Hands-on Workshop
LaTeX

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What is LaTeX?

- **LaTeX** pronounced as **Lah-Tech** (not Lay-Tax)
- TeX = program designed by Donald Knuth in 1979
- TeX => derived from Greek root tex (= technology)
- Not WYSIWYG like Word
- **Excellent for writing documents with lots of mathematics**

Why LaTeX?

$f'_{act}(x) = f_{act}(x)(1 - f_{act}(x))$ is required in the training procedure to modify the weight w_{ij}. In each iteration, delta rule is used to update the weights by computing the required change as follows:

$$\Delta w_{ij} = \eta \, \delta_j \, z_i \qquad (5)$$

$$\delta_j = \begin{cases} f'_{act}(net_j)(t_j - z_j) & \text{if } j \text{ is output unit} \\ f'_{act}(net_j) \sum_k \delta_k w_{kj} & \text{if } j \text{ is hidden unit} \end{cases} \qquad (6)$$

where η= learning factor (constant)

MS Word

The derivative of sigmoid activation function $f'_{act}(x) = f_{act}(x)(1 - f_{act}(x))$ is required in the training procedure to modify the weights w_{ij}. In each iteration, delta rule is used to update the weights by computing the required change Δw_{ij} as follows:

$$\Delta w_{ij} = \eta \, \delta_j \, x_i \qquad (6)$$

$$\delta_j = \begin{cases} f'_{act}(net_j)\,(t_j - zj) & \text{if unit } j \text{ is an output unit} \\ f'_{act}(net_j)\,\sum_k \delta_k \, w_{kj} & \text{if unit } j \text{ is a hidden unit} \end{cases} \qquad (7)$$

where

η = learning factor (constant)

LaTeX

1) Consider the cover image as I with 8 bpp grayscale of width I_w and height I_h, $0 \le I(i,j) \le 255$, $0 \le i < I_w$ and $0 \le j < I_h$. A binary digit watermark image is represented as W of width W_w and height W_h, $W(i,j) \in (0,1)$, $0 \le i < W_w$ and $0 \le j < W_h$.

1) Consider the cover image as I with 8 bpp grayscale of width I_w and height I_h, $0 \le I(i,j) \le 255$ where $0 \le i < I_w$ and $0 \le j < I_h$. A binary valued watermark image is represented as W of width W_w and height W_h, $W(i,j) \in (0,1)$ where $0 \le i < W_w$ and $0 \le j < W_h$.

Why LaTeX? (contd.)

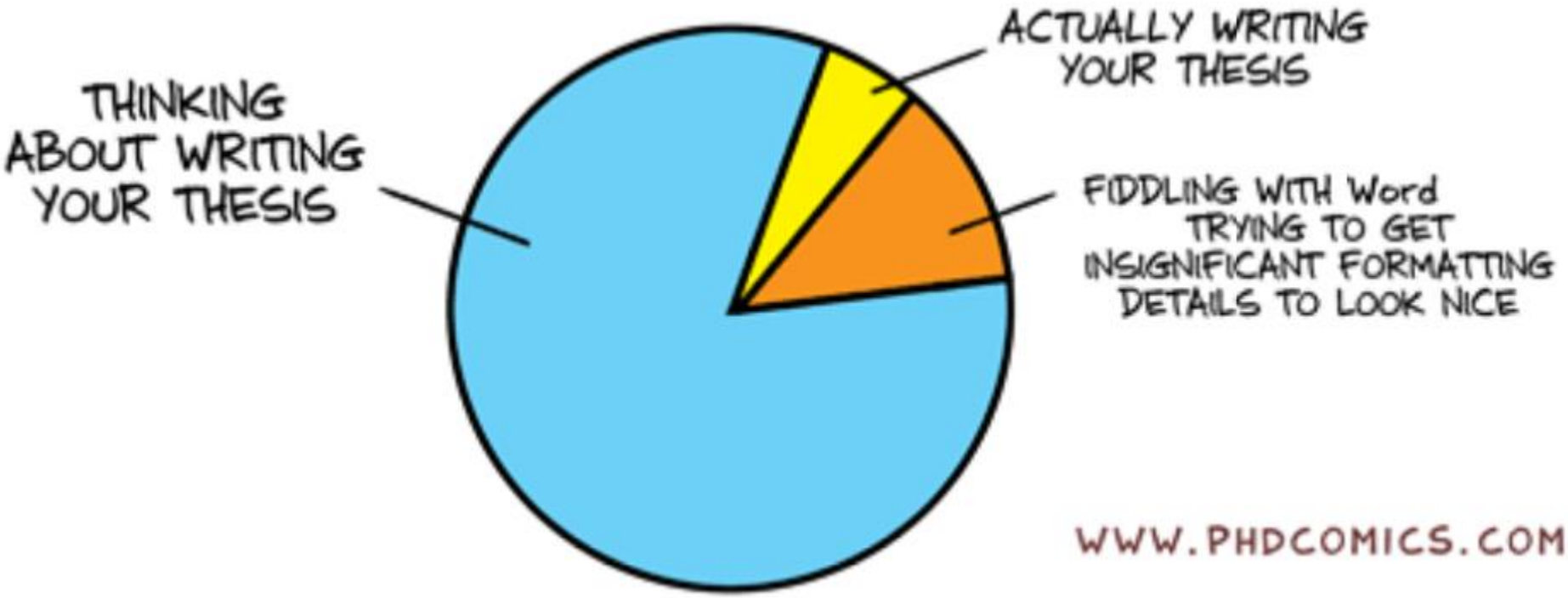
- Word:

$$\iiint_G \left[u\nabla^2 v + (\nabla u, \nabla v)\right] d^3V = \iint_S \left(u\frac{\partial v}{\partial n} + v\frac{\partial u}{\partial n}\right) d^2A$$

- LaTeX:

$$\iiint_G \left[u\nabla^2 v - v\nabla^2 u\right] d^3V = \oiint_S \left(u\frac{\partial v}{\partial n} - v\frac{\partial u}{\partial n}\right) d^2A$$

Why LaTeX? (contd.)



Why LaTeX? (contd.)

"Laws" on Microsoft Word:

- Likelihood of a crash is directly proportional to the importance of a document.
- Likelihood of a crash is inversely proportional to the time left before its deadline.
- Likelihood of a crash is directly proportional to the duration since you last saved.

Why LaTeX? (contd.)

- It looks Awesome & Professional straight away!
- **Free & Open Source**
- Page Setting: automatic styles/templates
- Easy to type **mathematical equations**
- Handles tables, bibliography, pictures, table of contents **perfectly & automagically**
- Customizable
- **Focus only on content, LaTeX takes care of layout and formatting!**

How to install LaTeX?

