i=1}^{\infty} \frac{1}{i}$$

Use $\text{\texttt{\$}\texttt{\displaystyle}\dots\texttt{\$}}$ to make inline math symbols appear big, i.e. as if they were inside the \dots .

Just like the other commands, math commands start with a backslash. Most of them make sense.. no need to memorize:

$\text{\texttt{x^y}}$	x^y
$\text{\texttt{x_y}}$	x_y
$\text{\texttt{\frac{x}{y}}}$	$\frac{x}{y}$
$\text{\texttt{\sin x}}$	$\sin x$
$\text{\texttt{\log x}}$	$\log x$
$\text{\texttt{\sqrt{x}}}$	\sqrt{x}
$\text{\texttt{\lim_{n\to\infty} \{5\over n\}}}$	$\lim_{n \rightarrow \infty} \frac{5}{n}$
$\text{\texttt{\{n \choose k\}}}$	$\binom{n}{k}$
$\text{\texttt{\int_a^b dt}}$	$\int_a^b dt$
$\text{\texttt{\gamma}}$	γ
$\text{\texttt{\Gamma}}$	Γ

Another important environment in math is the equation array, which lets you align correctly a set of equations together.

$$b = a$$

We multiply both sides by a .

$$ab = a^2$$

$$ab - b^2 = a^2 - b^2$$

$$(b)(a - b) = (a + b)(a - b)$$

$$b = a + b$$

$$1 = 2$$

Which was created using the following. Note the use of $\&$ around the equal sign to determine what to align with what and the use of \backslash to go to the next line.

```
\begin{align*}
a \&= b \\\
\intertext{We multiply both sides by $a$:}
ab \&= a^2 \\\
ab - b^2 \&= a^2 - b^2 \\\
(b)(a-b) \&= (a+b)(a-b) \\\
b \&= a+b \\\
1 \&= 2
\end{align*}
```

You can also use `\textrm{}` to insert text in your math. For example:

```
\begin{displaymath}
P(X=i) = \left\{
\begin{array}{ll}
\frac{1}{36} & \textrm{if } 1 \leq i \leq 36 \\
0 & \textrm{otherwise}
\end{array}
\right.
\end{displaymath}
```

Is displayed in L^AT_EX as:

$$P(X = i) = \begin{cases} \frac{1}{36} & \text{if } 1 \leq i \leq 36 \\ 0 & \text{otherwise} \end{cases}$$

Note that all math symbols must be inside `$...$`, `$$...$$`, `\begin{displaymath}`, or `\begin{eqnarray}`! You will get errors when math symbols are outside of these.

You should take a look at the extensive listings of math commands in the reference documents listed at the end of this tutorial.

In order to access some formatting commands (such as `\texttt{align*}`) and more obscure math symbols, you may need to include the following packages at the top of your document: `amssymb`, `amsmath`, and `mathrsfs`. To use a package, include the line `\usepackage{<name>}` in the preamble of your document.

Algorithms

The **newalg** package is very useful for writing nicely formatted algorithms in L^AT_EX.

Here's an example:

SUM(n)
1 $sum \leftarrow 0$
2 **for** $i \leftarrow 1$ **to** n
3 **do** $sum \leftarrow sum + i$
4 **return** sum

Which is given by the following:

```
\begin{algorithm}{Sum}{n}  
sum \= 0 \\  
\begin{FOR}{i \gets 1 \TO n}  
    sum \= sum + i  
\end{FOR} \\  
\RETURN sum  
\end{algorithm}
```

The package can be kind of picky about where you should put your end of line markers (`\\`).

My parents want me to take humanities

So you're all set, you can type your math homework from the sunlab... oh wait, you still have to type papers?
DON'T LEAVE THE SUNLAB!

Here are a couple commands that'll probably want to use:

- `\linespread`: lets you doublespace your text
- `fancyhdr`: lets you make more advanced headers.

Here's an example:

```
\documentclass[12pt]{article}
\usepackage{fancyhdr}
\addtolength{\oddsidemargin}{-.3in}
\addtolength{\evensidemargin}{-.3in}
\addtolength{\textwidth}{.6in}

\linespread{1.6}

\pagestyle{fancy}
\begin{document}

\markright{Thomas Crulli\hspace{1cm}} % your name and whatever goes in header
      BS 77 10/1/98}
\renewcommand{\headrule}{}
\cfoot{\thepage}

Blah, blah, blah... % your paper goes here

\end{document}
```


What about graphics?

Need to include graphics in your \LaTeX document? Use the `psfig` package, and then use `\psfig{file=...}` to include the “graphic”:

```
\documentclass[12pt]{article}

\usepackage{psfig}           %psfig package added in

\begin{document}             %REQUIRED

\psfig{file=image.eps}

\end{document}               %REQUIRED
```

`image.eps` is an “encapsulated postscript file” generated using the program `xfig`. For the output, see

`/pro/consult/Minicourses/latex/examples/graphics.dvi`



Additional Information

- Brown \LaTeX web site:
`http://localhost/system/software/latex`
 - *The Not So Short Introduction to $\text{\LaTeX}2\epsilon$*
 - *Essential \LaTeX*
- `www.ctan.org/ctan/tex-archive/info/lshort/english/`
- newsgroup: `comp.text.tex`
- `/cs/data/texmf/doc/`