

# ADVANCED L<sup>A</sup>T<sub>E</sub>X WORKSHOP



*Organized by,*  
Industrial Power Group  
in association with IEEE PES NITC chapter



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- A document preparation system -

- A document preparation system - pronounced as lay-tek

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- It is a markup and programming language created by Donald Knuth to typeset documents attractively and consistently.
- L<sup>A</sup>T<sub>E</sub>X is a high-quality typesetting system; it includes features designed for the production of technical and scientific documentation [1].
  - Automatic numbering of chapters, sections, theorems, equations ... etc
  - Table of contents, List of figures, List of Tables ... etc
  - Facilities for cross-referencing.
  - Bibliography Management.
  - Index
- L<sup>A</sup>T<sub>E</sub>X is available as free software.

- MikTeX
- L<sup>A</sup>T<sub>E</sub>X Editors
  - Texmaker
  - TeXnicCenter
- Ghostscript - for displaying or printing of document pages, and the conversion between PostScript and PDF files.

# Required Components of a L<sup>A</sup>T<sub>E</sub>X Document

Every L<sup>A</sup>T<sub>E</sub>X document must contain the following three components [2].

① `\documentclass { class }`

② `\begin { document }`

③ `\end { document }`

Everything else is optional (even text).

- `\documentclass{article}`

- what kind of document it is to process

- article
- report
- letter
- beamer
- IEEEtran

- Example

- `\documentclass[12pt]{article}`

- `\documentclass[12pt, twocolumn]{article}`

- This command must appear at the very beginning of your  $\text{\LaTeX}$  document, before any other  $\text{\LaTeX}$  commands, or you will get an error message.

- `\begin{document}`

`\end{document}`

- The body of the document, where you include all of your text, must occur between these commands
- If you have commands for L<sup>A</sup>T<sub>E</sub>X that will affect the whole document, you should include them in the preamble, which is the space between the `documentclass` and `begin{document}` commands is called.

- ```
\documentclass[a4paper,11pt,twocolumn]{article}
\usepackage{amsmath,graphicx}
\begin{document}
\end{document}
```



# Error Messages

- A common error is not to close braces for a command.
- Another one that occurs frequently is to use math commands outside of math mode [2].

# Open the file rpt.tex

C:\Users\... \Documents\... \rpt.tex

```
%%
[;] m_pu-2.t *
[QOCU *
~OfceOCU*
[;]Intro.t *
[;] nol_...mo".u *
[Qmogo_...p.t *
~bit_PL""t * [;]
~Log_m.t *
[QOO.k_opo_nio05*
~lm_...t_...no'm5.t *
~ bl_...
~ HMM ...trig5_...t...
[Q mypU-1c.1io05*
```

- 1 Titlepage
- 2 Acknowledgement
- 3 Abstract
- 4 Table of Contents
- 5 List of Figures
- 6 List of Tables
- 7 Chapters

# Text Formatting

## 1 Centering Text

```
\begin{center}
```

```
\end{center}
```

## 2 Bold

```
\textbf{Hello}
```

• Hello

## 3 Italics

```
\textit{Hello}
```

• Hello

## 4 Underline

```
\underline{Hello}
```

• Hello

# Font Sizes [3]

- `\tiny {Hello}`

- Hello

- `\scriptsize {Hello}`

- Hello

- `\footnotesize {Hello}`

- Hello

- `\small {Hello}`

- Hello

- `\normalsize {Hello}`

- Hello

- `\large {Hello}`

- Hello

## Font Sizes ... contd.

- `\Large { Hello }`

- Hello

- `\LARGE { Hello }`

- Hello

- `\huge { Hello }`

- Hello

- `\Huge { Hello }`

- Hell

## Bulleted Lists [2]

- `\begin{itemize}`  
`\item {Apple}`  
`\item {Mango}`  
`\end{itemize}`
- Apple
- Mango

- A bulleted item.
- Another bulleted item.
  - A nested bulleted item.
- You get the idea.



- A bulleted item.
- Another bulleted item.
  - A nested bulleted item.
- You get the idea.

```
\begin{itemize}
\item {A bulleted item.}
\item {Another bulleted item.}
\begin{itemize}
\item A nested bulleted item.
\end{itemize}}
\item {You get the idea.}
\end{itemize}
```

# Numbered Lists [2]

```
\begin{enumerate}  
  \item {Apple}  
  \item {Mango}  
\end{enumerate}
```

- 1 Apple
- 2 Mango

- 1 A numbered item.
- 2 Another numbered item.
  - 1 A nested numbered item.
- 3 You get the idea.

- ① A numbered item.
- ② Another numbered item.
  - ① A nested numbered item.
- ③ You get the idea.

```
\begin{enumerate}  
\item {A numbered item.}  
\item {Another numbered item.}  
\begin{enumerate}  
\item {A nested numbered item.}  
\end{enumerate}}  
\item {You get the idea.}  
\end{enumerate}
```

- ① A numbered item.
- ② Another numbered item.
  - ④ First nested bulleted item.
  - ④ Second nested bulleted item.
- ③ You get the idea.

