LaTeX

Guidelines

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1. Introduction

1.1 LaTeX Definition

- Pronounced as 'lay-tech' or 'lah-tech'
- Document preparation system for high-quality typesetting
- Used for publishing articles, thesis reports, books, scientific documents, etc.

1.2 Why?

- Consistent layout, fonts, tables, etc.
- Mathematical formulae can be easily typeset
- References, footnotes can be easily generated

1.3 Word vs.LaTeX

- With a word processor, you spend valuable time agonizing over what font size to make the section headings.
- With LaTeX, you just tell it to start a new section..
- With a word processor, changing the formatting means you have to change each instance individually.
- With LaTeX, you just redefine the relevant commands..
- With a word processor, you have to carefully match any provided templates.
- With LaTeX, you can be sure you've fit the template, and switch templates easily.

.

LaTeX is like MS Word, Only better!

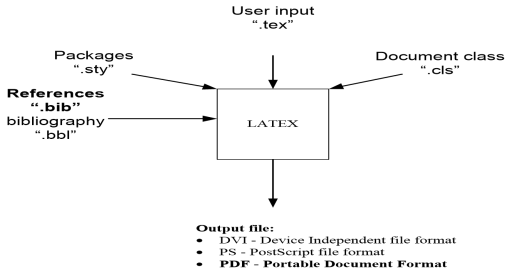

Figure 1.1: How LaTeX works

1.4 Setting-up in overleaf

- Go to overleaf.com and Sign up or Register for new account.
- Click on New Project icon then on blank Project.
- There exist at least one file named main.tex

LaTeX input file have a name that ends with ".tex" extension.

1.5 Document Structure

```
\documentclass [options]{class_name}
```

Preamble

```
\begin{document}
```

Body or document text

```
\end{document}
```

1.5.1 Document Class

```
\documentclass[option]{class_name}
```

Class_name

- It is the type of document we intended to create. It may be an article, report, book, letter, beamer.
- It is a mandatory parameter "enclosed by `{}`"

. Options

- A document can be modified by options & Multiple options are separated by commas.
- Some common options are:
  - font size "10pt 'default', 11pt, 12pt"
  - column-size "single column 'default', two columns 'needed in article class'"

1.5.2 Preamble

Preamble includes:

- The commands that will influence the style of your entire document
- macro definitions that we will use later, it loads packages that add new features to LaTeX.

Text is not allowed in the preamble.

1.6 Body or Document text

corresponding output

It uses the **report class**.
Nothing in the preamble is "perfectly acceptable"

LaTeX command

```
\documentclass[12pt]{report}
%\begin{document}
It uses the \textbf{report class}.\\
Nothing in the preamble is "perfectly acceptable"
%\end{document}
```

1.7 Packages

Syntax:
`\usepackage[options]{packageName}`
. Examples:
`\usepackage[margin=1in]{geometry}` `\usepackage[left=1.0in,right=1.0in,top=.8in,bottom=.8in]{ge`

- This geometry package helps to change the layout, such as the document's paper size, orientation, margins, etc.

. `\usepackage{graphicx}`

- The graphicx command above instructs LaTeX to read the file graphicx.sty which is used to include images and figures in the document.

. `\usepackage{amsmath}`

- The amsmath command is used to typesetting mathematics in the document.

1.8 Things to Remember in LaTeX

- All the latex commands start with a backslash "\".
- Some commands consist of the backslash followed by exactly one non-letter, they are often used to put a special symbol in the text.
- E.g.: ``\$'', ``\%'' prints ``$'' and ``%'', which cannot be entered directly because LaTeXuses it to begin math mode and comments respectively. i.e. Symbol ``%'' can be used to put a comment in your input file. When LaTeX sees a ``%'', it ignores the rest of the line.
- LaTeX ignores multiple blank spaces and multiple blank lines.

- Mandatory commands are enclosed in braces`{}` & Optional arguments are enclosed in square brackets`[]`
- Units of Measurement (basics): Centimeter: cm Millimeter: mm Inch: in
- LaTeX commands are case-sensitive and most are in lowercase.
- **\tableofcontents**
  This command is used to Generate a Table of Contents
- **\listoffigures**
  This command is used to Generate a list of figures
- **\listoftables**
  This command is used to Generate a list of tables
- **\linespread**
  It is placed in the preamble for spacing in a document. `\linesoread{1.6}` will produce a document with double spacing. The default is "single spacing" and for "line and a half" use `\linespread{1.3}`.
- `\pagenumbering{roman}` → Put before the text begins & `pagenumbering{arabic}` → Put after the first `\chapter` command
- "\\" will produces a new line
- `\newpage` will start a new page & `\newline` will start a new line immediately.
- `\hspace` and `\vspace` leave horizontal and vertical space in your text.
- Example: `\vspace{3in}` → It will leave 3 inches of blank space vertically.