- MikTex distribution www.miktex.org
- Free LaTeX library and executables

How to install LaTeX?

- TexNic Center www.texniccenter.org
- Free IDE for MikTex
- Easy-to-use editor and compiler

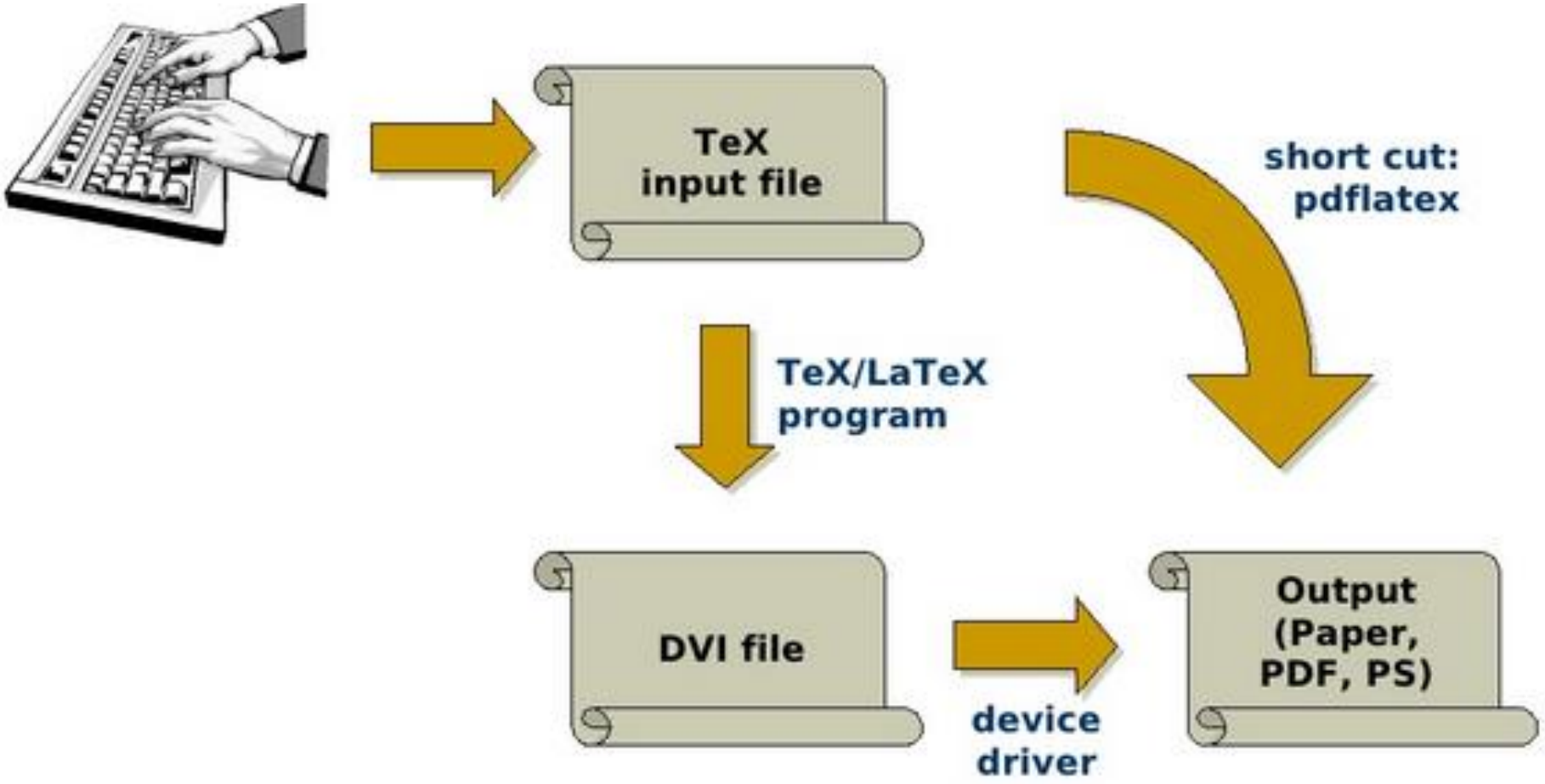
How to install LaTeX?

- Texmaker http://www.xm1math.net/texmaker/
- Free IDE for MikTex
- Easy-to-use editor and compiler

