

\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Overview

You will learn...

- What \LaTeX is [1]
- When and why people use it
- What can you do in \LaTeX
- Some sample documents

Overview

- Leslie Lamport
- Document preparation system
- An alternative to text editing software
- Free software
- License: LaTeX Project Public License
- Website: <https://www.latex-project.org/>

What's Different?

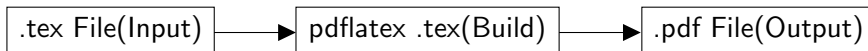
- It is not WYSIWYG
- Concentrate on content and not formatting
- Write simple commands for formatting
- Write content and complex mathematical formulae with ease

What can be done?

- Write articles, books, scientific journals, and papers
- Design posters, banners, resume, etc.
- Mostly used by writers and engineers

Process of Writing

- Write content using any text editor:
 - notepad
 - gedit
 - \LaTeX IDEs
- Save it as .tex
- Build
- Output: pdf file



Sample Documents

Show documents

Thank you



References I

- [1] “Latex.” <https://en.wikipedia.org/wiki/LaTeX>, July 2019.
[Online; accessed 22-July-2019].

L^AT_EX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Install L^AT_EX

You will learn...

- To install \LaTeX
- Get introduced to different IDEs
- Get introduced Web based editors

Installation (Windows)

- Download miktex
- <https://miktex.org/download>

Installation (Ubuntu)

- `sudo apt-get install texlive-full`

L^AT_EX IDEs

- Texstudio
<https://www.texstudio.org/>
- Kile
<https://kile.sourceforge.io/>
- TeXworks
<http://www.tug.org/texworks/>

Web based Editors

- Overleaf
<https://www.overleaf.com/>
- LaTeX Base
<https://latexbase.com/>
- Papeeria
<https://papeeria.com/>
- Authorea
<https://www.authorea.com/>

Editor Features

- Auto complete of LaTeX commands
- Parenthesis matching
- Collapsible sections
- Inverse search
- No. of collaborators
- Public project
- Private project
- Track changes
- History
- Comments

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Create First \LaTeX Document

You will learn to ...

- Define document class
- Provide document information
- Create your first \LaTeX document

Document class

- Type of document
- Use of appropriate class
- Syntax

```
\documentclass{article}
```

Document Information

- Title

```
\title{Creating first document in \LaTeX}
```

- Author

```
\author{Firuza}
```

- Date

```
\date{\today}
```

Document

- Write content

```
\begin{document}  
  content...  
\end{document}
```



Demo

All in One

```
\documentclass{article}

\title{Creating first document in \LaTeX}
\author{Firuza}
\date{\today}


\begin{document}
    My first document
\end{document}
```

maketitle

```
\maketitle
```


Now, you can ...

- create a basic \LaTeX document
- build and view it

Thank you



Document Preparation using L^AT_EX

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Defining Sections

You will learn to ...

- Organize the content into different sections
- Insert Table of Contents

Recapitulate document class

- Document class
 - article
 - book
 - report
- `\documentclass{article}`

Sections

- Divide/Classify content in document
- Associated with document class
- Has a level number

Section Levels

- 1. `\part{...}`: article, report, book
- 0. `\chapter{...}`: report, book
- 1. `\section{...}`
- 2. `\subsection{...}`
- 3. `\subsubsection{...}`
- 4. `\paragraph{...}`
- 5. `\subparagraph{...}`

Note: 1 to 5 in all document classes



Demo

Table of Contents

- `\tableofcontents`
- Display alias
 - `\section[alias]{...}`



Demo

Now, you can ...

- Organize content by creating sections
- Insert table of contents

Thank you



Document Preparation using L^AT_EX

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Recapitulate Topic 1

Recapitulate Session 1

- What is \LaTeX ?
- Why is it used?
- Generate pdf from .tex

Recapitulate Session 2

- Installed \LaTeX
- \LaTeX IDEs: Texstudio, Kile
- Web Editors: Overleaf, Papeeria

Recapitulate Session 3

```
\documentclass{article}

\title{Creating first document in \LaTeX}
\author{Firuza}
\date{\today}


\begin{document}
    My first document
\end{document}
```

Recapitulate Session 4

- Sections and its use in appropriate class
- `\tableofcontents`



Thank you

\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Paper Size and Margin

You will learn to ...

