

Basic Graphics, Figures and Tables in L^AT_EX

Professional Document Preparation System

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Using Color in L^AT_EX

This topic explains how to use color in your L^AT_EX document via the `xcolor` package which provides a set of commands for color manipulation and supports a larger number of color models.

```
\usepackage{xcolor}
```




















Commands:

```
This is some sample {\color{red} text with color}.  
We can use many {\color{blue} built-in} {\color{violet} colors}  
↪ {\color{brown} here}.
```

Output:

This is some sample **text with color**. We can use many **built-in colors here**.

Named colors provided by the xcolor package

	red		lightgray
	green		brown
	blue		lime
	cyan		olive
	magenta		orange
	yellow		pink
	black		purple
	gray		teal
	white		violet
	darkgray		

Named colors provided by the xcolor package

xcolor package options:

- ▶ dvipsnames: loads 68 named colors (CMYK)
- ▶ svgnames: loads 151 named colors (RGB)
- ▶ x11names: loads 317 named colors (RGB)

```
\usepackage[dvipsnames]{xcolor}
```

 Apricot	 Aquamarine	 Bittersweet	 Black
 Blue	 BlueGreen	 BlueViolet	 BrickRed
 Brown	 BurntOrange	 CadetBlue	 CarnationPink
 Cerulean	 CornflowerBlue	 Cyan	 Dandelion
 DarkOrchid	 Emerald	 ForestGreen	 Fuchsia
 Goldenrod	 Gray	 Green	 GreenYellow
 JungleGreen	 Lavender	 LimeGreen	 Magenta
 Mahogany	 Maroon	 Melon	 MidnightBlue
 Mulberry	 NavyBlue	 OliveGreen	 Orange
 OrangeRed	 Orchid	 Peach	 Periwinkle
 PineGreen	 Plum	 ProcessBlue	 Purple
 RawSienna	 Red	 RedOrange	 RedViolet
 Rhodamine	 RoyalBlue	 RoyalPurple	 RubineRed
 Salmon	 SeaGreen	 Sepia	 SkyBlue
 SpringGreen	 Tan	 TealBlue	 Thistle
 Turquoise	 Violet	 VioletRed	 White
 WildStrawberry	 Yellow	 YellowGreen	 YellowOrange

Defining your own colors

```
\usepackage{xcolor}

\definecolor{mypink1}{rgb}{0.858, 0.188, 0.478}
\definecolor{mypink2}{RGB}{219, 48, 122}
\definecolor{mypink3}{cmyk}{0, 0.7808, 0.4429, 0.1412}
\definecolor{mypink4}{HTML}{F88379}
```

Commands:

```
Defined color with {\color{mypink1} different color models}.
Defined color with {\color{mypink2} different color models}.
Defined color with {\color{mypink3} different color models}.
Defined color with {\color{mypink4} different color models}.
```

Output:

Defined color with different color models.
Defined color with different color models.
Defined color with different color models.
Defined color with different color models.

Color Codes



Name: Thistle
Hex: #E0BBE4
RGB: (224, 187, 228)
CMYK: 0.017, 0.179, 0, 0.105



Name: Lavender Purple
Hex: #957DAD
RGB: (149, 125, 173)
CMYK: 0.138, 0.277, 0, 0.321



Name: Pastel Violet
Hex: #D291BC
RGB: (210, 145, 188)
CMYK: 0, 0.309, 0.104, 0.176



Name: Cotton Candy
Hex: #FEC8D8
RGB: (254, 200, 216)
CMYK: 0, 0.212, 0.149, 0.003



Name: Lumber
Hex: #FFDFD3
RGB: (255, 223, 211)
CMYK: 0, 0.125, 0.172, 0

Find more color codes and schemes:

- ▶ <https://www.schemecolor.com>
- ▶ <https://colorhunt.co>
- ▶ <https://htmlcolorcodes.com>
- ▶ <https://paletton.com>
- ▶ <https://coolors.co>
- ▶ <https://mycolor.space>
- ▶ <http://colormind.io>
- ▶ <https://color.adobe.com/create/color-wheel>
- ▶ <https://www.canva.com/colors/color-palettes/>

Mixing colors

```
\usepackage{xcolor}

\colorlet{LightRed}{red!50}
\colorlet{CottonCandy}{pink!80!blue}
```

Commands:

This is `{\color{LightRed}}` how we mixed colors.

