



Getting Started with L^AT_EX

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Welcome to L^AT_EX



- L^AT_EX is a text-based programming language
- It's used to make beautiful documents
- There's lots of automation you can do, including defining your own commands
- Everything is completely open-source, and you'll never pay for anything related to using L^AT_EX

Typesetters The Fundamental Choice

\LaTeX is a compiled language, but the vocabulary word is *typesetter*. There are two species of typesetters- desktop and online.

- Desktop typesetters are programs run on your computer which turn \LaTeX code into PDFs stored on your hard drive.
- Online typesetters are web services hosted on a third-party server which turn input \LaTeX code into PDFs which can be downloaded.

It's really a personal choice which you use. Desktop ones gain a lot of power if your files are automatically stored in a cloud service like mine, but I can't edit my documents on my tablet or phone. This is OK for me, but might be a deal-breaker for you.

Typesetters Getting Started

There are two primary desktop typesetters:

- MacT_EX or T_EXShop, for MacOS.
<http://www.tug.org/mactex/morepackages.html>.
- MiK_TE_X, for Windows. <https://miktex.org>.

There's many more online typesetters, but the two on the forefront are:

- Overleaf. <https://www.overleaf.com>.
- ShareL_AT_EX. <https://www.sharelatex.com>. This site also has lots of handy templates you can use even if you aren't typesetting there.

For the record, I use T_EXShop.

I won't walk you through how to use them, but go ahead and open your typesetter of choice.

First Intermission



This is where you get your typesetter ready to go.

Take a look at Section 2 of the companion guide at upsilonlab.org/latex.

Coding Document Structure



Every document is made up of four pieces in this order.

- **The preamble.** All package imports, page geometries, and other document-defining matter.
- `\begin{document}`
- **The document.** All body text, figures, graphics, etc.
- `\end{document}`

Preambling The Basics

Here's a basic preamble. I almost always use a template I find online, or copy over from something I wrote previously.

1. `\documentclass[11pt, oneside]{extarticle}`
2. `\usepackage{geometry}`
3. `\geometry{letterpaper,margin=1in}`
4. `%\geometry{landscape}`
5. `\begin{document}`

Preambling Useful Packages

You can import any package you need using `\usepackage[optional-packageoptions]{packagename}`. You'll likely want all of these in every document you make.

- `xcolor`
- `fancyhdr`
- `graphicx`
- `hyperref`

\TeX Shop includes almost every package I've ever needed, but downloading more of them in the form of `.sty` files is straightforward, and the process is easy to follow with a simple web search.

The Document Basic Body Formatting

Here, you can pretty much just write plain text as you would into word, but without fiddling with the formatting in the meantime. Regular text will do exactly what you expect.

If you want to start a new paragraph, just add a blank line between the lines of text. You can write long paragraphs by splitting the text between lines with **no** blank lines, just a single return.

The Document Accents Etc.

- Don't type in the unicode character as you would in Word or other.
- Each accent has a command which can be found easily online.
- For example, “ç” is printed by typing `\c c`.

You can enable unicode with a package, but it does make compiling your documents significantly slower.

The Document Quotes, “Money or Math?” and And.

- Use one or two ``` (on the same key as `~`) to make the left side of a ‘quote’ or “quote”.
- `&` and `$` require a backslash since those characters have their own special purposes- table and equation delimiters.

The Document Spacing

- Other modifiers are similarly self-explanatory, for example, `\noindent` at the beginning of a line will remove all indentation, and `\newpage` will force content following it to start on a new page.
- Force a new paragraph by adding a blank line between lines of text, or a double backslash `\\`.
- `\vspace{5mm}` (with any length) is a very useful command to fiddle with spacing- if you use it often, you're doing something wrong, but it's useful on occasion.

The Document ***BISU***

- **Bold**
- *italics*
- *slanted text*, *and*
- underlining?

It's just as easy as it is garish.

- `\textbf{Bold}`
- `\textit{italics}`
- `\textsl{slanted text}`, and
- `\underline{italics}`.

Note that *italics* match the variables in equations, but *slanted text* is a bit cleaner.

The Document Itemization

Make lists!

- `\begin{enumerate}`, or
- `\begin{itemize}`,
- Delineate each item with a `\item`.

These environments don't even require new lines.

Don't forget to close out the environment with a `\end{enumerate}` or `\end{itemize}`.

The Document = $e^q \mu A t i \mathbf{O}(n) s$

- $\$$ for inline math
- $\$\$$ for separated equations

Within the math environment, almost everything is self-explanatory. Some examples are:

- \wedge for exponents
- $_$ for subscripts
- \int , \iint , \iiint for \int , \iint and \iiint .

Just about any symbol you'd need to type in \LaTeX 's math mode can be found from a quick web search.