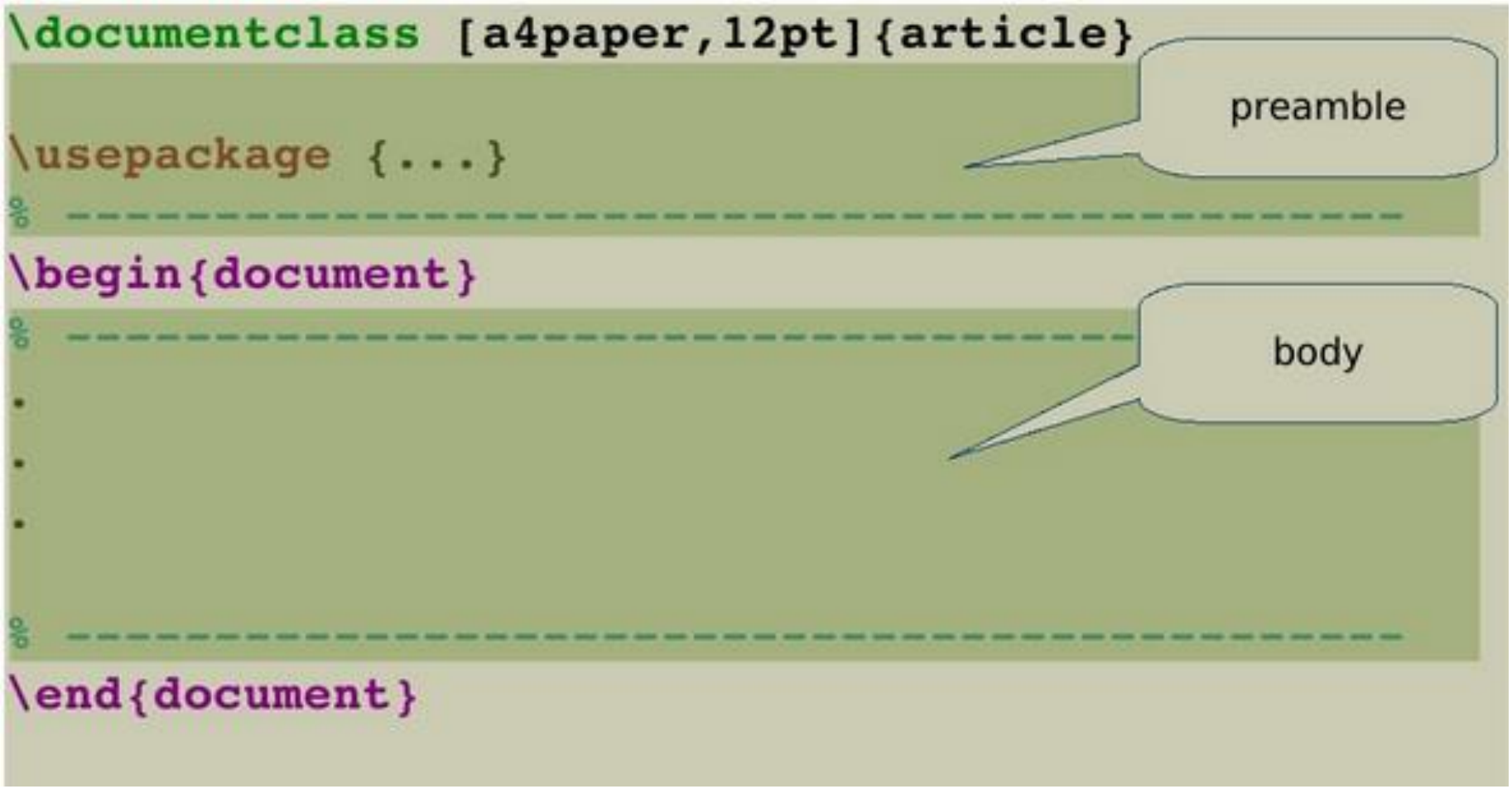
File types in LaTeX

- **Source files**: *.tex
- Style files: *.sty
- System file: *.aux
- **Output file**: *.pdf (or *.dvi or *.ps)

LaTeX Steps


TeX
input file
short cut:
pdflatex
TeX/LaTeX
program
DVI file
device
driver
Output
(Paper,
PDF, PS)

LaTeX Document Structure



Getting Started

- Create a plain text file “myfile1.tex”

```
1 \documentclass{article}
2
3 \begin{document}
4 Small is beautiful.
5 \end{document}
6
```

- Compile and view the PDF “myfile1.pdf”

- Change line 4 to:

This is a simple way to learn \LaTeX.

Document Classes

class	*purpose*
`article`	papers in scientific journals, short tutorials, etc.
`report`	rather long texts, master theses, etc.
`book`	actual books
`letter`	letters
`slides`	transparencies

Class Options

class option	*purpose*
`11pt`	specifies an eleven-point type size, which is 10% larger than the default ten-point type size.
`12pt`	specifies an twelve-point type size.
`twocolumn`	produces two-column output.
`a4paper`	generates an A4 page layout.
`landscape`	uses the landscape orientation, where the longer side of the paper is horizontally oriented.

Ex: Edit the class option in myfile1.tex as

\documentclass[11pt, twocolumn]{article}

Packages

Additional packages must be declared via the `\usepackage` command in the *preamble*, i.e., they must be declared between the `\documentclass` command and `\begin{document}`. Much used packages are listed below:

packages	*purpose*
`a4wide`	produces an A4 page layout with longer lines.
`amssymb`	allows the use of mathematical symbols developed by the American Mathematical Society (AMS).
`babel`	facilitates the use of several languages.
`graphicx`	allows the use of the imported graphics via the extended graphics package.
`color`	allows the use of colors.

Some Useful LaTeX 2_ε Packages.

Example LaTeX File

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

% We have defined the document to be an article using 12 point font.
% Blank lines mean nothing here, in the preamble.

\begin{document}                % Begin document "environment".

\section{This is a Section}
\subsection{This is a subsection}
This is the body of the subsection.
I can move to a new line anytime, and I can put in     lots
of       blanks     with       no        effect.



Skipping four lines is the same as skipping one line
--- it starts a new paragraph.

\subsection{Here is another subsection}
\section{Here is another section}
\end{document}
```

Example LaTeX Output

1 This is a Section

1.1 This is a subsection

This is the body of the subsection. I can move to a new line anytime, and I can put in lots of blanks with no effect.

Skipping four lines is the same as skipping one line — it starts a new paragraph.

1.2 Here is another subsection

2 Here is another section

Font Styles

What you write		How it appears
`This is \textbf{boldface}.`	⇒	This is **boldface**.
`This is \textit{italic}.`	⇒	This is *italic*.
`This is \textrm{roman}.`	⇒	This is roman.
`This is \textsc{small caps}.`	⇒	This is SMALL CAPS.
`This is \textsf{sans serif}.`	⇒	This is sans serif.
`This is \textsl{slanted}.`	⇒	This is *slanted*.
`This is \texttt{typewriter}.`	⇒	This is `typewriter`.

`\textbf{\textit{bolditalic}}` ⇒ ***bolditalic***.

Font Sizes

```
You can make the text {\large large} or {\Large larger} or
even {\LARGE larger still}.  You can also make it {\huge huge}.
You might want to make something {\small small} or
{\footnotesize smaller} or even {\scriptsize smaller still}.
You can make it really {\tiny tiny}.
```

You can make the text large or larger or even larger still. You can also make it huge. You might want to make something small or smaller or even smaller still. You can make it really tiny.

WYMIWYG

Itemize

```
\begin{itemize}
   \item This is item 1 and our task has just begun.  Blank lines
         before an item have no effect.

   \item This is item 2 and we shall limit to just this few.