This is `{\color{CottonCandy}}` how we mixed colors.

Output:

This is how we mixed colors.

This is how we mixed colors.

Setting the page background color

```
1 \documentclass{article}
2 \usepackage{xcolor}
3 \colorlet{CottonCandy}{pink!80!blue}
4
5 \begin{document}
6 \pagecolor{CottonCandy}
7 This document presents several
  ↳ examples showing how to use the
  ↳ xcolor package to change the
  ↳ color of page elements.
8 \end{document}
```

This document presents several examples showing how to use the `xcolor` package to change the color of page elements.

Inserting Images

```
1 \documentclass{article}
2 \usepackage{graphicx}
3 \graphicspath{ {./images/} }
4
5 \begin{document}
6 The universe is immense and it seems to be homogeneous,
7 in a large scale, everywhere we look at.
8
9 \includegraphics{universe.jpeg}
10
11 There's a picture of a galaxy above
12 \end{document}
```

The universe is immense and it seems to be homogeneous, in a large scale, everywhere we look at.



There's a picture of a galaxy above

Changing the image size

```
1 \begin{document}
2
3 Overleaf is a great professional tool to edit online documents,
4 share and backup your \LaTeX{} projects. Also offers a
5 rather large help documentation.
6
7 \includegraphics[scale=1.5]{overleaf-logo.png}
```

Overleaf is a great professional tool to edit online documents, share and backup your \LaTeX projects. Also offers a rather large help documentation.



Changing the image size

```
1 \begin{document}
2
3 Overleaf is a great professional tool to edit online documents,
4 share and backup your \LaTeX{} projects. Also offers a
5 rather large help documentation.
6
7 \includegraphics[width=5cm, height=4cm]{overleaf-logo.png}
```

Overleaf is a great professional tool to edit online documents, share and backup your \LaTeX projects. Also offers a rather large help documentation.



Changing the image size

```
1 \begin{document}
2
3 The universe is immense and it seems to be homogeneous,
4 in a large scale, everywhere we look at.
5
6 \includegraphics[width=\textwidth]{universe.jpeg}
```

The universe is immense and it seems to be homogeneous, in a large scale,
everywhere we look at.



Rotating the image

```
1 \begin{document}
2
3 Overleaf is a great professional tool to edit online,
4 share and backup your \LaTeX{} projects. Also offers a
5 rather large base of help documentation.
6
7 \includegraphics[scale=1.2, angle=45]{overleaf-logo.png}
```

Overleaf is a great professional tool to edit online, share and backup your \LaTeX projects. Also offers a rather large base of help documentation.



Figures

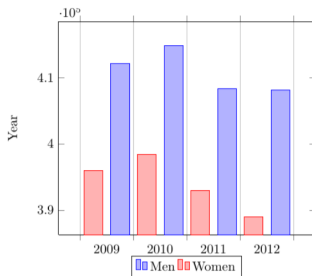
The `figure` environment is used to display pictures as **floating elements** within the document.

- ▶ This means you include the picture inside the `figure` environment and you don't have to worry about its placement.
- ▶ \LaTeX will position it in a such way that it fits the flow of the document.

Figures

1 In this picture you can see a bar graph that shows
2 the results of a survey which involved some important
3 data studied as time passed.

```
4  
5 \begin{figure}[t]  
6 \includegraphics[width=8cm]{Plot.png}  
7 \centering  
8 \end{figure}
```



In this picture you can see a bar graph that shows the results of a survey which involved some tricky data studied as time passed.

