What is LaTeX?

LaTeX (pronounced *LAY-tek* or *LAH-tek*) is a tool used to **create professional-looking** documents. It is based on the **WYSIWYM** (what you see is what you mean) idea, meaning you only have **focus on the contents of your document** and the computer will take care of the formatting. Instead of spacing out text on a page to control formatting, as with Microsoft Word or LibreOffice Writer, users can enter plain text and let LaTeX take care of the rest.

How to run latex in Linux?

To install LaTeX, use the terminal command:

```
sudo apt-get install texlive-full
```

One of the best and easiest references for LATEX is the WikiBook https://en.wikibooks.org/wiki/LaTeX.

editing tex files

LaTeX tex files can be edited and compiled in the terminal. I often use vim equipped with <u>vimtex</u> plugin. but they can also be edited and compiled in a text editor such as TexStudio: <u>https://www.texstudio.org/</u>.

Why learn LaTeX?

LaTeX is used all over the world for scientific documents, books, as well as many other forms of publishing. Not only can it create beautifully typeset documents, but it allows users to very quickly tackle the more complicated parts of typesetting, such as inputting mathematics, creating tables of contents, referencing and creating bibliographies, and having a consistent layout across all sections. Due to the **huge number of open source** *packages* available (more on this later), the possibilities with LaTeX are endless. These *packages* allow users to do even more with LaTeX, such as add footnotes, draw schematics, create tables etc.

You can create one style of document which can be used to **standardise the appearance of many different documents**. This allows scientific journals to create templates for submissions. These templates have a pre-made layout meaning that only the content needs to be added. In fact there are hundreds of <u>templates</u> available for everything from CVs to slideshows.

Writing your first piece of LaTeX

The first step is to create a new LaTeX project. Let's start with the simplest working example:

\documentclass{article}

\begin{document}
First document. This is a simple example, with no
extra parameters or packages included.
\end{document}

First document. This is a simple example, with no extra parameters or packages included.

The preamble of a document

In the previous example the text was entered after the **\begin{document}** command. Everything in your **.tex** file *before* this point is called the **preamble**. In the preamble you define the type of document you are writing, the language you are writing in, the *packages* you would like to use (more on this later) and several other elements. For instance, a normal document preamble would look like this:

```
\documentclass[12pt, letterpaper]{article}
\usepackage[utf8]{inputenc}
```

Below a detailed description of each line:

\documentclass[12pt, letterpaper]{article}

As said before, this defines the type of document. Some additional parameters included in the square brackets can be passed to the command. These parameters must be comma-separated. In the example, the extra parameters set the font size (**12pt**) and the paper size (**letterpaper**). Of course other font sizes (**9pt**, **11pt**, **12pt**) can be used, but if none is specified, the default size is **10pt**. As for the paper size other possible values are **a4paper** and **legalpaper**; see the article about <u>Page size and margins</u> for more details about this.

\usepackage[utf8]{inputenc}

This is the encoding for the document. It can be omitted or changed to another encoding but utf-8 is recommended. Unless you specifically need another encoding, or if you are unsure about it, add this line to the preamble.

Adding a title, author and date

To add a title, author and date to our document, you must add three lines to the **preamble** (NOT the main body of the document). These lines are

\title{First document}

This is the title.

• \author{Hubert Farnsworth}

Here you put the name of the Author(s) and, as an optional addition, you can add the next command within the curly braces:

• \thanks{funded by the Overleaf team}

This can be added after the name of the author, inside the braces of the **author** command. It will add a superscript and a footnote with the text inside the braces. Useful if you need to thank an institution in your article.

• \date{February 2014}

You can enter the date manually or use the command **\today** so the date will be updated automatically at the time you compile your document

With these lines added, your preamble should look something like this

```
\documentclass[12pt, letterpaper, twoside]{article}
\usepackage[utf8]{inputenc}
\title{First document}
\author{Hubert Farnsworth \thanks{funded by the Overleaf team}}
\date{February 2017}
```

Now that you have given your document a title, author and date, you can print this information on the document with the **\maketitle** command. This should be included in the **body** of the document at the place you want the title to be printed.

```
\begin{document}
\maketitle
We have now added a title, author and date to our first \LaTeX{} document!
\end{document}
```

Adding comments

As with any code you are writing, it can often be useful to include comments. Comments are pieces of text you can include in the document which will not be printed, and will not affect the document in any way. They are useful for organizing your work, taking notes, or commenting out lines/sections when debugging. To make a comment in LaTeX, simply write a % symbol at the beginning of the line as shown below:

```
\begin{document}
\maketitle
We have now added a title, author and date to our first \LaTeX{} document!
% This line here is a comment. It will not be printed in the document.
\end{document}
```

Bold, italics and underlining

We will now look at some simple text formatting commands.

- **Bold**: Bold text in LaTeX is written with the **\textbf{...}** command.
- *Italics*: Italicised text in LaTeX is written with the **\textit{...}** command.
- Underline: Underlined text in LaTeX is written with the **\underline{...}** command.

An example of each of these in action is shown below:

```
Some of the \textbf{greatest}
discoveries in \underline{science}
were made by \textbf{\textit{accident}}.
```

Some of the **greatest** discoveries in <u>science</u> were made by *accident*.