- ① A numbered item.
- ② Another numbered item.
  - First nested bulleted item.
  - Second nested bulleted item.
- ③ You get the idea.

```
\begin{enumerate}  
\item {A numbered item.}  
\item {Another numbered item.}  
\begin{itemize}  
\item {First nested bulleted item.}  
\item {Second nested bulleted item.}  
\end{itemize}  
\item {You get the idea.}  
\end{enumerate}
```

# Including Graphics in Your Document

- bmp
- eps
- gif
- jpg
- pdf
- ps

L<sup>A</sup>T<sub>E</sub>X works best with the postscript formats (eps, ps) [2]

- Add graphics Package in the preamble

```
\usepackage{graphicx}
```

# Including Graphics Within Your Document

```
\begin{figure}[htp]  
\begin{center}  
\includegraphics[scale=0.3]{acc_cur.jpg}  
\caption{Accuracy Curve}  
\label{ac}  
\end{center}  
\end{figure}
```

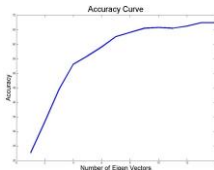


Figure 2: Accuracy Curve



As shown in Fig.2

- As shown in Fig.\ref{ac}



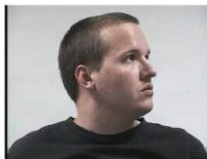
(a) Caption 1



(b) Caption 2



(c) Caption 3



(d) Caption 4

Figure 3: Figure Caption

```
\begin{figure}[htp]
\begin{center}
\subfigure[Caption 1]{\label{avgo1}\includegraphics[scale=0.2]{in_75.jpg}}
\subfigure[Caption 2]{\label{avgo2}\includegraphics[scale=0.2]{in_100.jpg}} \\
\subfigure[Caption 3]{\label{avgo3}\includegraphics[scale=0.2]{in_125.jpg}}
\subfigure[Caption 4]{\label{avgo4}\includegraphics[scale=0.2]{in_150.jpg}}
\end{center}
\caption{Figure Caption}
\label{avgfo}
\end{figure}
```

## • LaTeX Draw

```
\begin{ table }  
  table  
\end{ table }
```

# Example

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 7 | 8 | 9 |

Table 1: Caption

```
\begin{table}
\begin{tabular}{lcr}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9 \\
\end{tabular}
\caption{Caption}
\label{ex}
\end{table}
```

# Example

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 7 | 8 | 9 |

Table 2: Caption

```
\begin{table}
\begin{tabular}{|l| c || r| }
\hline
 1 & 2 & 3 \\
\hline
 4 & 5 & 6 \\
 7 & 8 & 9 \\
\hline
\end{tabular}
\caption{Caption}
\label{ex}
\end{table}
```

|   |   |   |
|---|---|---|
| 1 | 2 | 3 |
| 4 | 5 | 6 |
| 7 | 8 | 9 |

```

\begin{table}
  \begin{tabular}{|l|c|r|}
    \hline
    1 & 2 & 3 \\
    \cline{1-2}
    4 & 5 & 6 \\
    \cline{2-3}
    7 & 8 & 9 \\
    \hline
  \end{tabular}
\end{table}

```

`\cline{i-j}` - partial horizontal line beginning in column *i* and ending in column *j*

# Rows spanning multiple columns

```
\multicolumn{ ' numcols ' }{ ' alignment ' }{ ' contents ' }
```

- numcols - is the number of subsequent columns to merge
- alignment - l, c or r
- contents - is simply the actual data you want to be contained within that cell [4].



| Team sheet |                 |
|------------|-----------------|
| GK         | Paul Robinson   |
| LB         | Lucus Radebe    |
| DC         | Michael Duberry |
| DC         | Dominic Matteo  |
| RB         | Didier Domi     |
| MC         | David Batty     |

```

\begin{ table }
\begin{ tabular } { | l | l | }
\hline
\multicolumn { 2 } { | c | } { Team sheet } \\
\hline
GK & Paul Robinson \\
LB & Lucus Radebe \\
DC & Michael Duberry \\
DC & Dominic Matteo \\
RB & Didier Domi \\
MC & David Batty \\
\hline
\end{ tabular }
\end{ table }

```

## • Equations [5]

$$a = \frac{b}{c} \tag{1}$$

```
\begin{equation}  
a = \frac{b}{c}  
\label{te}  
\end{equation}
```