Figure's Positionings

Parameter	Position
h	Place the float here, i.e., approximately at the same point it occurs in the source text (however, not exactly at the spot).
t	Position at the top of the page.
b	Position at the bottom of the page.
p	Put on a special page for floats only.
!	Override internal parameters \LaTeX uses for determining "good" float positions.
H	Places the float at precisely the location in the \LaTeX code. Requires the float package, though may cause problems occasionally. This is somewhat equivalent to h!.

Wrapping text around figures

```
\usepackage{wrapfig}
```

```
1 \begin{wrapfigure}{r}{0.25\textwidth} %this will be at the right  
2   \centering  
3   \includegraphics[width=0.25\textwidth]{mesh.png}  
4 \end{wrapfigure}
```

There are several ways to plot a function of two variables, depending
→ on the information you are interested in.

For instance, if you want to see the mesh of a function so it easier
→ to see the derivative you can use a plot like the one on the left.

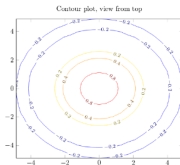
```
9 \begin{wrapfigure}{l}{0.25\textwidth}  
10   \centering  
11   \includegraphics[width=0.25\textwidth]{contour.png}  
12 \end{wrapfigure}
```

On the other side, if you are only interested on certain values you
→ can use the contour plot, you can use the contour plot, you can
→ use the contour plot, you can use the contour plot, you can use
→ the contour plot, you can use the contour plot, you can use the
→ contour plot, like the one on the left.

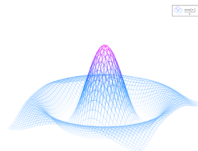
Output

There are several ways to plot a function of two variables, depending on the information you are interested in. For instance, if you want to see the mesh of a function so it easier to see the derivative you can use a plot like the one on the left.

On the other side, if you are only interested on certain values you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, like the one on the left.



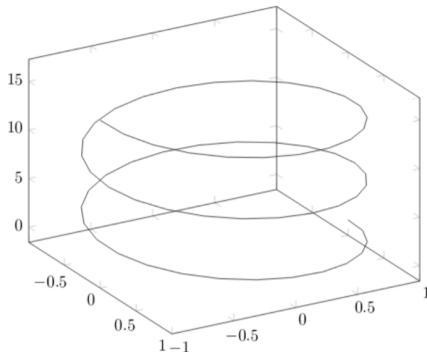
On the other side, if you are only interested on certain values you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, you can use the contour plot, like the one on the left.



Figure's Captioning

```
1 \begin{figure}[h]
2 \caption{Example of a parametric plot  $(\sin(x), \cos(x), x)$ }
3 \centering
4 \includegraphics[width=0.5\textwidth]{spiral.png}
5 \end{figure}
```

Figure 1: Example of a parametric plot $(\sin(x), \cos(x), x)$



Labels and Cross-references

```
1 \begin{figure}[h]
2   \centering
3   \includegraphics[width=0.25\textwidth]{mesh.png}
4   \caption{a nice plot}
5   \label{fig:mesh1}
6 \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.

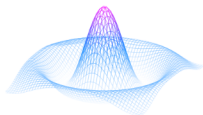


Figure 3: a nice plot

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

List of Figures

Another great characteristic in a \LaTeX document is the ability to automatically generate a list of figures. This is straightforward.

```
\listoffigures
```

List of Figures

1	Example of a parametric plot $(\sin(x), \cos(x), x)$	6
2	Using again the picture of the universe. This caption will be on the right	6
3	a nice plot	7
4	a nice contour plot	7

This command **only works on captioned figures**, since it uses the caption in the table.

Reference Guide: Length Abbreviation

Abbreviation	Definition
pt	A point, is the default length unit. About 0.3515mm
mm	a millimetre
cm	a centimetre
in	an inch
ex	the height of an x in the current font
em	the width of an m in the current font
<code>\columnsep</code>	distance between columns
<code>\columnwidth</code>	width of the column
<code>\linewidth</code>	width of the line in the current environment
<code>\paperwidth</code>	width of the page
<code>\paperheight</code>	height of the page
<code>\textwidth</code>	width of the text
<code>\textheight</code>	height of the text
<code>\unitlength</code>	units of length in the picture environment.

Reference Guide: Supported Graphic Formats

Format	Recommendation
jpg/jpeg	Popular bitmap graphic format. Good choice if we want to insert photos.
png	Better quality than jpg/jpeg format and supported transparent backgrounds. However, the file size is averagely larger.
pdf	Best choice and quality if it is sourced with vector graphic.
eps	These can be included using the <code>epstopdf</code> package (we just need to install the package, we don't need to use <code>\usepackage {}</code> to include it in our document.)

Tabular Environment

