

Rajiv Gandhi University of Knowledge Technologies basar

It workshop

Week:4

Tables in LaTeX:

Tables are used to envision the data in a structured way. It makes the information to become more presentable and easier to read. In this tutorial we are going to learn how to create simple and multi-page tables in LaTeX with customization in their rules and spacing, combining and colouring rows and columns, dealing with captions, references, cell width, positioning and omitting cells.

How do we create tables in LaTeX

The tables in LaTeX can be created using the table environment and the tabular environment which uses **ampersands (&)** as column separators and **new line symbols (\\)** as row separators. The vertical lines (|) are passed as an argument and the letters l, c and r tell us whether we want to place the content in the left, centre or right respectively. Following is the code and result of a simple table created.

1. **\begin{tabular}{|c|c|c|}**: This command begins a **tabular** environment, which is used for creating tables. The argument **{|c|c|c|}** specifies the table format: three columns, each centered (**c**), with vertical lines (**|**) between the columns.
2. **\hline**: This command draws a horizontal line across the width of the table.
3. **\textbf{Column 1} & \textbf{Column 2} & \textbf{Column 3}**: This line specifies the

```

\documentclass{article}

\begin{document}

\begin{table}[h]
  \centering

  \begin{tabular}{|c|c|c|}
    \hline
    \textbf{Column 1} & \textbf{Column 2} & \textbf{Column 3} \\
    \hline
    Row 1, Cell 1 & Row 1, Cell 2 & Row 1, Cell 3 \\
    \hline
    Row 2, Cell 1 & Row 2, Cell 2 & Row 2, Cell 3 \\
    \hline
  \end{tabular}
  \caption{Example Table}
  \label{tab:example}
\end{table}

\end{document}

```

Output:

Column 1	Column 2	Column 3
Row1, cell 1	Row1,cell <u>2</u>	Row1, cell 3
Row 2,cell 1	Row 2,cell <u>2</u>	Row 2,cell 3

____Table 1:Example table

\begin{table}[h]: This command begins a table environment. The **[h]** specifier indicates that LaTeX should try to place the table "here" if possible. You can use other specifiers like **[t]** (top), **[b]** (bottom), or **[p]** (on a separate page).

We need **xcolor** package with the table option to introduce colors to our tables, we can add it with **\usepackage[table]{xcolor}** command. To add color only to a single cell, there is a **\cellcolor{<color>}** command, which needs to be placed in the cell. Below, we changed the colors of some cells.

table (xcolor)

Example:2

```
\documentclass{article}
\usepackage[table]{xcolor}

\begin{document}

\begin{tabular}{|c|c|}
\hline
\cellcolor{green}V & \cellcolor{red}E \\
\hline
\cellcolor{yellow}N & \cellcolor{brown}K \\
\hline
\end{tabular}

\end{document}
```

Output:

V	E
N	K

Figures:

Make sure to replace **example-image** with the filename of your image. This code will insert an image named **example-image** and add a caption below it. The `\centering` command is used to center the image horizontally. The `\caption` command adds a caption to the image, and the `\label` command assigns a label to the figure so you can refer to it later using `\ref{}`.

Example: 1

```
\documentclass{article}
\usepackage{graphicx}

\begin{document}

    \begin{figure}
        \centering
        \includegraphics[width=0.5\textwidth]{image 1}
        \caption{ image 1}
        \label{fig:example}
    \end{figure}

\end{document}
```

Output:



Fig: image 1

Example:2

```
\documentclass{article}
\usepackage{graphicx}
\usepackage{subcaption}

\begin{document}
\begin{figure}[h]

\begin{subfigure}{0.5\textwidth}
\includegraphics[width=1.0\linewidth,
height=8cm]{image 12}
\caption{Caption1}
\end{subfigure}

\hfill
\begin{subfigure}{0.5\textwidth}
\includegraphics[width=1.0\linewidth,
height=8cm]{image 13}
\caption{Caption 2}
\end{subfigure}

\end{figure}

\end{document}
```

Output:



A) Caption 1



B) caption 2

Example:3

```
\documentclass{article}  
\usepackage{graphicx}  
\usepackage{wrapfig}
```

```
\begin{document}  
  \section{laptop}
```

A laptop, also known as a notebook, is a portable computer with a built-in LCD screen, keyboard, and trackpad. A laptop's screen is on a hinge, which allows it to open up when in use and to close like a book to keep it safe when stowed away. A laptop computer also includes a battery that allows it to run anywhere, regardless of whether or not there's a power outlet nearby. Built-in Wi-Fi networking, and in some cases LTE or 5G cellular connectivity, allows a laptop to connect to and browse the Internet without any wires at all.

```
  \begin{wrapfigure}{l}{0.25\textwidth}  
    \includegraphics[width=0.5\linewidth]{laptop}  
    \caption{lap }  
    \label{fig:wrapfig}  
  \end{wrapfigure}
```

