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Introduction to LaTeX

Missouri University of Science and Technology

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Introduction to LaTeX

- What is LaTeX?
- Why to use LaTeX?
- LaTeX Samples
- Basics of LaTeX
- LaTeX Help!



What is LaTeX?

- TeX = programming language by D. Knuth (1977)
- LaTeX = macro package based on TeX by L. Lamport (1985)
- Purpose of LaTeX = simplify typesetting of TeX
- by using pre-built macros
- Philosophy of LaTeX: WYSIWYM
- (What you see is what you mean)

Why to use LaTeX?

- Extremely stable for running on different kinds of computers
- Known to be bug free
- High learning curve
- LaTeX takes care of the formatting → supportive for writing a thesis or a scientific paper
- Mathematical formulas are automatically formatted → consistent outline
- LaTeX can be downloaded for free in the web
- <http://www.howtotex.com/howto/installing-latex-on-windows/>

Why to use LaTeX?

LaTeX vs Word

LaTeX

- WYSIWYM
- Free software
- Automatic formatting
- Initial investment of time
- High compatibility
- Scientific features available

Word

- WYSIWYG
- Purchase costs
- Formatting by user
- For simple documents, no time investment required
- Low compatibility
- Packages for additional features → costs

Learning Reference: http://openwetware.org/wiki/Word_vs._LaTeX

Why to use LaTeX?

Advantages & Disadvantages

Advantages

- No Layout issues
- → Focus on Content
- No manual adjustment of text sizes, heights etc.
- Document structure visible to user
- Consistency throughout
- Footnotes, Citations, Bibliography, Index are easily generated

Disadvantages

- Output not visible
- Knowledge of commands necessary
- Limited flexibility in formatting
→ Solution: Create own macros

Learning Reference: <http://www.ctan.org/>

LaTeX Samples

- Academic Use:
 - Master's-Thesis
 - Conference-Abstract
 - Conference-Presentation
 - Solution Manual
- Daily Use:
 - Homework
 - Lecture Summary
 - Quizzes

Basics of LaTeX

Learning Reference: 'A Guide to LaTeX', H. Kopka&P.W.Daly, 3rd edition

- Structure of LaTeX file: „preamble“ + „body“
- Preamble:
 - Documentclass: book, report, article, letter, beamer (for presentation)
 - `\documentclass[options]{class}`
 - Packages: add extra features by including packages (e.g. mathematical environment)
 - `\usepackage{package}`
 - Style Options: Specific Page Set-Up
 - (e.g. `\pagestyle{style}`, `\pagenumbering{num_style}`)

Basics of LaTeX

Learning by Doing!

- Body:
 - Content of the document
 - Structure commands:
 - `\section{...}`, `\subsection{...}`, `\section*{...}`
 - `\footnote{...}`
 - `\cite{.....}`
 - `\setcounter{...}`
 - `\maketitle`
 - `\appendix`
 - `\tableofcontents`

Basics of LaTeX

Learning by Doing!

- Writing in LaTeX:
 - text is entered in LaTeX as text
 - Comments: %....., Math: \$...\$
 - Textsize: `\begin{large}`, `\end{large}`
 - Structure: `\begin{center}`, `\end{center}`
 - End line: `\\`, `\newline`, `\newpage`
 - Space: `\vspace{5mm}`, `\hspace{10mm}`
 - Characters: `\$`, `\&`, `\{ \}`, `\%`, `\^`, `\~`, `_`
 - `\underline{....}`, `\emph{....}`

Basics of LaTeX

Learning by Doing!

- Writing in LaTeX, A Sample:

```
\begin{center}
```

```
Hello\\
```

```
\underline{MST} \emph{students}
```

```
\end{center}
```

```
I love \begin{large} LaTeX \end{large} $100$ \% \footnote{based  
on a $100$ percent scale}. \\
```

```
%believe it or not :)
```

Basics of LaTeX

Learning by Doing!

- Mathematical Environment:
 - `\begin{proof}`, `\end{proof}`
 - `\begin{theorem}`, `\end{theorem}`
 - `\begin{equation}`, `\end{equation}`
 - `\label{..}`, `\eqref{..}`
 - `\begin{align*}`, `\end{align*}`
 - `\begin{itemize}`, `\item[a]`, `\end{itemize}`
 - `\begin{enumerate}`, `\item`, `\end{enumerate}`
 - `\begin{multline*}`, `\end{mutline*}`

Basics of LaTeX

Learning by Doing!

