Basic LaTeX

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Abstract—This document contains a basic tutorial on how to create a simple LaTeX file .

Index Terms—CMPE185, LaTeX Tutorial, IEEEtran, journal, LaTeX, paper, template.

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1 INTRODUCTION

THIS is a tutorial on the basics of LaTeX . LaTeX is a free typesetting language created by Leslie Lamport in order to make it easier to produce general-purpose books and articles within TeX. Because LaTeX is an extension to the TeX typesetting system, LaTeX is popular with scientists and engineers.

2 CREATING A .TEX FILE

All Latex files are in the .tex format. Creating an account in Overleaf and opening a new file is a very simple way to create a .tex file. Thankfully Professor Moulds was generous enough to give us a zip file containing a .tex file already.

2.1 Environments

In order to begin a document you must start with command \begin{} and end with \end{} . There are several other keywords in LaTeX that follow the *keyword*{} format. Including \begin{} and \end{} is very important in order to avoid errors during the compiling process.

2.2 Reserved Characters

Reserved characters or special characters are characters that have a specific function in LaTeX .Here are a few of the most popular ones

$ % & { } _ ˜ ˆ \

The % is a very useful character, it comments out lines in the code that do not show up when the document is compiled. \is used before every function or special character. \\creates a line break like this. Tilde ( ) is used in LaTeX code to produce non-breakable space. Because these characters are reserved, they will throw an error if you are to simply type them out in your LaTeX document. You must add a \in front of each reserved character in order for them to be displayed normally like so: \# \$ \& _
For a more detailed explanation of each character and symbol I would recommend checking out

Special Characters and Symbols
https://www.dickimaw-books.com/latex/novices/html/symbols.html

2.3 Preamble

The preamble is the first section of an input file, before the text of the document itself, in which you tell the LaTeX the type of document, and other information LaTeX will need to format the document correctly. It contains packages, document class, title, author, and the date. Packages have extra commands that let you customize your document and add extras to it. In order to add a package, you need to type \usepackage{*your package name*}. A simple google search will allow you to find any package you are looking for. It is necessary to include what type of document you are

using. LaTeX supports reports, articles, slides, and many more. You can specify this by using the \documentclass{*document type*}. All you have to do in order to get started working on your document is put all your information in between \documentclass{*document type*} and \end{*document type*}. It is important to note, that you can specify font sizes in two levels, the first being with the documentclass command like so \documentclass[12pt]{report} and the second being inline to a smaller portion of text instead of the entire document. Here is a link that goes into more detail:

https://texblog.org/2012/08/29/changing-the-font-size-in-latex/

2.4 Title and Heading Information

In order to make a title in LaTeX , you must start with \title{} and end with \maketitle. In between those two you can specify many things including who the author is using \author{} and the date using \date{}. Below I will show an example of how I made the exact title I used for this document below.

\title{Basic\LaTeX{} }
\author { Jason Bonilla \\
CSE185, \\
University of California, Santa Cruz \\
\date{10-22-2020 } }\\
\maketitle

3 SECTIONS

LaTeX can organize, number, and index chapters and sections of document. There are up to 7 levels of depth for defining sections depending on the document class. In order to create this paragraph I used \section{section}. If you would wish to not include a number with each section you would simply put a * like so \section*{section}.

\part{part}
\chapter{chapter}
\section{section}
\subsection{subsection}
\subsubsection{subsubsection}
\paragraph{paragraph}
\subparagraph{subparagraph}

3.1 Subsections

Subsections are very similar to sections, in the way that they are used to organize a document. But a subsection, is typically a more specific part of the very general section that it belongs to. You can use a subsection by using \subsection{subsection}

4 BODY TEXT: PARAGRAPHS AND CONTENT

Even though the default formatting in LaTeX is fine, sometimes we need to change some elements. In order to format a paragraph in the center you can use \begin{center} *insert content here* \end{center}

This is an example of having a centered stand alone paragraph.

To start a new paragraph in LaTeX you can \\or use the command \par after the last sentence in the paragraph that you wish to end. This will however indent both paragraphs. Below is an example of how to use the command:

What you doin' in the club on a Thursday? She say she only here for her girl birthday.
They ordered champagne but still look thirsty. Rock Forever 21 but just turned thirty.

5 TABLES

LaTeX already has built-in support to typeset tables. For beginners it may be a bit confusing, since LaTeX provides two environments: tabular and table. To typeset material in rows and columns, tabular is needed, while the table environment is a container for floating material similar to figure, into which a tabular environment may be included. Here is an example of a tabular without the use of a table container

1	2	3
4	5	6
7	8	9

Here is an example of a tabular within a table container
As you see, table is the outer container, creating a floating table object with a title and a

TABLE 1
Performance at peak F-measure

1	2	3
4	5	6
7	8	9

caption, whereas tabular is the inner container, creating the actual grid of table cells. Tables offer more flexibility than a tabular, but tabulars are favored for their simplicity. Tables and tabulars could not be made possible without the following symbols.