- Use packages
- Define different paper sizes
- Set margins

Using Packages

- File containing extra \LaTeX commands
- .sty file
- Styling, new features
- `\usepackage[Parameters]{PackageName}`
- Mentioned before document begins

Paper Size

- A series: A0, A1, A2, A3, A4, ...
- B series: B0, B1, B2, B3, B4, ...
- https://en.wikipedia.org/wiki/Paper_size
- `\usepackage[a5paper]{geometry}`

Margins

- left, right, top, bottom
- `\usepackage[margin=1.5in]{geometry}`



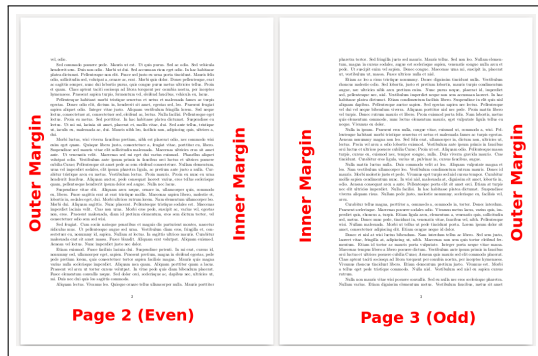
Demo

Margins (Single Side document)

- Different margins
- `\usepackage[top=1in, bottom=0.75in, left=1.25in, right=1.1in] {geometry}`

Margins (Two Side document)

- Print on both sides: Book, 2 sided article
- `\usepackage[inner=1.5in, outer=0.5in]{geometry}`



Now, you can ...

- Use a package in \LaTeX
- Mention size of the paper
- Set margins for single side and two side document

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Page Style

You will learn to ...

- Customize headers and footers
- Change page numbering style
- Reset page number

Page Style

- Displays header and footer
- Styles
 - empty: No header nor footer
 - plain: Footer contains the page number
 - headings: Header contains section name and page number
- Entire Document
 - `\pagestyle{<style>}`
- Current Page
 - `\thispagestyle{<style>}`



Demo

Reset Page Numer

- `\setcounter{page}{<Number>}`



Demo

Page Numbering Style

- arabic: 1, 2, 3, ...
- roman: i, ii, iii, ...
- Roman: I, II, III, ..
- alph: a, b, c, ..
- Alph: A,B, C, ...
- `\pagenumbering{<style>}`



Demo

Now, you can ...

- Customize header and footer
- Reset page numbering
- Customize page numbering style

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: More on Page Formatting

You will learn to ...

- Set orientation
- Add page breaks
- Set footnotes

Orientation

- Direction of the document
- Portrait (vertical)
- Landscape (horizontal)

Landscape - Entire Document

- `\usepackage[landscape]{geometry}`



Demo

Specific Part

- Package
 - `\usepackage{lscape}`
Rotates content by 90 degrees
 - `\usepackage{pdflscape}`
Rotates page by 90 degrees
- `\begin{landscape}`

`\end{landscape}`
- Note the difference



Demo

Page Breaks

- `\pagebreak`
- `\newpage`



Demo

Footnotes

- More information about the content
- Written at the bottom
- `\footnote{text to be displayed as footnote}`



Demo

Now, you can ...

- Change orientation of page/document
- Add page breaks
- Set footnotes

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Multi-Column Document

You will learn to ...

- Format your document into 2/multicolumns

Overview

- Seen one column document
- 2 columns
 - Research papers
 - Books
- Multi columns
 - Magazines
 - Newspapers

Two Columns

- `\documentclass[twocolumn]{...}`



Demo

Multi Columns

- Package: multicol
- Syntax

```
\begin{multicols}{<No.ofColumns>}
```

```
...
```

```
\end{multicols}
```



Demo

Formatting Multicolumns

- Column Spacing
 - Spacing between the columns
 - `\setlength{\columnsep}{<X>pt}`
- Column Separator
 - Dividing columns with a line
 - `\setlength{\columnseprule}{<X>pt }`
- Column Break
 - Force text into next column
 - `\columnbreak`

Now, you can ...

- Format your document into 2 column layout or multi columns

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Reading Error Messages

You will learn to ...

- Read and solve errors

Overview

- Building .tex file
- Displays error message if any issue
- Missing or mismatch in curly brace
- Environment not ended
- Package not included,
- Style file not found

Structure of Error Message

- Structure
 - ! <Error message>
 - l.<Line number>

Undefined control sequence

- Chapter in an article

```
\documentclass{article}  
\begin{document}  
\chapter{title}
```

Undefined control sequence

- Chapter in an article

```
\documentclass{article}  
\begin{document}  
\chapter{title}
```

- Error Message

```
Undefined control sequence. \chapter
```


Package not included

- lscap package not written

```
\begin{landscape}
```

```
...
```

```
\end{landscape}
```

- Error Message

```
! LaTeX Error: Environment landscape undefined.
```

```
...
```

Style file not found

- \LaTeX
`\usepackage{lscapes}` instead of `\usepackage{lscap}`
- Error Message
! LaTeX Error: File 'lscapes.sty' not found.
...

Missing or mismatch in curly brace

- \LaTeX

```
\begin{landscape  
hello  
\end{landscape}
```

- Error Message

Runaway argument?

```
{landscape
```

! Paragraph ended before \begin was complete.

Environment not ended or mismatch

- \LaTeX

```
\begin{landscape}
```

```
...
```

```
\end{multicols}
```

- Error Message

```
\begin{landscape} on input line 6 ended by \end{multicols}.
```

Now, you can ...