1.9 Section Headings

- `\chapter`
  Chapter command is not available in the article class.
- `\section[only Appears in TOC]{Only appears in body of report}`
- `\section*{}`
  - Section headings will not be numbered (Ok) and will not show up in the TOC (Not Ok)
  - To add the section name in the TOC we use the following command
    `\addcontentsline{toc}{chapter{\numberline{}Chapter_Name}`
- `\section`
- `\subsection`
- `\subsubsection`

1.10 Size syntax

corresponding output

Text Text Text

Text Text Text

Text Text

LaTeX command

```
\tiny Text \footnotesize Text \small Text\\
\large Text \Large Text \LARGE Text\\
\huge Text \Huge Text
```

1.11 Cover page

[]

corresponding output

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
PULCHOWK CAMPUS
A THESIS REPORT ON

TITLE OF THESIS
SUBMITTED BY:

NAME
(ROLL NUMBER)
SUPERVISED BY:

PROF. DR. ROGERS S PRESSMAN
SUBMITTED TO:

NAME OF DEPARTMENT
Month, Year

LaTeX command

```
\title{
{\includegraphics[scale=.3]{logo.png}}\\
\uppercase\tiny{%use \large instead of \tiny
    {Tribhuvan University}\\
    {Institute of Engineering}\\
    {Pulchowk Campus}\\
    \vspace{.5cm}
    {A Thesis Report On\\Title of Thesis}\\
    \vspace{.5cm}
    {\textbf{Submitted By:}\\Name\\(Roll Number)}\\
    \vspace{.5cm}
    {\textbf{Supervised By:}\\ Prof. Dr. Rogers s Pressma
    \vspace{.5cm}
    {\textbf{Submitted To:}\\ Name of Department}\\
                }
    }
\date{Month, Year} %{Month Year}
%\begin{document}
\maketitle
%\end{document}
```

1.12 Centering Text

corresponding output

Test 1
Test 2
Test 3

Test 4

LaTeX command

```
\begin{center}
    Test 1\\
    Test 2\\
    Test 3
\end{center}
\Centering{Test 4}
```

1.13 List & Descriptions

corresponding output

1. TU
    - IOE

      PC it is in Lalitpur

      WRC It is in Pokhara

      ERC it is in Dharan

      ThC it is in KTM
    - IOM
2. PU

corresponding output LaTeX command

LaTeX command

```
\begin{enumerate}
    \item TU
    \begin{itemize}
        \item IOE
        \begin{description}
            \item[PC] it is in Lalitpur
            \item[WRC] It is in Pokhara
            \item[ERC] it is in Dharan
            \item[ThC] it is in KTM
        \end{description}
        \item IOM
    \end{itemize}
    \item PU
\end{enumerate}
\begin{center}
{\textcolor{blue}{corresponding output}\hspace{100pt} \
\end{center}
```

1.14 Tables: Put caption package in preamble & goto https://www.tablesgenerator.com/ to draw more tables & for complex excel and word tables, you can convert the tables into pdf files and use the pdfpages package to load the pdf into your report

Table style 1

corresponding output

LaTeX command

Table 0: **Table style 1**

Roll	Name	Address
101	Suresh Pokheral	Gorkha
102	Sushil Ale	Lamjung

```
\begin{table}[htb]
\centering
    \caption{\textbf{Table style 1}}
    \vspace{8pt} %puts 8pt vertical space
\begin{tabular}{clr}%3 columns
% c=centered, l= leftJustified ,  r= rightJustified
\hline%insert hosizontal line
\textbf{Roll} & \textbf{Name} & \textbf{Address}\\
\hline
101 & Suresh Pokheral & Gorkha\\
102 & Sushil Ale      & Lamjung\\
\hline
\end{tabular}
\end{table}
```

