

\textbf{\LaTeX{} Overview}

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Please refer to \LaTeX{} WikiBooks and ShareLaTeX.com Documentation for more details.
Brief History

- **\TeX ("Tech")**: A low-level markup and programming language created by Donald Knuth for typesetting documents.

- **\LaTeX ("Lah-tech" or "Lay-tech")**: A macro package based on \TeX created by Leslie Lamport to simplify \TeX typesetting.
Comparison:

- **Word**
  - WYSIWYG
  - Convenient
  - Cumbersome
  - Can be ugly

- **\LaTeX**
  - Use markup language
  - Convenient
  - Cumbersome
  - Mostly pretty

Work flow:

- **Word**
  - Heavily mouse-oriented
  - Type
  - Use mouse to change
  - See

- **\LaTeX**
  - Heavily keyboard-oriented
  - Type
  - Compile
  - See
Terms

System  \LaTeX\ is a document preparation system based on \TeX\

Engine  An executable that can turn the source code into a printable output format

Distribution  A collection of packages and programs (compilers, fonts, and macro packages)

All in all, distributions are an easy way to install what you need to use the engines and the systems you want.
Just like programming, \LaTeX\ documents can be developed just using simple text editors and command lines, or through the GUI front-end editors (IDE): https://en.wikipedia.org/wiki/Comparison_of_TeX_editors

For direct source editing, I personally recommend TeXstudio. There are also WYSIWYG and WYSIWYM editors.
\LaTeX\ needs to know the type of document the author wants to create:

- article
- IEEEtran
- report
- letter
- beamer (presentations)
- and many customized classes, eg., thesis
No matter what document class is selected, the \LaTeX files share the same structure:

\documentclass{...} \% Preamble
\usepackage{...}

\begin{document}
\title{...} \% Top Matter
\author{...}
\date{...}
\maketitle
...
\% Abstract, TOC, Sections, Bibliography, etc.
\end{document}
Within the Global Structure above, frames can be inserted after the Top Matter and before \end{document}:

\begin{frame}{First Frame}
  Hello, world!
\end{frame}

\begin{frame}{Second Frame}
  A very important point
\end{frame}
Within the Global Structure, sections can be inserted after the Top Matter and before \end{document}:

\section{...}
This section’s content...

\subsection{...}
This subsection’s content...

\subsubsection{...}
This subsubsection’s content...

\LaTeX{} takes care of the numbering of all sections automatically.
Elements

Line break One line paragraph.\

Quotes `quote´ \(\Rightarrow\) ‘quote’
``quote´´ \(\Rightarrow\) “quote”
``quote” \(\Rightarrow\) “quote”

Ellipsis \ldots \(\Rightarrow\) …

Italic \textbf{Sample} \(\Rightarrow\) Sample

Bold \textbf{Sample} \(\Rightarrow\) Sample

Tiny size \{\textit{Sample}\} \(\Rightarrow\) Sample

Normal size \{\textbf{Sample}\} \(\Rightarrow\) Sample

Huge size \{\huge Sample\} \(\Rightarrow\) Sample
Lists

List structures come in three types:

▶ itemize: a bullet list
▶ enumerate: an enumerated list
▶ description: a descriptive list

\begin{itemize}
\item Item A
\item Item B
\end{itemize}

\begin{enumerate}
\item First item
\item Second item
\end{enumerate}

\begin{description}
\item [Ant] Ants are tiny
\item [Whale] Whales are huge
\end{description}

Item A
Item B

1 First item
2 Second item

Ant  Ants are tiny
Elephant  Elephants are huge
Creating a footnote is easy.\footnote{An example footnote.}

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\url{https://en.wikibooks.org/wiki/LaTeX}
\href{https://en.wikibooks.org/wiki/LaTeX}{Wikibooks LaTeX}

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Wikibooks LaTeX

\footnote{An example footnote.}
\usepackage{graphicx}

\begin{figure}
\centering
\includegraphics[width=0.5\textwidth]{figures/OpenCV.png}
\caption{OpenCV logo.}
\end{figure}

Figure 1: OpenCV logo.
Subfigures

```latex
\usepackage{graphicx}
\usepackage{caption}
\usepackage{subcaption}

\begin{figure}
  \centering
  \begin{subfigure}[h]{0.4\textwidth}
    \includegraphics[width=\textwidth]{object1.png}
    \caption{This is Object 1.}
    \label{fig:obj1}
  \end{subfigure} ~ % add desired spacing between images
  \begin{subfigure}[h]{0.4\textwidth}
    \includegraphics[width=\textwidth]{object2.jpg}
    \caption{This is Object 2.}
    \label{fig:obj2}
  \end{subfigure}
  \caption{Here are two objects.}
  \label{fig:objs}
\end{figure}
```
\section{Greetings} \label{sec:greetings}
Hello!