         A blank line within an item does create a new paragraph,
         using the indentation of the itemize environment.

      \begin{itemize}
         \item A second (nested) itemized list changes the bullet
               and indents another level.
      \end{itemize}
\end{itemize}
```

Itemize

- This is item 1 and our task has just begun. Blank lines before an item have no effect.
- This is item 2 and we shall limit to just this few.

  A blank line within an item does create a new paragraph, using the indentation of the itemize environment.

  – A second (nested) itemized list changes the bullet and indents another level.

Itemize

```
\begin{itemize}[labelitemi]{$\bullet$}
\item First item in the list
\item Second item
\item and so on
\end{itemize}
```

\circ – An open circle
\cdot – A centered dot
\star – A five-pointed star
\ast – A centered asterisk
\rightarrow – A short right-pointing arrow
\diamondsuit – An open diamond

Enumerate

```
\begin{enumerate}
   \item This is item 1, and we are having fun.
   \item This is item 2, and it's time to number anew.
      \begin{enumerate}
         \item Back to item 1, but we are not yet done.
         \item Two is new.
            \begin{enumerate}
               \item One again!
               \item Two (b) or knot 2b?
            \end{enumerate}
      \end{enumerate}
\end{enumerate}
```

Enumerate

1. This is item 1, and we are having fun.
2. This is item 2, and it's time to number anew.
   (a) Back to item 1, but we are not yet done.
   (b) Two is new.
      i. One again!
      ii. Two (b) or knot 2b?

Itemize & Enumerate

```
\begin{itemize}
\item First level, itemize, first item
\begin{itemize}
\item Second level, itemize, first item
\item Second level, itemize, second item
\begin{enumerate}
\item Third level, enumerate, first item
\item Third level, enumerate, second item
\end{enumerate}
\end{itemize}
\item First level, itemize, second item
\end{itemize}
```

- First level, itemize, first item
  - Second level, itemize, first item
  - Second level, itemize, second item
    1. Third level, enumerate, first item
    2. Third level, enumerate, second item
- First level, itemize, second item

Sections

command	*purpose*
`\part`	divides long documents into separate parts.
`\chapter`	starts a new chapter. Only in `report` and `book`, *not* in `article`.
`\section`	starts a new section.
`\subsection`	starts a new subsection.
`\subsubsection`	starts a nested subsection.

Example

This is an unnumbered section.

```
\subsubsection*{Example}
This is an unnumbered section.
```

myfile2.tex

```
 1
 2 \documentclass[a4paper,twocolumn,11pt]{article}
 3
 4 % define the title
 5 \author{Santosh Chapaneri}
 6 \title{Minimalism}
 7
 8 \begin{document}
 9
10 % generates the title
11 \maketitle
12
13 % insert the table of contents
14 \tableofcontents
15
16 \section{Introduction}
17 Here begins the introduction to this article.
18
19 \section{Good Bye World}
20 \ldots{} and here it ends.
21
22 \end{document}
```

myfile2.pdf

Minimalism

Santosh Chapaneri

June 26, 2012

Contents

1 Introduction

Here begins the introduction to this article.

2 Good Bye World

. . . and here it ends.

Exercise (myfile3.tex)

Create a LaTeX document that formats like the text shown

List of mathematical functions:

- Trigonometric functions
  - sine
  - cosine
  - tangent
- Special functions
  - Beta function
  - Gamma function
  - Riemann zeta function

Solution (myfile3.tex)

```
14
15\section{Introduction}
16List of mathematical functions:
17\begin{itemize}
18\item Trigonometric functions
19\begin{itemize}
20\item sine
21\item cosine
22\item tangent
23\end{itemize}
24\item Special functions
25\begin{itemize}
26\item Beta function
27\item Gamma function
28\item Riemann zeta function
29\end{itemize}
30\end{itemize}
31
```

Operation	How it appears	What you write
sum	$\sum$	`\sum`
	$\sum_{i=1}^{n} x_i$	`\sum_{i=1}^n x_i`
integral	$\int$	`\int`
	$\int_a^b f(x)\,dx$	`\int_a^b f(x)\,dx`
parentheses	$()$	`\left( \right)`
	$\left(\frac{x}{1+y}\right)$	`\left(\frac{x}{1+y} \right)`
braces	$\{\}$	`\left\{ \right\}`
	$\left\{\sum_i x_i\right\}$	`\left\{\sum_i x_i \right\}`
brackets	$[]$	`\left[ \right]`
	$\left[\int_0^\infty f(x)\,dx\right]$	`\left[\int_0^\infty f(x)\,dx\right]`

Common Math Commands

command	*example*	*result and explanation*
`^{}`	`x^{2}`	x^2, a superscript.
`_{}`	`x_{2}`	x_2, a subscript.
`\frac{}{}`	`\frac{1}{2}`	$\frac{1}{2}$, a fraction.
`\sqrt{}`	`\sqrt{2}`	$\sqrt{2}$, a square root.
`\sum_{}^{}`	`\sum_{k=1}^{n}k`	$\sum_{k=1}^{n} k$, here a definite sum.
`\int_{}^{}`	`\int_{0}^{1}x\,dx`	$\int_{x=0}^{1} x\,dx$, here a definite integral.
`\lim_{}`	`\lim_{x\to0}e^x`	$\lim_{x\to 0} e^x$, a limit.
`\ln`	`\ln x`	$\ln x$, a differently formatted function
`\cos` and `\pi`	`\cos\pi`	$\cos \pi$, a trigonometric function and a mathematical symbol.
`\infty`	`+\infty`	$+\infty$, the infinity symbol function

Math Operators

```
x_{a+b}^{c+d}
```
$\Rightarrow x_{a+b}^{c+d}$

```
x^{c+d}_{a+b}
```
$\Rightarrow x_{a+b}^{c+d}$

```
A\not\subseteq B
```
$\Rightarrow A \not\subseteq B$

```
x\not\in A\cup B
```
$\Rightarrow x \notin A \cup B$

```
A\setminus B\not\supset B
```
$\Rightarrow A \setminus B \not\supset B$

Math with LaTeX

- `\begin{math} ... \end{math}`: `$ $`

  This places a formula in the running text. Usually, one does not start and end the `math` environment in this way, but instead one uses a shortcut: one only puts a dollar symbol before and after the formula.

- `\begin{displaymath} ... \end{displaymath}`: `\[ \]`

  The mathematical formula is displayed centered on a separate line. Instead of these commands you can also use $$ before and after the formula, or put the formula between \[and \].

- `\begin{equation} ... \end{equation}`:

  The same as `displaymath` except that `equation` numbers the formula.

Math into LaTeX

```
The in-line formula
$\sum_{k=0}^{\infty}a_n$
differs from the displayed formula
\[ \sum_{k=0}^{\infty}a_n \]
```

The in-line formula $\sum_{k=0}^{\infty} a_n$ differs from the displayed formula

$$\sum_{k=0}^{\infty} a_n$$

Math with LaTeX

```
If we take $-1<a<1$, then
\begin{equation}
\int_{0}^{\infty} \frac{u^a}{(1+u)^2}\,du
= a!(-a)!
\label{eqno}
\end{equation}