The Document Parenthetical Equations

One of the most noticeable “rookie mistakes” a new T_EXer can make is bad parenthetical formatting. Compare Equations (1) and (2).

$$\omega^2 = (gk + k^3 \frac{\sigma}{\rho}) \tanh(kH) \quad (1)$$

$$\omega^2 = \left(gk + k^3 \frac{\sigma}{\rho} \right) \tanh(kH) \quad (2)$$

The Document Parenthetical Equations

Let's compare the code for both equations- I've highlighted the differences.

(1).

```
\omega^2=(gk+k^3\frac{\sigma}{\rho})\tanh(kH)
```

(2).

```
\omega^2=\left(gk+k^3\frac{\sigma}{\rho}\right)\tanh(kH)
```

I recommend putting `\left` and `\right` on every parenthetical- it even works on `[square]` and `{curly}` brackets.

The Document Multi-Columns



The `\begin{multicols}{}` environment will produce a flat-bottom result, i.e. it will fiddle with margins to make sure the columns are all the

same height. If there aren't any margins to tweak, the rightmost column may be a little short, as it is here.

The Document Multi-Columns*

The `\begin{multicols*}` environment will fill the leftmost column to the bottom of the page before starting the next column. As you can see here, there's barely enough text in this `multicols*` environment to spill into the second column. It's worth

noting that ending a `{multicols*}` environment forces a `\newpage`.

The Document Figure Code

Adding figures and graphics into your document is a breeze with `\usepackage{graphicx}`.

Make sure the image you want to include is in the same directory as your `.tex` file, then import using a modified version of this “MWE” (minimal working example):

1. `\begin{figure}`
2. `\includegraphics[scale=0.05]{jacobsaret}` % the image extension is optional
3. `\caption{A picture of the author taken in Alum Rock Park in San Jose, CA.}`
4. `\label{fig:author}` % label, see Slide 27.
5. `\end{figure}`

The Document Figure Output

This will give you the graphic seen below in Figure 1.



Figure: A picture of the author taken in Alum Rock Park in San Jose, CA.

It's worth noting the figure output looks slightly different in a document than it does in slides like this.

The Document Making Tables

Tables are perhaps the greatest shortcoming of L^AT_EX in its current form. My go-to solution is a downloadable Excel macro package called `Excel2LaTeX.xla`. Fortunately, this comes from a very reputable source, CTAN, as discussed in Section 2.2 of the companion guide [upsilonlab.org/latex](https://www.upsilonlab.org/latex). It is found at <https://ctan.org/tex-archive/support/excel2latex?lang=en>.

Second Intermission



This is where you get your `Excel2LaTeX.xla` ready to go. There are also many online converters for those of you who might not have Excel.

Take a look at Section 5.6 of the companion guide at upsilonlab.org/latex.

The Document Table Code

```
1. \begin{table}[htbp]
2. \centering
3. \caption{Fundamental Constants}
4. \begin{tabular}{l|r|r|r|c|l|l}
5. Const. & Meas. & Unc. & Acc. & Scale & Units
& \% Disc.\\\hline
6. \((e\)) & -1.46 & 0.09 & -1.60 &  $10^{19}$  & C &
9.2\\\hline
7. \((m\)) & \multicolumn{2}{*}{MRow} & 0.53 & 9.11 &
10\(^{-31}\) & kg & 4.0\\\hline
8. \((h\)) & & 0.48 &
\multicolumn{2}{r}{MultiColumn} & Js & 13.5\\\hline
9. \end{tabular}
10. \label{table:fundamentals}
11. \end{table}
```


The Document Table Output

Table: Fundamental Constants

Const.	Meas.	Unc.	Acc.	Scale	Units	% Disc.
e	-1.46	0.09	-1.60	10^{-19}	C	9.2
m	MRow	0.53	9.11	10^{-31}	kg	4.0
h		0.48	MultiColumn	Js	13.5	

Table of Contents



- Add a `\tableofcontents` where you want your table of contents.
- Following the command with a `\newpage` is optional.

Section Numbering

Add a command of this form to the preamble.

```
\renewcommand{\thesubsubsection}{\thesubsection  
\textsl{\small\Alph{subsubsection}}}
```

This will give you a subsubsection numbering style: 6.0A.

Cross References

All you need is a `\label{example-label}` placed in one of these spots:

- The same line as a `\section{Example Section}`
- Within your `figure` or `equation` environment, both using the `\begin{}` and `\end{}` delimiters.

Cross References Example

Below is Equation (3), the indefinite integral of $x dx$.

$$\int x dx = \frac{x^2}{2} + C \quad (3)$$

Exercises



I made a nice set of exercises for a new $\text{T}_{\text{E}}\text{X}$ er to try out.

Check them out in Section 8 of the companion guide at upsilonlab.org/latex.

Thanks for coming!

I hope you'll find \LaTeX a useful tool for the rest of your time in academia!