- Equations [5]

$$a = \frac{b}{c} \tag{1}$$

```
\begin{equation}
a = \frac{b}{c}
\label{te}
\end{equation}
```

$$a = \frac{b}{c}$$

```
$$
a = \frac{b}{c}
$$
```

$$\frac{\frac{1}{x} + \frac{1}{y}}{y - z} \quad (2)$$

```
\begin{equation}
\frac{\frac{1}{x} + \frac{1}{y}}{y - z}
\end{equation}
```

$$\frac{\frac{1}{x} + \frac{1}{y}}{y - z} \quad (2)$$

```
\begin{equation}
\frac{\frac{1}{x} + \frac{1}{y}}{y - z}
\end{equation}
```

$$\sqrt{\frac{a}{b}} \quad (3)$$

```
\begin{equation}
\sqrt{\frac{a}{b}}
\end{equation}
```

# Multi-line Equations

$$\begin{aligned}\cos 2\theta &= \cos^2 \theta - \sin^2 \theta \\ &= 2 \cos^2 \theta - 1.\end{aligned}$$

```
\begin{eqnarray*}
\cos 2\theta & = & \cos^2 \theta - \sin^2 \theta & \theta & \\
& = & 2 \cos^2 \theta - & & 1.
\end{eqnarray*}
```

# Multi-line Equations

$$\begin{aligned}\cos 2\theta &= \cos^2 \theta - \sin^2 \theta \\ &= 2 \cos^2 \theta - 1.\end{aligned}$$

```
\begin{eqnarray*}
\cos 2\theta &=& \cos^2 \theta - \sin^2 \theta && \\
&=& 2 \cos^2 \theta - 1. && \\\end{eqnarray*}
```

$$f(n) = \begin{cases} n/2, & \text{if } n \text{ is even} \\ 3n+1, & \text{if } n \text{ is odd} \end{cases} \quad (4)$$

```
\begin{equation}
f(n) = \begin{cases}
n/2, & \mbox{if } n \mbox{ is even} \\
3n+1, & \mbox{if } n \mbox{ is odd}
\end{cases} \\
\end{equation}
```

$$\begin{matrix} x & y \\ z & v \end{matrix} \quad (5)$$

```
\begin{equation}
\begin{matrix}
x & y \\
z & v
\end{matrix}
\end{equation}
```



$$\begin{matrix} x \\ z \end{matrix} \quad \begin{matrix} y \\ v \end{matrix} \quad (6)$$

```
\begin{equation}
\begin{bmatrix}
x & y \\
z & v
\end{bmatrix}
\end{equation}
```

$$\begin{matrix} x \\ z \end{matrix} \quad \begin{matrix} y \\ v \end{matrix} \quad (7)$$

```
\begin{equation}
\begin{pmatrix}
x & y \\
z & v
\end{pmatrix}
\end{equation}
```

$$\begin{matrix}
 \square & & \square \\
 0 & \cdots & 0 \\
 \square & \vdots & \square \\
 \square & \ddots & \square \\
 0 & \cdots & 0 \\
 & \vdots &
 \end{matrix} \tag{8}$$

```

\begin{equation}
\begin{bmatrix}
0 & \cdots & 0 \\
\vdots & \ddots & \vdots \\
0 & \cdots & 0
\end{bmatrix}
\end{equation}

```

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \times \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} \quad (9)$$

```
\left[ \begin{array}{c} x_1 \\ x_2 \end{array} \right] =
\begin{bmatrix} A & B \\ C & D \end{bmatrix}
\times
\left[ \begin{array}{c} y_1 \\ y_2 \end{array} \right]
```

## • BibTeX

- Create a plain text file and save it as .bib extension.
- Cite the appropriate reference with the tag.
- Google Scholar is the best and the powerful tool for getting references.

```
\bibliographystyle { IEEEtran }  
\bibliography { bib_file }
```

## • Compile

- latex filename.tex (2 times)
- bibtex filename (2 - 3 times)
- latex filename.tex (2 times)

## • MakeIndex [6]







- MakeIndex is a program for making an index in a document generated with  $\text{\LaTeX}$
- Use the `makeidx` package in the preamble.
- Put `\makeindex` command in the preamble.
- Put `\printindex` command where you want the index to appear – usually at the end, right before the `\end{document}` command.
- `\index{}` command causes to write an index entry.

## • Compile

- `latex filename.tex` (2 times)
- `bibtex filename` (2 - 3 times)
- `latex filename.tex` (2 times)
- `makeindex filename` (2 - 3 times)
- `latex filename.tex` (2 times)

- Report
- IEEE Paper
- Beamer
- Resume

# References

-  “Latex,” 2010. [Online]. Available: <http://www.latex-project.org/>
-  J. Clark, “Latex tutorial,” 2002.
-  “Latex: Changing the font size,” 2013. [Online]. Available: <https://engineering.purdue.edu/ECN/Support/KB/Docs/LaTeXChangingTheFont>
-  “Latex/tables,” 2013. [Online]. Available: <http://en.wikibooks.org/wiki/LaTeX/Tables>
-  “Latex/mathematics,” 2013. [Online]. Available: <http://en.wikibooks.org/wiki/LaTeX/Mathematics>
-  L. Lamport, “Makeindex: An index processor for latex.”



# Thank You