By contour integration the left-hand side
of (\ref{eqno}) may by shown to be equal
to $\pi a / \sin \pi a$, thus obtaining
the identity
\[
z!(-z)!= \frac{\pi z}{\sin \pi z}\,.
\]
```

If we take $-1 < a < 1$, then

$$\int_0^\infty \frac{u^a}{(1+u)^2}\,du = a!(-a)! \qquad (1)$$

By contour integration the left-hand side of (1) may by shown to be equal to $\pi a / \sin \pi a$, thus obtaining the identity

$$z!(-z)! = \frac{\pi z}{\sin \pi z}\,.$$

More Math

Font Style	Command	Example Result
boldface	\mathbf	$\tilde{\mathbf{A}} \times \vec{\mathbf{1}} \otimes \overline{\mathbf{2}}$
calligraphic	\mathcal	$\tilde{\mathcal{A}} \times \vec{\infty} \otimes \overline{\in}$
italic	\mathit	$\tilde{A} \times \vec{\imath} \otimes \overline{2}$
normal	\mathnormal	$\tilde{A} \times \vec{1} \otimes \overline{2}$
roman	\mathrm	$\tilde{\mathrm{A}} \times \vec{1} \otimes \overline{2}$
sans serif	\mathsf	$\tilde{\mathsf{A}} \times \vec{1} \otimes \overline{2}$
typewriter	\mathtt	$\tilde{\mathtt{A}} \times \vec{1} \otimes \overline{2}$

```
$\mathbf{\tilde A\times\vec{1}\otimes\overline{2} }$
```

$$\Rightarrow \tilde{\mathbf{A}} \times \vec{\mathbf{1}} \otimes \overline{\mathbf{2}}$$

Exercise: myfile4.tex

```
15
16 \section{Preliminaries}\label{sec:Prelim}
17 % Example 1
18 \ldots when Einstein introduced his formula
19 \begin{equation}
20 e = m \cdot c^2 ,
21 \end{equation}
22 which is at the same time the most widely known and the least
23 well understood physical formula.
24 % Example 2
25 \ldots from which follows Kirchhoff's current law:
26 \begin{equation}
27 \sum_{k=1}^{n} I_k = 0.
28 \end{equation}
29 Kirchhoff's voltage law can be derived \ldots
30 % Example 3
31 \ldots which has several advantages.
32 \begin{equation}
33 I_D = I_F - I_R
34 \end{equation}
35 is the core of a very different transistor model. \ldots \\
36
37 It's $-30\,^{\circ}\mathrm{C}$. I will soon start to super-conduct.\\
```

Output: myfile4.pdf

2 Preliminaries

. . . when Einstein introduced his formula

$$e = m \cdot c^2, \tag{1}$$

which is at the same time the most widely known and the least well understood physical formula. . . . from which follows Kirchhoffs current law:

$$\sum_{k=1}^{n} I_k = 0. \tag{2}$$

Kirchhoffs voltage law can be derived . . . . . which has several advantages.

$$I_D = I_F - I_R \tag{3}$$

is the core of a very different transistor model. . . .

Its −30 °C. I will soon start to super-conduct.

Exercise: myfile5.tex

```
51 \section{More stuff}
52 Add $a$ squared and $b$ squared to get $c$ squared.
53 Or, using a more mathematical approach: $c^{2}=a^{2}+b^{2}$
54
55 Add $a$ squared and $b$ squared to get $c$ squared.
56 Or, using a more mathematical approach:
57 \begin{displaymath}
58 c^{2}=a^{2}+b^{2}
59 \end{displaymath}
60
61 $\lim_{n \to \infty}
62 \sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6}$
63
64 \begin{displaymath}
65 \lim_{n \to \infty}
66 \sum_{k=1}^n \frac{1}{k^2} = \frac{\pi^2}{6}
67 \end{displaymath}
68
69
70 \begin{equation}
71 \forall x \in \mathbf{R}:
72 \qquad x^{2} \geq 0
73 \end{equation}
```

Output: myfile5.pdf

3 More stuff

Add a squared and b squared to get c squared. Or, using a more mathematical approach: $c^2 = a^2 + b^2$

Add a squared and b squared to get c squared. Or, using a more mathematical approach:

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

$\lim_{n\to\infty} \sum_{k=1}^{n} \frac{1}{k^2} = \frac{\pi^2}{6}$

$$\lim_{n\to\infty} \sum_{k=1}^{n} \frac{1}{k^2} = \frac{\pi^2}{6}$$

$$\forall x \in \mathbf{R}: \qquad x^2 \geq 0 \tag{4}$$

Spacing in LaTeX

Name	Command	Example
default space		$abc \rightarrow\leftarrow abc$
thin space	`\,`	$abc \rightarrow \, \leftarrow abc$
thin neg. space	`\!`	$abc \rightarrow\!\leftarrow abc$
medium space	`\:`	$abc \rightarrow \: \leftarrow abc$
large space	`\;`	$abc \rightarrow \; \leftarrow abc$
0.5em space	`\enspace`	$abc \rightarrow \enspace \leftarrow abc$
1em space	`\quad`	$abc \rightarrow \quad \leftarrow abc$
2em space	`\qquad`	$abc \rightarrow \qquad \leftarrow abc$
custom space	`\hspace{3em}`	$abc \rightarrow \hspace{3em} \leftarrow abc$
fill empty space	`\hfill`	$abc \rightarrow \hfill \cdots$

Exercise: myfile5.tex

```
$\sqrt{x}$ \qquad
$\sqrt{ x^{2}+\sqrt{y} }$
\qquad $\sqrt[3]{2}$\\[3pt]

$\overline{m+n}$
$\underbrace{ a+b+\cdots+z }_{26}$

\begin{displaymath}
\vec a\quad\overrightarrow{AB}
\end{displaymath}

\[\lim_{x \rightarrow 0}
\frac{\sin x}{x}=1\]

$a\bmod b$\\
$x\equiv a \pmod{b}$

\begin{displaymath}
\sum_{\substack{0<i<n \\ 1<j<m}}
P(i,j) = \sum_{\begin{subarray}{l} i\in I\\ 1<j<m \end{subarray}} Q(i,j)
\end{displaymath}

\begin{displaymath}
x_{1},\ldots,x_{n} \qquad
x_{1}+\cdots+x_{n}
\end{displaymath}
```

Output: myfile5.pdf

$$\sqrt{x} \qquad \sqrt{x^2+\sqrt{y}} \qquad \sqrt[3]{2}$$

$$\overline{m+n} \quad \underbrace{a+b+\cdots+z}_{26}$$

$$\vec{a} \quad \overrightarrow{AB}$$

$$\lim_{x\to 0} \frac{\sin x}{x} = 1$$

$$a \bmod b$$

$$x \equiv a \pmod{b}$$

$$\sum_{\substack{0<i<n \\ 1<j<m}} P(i,j) = \sum_{\substack{i\in I \\ 1<j<m}} Q(i,j)$$

$$x_1, \ldots, x_n \qquad x_1 + \cdots + x_n$$

Brackets for Math

Use `\left` and `\right` before any bracket ( ), curly bracket { }, square bracket [ ], angle bracket $\langle\ \rangle$, etc.

Example

`$(\frac{a}{b})$` gives

$$(\frac{a}{b})$$

but `$\left(\frac{a}{b}\right)$` gives

$$\left(\frac{a}{b}\right)$$

Exercise: myfile5.tex