Table style 2

corresponding output

LaTeX command

Table 0: **Table style 2**

Roll	Name	Address
101	Suresh Pokheral	Gorkha
102	Sushil Ale	Lamjung

```
\begin{table}[htb]
\centering
    \caption{\textbf{Table style 2}}
    \vspace{8pt} %puts 8pt vertical space
\begin{tabular}{|c|l|r|} %3 columns
% c=centered, l= leftJustified ,  r= rightJustified
\hline%insert hosizontal line
\textbf{Roll} & \textbf{Name} & \textbf{Address}\\
\hline
101 & Suresh Pokheral & Gorkha\\
102 & Sushil Ale      & Lamjung\\
\hline
\end{tabular}
\end{table}
```

1.14.1 Sub-plot in Table: Use caption & subcaption package in preamble

corresponding output

Table 0: Example of the sub-plot of Tables

(a) First Week

Day	Temp
Mon	20
Tue	22

(b) Second Week

Day	Temp
Mon	17
Tue	16

LaTeX command

```
\begin{table}[htb]
\caption{Example of the sub-plot of Tables}
    \begin{subtable}[h]{0.45\textwidth}
        \centering
        \caption{First Week}
        \begin{tabular}{|l|l|}
        Day & Temp\\
        \hline \hline
        Mon & 20\\
        Tue & 22
       \end{tabular}
    \end{subtable}
    \hfill
    \begin{subtable}[h]{0.45\textwidth}
        \centering
        \caption{Second Week}
        \begin{tabular}{|l|l|}
        Day & Temp\\
        \hline \hline
        Mon & 17\\
        Tue & 16
        \end{tabular}
     \end{subtable}
\end{table}
```

1.15 Figures:

- At first, we put the command in the preamble as: `\usepackage{graphicx}`
- Then we create the image folder using `\graphicspath{{Folder_name/}}` or `\graphicspath{{./Folder_name/}}` command, which stores all the image files.
- Syntax: `\includegraphics[optional]{file_name}`

Figure: Example 1

corresponding output

LaTeX command

```
\centering\includegraphics[scale=.2]{logo.png}
```

Optional parameters other than **scale** are as follow:

- `angle=angleValue`: Rotates figure to specified degree counter-clockwise.
- `width=\textwidth`: Scale graphic to the specified width i.e. text-width
- `height=6in`: Scale graphic to the specified height
- `scale=2`: It makes the graphic twice as large as the original

Figure: Example 2

corresponding output

Figure 0: figure is scale to 20 % of the original and rotated to 90 degrees

LaTeX command

```
\begin{figure}
    \centering
\includegraphics[angle=90,scale=.2]{logo.png}
    \caption{figure is scale to 20 \% of the original
    and rotated to 90 degrees}
    \label{fig_label}
\end{figure}
```

1.15.1 Sub-Figures

Figure: Example 3

corresponding output

(a) Sub-figure 1

(b) sub-figure 2

Figure 0: sub-figure demonstration's

LaTeX command

```
\begin{figure}[htb]
    \centering
    \begin{subfigure}{0.45\textwidth}
        \centering
        \includegraphics[height=1in]{logo.png}
        \caption{Sub-figure 1}
    \end{subfigure}
    \begin{subfigure}{0.45\textwidth}
        \centering
        \includegraphics[height=1in]{logo.png}
        \caption{sub-figure 2}
    \end{subfigure}
    \caption{sub-figure demonstration's}
\end{figure}
```

1.15.2 Landscape Plot: include rotating package in preamble

```
\begin{sidewaysfigure}
\centering
\includegraphics[width=\textwidth]{fileName}
\caption{Caption in the landscape to a figure in landscape.}
\end{sidewaysfigure}
```

Output

Figure 1.4: Caption in the landscape to the figure in the landscape

1.16 Typesetting Mathematics

- At first, we put the command in the preamble as: `\usepackage{amsmath}`
- Math environment can be invoked in one of three ways:
  - `$.......$`
  - `\(......\)`
  - `\begin{math}......\end{math}`

1.16.1 Some math formulas

x^2	x^2	$\sqrt{x}$	$\sqrt{x}$
x_2	x_2	$\sqrt[6]{n+3}$	$\sqrt[6]{n+3}$
x^{n+2}	x^{n+2}	$\frac{x^2}{y}$	$\frac{x^2}{y}$
x_{n+2}	x_{n+2}	$\int_0^t xdx$	$\int_0^t xdx$
x_{n+2}^{n+2}	x_{n+2}^{n+2}	$\lim_{x \rightarrow x_0}$	$\lim_{x \rightarrow x_0}$
$\sum_{n=0}^{\infty} n$	$\sum_{n=0}^{\infty} n$	$\int xdx$	$\int xdx$

1.16.2 Equation Environment:for numbered equations

This environment is used for numbered equation
Example:

The derivative of the function $f(x)$ at the point x_0 is

$$f'(x_0) = \lim_{x \to x_0} \frac{f(x) - f(x_0)}{x - x_0} \qquad (1.1)$$

```
1  The derivative of the function $f(x)$
2  at the point $x_0$ is
3  \begin{equation}
4      f'(x_0) =
5      \lim_{x \rightarrow x_0}
6      \frac{f(x) - f(x_0)}{x - x_0}
7  \end{equation}
```

1.16.3 Eqnarray Environment:for multi-line equations

This environment is used for multiple-column numbered equations. Include the command `\nonumber` on any line to suppress the equation number.