- Read error messages and resolve them

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Recapitulate Topic 2

Recapitulate Session 6

- Reviewed paper sizes and used them
- Included packages
- Set margins

Recapitulate Session 7

- Customized headers and footers
- Formatted the page numbering style
- Rest page numbers

Recapitulate Session 8

- Worked with portrait and landscape orientation
- Added page breaks
- Inserted foot notes in the document

Recapitulate Session 9

- Created a 2 column / multi column document
- Tweaked the spacing and dividing line of the columns

Recapitulate Session 10

- Understood and resolved error messages
- Undefined control sequence
- Package not included
- Style file not found
- Missing or mismatch in curly brace
- Environment not ended or mismatch

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Formatting Text

You will learn to ...

- Increase/decrease font size
- Use different font styles

Font Style

<code>\textbf{ ... }</code>	Text
<code>\textit{ ... }</code>	<i>Text</i>
<code>\emph{ ... }</code>	<i>Text</i>
<code>\underline{ ... }</code>	<u>Text</u>
<code>\textsc{ ... }</code>	TEXT
<code>\textrm{ ... }</code>	Text
<code>\textsf{ ... }</code>	Text
<code>\texttt{ ... }</code>	Text
<code> ... </code>	Text ^{text}
<code>\textsubscript{ ... }</code>	Text _{text}

Font Size

<code>\tiny</code>	The smallest font
<code>\scriptsize</code>	Font size for scripts
<code>\footnotesize</code>	Footnote font size
<code>\small</code>	Small font size
<code>\normalsize</code>	The default font size
<code>\large</code>	large font size
<code>\Large</code>	Large font size
<code>\LARGE</code>	LARGE font size
<code>\huge</code>	huge font size
<code>\Huge</code>	The largest font size

Now, you can ...

- Change the font size
- Use different font styles

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Coloring Text

You will learn to ...

- Assign a color to your text
- Assign a color to your page

Overview

- Basic Colors
 - red
 - blue
 - green
 - white
 - yellow, etc
 - Package: color
- More Colors
 - Package: xolor
 - Parameter: dvipsnames
- <https://en.wikibooks.org/wiki/LaTeX/Colors>

Text Color

- Single Color

```
\textcolor{blue}{Text}
```

My text is colored blue

- Mixing with White

```
\textcolor{red!70}{Text}
```

A mixture of 70% red and 30% white

- Mixture of 2 colors

```
\textcolor{red!70!blue}{}{}
```

Mixture of red and blue



Demo

Page Color

- `\pagecolor{yellow}`

Now, you can ...

- Color text using a single color
- Color text by mixing white or two colors
- Add a background color to the page

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Align Text

You will learn to ...

- Align your text (left, right, center)

Alignment

- Default: Justify

- Left Align

```
\begin{flushleft} ... \end{flushleft}
```

- Center Align

```
\begin{center} ... \end{center}
```

- Right Align

```
\begin{flushright} ... \end{flushright}
```



Demo

Large text

- Left Align
`\flushleft`
- Center Align
`\centering`
- Right Align
`\flushright`

ragged2e

- Package: ragged2e
- Switch back: `\justify`

Now, you can ...

- Align only certain part of the document
- Align entire document and switch between the alignments

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Spacing

You will learn to ...

- add single, one and a half, and double line spacing
- insert vertical and horizontal spacing

Fixed Spacing

- Package: setspace
- Entire document
 - `\singlespacing`
 - `\onehalfspacing`
 - `\doublespacing`

- Certain part

```
\begin{singlespace | onehalfspace | doublespace}
```

```
...
```

```
\end{...}
```



Demo

Vertical Spacing

- `\vspace{Xpt}`
- `\smallskip`
- `\medskip`
- `\bigskip`
- `\vfill`



Horizontal Spacing

- `\`
- `\,`
- `\hspace{Xpt}`
- `\hfill`



Demo

Now, you can ...

- assign single, one and a half, and double line spacing to entire or a part of the document
- insert vertical and horizontal spacing
- fill up the vertical and horizontal space

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Bullets and Numbering

You will learn to ...

- create ordered list
- create unordered list
- create description list
- change the bullet style
- change the numbering

Unordered List

- Bulleted list

```
\begin{itemize}
  \item Mouse
  \item Keyboard
  \item Monitor
\end{itemize}
```

Ordered List

- Numbered list

```
\begin{enumerate}  
  \item Red  
  \item Blue  
  \item Green  
\end{enumerate}
```

Description

- Labeled list

```
\begin{description}  
  \item [Input Devices]: mouse, keyboard  
  \item [Output Devices]: monitor, printer  
\end{description}
```



Nested List

- List inside another list
- Combination of un-ordered and ordered

```
\begin{itemize}
  \item Input devices
  \begin{enumerate}
    \item keyboard
  \end{enumerate}
  \item Output devices
  \begin{itemize}
    \item printer
  \end{itemize}
\end{itemize}
```

Change numbering in Enumerate

- Package: enumerate
- Style: (i, ii, ...), (I, II, ...), (a, b, ...), (A, B, ...), (1, 2, ...)
- Syntax

```
\begin{enumerate}<Style>
```

- Example

```
\begin{enumerate}[(A)]
```



Demo

Change bullet style

- Package: amssymb
- Style:
`\blacksquare, \square, \bullet, \cdot, \diamond, -, *, \circ`
- Level: i, ii, iii, iv
- Command
`\renewcommand{\labelitem<Level>}{${<Style>}}`
- Example
`\renewcommand\labelitemiv{${\diamond$}}`

[Demo]

Now, you can ...