\section{Referencing}
I greeted in Section \ref{sec:greetings}, and I also showed Object 2 in Figure \ref{fig:obj2}.
\begin{tabular}{ | l | c | r | }
  \hline
  1 & 2 & 3 \\
  \hline
  4 & 5 & 6 \\
  \hline
  7 & 8 & 9 \\
  \hline
\end{tabular}

- \textbf{l}: left-justified column
- \textbf{c}: centered column
- \textbf{r}: right justified column
- \textbf{|}: vertical line
- \textbf{\hline}: horizontal line

<table>
<thead>
<tr>
<th></th>
<th>One</th>
<th>Two</th>
<th>Three</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four</td>
<td>Five</td>
<td>Six</td>
<td></td>
</tr>
<tr>
<td>Seven</td>
<td>Eight</td>
<td>Nine</td>
<td></td>
</tr>
</tbody>
</table>
There are two ways to show math contents:

- **text**: text formulas are displayed inline
  \[(...\), or $...$

- **displayed**: displayed formulas are separate from the main text
  \[[...\], or \begin{equation}...\end{equation}

See the Math sections of the WikiBooks for details on displaying math symbols, Greek letters, operators, powers, fractions, integrals, etc.
\usepackage{algorithmic}
\begin{algorithmic}
\IF {$i \geq maxval$}
\STATE $i \gets 0$
\ELSE
\IF {$i+k \leq maxval$}
\STATE $i \gets i+k$
\ENDIF
\ENDIF
\WHILE{condition}
\STATE stuff
\ENDWHILE
\end{algorithmic}
This single line directly displays the code from an external C file!

```c
#include <stdio.h>
#define N 10
/* Comment */
int main()
{
    int i;
    // Line comment.
    puts("Hello world!");
    for (i = 0; i < N; i++)
    {
        puts("LaTeX is also great for programmers!");
    }
    return 0;
}
```
This way, the space of this very slide is divided into 60% for the left part and 40% for the right part.
Using a standard \LaTeX document class, like article, you can simply pass the optional argument `twocolumn` to the document class, e.g., `\documentclass[twocolumn]{article}`.

Another method is to use the `multicol` package:

```latex
\usepackage{multicol}
\begin{multicols}{3}
  lots of text
\end{multicols}
```
One way to attach the references after the text and just before the \end{document} command is to use the built-in thebibliography environment:

\begin{thebibliography}{7}
\bibitem{lamport94}
Leslie Lamport,
\textit{LaTeX: a document preparation system},
\end{thebibliography}


The parameter after the \begin{thebibliography} command tells \LaTeX{} to reserve the width of the parameter itself for all the entries. Here is an example:

It is the width of the parameter that matters.
To cite a given document, just insert the citation key in the text:

LaTeX \cite{lamport94} has some advantages and disadvantages in comparison with LibreOffice Writer or Microsoft Word.

LaTeX [1] has some advantages and disadvantages in comparison with LibreOffice Writer or Microsoft Word.
A BibTeX database is stored as a .bib file. It is a plain text file, and so can be viewed and edited easily. An example of a BibTeX entry is like:

```biblatex
title = "The \{C\}omprehesive \{T\}ex \{A\}rchive \{N\}etwork (\{CTAN\})",
```

Each entry begins with the declaration of the reference type, in the form of `@type`. 
To include the BibTeX entries, place the following commands before `\end{document}`:

```
\bibliographystyle {plain}
\bibliography {db1.bib,db2.bib,db3.bib}
```

- Note the lack of whitespace between the commas and the next bib file.
- A commonly used bibliography style for papers is IEEEtran.
A minimal working example for slides is in the Example_slides folder.

The Example_papers folder includes the IEEE LaTeX and BibTeX templates. You can start with the bare_conf.tex file. There are lots of great comments in these templates. They are also available at https://www.ieee.org/conferences_events/conferences/publishing/templates.html

The GUI LaTeX editors like TeXstudio provide template wizards for various document types.