Some laptops also include tablet-style touchscreen displays, providing an additional way to interact with it. Some laptops, known as convertible laptops, blur the line between tablet and laptop even further by allowing you to open the screen all the way around to the back. This turns the laptop into a tablet, albeit one with a keyboard and trackpad on the back.

```
\end{document}
```

Output:

1 laptop

A laptop, also known as a notebook, is a portable computer with a built-in LCD screen, keyboard, and trackpad. A laptop's screen is on a hinge, which allows it to open up when in use and to close like a book to keep it safe when stowed away. A laptop computer also includes a battery that allows it to run anywhere, regardless of whether or not there's a power outlet nearby. Built-in Wi-Fi networking, and in some cases LTE or 5G cellular connectivity, allows a laptop to connect to and browse the Internet without any wires at all.



Figure 1: lap 1

Some laptops also include tablet-style touchscreen displays, providing an additional way to interact with it. Some laptops, known as convertible laptops, blur the line between tablet and laptop even further by allowing you to open the screen all the way around to the back. This turns the laptop into a tablet, albeit one with a keyboard

Example:4

```
\documentclass{article}
\usepackage{graphicx}
\begin{document}
\begin{figure}[h]
  \centering
  \includegraphics[width=0.25\textwidth]{mesh}
  \caption{a plot}
  \label{fig:mesh1}
\end{figure}
```

As you can see in the figure \ref{fig:mesh1}, the function grows near 0. Also, in the page \pageref{fig:mesh1} is the same example.

\end{document}

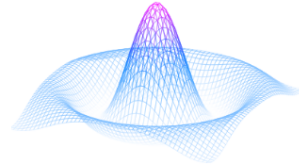


Figure 3: a nice plot

As you can see in the figure 3, the function grows near 0. Also, in the page 7 is the same example.

Inserting Equations Mathematical Symbols:

Inserting Equations Mathematical Symbols

Packages for mathematical typesetting

<code>\usepackage{amsmath}</code>	For enhanced mathematical formatting
<code>\usepackage{amsfonts}</code>	For additional mathematical fonts
<code>\usepackage{amssymb}</code>	For additional mathematical symbols
<code>\usepackage{mathtools}</code>	For additional tools for mathematical typesetting

Equations: basic

Ex:1

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

The equation of a straight line is given by:

```
\[ y = mx + c \]
```

```
\end{document}
```


Output:

The equation of straight line is given by:

$$Y = mx + c$$

Ex:2

```
documentclass{article}
\usepackage{amsmath}
```

```
\begin{document}
```

The well known Pythagorean theorem $(x^2 + y^2 = z^2)$ was proved to be invalid for other exponents.

Meaning the next equation has no integer solutions:

The mass-energy equivalence is described by the famous equation

```
\begin{math}
E=mc^2
E=m
\end{math}
```

```
\end{document}
```

Output:

The well known Pythagorean theorem $x^2 + y^2 = z^2$ was proved to be invalid

for other exponents. Meaning the next equation has no integer solutions:

The mass-energy equivalence is described by the famous equation

$$E = mc^2$$

$$E = m$$

Equations:

```
\documentclass{article}
\usepackage{amsmath}
\begin{document}
```

```
\[ x^n + y^n = z^n \]
```

The formula of

```
\[(a+b)^2\]
\begin{equation}
a^2+b^2+2ab=(a+b)^2
\end{equation}
```

```
\[(x+y)^2\]
\begin{equation}
x^2+y^2+2xy=(x+y)^2
\end{equation}
```

This is a simple math expression $\sqrt{x^2+1}$ inside text.
And this is also the same:

```
\begin{math}
\sqrt{x^2+1}
\end{math}
```

but by using another command.

This is a simple math expression without numbering

```
\[\sqrt{x^2+1}\]
```

separated from text.

This is also the same:

```
\begin{displaymath}
\sqrt{x^2+1}
\end{displaymath}
```

`\end{document}`

Output:

$$x^n + y^n = z^n$$

The formula of

$$\begin{aligned} &(a+b)^2 \\ a^2 + b^2 + 2ab &= (a+b)^2 \end{aligned} \tag{1}$$

$$\begin{aligned} &(x+y)^2 \\ x^2 + y^2 + 2xy &= (x+y)^2 \end{aligned} \tag{2}$$

This is a simple math expression $\sqrt{x^2+1}$ inside text. And this is also the same:

$$\sqrt{x^2+1}$$

but by using another command.