TABLE 2
Symbols

l	left-justified column
c	centered column
r	right-justified column
|	vertical line
||	double vertical line
\hline	horizontal line
\\\\	new line

Here is the code used to make the table above using [h] for positioning ,l, c, r, \hline, \\, and |. Alternatively you can use [t],[b],[p],[H], or [!] for different positions.

\begin{table}[h] \footnotesize
\caption{Performance at peak F-measure}
\begin{center}
\begin{tabular} { | l | c | r |}
\hline
1 & 2 & 3 \\ \hline
4 & 5 & 6 \\ \hline
4 & 5 & 6 \\
\hline
\end{tabular}
\end{center}
\end{table}

Notice that the content is entered in the tabular spaced by columns using & in between each piece of data. \hline is entered at the beginning and end as well as after each row of data in order to produce horizontal lines.

6 FIGURES

Figures in LATEX must start with a \begin{figure} and end with a \end{figure}. In order to create this graph I manually entered the data from Titration_ Plot.pdf into Microsoft Excel and turned it into a linear graph. I then saved the graph as a pdf and uploaded the file into overleaf and inserted it using \includegraphics[x]{} where x is a number used to scale. Figure 1 up above is an example of a figure specifically a graphic.
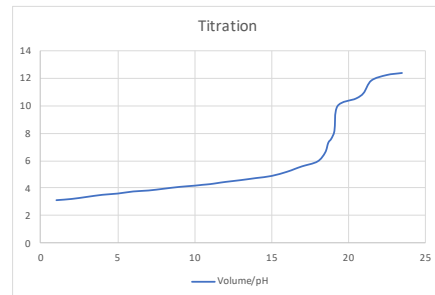
Fig. 1. A graph of a Titration curve based of of data that was provided by Professor Moulds. The Volume and pH seem linear up until around 18mL where pH seems to not increase as much.

7 MATHEMATICAL FORMULAS

There are two ways to express formulas in LATEX . In-line and display. In-line isplay is where your formulas show within a sentence such as $f(x) = \sum_{i=0}^{n} \frac{a_i}{1+x}$ and this can be done by adding \displaystyle in front of the mathematical expression of your choice. The other option is regular display and this method has its own section away from the sentence like so:

$$f(x) = \sum_{i=0}^{n} \frac{a_i}{1+x} \tag{1}$$

It is very simple to get any mathematical symbol. All you have to do is add a \, followed by the name of the symbol you want. But be careful, you must be in math mode or else you will get an error. For example if you wanted θ all you need to type is θ

Fractions are just as easy to use. In order to work with fractions, you must be in mathmode and use the command \frac{}{}. Here is an

example of a fraction that would produce one quarter. \frac{1}{4}

$$\frac{1}{4} \tag{2}$$

Once again, in order to work with superscripts and subscripts, you have to be in mathmode. The command to work with a superscript is written $x\hat{\ }\{3\}$ and gives us x^3. While the command for a subscript $x\_\{3\}$ gives us x_3.

$$\hat{\ } \text{ for a superscript}$$
$$\_ \text{ for a subscript}$$

8 HOW TO: ACKNOWLEDGEMENTS

Acknowledgements are used to thank all those who helped make your document possible.

9 HOW TO: REFERENCES

LATEX supports bibliographies out of the box, either embedding the references in your document or storing them in an external file. It is much more convenient to use a .bib file but for the sake of the assignment we will be focusing on thebibliography environment. Here is an example below so lets break it down

REFERENCES

[1] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The LATEX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.

[2] Albert Einstein. *Zur Elektrodynamik bewegter Körper*. (German) [*On the electrodynamics of moving bodies*]. Annalen der Physik, 322(10):891–921, 1905.

[3] Knuth: Computers and Typesetting, http://www-cs-faculty.stanford.edu/~uno/abcde.html

You must begin with a \begin{thebibliography}{x} where x is the number of entries you will have in your bibliography environment ending with \end{thebibliography} Warning, you can have a maximum of 99 items in your bibliography.

Within that environment you insert \bibitem{id} where id is the identifier for that specific bibliography item. Each item typically starts with the name of the author followed by

the title and where you got your information from in italics. Italics can be made using the \textit{content} command.

\label{marker} : used to give the object you want to reference a marker
\ref{marker} : used to reference an object with the specified marker.
\pageref{marker} : used to print the page number where the object with the specified marker is found.
The following code will create two sections, one with a label and one referencing that label followed by the page it was referenced on:
\section{Greetings}
\label{sec:greetings}
Hello!
\section{Referencing}
I greeted in section ˜ \ref{sec:greetings}
I greeted in section ˜ \pageref{sec:greetings}

10 GREETINGS

Hello!

11 REFERENCING

I greeted in section 10.
I greeted on page 4
\cite{id} : used to print a number of text, depending on the bibliography style, to reference the bibliography entry whose label is passed to the command

You can now embed your work with citations using the command \cite{id}, where id is the identifier you chose for each citation. If I wanted to reference Albert Einstein's *On the electrodynamics of moving bodies*. I would call \cite{einstein} and get [2].

12 CONCLUSION

I hope that this tutorial finds you well and assists you in your journey with LATEX . LATEX is a fairly simple language to learn and has many uses for almost all pieces of literature. It is a very flexible tool that can turn any piece of writing into a clean masterpiece.

13 ACKNOWLEDGEMENTS

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$/\texttt{Labels}_a nd_C ross - referencing, Wikimedia Foundation,$
$Inc, Apr 2020$

[3] Overleaf, online latex editor
`https://www.overleaf.com/learn/latex/`
$\texttt{Main}_{p} age$

[4] William L. Hosch,
`https://www.britannica.com/technology/`
`LaTeX-computer -programming-language`