```
1 \begin{tabular}{c c c }  
2   cell1 & cell2 & cell3 \\  
3   cell4 & cell5 & cell6 \\  
4   cell7 & cell8 & cell9  
5 \end{tabular}
```

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

Adding borders

```
1 \begin{tabular}{|c|c|c| }
2   \hline
3   cell1 & cell2 & cell3 \\\
4   cell4 & cell5 & cell6 \\\
5   cell7 & cell8 & cell9 \\\
6   \hline
7 \end{tabular}
```

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

Adding more borders

```
1 \begin{tabular}{||c c c c||}  
2 \hline  
3 Col1 & Col2 & Col2 & Col3 \\\[0.5ex]  
4 \hline\hline  
5 1 & 6 & 87837 & 787 \\  
6 \hline  
7 2 & 7 & 78 & 5415 \\  
8 \hline  
9 3 & 545 & 778 & 7507 \\  
10 \hline  
11 4 & 545 & 18744 & 7560 \\  
12 \hline  
13 5 & 88 & 788 & 6344 \\\[1ex]  
14 \hline  
15 \end{tabular}
```

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

Column Aligning

Abbreviation	Alignment
c	The contents of the column will be centered.
l	The contents of the column will be left aligned.
r	The contents of the column will be right aligned.
p{xxx}	The contents of the column will be aligned as a paragraph with fixed length of text width, e.g., p{5cm} or p{0.45\textwidth }.

Positioning Tables

```
1 Below is a table positioned exactly  
2 ↪ here:  
3 \begin{table}[h!]  
4 \centering  
5 \begin{tabular}{||c c c c||}  
6 \hline  
7 Col1 & Col2 & Col2 & Col3 \\\ [0.5ex]  
8 \hline\hline  
9 1 & 6 & 87837 & 787 \\  
10 2 & 7 & 78 & 5415 \\  
11 3 & 545 & 778 & 7507 \\  
12 4 & 545 & 18744 & 7560 \\  
13 5 & 88 & 788 & 6344 \\\ [1ex]  
14 \hline  
15 \end{tabular}  
\end{table}
```

Below is a table positioned exactly here:

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

Captions and Cross-references

```
1 Table \ref{table:1} is
2 an example of a referenced
3 ↪ \LaTeX{} element.
4
5 \begin{table}[h!]
6 \centering
7 \begin{tabular}{|c|c|c|c|}
8 \hline
9 Col1 & Col2 & Col2 & Col3 \\
10 \hline
11 1 & 6 & 87837 & 787 \\
12 2 & 7 & 78 & 5415 \\
13 3 & 545 & 778 & 7507 \\
14 4 & 545 & 18744 & 7560 \\
15 5 & 88 & 788 & 6344 \\
16 \hline
17 \end{tabular}
18 \caption{Table to test
19 ↪ captions and labels.}
20 \label{table:1}
21 \end{table}
```

Table 1 is an example of a referenced L^AT_EX element.

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

Table 1: Table to test captions and labels.

List of Tables

To create a list of tables use the command. The caption of each table will be used to generate this list

```
\listoftables
```

List of Tables

- 1 This is the caption for the first table. 1
- 2 This is the caption for the second table. 1

The table 1 is an example of referenced L^AT_EX elements.

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

Table 1: This is the caption for the first table.

Col1	Col2	Col2	Col3
4	545	18744	7560
5	88	788	6344

Table 2: This is the caption for the second table.

This command **only works on captioned tables.**