- create ordered, unordered, and description list
- create a nested list
- use different bullet styles in unordered list
- use different numbering in ordered list

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Mathematics - I

You will learn to ...

- Typeset simple mathematical expressions and fractions

Overview

- Simple Maths: No expressions
- Complex ones: `amsmath` or `mathtools`
- Written in between: `$... $` or `\[... \]`

Simple Maths

- $2^2 + 2^2 = 4$

$$2^2 + 2^2 = 4$$

- $\sqrt[4]{4096} = 8$

$$\sqrt[4]{4096} = 8$$

- $e^{x+iy} = e^x(\cos y + i \sin y)$

$$e^{x+iy} = e^x(\cos y + i \sin y)$$

- $A \cup B = n(A) + n(B) - n(A \cap B)$

$$A \cup B = n(A) + n(B) - n(A \cap B)$$

Symbols

- The Comprehensive LaTeX Symbol List.
<http://tug.ctan.org/info/symbols/comprehensive/symbols-a4.pdf>
- Finding unknown symbol
<http://detexify.kirelabs.org/classify.html>

Fractions

- $\frac{\text{numerator}}{\text{denominator}}$
- $\frac{2}{3}$ $\frac{\text{2}}{\text{3}}$
- $\frac{8}{\frac{1}{3}} = 8 \times \frac{3}{1}$
 $\frac{8}{\frac{1}{3}} = 8 \times \frac{3}{1}$
- $\frac{a}{b} \geq \frac{c}{d}$
 $\frac{a}{b} \geq \frac{c}{d}$
- $\frac{\sqrt{x+2}}{x^2-3}$
 $\frac{\sqrt{x+2}}{x^2-3}$

Variable Size of Braces

- Sizes + braces: $()$ or $\{\}$ or $[\]$

- $\backslash Bigg \backslash bigg \backslash Big \backslash big$

- $\left[\left\{ (3 + 2) / 5 \right\} \times 6 \right]$

$\$ \backslash bigg[\backslash Big\{ \backslash big(3+2\big) / 5 \backslash Big\} \backslash times 6 \backslash bigg] \$$

- $\left\{ \left(\frac{8}{4} \right) + \left(\frac{3}{4} \right) \right\}$

$\$ \backslash bigg\{ \backslash Big(\backslash frac{8}{4}\backslash Big) + \backslash Big(\backslash frac{3}{4}\backslash Big) \backslash bigg\} \$$

Summation

- Syntax

`\sum_{min}^{max}`

- $\sum_{i=a}^b g(i) = 0, \text{ for } b < a.$

`\[\sum_{i=a}^{b} g(i)=0, \text{for } b < a. \]`

- $\sum_{i=1}^n i = \frac{n(n+1)}{2}$

`\[\sum_{i=1}^n i = \frac{n(n+1)}{2} \]`

Now, you can ...

- Typeset simple mathematical expressions
- Search symbols and commands
- Typeset fractions and summation
- Adjust the size of the braces

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Mathematics - II

You will learn to ...

- Integration
- Matrices
- Equations

Integration and Limits

- Integration

$$\int_{\min}^{\max}$$

- Limits

$$\lim_{\dots}$$

- $\int_0^{\infty} f(x) dx$

$$\int_0^{\infty} f(x) dx$$

- $\lim_{x \rightarrow c} f(x) = L$

$$\lim_{x \rightarrow c} f(x) = L$$

Matrix

- $\$ \begin{...}$
 \dots
 $\end{...} \$$
- matrix: without border
- pmatrix: with round bracket
- bmatrix: with box bracket
- Bmatrix: with curly bracket
- vmatrix: with |
- Vmatrix with ||
- & denotes the new column
- \\denotes a new row

Equation

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

- Centered and numbered. No need of dollar
- Only one equation
- Examples

$$3x + 5y = 2 \quad (1)$$

$$5x + 8y = 3 \quad (2)$$

$$x^2 - y^2 = (x + y)(x - y) \quad (3)$$

Align Environment

- Solve the equation
- Equation on multiple lines

$$3x - 6 = 9 \quad (4)$$

$$3x = 9 + 6$$

$$x = \frac{9 + 6}{3}$$

$$x = 5$$

Now, you can ...

- Typeset
 - Integration
 - Limits
 - Marices
 - Equations

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Recapitulate Topic 3

Recapitulate Session 12

- Font styles: `\textbf`, `\emph`, etc.
- Font sizes: `\large`, `\huge`, etc.

