

# L<sup>A</sup>T<sub>E</sub>X Tutorial

Name

**Abstract**—Learning L<sup>A</sup>T<sub>E</sub>X can be a challenging task. This tutorial aims to help people with little to no understanding of it by teaching the basics.

**Index Terms**—CMPE185, L<sup>A</sup>T<sub>E</sub>X Tutorial, IEEEtran, journal, L<sup>A</sup>T<sub>E</sub>X, paper, template.



## 1 INTRODUCTION

THIS tutorial is intended to serve as a L<sup>A</sup>T<sub>E</sub>X tutorial for novice engineering students. This tutorial is useful if you want to learn the basics and create professional looking documents. We will go over the topics such as creating a tex file, making tables, and formatting. L<sup>A</sup>T<sub>E</sub>X is flexible and allows for a large amount of customization that other applications do not offer.

## 2 STARTING A L<sup>A</sup>T<sub>E</sub>X FILE

### 2.1 Preamble

#### 2.1.1 Document Class

To begin, you will need to specify `\documentclass{ }[ ]` at the very beginning of your .tex documents. This will be what you usually type first. You need to include this command because it will be used to determine what type of document you are working on. Inside the `[ ]`, you will be able to specify modifiers and inside the `{ }`, you will be able to set properties such as font size and templates. Here is an example taken from `latex_185_moulds_g.tex`.

```
\documentclass[12pt,journal,compsoc]{IEEEtran}
```

#### 2.1.2 Packages

L<sup>A</sup>T<sub>E</sub>X allows for the use of Packages which provides users with additional commands that gives you more power to modify your document. In order to use packages, you can simply type in the `\usepackage{ }` command. Inside the brackets will be where you say what specific package you want to use. The package must be contained

### 2.2 Title and Heading Information

It is important to also specify the title, author, and date for the paper with the following commands. These are relatively simple and all you have to do is simply enter with in `{ }` the parameters.

```
\title{ }
\author{ }
\date{ }
```

After this, simply use the command `\maketitle` and it will generate the title at the top of the first page for you.

### 2.3 Environments

The hardest part of learning L<sup>A</sup>T<sub>E</sub>X is the beginning. It may be challenging at first, but once you familiarize yourself with the general gist of things, everything becomes much easier. Let's begin by starting our .tex file and establishing the base environment of our document. Tex files should begin with `"\begin{document}"` after specifying the document class and end with `"\end{document}"`. This specifies where our document begins and where are document ends. In between these two commands will be where the body of our paper will be.

The `"\begin{ }"` and `"\end{ }"` commands are also used throughout a L<sup>A</sup>T<sub>E</sub>X to document specify where other environments you create begins and ends. Environments will be how you format your blocks of text on the document. Similar to how the "document" parameter specified the the beginning and ending of

our documents, other parameters such as the following can be used:

figure  
tabular

I will go more in depth about these and what they do in the later sections of this tutorial.

## 2.4 Reserved Characters

In LaTeX, there are characters known as reserved characters. You have already seen the reserved character “\” used when we were setting up our document. They are special in that they typically do something when typed in to a LaTeX document. Here is a list of some reserved characters separated by commas:

\ , ~ , \\ , %

### 2.4.1 Uses

The “\” symbol is typically used when calling commands. It is used at the beginning of a command to specify that the text following it is the command you want to call.

The textasciitilde/tilda: “~” is used to when you want to input a space that cannot be modified. This means the space cannot break, expand, or shrink.

The “\\” is used to start a new line in a text. This means the text right after this will be displayed on a newline rather than the line you were previously on.

The “%” is used when you want to comment text in your LaTeX document. These comments will not show up in the final document and can only be viewed when editing or looking at the source .tex file.

### 2.4.2 Displaying Reserved Characters

Since the characters I have just discussed are reserved, they cannot be printed through normal means. In order to print them, you must use escape characters or a special notation in order to display them on your final document. Below is a table that you can use when you want to print these characters out.

\	\backslash
~	\textasciitilde
\\	\backslash\backslash
%	\%

## 3 SECTIONS

LaTeX allows you to label sections in your document. This is very useful for separating your content into digestible and coherent chunks. You will also be able to label a title for each of these sections to help your readers understand the general point or idea of that part of your document. You are able to create a section by typing the following:

```
\section{title}
```

### 3.1 Subsections

If you would like to create more sections, simply add a “sub” before “section” to create a subsection:

```
\subsection{title}
```

## 4 BODY TEXT: PARAGRAPHS AND CONTENT

To begin writing a paragraph, you use:

```
\begin{ }
```

Inside the { }, you will be able to specify the alignment of your paragraph. You have three options:

```
center  
flushleft  
flushright
```

By default, the first paragraph is always not indented, so if you ever want to change the indentation of a paragraph, use:

```
\setlength{\parindent}{5ex}  
OR  
\noindent
```

In the first option, your paragraph will be indented by the number you input in the brackets. In the second option, your paragraph will contain no indentation

## 5 TABLES

Creating tables can easily be done in LaTeX. You can use either table or tabular environments to do this.

TABLE 1  
An Example of a Table

One	Two
Three	Four
Five	Six

```
\begin{table}[h]
\renewcommand{\arraystretch}{1.3}
\centering
\begin{tabular}{|c||c|}
\hline
One & Two\\
\hline
Three & Four\\
\hline
Five & Six\\
\hline
\end{tabular}
\end{table}
```

Above, I have the commands for creating the example table. As you will see, you will first have to specify that you want to begin a table. The `\renewcommand` followed by the `\arraystretch` command allows you to modify the table parameters to your own liking. The `\begin{tabular}` line lets you basically format the table and will be how you will be inserting data in to your table. I have decided to enter 'c' in the parameter, and this basically means I want a center justified column. You also have the option of making it left or right justified by using 'l' or 'r.' The | and || represents a vertical line and double vertical line respectively for the table. `\hline` represents the horizontal line of the graph.