This is a simple math expression without numbering

$$\sqrt{x^2+1}$$

separated from text.

This is also the same:

$$\sqrt{x^2+1}$$

Fractions

It's possible to typeset integrals, fractions and more. Every command has a specific syntax to use. I will demonstrate some of the most common LaTeX math features:

`\documentclass{article}`

`\usepackage{amsmath}`

```

\begin{document}
\begin{align*}
f(x) &= x^2 \\
g(x) &= \frac{1}{x} \\
F(x) &= \int_a^b \frac{1}{3}x^3 \\
\end{align*}
\end{document}

```

Output:

$$f(x)=x^2$$

$$g(x)=\frac{1}{x}$$

$$F(x)=\int_b^a x^3$$

Gather:

```

\documentclass{article}
\usepackage{amsmath}

\begin{document}

\begin{gather}
f(x) = ax^2 + bx + c \\
g(x) = dx^3 + ex^2 + fx + g \\
h(x) = \frac{1}{x} \\
j(x) = \int_0^x e^{-t^2} dt
\end{gather}
\end{document}

```

Output:

$$\begin{array}{ll} f(x) = ax^2 + bx + c & (1) \\ g(x) = dx^3 + ex^2 + fx + g & (2) \\ h(x) = \frac{1}{x} & (3) \\ j(x) = \int_0^x e^{-t^2} dt & (4) \end{array}$$

Matrices

- `\begin{bmatrix}` and `\end{bmatrix}` delimit the matrix environment.
- The content inside the `bmatrix` environment represents the entries of the matrix.
- `&` separates entries within a row.
- `\\` indicates the end of a row and the start of a new one.

This code will produce a 3x3 matrix displayed in the document. Make sure you have the `amsmath` package included for the `bmatrix` environment to work.

```
\documentclass{article}
\usepackage{amsmath} % Required for matrix environment
\begin{document}
```

A matrix example:

```
\[
\begin{bmatrix}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9
\end{bmatrix}
\]
```

```
\end{document}
```

output:

A matrix example:

1	2	3
4	5	6
7	8	9

Mathematical Symbols

Try it

```
\documentclass{article}
```

```
\begin{document}
```

Some mathematical symbols: α , β , $\sum_{i=1}^n x_i$, $\int_a^b f(x) \, dx$, $\lim_{x \rightarrow \infty} f(x)$.

```
\end{document}
```

letters and math symbols

description	code
Greek letters	α β γ ρ σ δ ϵ
Binary operators	\times \otimes \oplus \cup \cap
Relation operators	$<$ $>$ \subset \supset \subseteq \supseteq
Others	\int \oint \sum \prod

BibTeX:

BibTeX is a tool and a file format which are used to describe and process lists of references, mostly in conjunction with LaTeX documents.

- BibTeX stores all references in a plain text database external to a LaTeX document.
- References in a BibTeX database can be cited in a LaTeX document
- Bibliography can be created in many styles
- BibTeX files have a file extension **.bib**

A Sample BibTeX Database Entry

```
@article{lamport1986latex,  
  author   = "Leslie Lamport",  
  title    = "LaTeX: A Document Preparation System",  
  journal  = "Addison-Wesley series in computer science",  
  volume   = "35",  
  year     = "1986",  
  publisher = "Addison-Wesley"  
}
```

Bibliography Styles:

Set up bibliography style:

Choose a bibliography style (.bst) file that determines the formatting of your bibliography. Common styles include **plain**, **alpha**, and **unsrt**. Include the style in your LaTeX document with the `\bibliographystyle{style}`

- After we finish writing and citing, we need to create the reference list using a bibliography style
- A bibliography style determines how a reference is formatted
- A bibliography style file has the extension.bst

[Cite \(Citation\)](#)

When citing references in LaTeX using BibTeX, you typically use the `\cite{}` command. Here's how you can include citation details using BibTeX:

Include citations in your LaTeX document: In your document, where you want to cite a reference, use the `\cite{key}` command. Replace **key** with the corresponding citation key from your **.bib** file.

- `\cite{einstein1905}` will produce a citation corresponding to the entry with the key **einstein1905** in your **.bib** file.
- `\cite{bohm1951}` will produce a citation corresponding to the entry with the key **bohm1951**.