Recapitulate Session 13

- Basic colors: `color`
- More colors: `xcolor`, `dvipsnames`
- `\textcolor...text`
- Mix colors: `!`
- `\pagecolor`

Recapitulate Session 14

- left, center, right
- flushleft, flushright, center, centering
- justify (ragged2e)

Recapitulate Session 15

- `setspace`
- Commands: `singlespacing`, `onehalfspacing`, `doublespacing`
- Environment: `singlespace`, `onehalfspace`, `doublespace`
- vertical and horizontal spacing

Recapitulate Session 16

- ordered and unordered list
- itemize, enumerate, description

Recapitulate Session 17

- Basic maths
- Finding unknown symbols
- Fractions
- Vary the size of braces
- Summation

Recapitulate Session 18

- Integration
- Limits
- Matrix
- Equations
- Equations spanning multiple lines

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Creating Tables

You will learn to ...

- Create a table using tabular environment
- Align contents of column
- Specify column width

Overview

- Tabular environment
- `\begin{tabular}{cols}`
 ...
 `\end{tabular}`
- cols
 - l
 - r
 - c
 - `p{Xcm}`: left align
- Column: `&`
- Row: `\\`

Basic Table

No.	Item	Price
1	Pen	10
2	Pencil	5

```
\begin{tabular}{clr}  
  No. & Item & Price \\  
  1 & Pen & 10 \\  
  2 & Pencil & 5 \\  
\end{tabular}
```



Demo

Column width

No.	Item	Price
1	Pen	10
2	Pencil	5

```
\begin{tabular}{p{1cm}p{3cm}p{2cm}}  
  No. & Item & Price \\  
  1 & Pen & 10 \\  
  2 & Pencil & 5 \\  
\end{tabular}
```



Demo

Now, you can ...

- Use tabular environment
- Create a basic table
- Align contents of columns
- Specify width of a column

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Table Borders

Recapitulate

No.	Item	Price
1	Pen	10
2	Pencil	5

```
\begin{tabular}{clr}  
  No. & Item & Price \\  
  1 & Pen & 10 \\  
  2 & Pencil & 5 \\  
\end{tabular}
```

You will learn to ...

- Add simple borders to the table
- Add dashed borders to the table

Overview

- Vertical: |
- Horizontal: `\hline`
- Specific: `\cline{i-j}`

Table with Border

No.	Item	Quantity	Price
1	Pen	3	10
2	Pencil	3	5

```
\begin{tabular}{|c|l|l|r|}  
  \hline  
  No. & Item & Quantity & Price \\  
  \hline  
  1 & Pen & 3 & 10 \\  
  \hline  
  2 & Pencil & 3 & 5 \\  
  \hline  
\end{tabular}
```

cline

No.	Item	Quantity	Price
1	Pen	3	10
2	Pencil		5

```

\begin{tabular}{|c|l|l|r|}
  \hline
  No. & Item & Quantity & Price \\
  \hline
  1 & Pen & 3 & 10 \\
  \cline{1-2}\cline{4-4}
  2 & Pencil & & 5 \\
  \hline
\end{tabular}

```

Dashed Borders

- Package: `arydshln`
- Vertical: `:`
- Horizontal: `\hdashline[size of dash / space between dashes]`
- Specific: `\cdashline {i-j}[size of dash / space between dashes]`
- Example
 - `\hdashline[1pt/2pt]`
 - `\cdashline{2-3}[1pt/2pt]`

Example: Dashed borders

No.	Item	Quantity	Price
1	Pen	3	10
2	Pencil		5

```

\begin{tabular}{:c:l:l:r:}
  \hdashline[3pt/5pt]
  No. & Item & Quantity & Price \\
  \hdashline[3pt/5pt]
  1 & Pen & 3 & 10 \\
  \cdashline{1-2}[3pt/5pt]
  \cdashline{4-4}[3pt/5pt]
  2 & Pencil & & 5 \\
  \hdashline[3pt/5pt]
\end{tabular}

```

Now, you can ...

- Add plain border to the table
- Add dashed border to the table

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Merging Rows and Columns

You will learn to ...

- Merge rows and columns
- Spacing tables

Recall cline

No.	Item	Quantity	Price
1	Pen	3	10
2	Pencil		5

```
\begin{tabular}{|c|l|l|r|}
\hline
No. & Item & Quantity & Price \\
\hline
1 & Pen & 3 & 10 \\
\cline{1-2}\cline{4-4}
2 & Pencil & & 5 \\
\hline
\end{tabular}
```

Merge Rows

- Package: multirow
- Syntax: `\multirow {NumberOfRows}{Width}{...}`

Merge Rows

No.	Item	Quantity	Price
1	Pen	3	10
2	Pencil		5

```
\begin{tabular}{|c|l|l|r|}
\hline
No. & Item & Quantity & Price \\
\hline
1 & Pen & \multirow{2}{*}{3} & 10 \\
...
```



Demo

Merge Columns

- `\multicolumn{TotalColumns}{Alignment}{...}`

Stationery Items			
No.	Item	Quantity	Price

```
\begin{tabular}{|c|l|l|r|}
\hline
\multicolumn{4}{|c|}{Stationery Items} \\
\hline
No. & Item & Quantity & Price \\
...
```



Demo

Spacing

- `\renewcommand{\arraystretch}{value}`
- Default value: 1
- Before tabular environment

Stationery Items			
No.	Item	Quantity	Price
1	Pen	3	10

```
\renewcommand{\arraystretch }{1.5}  
\begin{tabular}{|c|l|l|r|}  
...
```

Now, you can ...