```
\begin{displaymath}
\mathbf{X} =
\left( \begin{array}{ccc}
x_{11} & x_{12} & \ldots \\
x_{21} & x_{22} & \ldots \\
\vdots & \vdots & \ddots
\end{array} \right)
\end{displaymath}

\begin{eqnarray}
f(x) & = & \cos x \\
f'(x) & = & -\sin x \\
\int_{0}^{x} f(y)dy & 
= & \sin x
\end{eqnarray}

\begin{displaymath}
\mathop{\mathrm{corr}}(X,Y)=
\frac{\displaystyle
\sum_{i=1}^n(x_i-\overline x)
(y_i-\overline y)}
{\displaystyle\biggl[
\sum_{i=1}^n(x_i-\overline x)^2
\sum_{i=1}^n(y_i-\overline y)^2
\biggr]^{1/2}}
\end{displaymath}
```

Output: myfile5.pdf

$$\mathbf{X} = \begin{pmatrix} x_{11} & x_{12} & \cdots \\ x_{21} & x_{22} & \cdots \\ \vdots & \vdots & \ddots \end{pmatrix}$$

$$f(x) = \cos x \tag{5}$$

$$f(x) = -\sin x \tag{6}$$

$$\int_0^x f(y)dy = \sin x \tag{7}$$

$$\operatorname{corr}(X, Y) = \frac{\sum_{i=1}^{n}(x_i - \overline{x})(y_i - \overline{y})}{\left[\sum_{i=1}^{n}(x_i - \overline{x})^2 \sum_{i=1}^{n}(y_i - \overline{y})^2\right]^{1/2}}$$

Exercise: myfile6.tex

Create a LaTeX document that formats the text shown

The equation

$$ax^2 + bx + c$$

has as solution

$$x_{12} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Note: Use **\pm** for plus/minus sign

Solution: myfile6.tex

```
32 The equation
33 \begin{displaymath}
34 ax^{2}+bx+c
35 \end{displaymath}
36 has as solution
37 \begin{displaymath}
38 x_{12}=\frac{-b\pm\sqrt{b^{2}-4ac}}{2a}
39 \end{displaymath}
40
```

Math IEEE Style

```
\begin{multline}
  h^{-}(X|Y) \le \frac{n+1}{e}
  - h(X|Y)
  \\
  + \int p(y) \log \left(
    \frac{\mathsf{E}\big[|X|^2
      \big| Y=y\big]}{n}
  \right) \dd y
\end{multline}
```

$$h^{-}(X|Y) \le \frac{n+1}{e} - h(X|Y) + \int p(y) \log \left(\frac{\mathsf{E}\big[|X|^2 \big| Y=y\big]}{n} \right) \dd y \quad (11)$$

Some more Math…

Γ \Gamma	α \alpha	ξ \xi	$\digamma$ \digamma
Δ \Delta	β \beta	π \pi	ε \varepsilon
Λ \Lambda	γ \gamma	ρ \rho	$\varkappa$ \varkappa
Φ \Phi	δ \delta	σ \sigma	φ \varphi
Π \Pi	ϵ \epsilon	τ \tau	ϖ \varpi
Ψ \Psi	ζ \zeta	υ \upsilon	ϱ \varrho
Σ \Sigma	η \eta	ϕ \phi	ς \varsigma
Θ \Theta	θ \theta	χ \chi	ϑ \vartheta
Υ \Upsilon	ι \iota	ψ \psi	
Ξ \Xi	κ \kappa	ω \omega	
Ω \Omega	λ \lambda		
	μ \mu		
	ν \nu		

Some more Math… Symbols

# \#	♣ \clubsuit	◊ \lozenge	□ \square
& \&	╲ \diagdown	∡ \measuredangle	√ \surd
∠ \angle	╱ \diagup	∇ \nabla	⊤ \top
‵ \backprime	♢ \diamondsuit	♮ \natural	△ \triangle
★ \bigstar	∅ \emptyset	¬ \neg	▽ \triangledown
⧫ \blacklozenge	∃ \exists	∄ \nexists	∅ \varnothing
■ \blacksquare	♭ \flat	′ \prime	
▲ \blacktriangle	∀ \forall	♯ \sharp	
▼ \blacktriangledown	♡ \heartsuit	♠ \spadesuit	
⊥ \bot	∞ \infty	◁ \sphericalangle	

Some more Math… Accents

$\acute{x}$ \acute{x}	$\bar{x}$ \bar{x}	$\vec{x}$ \vec{x}
$\grave{x}$ \grave{x}	$\breve{x}$ \breve{x}	$\dot{x}$ \dot{x}
$\ddot{x}$ \ddot{x}	$\check{x}$ \check{x}	$\ddot{x}$ \ddot{x}
$\tilde{x}$ \tilde{x}	$\hat{x}$ \hat{x}	$\dddot{x}$ \dddot{x}

Style

Calligraphic letters Usage: `\mathcal{M}`.

$\mathcal{A}\,\mathcal{B}\,\mathcal{C}\,\mathcal{D}\,\mathcal{E}\,\mathcal{F}\,\mathcal{G}\,\mathcal{H}\,\mathcal{I}\,\mathcal{J}\,\mathcal{K}\,\mathcal{L}\,\mathcal{M}\,\mathcal{N}\,\mathcal{O}\,\mathcal{P}\,\mathcal{Q}\,\mathcal{R}\,\mathcal{S}\,\mathcal{T}\,\mathcal{U}\,\mathcal{V}\,\mathcal{W}\,\mathcal{X}\,\mathcal{Y}\,\mathcal{Z}$

Blackboard Bold letters Usage: `\mathbb{R}`.

$\mathbb{A}\,\mathbb{B}\,\mathbb{C}\,\mathbb{D}\,\mathbb{E}\,\mathbb{F}\,\mathbb{G}\,\mathbb{H}\,\mathbb{I}\,\mathbb{J}\,\mathbb{K}\,\mathbb{L}\,\mathbb{M}\,\mathbb{N}\,\mathbb{O}\,\mathbb{P}\,\mathbb{Q}\,\mathbb{R}\,\mathbb{S}\,\mathbb{T}\,\mathbb{U}\,\mathbb{V}\,\mathbb{W}\,\mathbb{X}\,\mathbb{Y}\,\mathbb{Z}$

Fraktur letters Usage: `\mathfrak{S}`.

$\mathfrak{A}\,\mathfrak{B}\,\mathfrak{C}\,\mathfrak{D}\,\mathfrak{E}\,\mathfrak{F}\,\mathfrak{G}\,\mathfrak{H}\,\mathfrak{I}\,\mathfrak{J}\,\mathfrak{K}\,\mathfrak{L}\,\mathfrak{M}\,\mathfrak{N}\,\mathfrak{O}\,\mathfrak{P}\,\mathfrak{Q}\,\mathfrak{R}\,\mathfrak{S}\,\mathfrak{T}\,\mathfrak{U}\,\mathfrak{V}\,\mathfrak{W}\,\mathfrak{X}\,\mathfrak{Y}\,\mathfrak{Z}$

$\mathfrak{a}\,\mathfrak{b}\,\mathfrak{c}\,\mathfrak{d}\,\mathfrak{e}\,\mathfrak{f}\,\mathfrak{g}\,\mathfrak{h}\,\mathfrak{i}\,\mathfrak{j}\,\mathfrak{k}\,\mathfrak{l}\,\mathfrak{m}\,\mathfrak{n}\,\mathfrak{o}\,\mathfrak{p}\,\mathfrak{q}\,\mathfrak{r}\,\mathfrak{s}\,\mathfrak{t}\,\mathfrak{u}\,\mathfrak{v}\,\mathfrak{w}\,\mathfrak{x}\,\mathfrak{y}\,\mathfrak{z}$

Tables