[References:](#)

Once you've created your **.bib** file with your references, you can include it in your LaTeX document using the `\bibliography{filename}` command, where **filename** is the name of your **.bib** file without the extension. For example:

```
\bibliography{references}
```

[Inserting the bibliography:](#)

commands to create bibliography

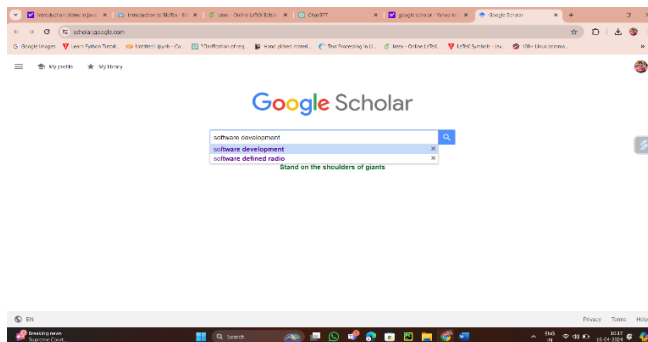
- To specify which bibliography style for your LaTeX document, use this command:
`\bibliographystyle{stylename}`

- To specify from which BibTex database to create your bibliography, use this command:
\bibliography{bibfilename}
- Insert the two commands to where you want to create bibliography

\bibliographystyle{plain}
\bibliography{mybibtex}

- BibTex database has been created
- Writing and citing has been completed
- Bibliography style has been chosen
- \bibliography command is in place

Open google Scholar



Bibtex Database

ref.bib

```
@article{abrahamsson2017agile,
  title={Agile software development methods: Review and analysis},
  author={Abrahamsson, Pekka and Salo, Outi and Ronkainen, Jussi and Warsta, Juhani},
  journal={arXiv preprint arXiv:1709.08439},
  year={2017}
```

```
}
```

main.bib

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

```
\title{Basic BibTeX Program}  
\author{Your Name}  
\date{\today}  
\maketitle
```

```
\section{Introduction}
```

This is a basic example of using BibTeX to manage bibliographic references in LaTeX.

```
\section{Citation}
```

Here is a citation using BibTeX: \cite{abrahamsson2017agile},

```
\section{References}  
\bibliographystyle{plain}  
\bibliography{ref}
```

```
\end{document}
```

Output:

Basic BibTeX Program

Your Name

April 16, 2024

1 Introduction

This is a basic example of using BibTeX to manage bibliographic references in LaTeX.

2 Citation

Here is a citation using BibTeX: [1],

3 References

References

- [1] Pekka Abrahamsson, Outi Salo, Jussi Ronkainen, and Juhani Warsta. Agile software development methods: Review and analysis. *arXiv preprint arXiv:1709.08439*, 2017.

Ex:2

BibTex Database

reference1.bib

```
@article{ulversoy2010software,  
  title={Software defined radio: Challenges and opportunities},  
  author={Ulversoy, Tore},  
  journal={IEEE Communications Surveys \& Tutorials},  
  volume={12},  
  number={4},  
  pages={531--550},  
  year={2010},  
  publisher={IEEE}  
}
```

```
@article{sadiku2004software,  
  title={Software-defined radio: a brief overview},  
  author={Sadiku, Mathew NO and Akujuobi, Cajetan M},
```

```

journal={Ieee Potentials},
volume={23},
number={4},
pages={14--15},
year={2004},
publisher={IEEE}
}

```

```

@article{jondral2005software,
title={Software-defined radio—basics and evolution to cognitive radio},
author={Jondral, Friedrich K},
journal={EURASIP journal on wireless communications and networking},
volume={2005},
pages={1--9},
year={2005},
publisher={Springer}
}

```

main.bib

```

\documentclass{article}
\begin{document}

```

```

\title{Basic BibTeX Program}
\author{venky}
\date{14/08/2000}
\maketitle

```

```

\section{Introduction}

```

This is a basic example of using BibTeX to manage bibliographic references in LaTeX.

```

\section{Citation}

```

Here is a citation using BibTeX: \cite{ulversoy2010software},
\cite{sadiku2004software},
\cite{jondral2005software},

```

\section{References}

```

```

\bibliographystyle{plain}
\bibliography{reference1}

```

`\end{document}`

Output:

Basic BibTeX Program

venky

14/08/2000

1 Introduction

This is a basic example of using BibTeX to manage bibliographic references in LaTeX.

2 Citation

Here is a citation using BibTeX: [3], [2], [1],

3 References

References

- [1] Friedrich K Jondral. Software-defined radio—basics and evolution to cognitive radio. *EURASIP journal on wireless communications and networking*, 2005:1–9, 2005.
- [2] Mathew NO Sadiku and Cajetan M Akujuobi. Software-defined radio: a brief overview. *Ieee Potentials*, 23(4):14–15, 2004.
- [3] Tore Ulversoy. Software defined radio: Challenges and opportunities. *IEEE Communications Surveys & Tutorials*, 12(4):531–550, 2010.