- Merge rows
- Merge columns
- Space out text in the table

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Saviour for Large Tables

Recapitulate the Exercise

- A large table
- Content not getting displayed
- Limitation: Manually split data

You will learn to ...

- Handle large data in a table

Long Tables

- Package: longtable
- Environment

```
\begin{longtable}{columns}
```

```
...
```

```
\end{longtable}
```



Demo

Repeat Heading

- Demo: No headings except 1st page
- Command: `\endhead`

Now, you can ...

- Handle large tables using longtable environment

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Table Environment

You will learn to ...

- Work with table environment

Overview

- Add captions
- Position the table
 - t: top
 - b: bottom
 - h: approximately here

Table Environment

- Environment

```
\begin{table}[position]  
  your tabular code  
  \caption{...}  
\end{table}
```

Example

```
\begin{table}[t]
  \begin{tabular}{l|l}
    No. & Items \\
    1 & Pen \\
    ...
  \end{tabular}
  \caption{Stationery Items}
\end{table}
```



Demo

List of Tables

- Placed just after table of contents
- `\listoftables`

Now, you can ...

- Add captions to the table
- Position the table
- Generate list of tables

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Including Graphics

You will learn to ...

- Include images and resize them

Overview

- Package: `graphicx`
- Supported formats: `jpg`, `png`, `eps`, `pdf`
- Resize
- Scale
- Trim/Crop
- Rotate
- Border

Include Graphics

- `\includegraphics[attributes]{filename.extn}`
- Attributes to change size
 - width
 - height

Example: Falkirk Wheel

```
\includegraphics{Falkirkwheel.jpg}
```



Example: Change height

```
\includegraphics[height=4cm]{Falkirkwheel.jpg}
```



Example: Change width

```
\includegraphics[width=4cm]{Falkirkwheel.jpg}
```



Example: Change both

```
\includegraphics[width=4cm, height=4cm]{Falkirkwheel.jpg}
```



No proportion, Avoid it.

Now, you can ...

- Include images and resize

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Image Properties

You will learn to ...

- Scale, crop, and rotate images

Scale

Scaled: `\includegraphics[scale=0.5]{parrot.png}`



Figure: Original



Figure: Scaled

Crop

Cropped: `\includegraphics[clip=true, trim=15mm 5mm 7mm 3mm]{parrot.png}`



Figure: Original



Figure: Cropped

Rotate

Rotate: `\includegraphics[angle=60]{parrot.png}`



Figure: Original



Figure: Rotated

Now, you can ...

- Scale an image
- Crop an image
- Rotate an image

References

<https://commons.wikimedia.org/wiki/File:Creative-Tail-Animal-parrot.svg>

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Working with Image Borders

You will learn to ...

- Add border to image
- Customize borders

Image Border

- `\fbox{ \includegraphics... }`
- `\fbox{ \includegraphics{computer.png} }`



Border Thickness

- `\setlength{\fboxrule}{2pt}`



Border Spacing

- `\setlength{\fboxsep}{15pt}`





Now, you can ...

- add border to an image
- vary the thickness of the border
- add spacing between the border and an image

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Figure and Sub Figure

You will learn to ...

- Specify caption for a figure
- Generate list of figures
- Include multiple images under one image

Figure Environment

- Environment

```
\begin{figure}[position]  
  \includegraphics[...]{...}  
  \caption{...}  
\end{figure}
```

- List

```
\listoffigures
```



Demo

Sub-Figure



(a) Original



(b) Rotated: 90 degrees



(c) Rotated: 180 degrees

Figure: Image of a Parrot

Sub-Figure

- Package: caption, subcaption

- Structure

```
\begin{figure}[<position>]
  \begin{subfigure}{<width>}
    \includegraphics...
    \caption{...}
  \end{subfigure}
  ...
  \caption{...}
\end{figure}
```

Now, you can ...