To input content, you can take a look at the line "One & Two \\\." Here, you are inputting "One" and "Two" in to the first and second column of the first row respectively.



Fig. 1. Sammy the Slug

## 6 FIGURES

### 6.1 Graphics

Adding graphic images is very simple in LaTeX. Take a look at the following example:

```
\begin{figure}[h]
\centering
\includegraphics[width=1.5in]{slug.pdf}
\caption{Sammy the Slug}
\end{figure}

- taken from latex_185_moulds_g.tex

https://cse185e-spring20-01.courses.soe.ucsc.edu/
```

The "begin" line starts off the use of an image. The "figure" environment will set what we're handling as a figure take care of the positioning for us. After that, you will need to use the "includegraphics" command to specify that it is a graphic that you want to use. You can also enter the width that you want the picture to be in your document. Following that, you will have to specify the image file within the brackets ". " It should be noted that the image needs to be in the same directory as the .tex file otherwise it will not appear.

### 6.2 Titration

Below, I will use the same method to display a chart that I have brought in as a pdf from google sheets. This just shows how versatile LaTeX is when it comes to representing data. The data presented is from a Titration lab procedure. It is used to determine the endpoint of a reaction between a titrant and a titrand. By observing the displacement of the volume, you will be able to determine this.

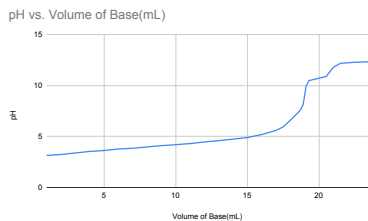


Fig. 2. The above chart represents a titration curve that shows pH vs volume of NaOH. At the middle of the sharp rise is the equivalence point

## 7 MATHEMATICAL FORMULAS

To use some of the following mathematical commands, you will have to import a mathematical package. The package I have used is listed below:

```
\usepackage{amsmath}
```

### 7.1 Fractions and Binomials

L<sup>A</sup>T<sub>E</sub>X allows for easy representation of many math equations and formulas. Below is one example of fractions and Binomials.

$$\frac{n!}{k!(n-k)!} = \binom{n}{k}$$

I have provided the input needed to display the above.

```
\[
  \frac{n!}{k!(n-k)!} = \binom{n}{k}
\]
```

On the left hand side of the equal, I have represented the fraction. Fractions are simple to make. Simply replace the parameters within the two brackets to change the numerator or the denominator. The same goes for the binomial on the right hand side. Changing the parameters will allow you to change what value is displayed in the end. In this case, I have chosen  $n$  and  $k$ , so those are displayed in the final document.

It should be noted that whenever you are doing mathematical text, L<sup>A</sup>T<sub>E</sub>X needs to know if it is mathematical. There are two kinds: inline and displayed. Displayed formulas are on their own lines while inline formulas are displayed within the body where the command is called.

In my above example, I have a displayed formula. To change this in to an inline formula, simply replace the `[ ]` with `( )`.

### 7.2 Symbols

Mathematics typically requires the use of symbols and L<sup>A</sup>T<sub>E</sub>X has the following set of mathematical symbols that can be accessed for use:

+ - = ! / ( ) [ ] < > | ' : \*

### 7.3 Superscripts and Subscripts

$$i_1^1 + j_2^2 = k_3^3$$

To create superscripts and subscripts, you can just use the `_` and `^` symbol to represent them.

```
\[ i_1^1 + j_2^2 = k_3^3 \]
```

If the expression has a relatively long superscript or subscript, you need to use curly braces around the scripts.

```
\[ i^{x/y} + j_{xy} = k_{xy} \]
```

The above will evaluate to the following:

$$i^{x/y} + j_{xy} = k_{xy}$$

## 8 HOW TO: REFERENCES

The `\label` and `\ref` commands are used to set labels so that you can reference them later in your document. Take the following for example. I have already labeled introduction above when I made the introduction. I have listed the command below. I will also now reference it using `\ref` to show you what it does.

```
\label{introduction}
```

Ref Command

```
\ref{introduction}
```

appears like: 1

It is returning 1 because that is the first text section that I made a label for.

```
\cite{IEEEhowto:kopka}
```

appears like: [1]

Cite returns 1 because the parameters I have entered is the first reference in my reference list.

## 9 HOW TO: ACKNOWLEDGEMENTS

The acknowledgements section is used for the author or authors to thank or mention individuals or entities that have assisted or helped with the respect paper or study. You can add a `*` between the “section” and `{ }` parts of the code and the final document will no longer display section number.

## 10 CONCLUSION

This tutorial aimed to go over some of the useful things offered and some things to help you get started. I hope this tutorial was helpful in helping you learn the basics of L<sup>A</sup>T<sub>E</sub>X. L<sup>A</sup>T<sub>E</sub>X has a lot of options for users and it is up to you now to learn more about it now.

One last thing, you will notice that the next Acknowledgements section no longer has a number associated to show it's section. This can be done by creating a new section with `\section*`. The reference section is also used to list your references. This section will use the `\bibitem` command to add items to the list.

## ACKNOWLEDGEMENTS

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## REFERENCES

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