Example

corresponding output LaTeX command

$$
\begin{aligned}
(a+b)(a+b) &= a^2+ab+ba+b^2 \\
&= a^2+2ab+b^2 \qquad (1.2)\\
(a+b)(a-b) &= a^2-ab+ba-b^2 \\
&= a^2-b^2 \qquad (1.3)\\
(a+b)^3 &= a^3+3a^2b+3ab^2+b^3 \qquad (1.4)
\end{aligned}
$$

```
\begin{eqnarray}
(a + b)(a + b) & = & a^2 + ab + ba + b^2
\nonumber \\
& = & a^2 + 2ab + b^2 \\
(a + b)(a - b) & = & a^2 - ab + ba - b^2
\nonumber \\
& = & a^2 - b^2\\
(a + b)^3 & = & a^3 + 3a^2b + 3ab^2 + b^3
\end{eqnarray}
```

1.16.4 Array Environment:for matrix

Example

corresponding output

LaTeX command

$$
A = \begin{bmatrix}
a_{1,1} & a_{1,2} & \dots & a_{1,n} \\
a_{2,1} & a_{2,2} & \dots & a_{2,n} \\
\vdots & \vdots & \ddots & \vdots \\
a_{m,1} & a_{m,2} & \dots & a_{m,n}
\end{bmatrix} \qquad (1.5)
$$

```
\begin{equation}
A=\left[
\begin{array}{cccc}
a_{1,1} & a_{1,2} & \ldots & a_{1,n}\\
a_{2,1} & a_{2,2} & \ldots & a_{2,n}\\
\vdots & \vdots & \ddots & \vdots \\
a_{m,1} & a_{m,2} & \ldots & a_{m,n}
\end{array}
\right]
\end{equation}
```

1.17 Referencing

- First include the command `\usepackage{natbib}` in preamble for referencing.
- Then, we create a file whose name ends with the extension .bib i.e. 'fileName.bib' that holds all the sources for referencing.
- Then, place all the references\entries in the file: 'fileName.bib'
- The entries in your '.bib file' are called in your LaTeX file with `\cite` commands as: `\cite{sourceName}`
- After that, in your LaTeX file, you provide just two more pieces of information:
  - A `\bibliographystyle{styleName}` command to specify the formatting style of the citations.
  - The `\bibliography{fileName}` at the point you want the bibliography printed.

Example

`\renewcommand{\bibname}{References}`
It will change the default title 'Bibliography' to 'References'
`\bibliography{unsrt}`
we use 'unsrt' in place of 'plain' for entries to appear in the order in which they were cited in the whole document.
`\bibliography{ref}`
It will provide the name of the .bib file i.e. 'fileName' that holds all the sources for referencing.

1.18 Manuscript: Basics

- Use `\documentclass[twocolumn]{article}`.
- Default ⟨options⟩ for `article`: letter-paper,10pt,one side,one-column
- Default ⟨options⟩ for `report`: letter-paper,10pt,one side,one-column
- `\chapter{}` command is not supported in `article` class, so start from `\section{}` command.
- Almost all commands are the same as in the `report` class.
- try `\toprule, \midrule and \bottomrule` commands in Table, which are improved versions of `\hline`
- Use `\begin{columns} ...\end{columns}` environment for side by side plot.
- try command like `\unskip`, `\nobreak, \indent, \noindent` & more.
- for Header and Footer: follow this link: https://www.overleaf.com/learn/latex/Headers_and_footers

1.19 How modify any LaTeX templates in overleaf

- Go to New Project icon then, click on Upload Project and select a LaTeX template with .zip extension..
- Now, modify the template as per your requirement.

1.20 LaTeX in offline mode

- Download TeXLive and Texmaker separately.
- Installation instructions:
  - Install texlive: run as admin
  - Install texmaker
  - Ready to Go!