- Specify caption and position the figure
- Generate list of figures
- Include multiple figures under one figure

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Recapitulate Topic 4

Recapitulate Session 20

- Created a basic table
- Aligned content of the table
- Adjusted the width of the column

Recapitulate Session 21

- Added full borders to the table (hline)
- Added necessary borders to the table (cline)
- Added dashed borders to the table using `arydshln` package

Recapitulate Session 22

- Merged rows and columns of a table
- Added spacing to the table

Recapitulate Session 23

- Used longtable for handling large data in a table
- endhead command to repeat the header rows on every page

Recapitulate Session 24

- Table environment
- Position the table
- Added captions
- Created a list of tables

Recapitulate Session 25

- Include images and supported format types
- Changed width and height of an image

Recapitulate Session 26

- Scaled the image
- Cropped the image
- Rotated the image

Recapitulate Session 27

- Added borders for an image
- Adjusted the border thickness
- Space between the border and image

Recapitulate Session 28

- Figure environment (position, caption, list of figures)
- Sub-Figure environment

Thank you



L^AT_EX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Creating Title Page

You will learn to ...

- Create a title page

Recapitulate maketitle

- title
- author
- date
- `\maketitle`

Examine titlepage

- Environment: titlepage

```
\begin{titlepage}
```

...

```
\end{titlepage}
```

- Add text and images
- Style text



Now, you can ...

- Create a title page
 - Style Text
 - Add logos

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Hyperlinks

You will learn to ...

- Add hyperlinks
- Add hypertext (link with an alias)

Hyperlinks – URL

- Package: url
- Displays the link
- `https://firuza.github.io/`
`\url{https://firuza.github.io/}`

Hypertext – href

- Package: hyperref
- Displays the Alias which points to the link
- Click here to view more information

Click `\href{https://firuza.github.io/}{here}`
to view more information

Now, you can ...

- Add hyperlink
- Add hypertext

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Cross Referencing

You will learn to ...

- Add labels
- Refer them
- Cross referencing

Cross Referencing

- Refer
 - Section, subsection, ...
 - Table
 - Figure
 - Page number
- Label: `\label{KEY}`
- Refer
 - `\ref{KEY}`
 - `\pageref{KEY}`
 - `\nameref{KEY}`

Best Practice for Defining Labels

- ch:
- sec:
- subsec:
- fig:
- tbl:



Now, you can ...

- Add labels
- Refer to them in the document

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Creating Indexes

You will learn to ...

- Create index (back index)
- Format it
- Display in ToC

Overview

- Entry of a word at the end
- Used to refer using page number

Steps

- Include package and make the index
`\usepackage{imakeidx}`
`\makeindex`
- Create index keys (Words)
`\index{KEY}`
- Display them (Usually at the end)
`\printindex`



Format Indexes

- Subentry

`\index{ParentKEY!KEY}`

- Cross referencing a key

`\index{KEY|see{OtherKEY}}`

Number of Columns

- Columns
`\makeindex[columns=X]`
X denotes a number
- Display custom title
`\makeindex[title=Back Index]`
- Add the entry in Table of Contents
`\makeindex[intoc]`



Demo

Now, you can ...

- Create an index
- Add sub entry
- Cross reference a key
- Format the index
- Display custom title
- Add entry in ToC

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Creating Bibliography

You will learn to ...

- Add and Style references

Overview

- Attribute
- Research papers, journals, books, articles, etc.
- Create bib file
- Cite it in the document

Bibliography File (.bib)

- Example 1

```
@inproceedings{KEY,  
  title={},  
  author={},  
  booktitle={},  
  pages={X--Y},  
  year={},  
  organization={}  
}
```

- Example 2

```
@article{KEY,  
  title={},  
  author={},  
  journal={},  
  volume={},  
  number={},  
  pages={X--Y},  
  year={},  
  publisher={}  
}
```

- Example 3

```
@book{KEY,  
  title={},  
  author={},  
  volume={},  
  year={},  
  publisher={},  
  location={}  
}
```

Get bibtex

- BibTeX
- Google scholar
- Click Cite, BibTeX
- Copy



Cite

- Cite
`\cite{KEY}`
- Styles: plain, alpha, unsrt, acm
`\bibliographystyle{Style}`
- bib file
`\bibliography{filename}`
- Include reference without citing
`\nocite{KEY}`

Paper Style

- Templates
- IEEE <https://www.ieee.org/conferences/publishing/templates.html>

Now, you can ...

- Create .bib file
- Add references
- Use different bibliography styles

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Recapitulate Topic 5

Recapitulate 30

- Environment: `titlepage`
- Created a sample title page
- Exercise

Recapitulate 31

- Hyperlinks and Hypertext
- Packages: url, hyperref
- Commands: url, href

Recapitulate 32

- Cross-Referencing
- Commands: label, ref, pageref, and nameref

Recapitulate 33

- Created Index
- Package: imakeidx
- Added entries, subentries, and cross-referencing
- Commands: makeindex, index, printindex
- Formatted

Recapitulate 34

- Added references
- Created .bib file
- Added references (BibTeX)
- bibliography, bibliographystyle
- Formatted a basic article into IEEE Format

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Introduction to Beamer

You will learn to ...