- **Mathematical Environment: A Sample**

The mathematical formula from pythagoras states

```
\begin{equation}\label{Pyth}
```

$$a^2+b^2=c^2.$$

```
\end{equation}
```

In `\eqref{Pyth}`

```
\begin{itemize}
```

```
\item  $c$  = length of the hypotenuse
```

```
\item  $a$ ,  $b$  = lengths of the other sides
```

```
\end{itemize}
```

Basics of LaTeX

Learning by Doing!

- Mathematical Environment: A Sample
- `\begin{align*}`
- $y_{\{k\}} \&=x_{\{k\}}-z_{\{k\}}, \\\$
- $\&=x_{\{k+\omega\}}-z_{\{k+\omega\}}. \\\$
- `\end{align*}`
- `\begin{multline*}`
- $i+j+k+l+m+n \\\$
- $+o+p+q+r+s+t$
- `\end{multline*}`

Basics of LaTeX

Learning by Doing!

Tables in LaTeX:

- `\begin{array}[pos]{cols}, \end{array}`
- `\begin{tabular}[pos]{cols}, \end{tabular}`
- `\begin{tabular}{|1|1|1|p{5cm}|} \hline`
- Form of the roots & Form of solution y_{i} & m.g.s. $y(t)$ `\hline`
- $r_{1}, r_{2} \in \mathcal{R}, r_{1} \neq r_{2}$ & $y_{1}=e^{r_{1}t}, y_{2}=e^{r_{2}t}$ & $y(t)=c_{1}y_{1}+c_{2}y_{2}$ `\hline`
- $r_{1}=r_{2} \in \mathcal{R}$ & $y_{1}=e^{r_{1}t}, y_{2}=te^{r_{1}t}$ & $y(t)=(c_{1}+c_{2}t)e^{r_{1}t}$ `\hline`
- $r_{1/2}=\lambda \pm i\mu$ & $y_{1}=e^{\lambda t}\cos(\mu t), y_{2}=e^{\lambda t}\sin(\mu t)$ & $y_{t}=e^{\lambda t}(c_{1}\cos(\mu t)+c_{2}\sin(\mu t))$ `\hline`

`\end{tabular}`

Basics of LaTeX

Learning by Doing!

Graphics in LaTeX:

- Importing external graphics
 - Rescale
 - Rotate
 - Reflecting
- Create Pictures
 - Mathematical structures
 - Drawing (rounded corners)

Basics of LaTeX

Learning by Doing!

SAMPLE-Import external graphics

- `\usepackage{graphicx}`
- `\setlength{\unitlength}{0.8cm}`
- `\begin{picture}(10,10)`
- `\put(0,0){\includegraphics[`
- `width=10cm,height=10cm]{bild3.pdf} }`
- `\end{picture}`

Basics of LaTeX

Learning by Doing!

SAMPLE-Create Pictures

- `\usepackage{graphicx}`
- `\setlength{\unitlength}{0.8cm}`
- `\begin{picture}(20,20)`
- `\put(10,10){\vector(1,0){10}}`
- `\put(10,10){\circle{5}}`
- `\end{picture}`

Basics of LaTeX

Learning by Doing!

Presentations with LaTeX (Beamer class)

- `\title{...}`
- `\section{...}`, `\subsection{....}`
- `\begin{frame}`, `\end{frame}`
- `\frametitle{...}`
- `\begin{block}`, `\end{block}`
- `\transduration{.}`

Learning Reference: `\includepdf`: http://www.math.utah.edu/~smith/AmberSmith_GSAC_Beamer.pdf

<http://www.informatik.uni-freiburg.de/~frank/ENG/latex-course/latex-course-3/latex-course-3>

LaTeX Help

- Wikibooks: LaTeX Introduction
- <http://en.wikibooks.org/wiki/LaTeX>
- Harvard University
- <http://www.math.harvard.edu/texman/>
- LaTeX manual (pdf)
- <http://www.maths.tcd.ie/~dwilkins/LaTeXPrimer/GSWLaTeX.pdf>
- Youtube tutorials (step by step)

Thank you for your attention!

If you have any **questions**

I'll be more than happy
to answer them.