```
\begin{tabular}{column specs} options
 first row spec \\
      ⋮
 last row spec [\\ options]
\end{tabular}
```

How it appears

left	center	right
1	2	3

What you write

```
\begin{tabular}{lcr}
 left & center & right \\
   1  &   2    &  3
\end{tabular}
```

A 2×3 Table

Tables

How it appears

-110	-120.12	-130
210	220.	230

What you write

```
\begin{tabular}{|l|c|r|} \hline
  -110 &  120 & -130 \\ \hline
   210 & -220 &  230 \\ \hline
\end{tabular}
```

A 2×3 Table with Horizontal and Vertical Lines

How it appears

Name	Test 1	Test 2
Bob	67	72
Sue	72	67

What you write

```
\begin{tabular}{l|cc|}
 Name  & Test 1 & Test 2 \\ \cline{1-1}
 Bob   &  67    &  72 \\
 Sue   &  72    &  67 \\ \cline{2-3}
\end{tabular}
```

A Table with Partially Spanning Horizontal and Vertical Lines

Tables

```
\begin{tabular}{||l|l||} \hline
$n$ &  $P_n(x)$ \\ \hline
0 & $1$ \\
1 & $x$ \\
2 & $(3x^2-1)/2$ \\
3 & $(5x^3-3x)/2$ \\ \hline
\end{tabular}
```

n	$P_n(x)$
0	1
1	x
2	$(3x^2 - 1)/2$
3	$(5x^3 - 3x)/2$

Tables

```
\begin{table}[ht]
\caption{Nonlinear Model Results}
\centering
\begin{tabular}{c c c c}
\hline \hline
Case & Method\#1 & Method\#2 & Method\#3 \\
\hline
1 & 50 & 837 & 970 \\
2 & 47 & 877 & 230 \\
3 & 31 & 25 & 415 \\
4 & 35 & 144 & 2356 \\
5 & 45 & 300 & 556 \\
\hline
\end{tabular}
\label{table:nonlin}
\end{table}
```

Tables

Table 1: Nonlinear Model Results

Case	Method#1	Method#2	Method#3
1	50	837	970
2	47	877	230
3	31	25	415
4	35	144	2356
5	45	300	556

Tables

```
\usepackage{rotating}
...
\begin{tabular}{|l|l|l|}
\hline
\multicolumn{1}{|c|}{
   \begin{sideways}
      Column 1 \,
   \end{sideways}}&
      \multicolumn{1}{c|}{
         \begin{sideways}
            Column 22 \,
         \end{sideways}}&
            \multicolumn{1}{c|}{
               \begin{sideways}
                  Column 333 \,
               \end{sideways}} \\\hline
aa & bbbb & cccc \\\hline
aaa & bbbb & cccc \\\hline
aaaa & bbbb & cccc \\\hline
aaaaa & bbbb & cccc \\\hline
aaaaaa & bbbb & cccc \\\hline
\end{tabular}
```

Column 1	Column 22	Column 333
aa	bbbb	cccc
aaa	bbbb	cccc
aaaa	bbbb	cccc
aaaaa	bbbb	cccc
aaaaaa	bbbb	cccc

Pictures

- PS (postscript) for DVI, PS formats
- JPG/PDF for PDF format

- Can convert PS files to PDF format using “epstopdf” command at command prompt

- Required:

  \usepackage{graphicx} after \documentclass… line
- Then, write \includegraphicsfile{file.jpg}
- Add caption by \caption{Text for caption}

Pictures

Example

```
\begin{figure}
\begin{center}
\includegraphics[scale=1]{slackweb.jpg}
\caption{This is the text of the caption.}
\end{center}
\end{figure}
```

Bibliography

```
It was shown in \cite{b1} ...

\begin{thebibliography}
...
\bibitem{b1} Max Meier, \textsl{The final theory}, Springer 1999
...
\end{thebibliography}
```

It was shown in [7] ...

References

. . .

[7] Max Meier, *The final theory*, Springer 1999

Tables of References

- Table of content: just write `\tableofcontent` at the beginning of your document
- Table of figures: `\listoffigures`
- List of tables: `\listoftables`

Important: Compile at least twice your .tex file to get them right!

Using LaTeX for paper-writing

Almost all the conferences and journals provide a LaTeX template to write an article that respects their preferred layout.

- Most of the time this template includes a Tex file (.tex) and a Style file (.sty) or Class file (.cls).
- Write your article in the .tex file.
- Make sure to keep the .sty or .cls file in the folder in which you save and modify the .tex file

Example

IEEEtran is the official LaTeX class for authors of the IEEE transactions journals and conferences.

Using LaTeX for report-writing

When you write a report of more than a dozen pages in LaTeX it is better to write your chapters in different files:

- Create a main file (e.g. myReport.tex) which contains the document class, packages, `\begin(document)` and `\end(document)`, etc.
- Create your chapter files (e.g. Intro.tex, chapter2.tex, ch3.tex etc.) with no `\begin(document)` and `\end(document)` or packages
- Link your chapter files to your main file: put `\input{chapterName.tex}` in your main file for each chapter file

Demo:

IEEE ICIP Paper

&

PReMI Springer Paper

LaTeX Presentations – Beamer