- Create presentations in Beamer

Overview

- Creating Presentation Slides
- Microsoft PowerPoint, LibreOffice Impress, etc.
- Document Class: beamer

- Slides

```
\begin{frame}[t|c|b]{Frame Title}
```

...

```
\end{frame}
```

- Rest is LaTeX ...



Themes and Color Themes

- `https://hartwork.org/beamer-theme-matrix/`
- `\usetheme{....}`
- `\usecolortheme{...}`



ToC

- Create sections
- `\tableofcontents`



Demo

Now, you can ...

- Create presentations using Beamer
- Choose theme and color theme

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Blocks and Columns

You will learn to ...

- Add blocks
- Divide content into columns

Blocks

- `\begin{block}{Title}`
...
`\end{block}`
- `\begin{alertblock}{Title}`
...
`\end{alertblock}`
- `\begin{example}`
...
`\end{example}`



Demo

Columns

- Environment

```
\begin{columns}
```

```
...
```

```
\end{columns}
```

- Columns

```
\column{X\textwidth}
```



Demo

Now, you can ...

- Add basic, alert, and example blocks
- Divide the content into multiple columns

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Overlays

You will learn to ...

- Need to display only certain

You will learn to ...

- Need to display only certain
 - text

You will learn to ...

- Need to display only certain
 - text
 - rows of a table

You will learn to ...

- Need to display only certain
 - text
 - items
 - rows of a table

You will learn to ...

- Need to display only certain
 - text
 - items
 - rows of a table
- Reveal them one by one

You will learn to ...

- Need to display only certain
 - text
 - items
 - rows of a table
- Reveal them one by one
- What we just did!

You will learn to ...

- Need to display only certain
 - text
 - items
 - rows of a table
- Reveal them one by one
- Add animation effects to text (Overlays)
- What we just did!

Overview

- Pause
- $\langle \text{No} - \rangle$
- $\langle \text{No} \rangle$
- Onslide

Pause

- `\pause`
- Used in lists, blocks, text, etc.
- Displays one by one
- Sequential



Demo

Overlay

- Used in lists, blocks, etc.
- Sequence number is specified
- Displays items in the specified sequence
- $\langle \text{No} - \rangle$
- $\langle \text{No} \rangle$



Onslide

- Similar to overlay
- Displays text in specified sequence
- Used for normal text, tables, etc.
- `\onslide< No. – >`



Style

- Transparent Items

```
\setbeamercovered{transparent}
```

- Revert back

```
\setbeamercovered{invisible}
```

Now, you can ...

- Add effects to text, lists, blocks, and tables

Thank you



L^AT_EX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Customize Basic Information

You will learn to ...

- Customize basic information
- Add logo

Customize Title Page

- Title
`\title[...]{...}`
- Author
`\author[...]{...}`
- Institute
`\institute[...]{...}`
- Logo
`\logo{\includegraphics{...}}`

[Demo]

Now, you can ...

- Mention alias for title, author, institute
- Add logo

Thank you



L^AT_EX for Students, Engineers, and Scientists

Firuza Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Customize Themes

You will learn to ...

- Change colors of the theme

Theme Color

- `\setbeamercolor{structure}{fg=color}`
- Try out different colors
- Try out different themes



Color Elements (Footer)

- Tertiary

```
\setbeamercolor{palette tertiary}{bg=color, fg=color}
```

- Secondary

```
\setbeamercolor{palette secondary}{bg=color, fg=color}
```

- Primary

```
\setbeamercolor{palette primary}{bg=color, fg=color}
```



Demo

Color Elements (Title, Frametitle)

- Title

```
\setbeamercolor{title}{bg=color, fg=color}
```

- Frame Title

```
\setbeamercolor{frametitle}{bg=color, fg=color}
```

Background Color

- `\setbeamercolor{background canvas}{bg=color}`



Demo

Now, you can ...

- Change theme color, background color

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Aspect Ratio

You will learn to ...

- Specify aspect ratio

Aspect Ratio

- Relationship between width and height
- Represented as $a:b$
- Standards: 4:3, 16:9
- Open the pdf in presentation mode

Aspect Ratio

- `\documentclass[aspectratio=169]{beamer}`



Demo

Now, you can ...

- Mention 16:9 aspect ratio

Thank you



\LaTeX for Students, Engineers, and Scientists

Firuz Karmali
Nagesh Karmali

Department of Computer Science and Engineering
IIT Bombay

Session: Recapitulate Topic 6

Recapitulate Session 36

- Created first presentation in Beamer
- Explored themes and color themes
- Commands: `usetheme`, `usecolortheme`
- Environments for each slide: `frame`

Recapitulate Session 37

- Blocks: block, alertblock, examples
- Divided content into columns

Recapitulate Session 38

- Overlays
- Commands: `pause`, `onslide`, `<-No.>`, `<No.>`

Recapitulate Session 39

- Added basic information and alias
- Logo

Recapitulate Session 40

- Customized the color themes
- Changed colors of each element in beamer structure

Recapitulate Session 41

- Aspect ratio
- Command: `aspectratio=169`

Thank you