```
\documentclass{beamer}

\begin{document}

\title{Simple Usage of Beamer Class}
\author{Santosh Chapaneri}
\date{\today}

\frame{\titlepage}

\frame{\frametitle{Table of contents}\tableofcontents}
```

LaTeX Presentations – Beamer

```
\section{Section 1}

\frame{\frametitle{Title}
Each frame should have a title.
}

\subsection{Subsection 1.1}
\frame{
Without title something is missing.
}
```

LaTeX Presentations – Beamer

```
\section{Section 2}
\subsection{Lists I}
\frame{\frametitle{unnumbered lists}
\begin{itemize}
\item Introduction to  \LaTeX
\item Course
\item Beamer class
\end{itemize}
}
```

```
\frame{\frametitle{lists with pause}
\begin{itemize}
\item Introduction to  \LaTeX \pause
\item Course \pause
\item Beamer class
\end{itemize}
}
```

LaTeX Presentations – Beamer

```
\subsection{Lists II}
\frame{\frametitle{numbered lists with pause}
\begin{enumerate}
\item Introduction to  \LaTeX \pause
\item Course \pause
\item Beamer class
\end{enumerate}
}
```

LaTeX Presentations – Beamer

```
\section{Section 3}
\subsection{Tables}
\frame{\frametitle{Tables}
\begin{tabular}{|c|c|c|}
\hline
\textbf{Date} & \textbf{Name} & \textbf{Title} \\
\hline
01/07 & Santosh Chapaneri & First steps with  \LaTeX  \\
\hline
02/07 & My name & \LaTeX \ Practice \\
\hline
\end{tabular}}
```

LaTeX Presentations – Beamer

```
\frame{\frametitle{Tables with pause}
\begin{tabular}{c c c}
A & B & C \\
\pause
1 & 2 & 3 \\
\pause
A & B & C \\
\end{tabular} }

\end{document}
```

Make presentation look shiny:
\usepackage{beamerthemesplit}

LaTeX Presentations – Beamer

```
\section{Section 4}
\subsection{Blocks}
\frame{\frametitle{Blocks}
\begin{block}{title 1}
block text 1
\end{block}
\begin{exampleblock}{title 2}
block text 2
\end{exampleblock}
\begin{alertblock}{title 3}
block text 3
\end{alertblock}
}
\end{document}
```

Make presentation even more shinier:
\usepackage{beamerthemeshadow}

LaTeX for Thesis/Project Report

```
\documentclass[12pt]{report}
\begin{document}
\title{Sample Thesis Title}
\author{Santosh Chapaneri}

\maketitle
\pagenumbering{roman}
\tableofcontents
\listoffigures
\listoftables

\begin{abstract}
\ldots
\end{abstract}

\pagenumbering{arabic}
\include{chapter1}
\include{chapter2}
\include{chapter3}

\bibliographystyle{plain}
\bibliography{literature}

\end{document}
```

LaTeX for Thesis/Project Report

In thesis.tex:

```
\include{chapter1} % path/filename.tex
\include{chapter2}
%\include{chapter3}
```

In chapter1.tex:

```
\chapter{Introduction}
Some text...
```

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Home » LaTeX Template For B.Tech / M.Tech Project Preparation (Dissertation / Thesis / Report)

LATEX TEMPLATE FOR B.TECH / M.TECH PROJECT PREPARATION (DISSERTATION / THESIS / REPORT)

Students and research scholars put enormous amount of effort and time into undertaking their project or research work. The task of writing their thesis or dissertation is equally difficult. Moreover, these thesis or dissertations are accessed and referred to by future students, scholars and researchers. Taking these factors into account, the university has adopted uniform specifications to enhance legibility as well as to make the exercise of report writing a painless one.

The Faculty of Engineering and Technology has come up with a LaTeX template that is useful to write a dissertation / thesis / report (or synopsis) in a format suitable for submission at SRM University. The LaTeX class file provides options to format PhD, M.Tech. and B.Tech. project thesis. This template will save time in the long run for the students as well as the faculty members and officials, as the thesis, when prepared using LaTeX template, will automatically satisfy the specifications set forth by SRM University. There is no need for the department or a committee to check whether the dissertation / thesis / report conforms to the specification.

Kindly be advised that the thesis will not be accepted by the departments of the Faculty of Engineering and Technology unless and until the student follows the LaTeX template provided here.

Before preparing the final form of the dissertation / thesis / report, the students are advised to familiarize themselves with the features of the template by accessing the below given files:

(OR)

Help – Become a Champ

- The Not So Short Introduction to LaTeX2e
  http://tobi.oetiker.ch/lshort/lshort.pdf
- LaTeX for Word Processor Users
  http://www.tex.ac.uk/tex-archive/info/latex4wp/latex4wp.pdf
- Comprehensive TeX Archive Network
  http://www.ctan.org/ or http://www.tex.ac.uk/
- LaTeX Navigator
  http://tex.loria.fr/english/
- TeX Catalogue
  http://www.ctan.org/tex-archive/help/Catalogue/
- Wikibook LaTeX
  http://en.wikibooks.org/wiki/LaTeX

Help – Become a Champ

- LaTeX Related Information
  http://theoval.cmp.uea.ac.uk/~nlct/latex/
  - For Complete Novices
    http://theoval.cmp.uea.ac.uk/~nlct/latex/novices/novices.html
  - To Write a PhD Thesis
    http://theoval.cmp.uea.ac.uk/~nlct/latex/thesis/thesis.html
- LaTeX2e help 1.4
  http://www.emerson.emory.edu/services/latex/latex2e/latex2e_toc.html
- Beginning LaTeX
  http://www.cs.cornell.edu/Info/Misc/LaTeX-Tutorial/LaTeX-Home.html
- Norm Matloff's LaTeX Tutorial Site
  http://heather.cs.ucdavis.edu/~matloff/latex.html
  - 5-Minute LaTeX Tutorial
    http://heather.cs.ucdavis.edu/~matloff/LaTeX/FiveMinute.html