Another very useful command is the **\emph{...}** command. What the **\emph** command actually does with its argument depends on the context - inside normal text the emphasized text is italicized, but this behaviour is reversed if used inside an italicized text- see example below:

```
Some of the greatest \emph{discoveries}
in science
were made by accident.
\textit{Some of the greatest \emph{discoveries}
in science
were made by accident.}
\textbf{Some of the greatest \emph{discoveries}
in science
were made by accident.}
```

Some of the greatest *discoveries* in science were made by accident.

Some of the greatest discoveries in science were made by accident.

Some of the greatest *discoveries* in science were made by accident.

Moreover, some packages, e.g. <u>Beamer</u>, change the behaviour of **\emph** command.

Adding images

We will now look at how to add images to a LaTeX document. On Overleaf, you will first have to <u>upload</u> <u>the images</u>.

Below is a example on how to include a picture.

```
\documentclass{article}
\usepackage{graphicx}
\graphicspath{ {images/} }
\begin{document}
The universe is immense and it seems to be homogeneous,
in a large scale, everywhere we look at.
\includegraphics{universe}
There's a picture of a galaxy above
\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

Captions, labels and references

Images can be captioned, labelled and referenced by means of the **figure** environment as shown below:

```
\begin{figure}[h]
   \centering
   \includegraphics[width=0.25\textwidth]{mesh}
   \caption{a nice 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.
```



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.

There are three important commands in the example:

- **\caption{a nice plot}**: As you may expect this command sets the caption for the figure. If you create a list of figures this caption will be used there. You can place it above or below the figure.
- **\label{fig:mesh1}**: If you need to refer the image within your document, set a label with this command. The label will number the image, and combined with the next command will allow you to reference it.
- \ref{fig:mesh1}: This code will be substituted by the number corresponding to the referenced figure.

When placing images in a LaTeX document, we should always put them inside a **figure** environment or similar so that LaTeX will position the image in a way that fits in with the rest of your text.

*Note: If you are using captions and references, you **will have to compile the document twice** for the references to work. *

Creating lists in LaTeX

Lists are very simple to create in LaTeX. You can create lists using different list *environments*. Environments are sections of our document that you want to present in a different way to the rest of the document. They start with a **\begin{...}** command and end with an **\end{...}** command.

There are two main different types of lists, *ordered* lists and *unordered* lists. Each will use a different environment.

Unordered lists

Unordered lists are produced by the **itemize** environment. Each entry must be preceded by the control sequence **\item** as shown below.

```
\begin{itemize}
  \item The individual entries are indicated with a black dot, a so-called bullet.
  \item The text in the entries may be of any length.
  \end{itemize}
```

Ordered lists

Ordered list have the same syntax inside a different environment. We make ordered lists using the **enumerate** environment:

```
\begin{enumerate}
  \item This is the first entry in our list
  \item The list numbers increase with each entry we add
 \end{enumerate}
```

Adding math to LaTeX

One of the main advantages of LaTeX is the ease at which mathematical expressions can be written. LaTeX allows two writing modes for mathematical expressions: the **inline** mode and the **display** mode. The first one is used to write formulas that are part of a text. The second one is used to write expressions that are not part of a text or paragraph, and are therefore put on separate lines. Let's see an example of the **inline** mode:

In physics, the mass-energy equivalence is stated by the equation \$E=mc^2\$, discovered in 1905 by Albert Einstein.

In physics, the mass-energy equivalence is stated by the equation $E = mc^2$, discovered in 1905 by Albert Einstein.

To put your equations in *inline* mode use one of these delimiters: (\dots) , \dots or **begin{math}**... **\end{math}**. They all work and the choice is a matter of taste.

The *displayed* mode has two versions: numbered and unnumbered.

```
The mass-energy equivalence is described by the famous equation 
\[ E=mc^2 \]
discovered in 1905 by Albert Einstein.
In natural units ($c = 1$), the formula expresses the identity
\begin{equation}
E=m
\end{equation}
```

The mass-energy equivalence is described by the famous equation

$$E = mc^2$$

discovered in 1905 by Albert Einstein. In natural units (c = 1), the formula expresses the identity

$$E = m \tag{1}$$

To print your equations in *display* mode use one of these delimiters: **\[... \]**, **\begin{align} ... \end{displaymath}** or **\begin{align} ... \end{equation}**. \$\$... \$\$ is <u>discouraged</u> as it can give inconsistent spacing, and may not work well with some math packages.

Important Note: *equation* * *environment is provided by an external package, consult the* <u>amsmath</u> <u>article</u>.

Many math mode commands require the **amsmath** package, so be sure to include it when writing math. An example is shown below of some basic math mode commands.

Subscripts in math mode are written as \$a_b\$ and superscripts are written as \$a^b\$. These can be combined an nested to write expressions such as

\[T^{i_1 i_2 \dots i_p}_{j_1 j_2 \dots j_q} =
T(x^{i_1}, \dots, x^{i_p}, e_{j_1}, \dots, e_{j_q}) \]

We write integrals using \$\int\$ and fractions using \$\frac{a}{b}\$. Limits are placed on integrals using superscripts and subscripts:

```
\left[ \int d^1 \int dx \left[e^x\right] = \int dx \left[e^1\right] \left[e^x\right] \right]
```

Lower case Greek letters are written as \$\omega\$ \$\delta\$ etc. while upper case Greek letters are written as \$\Omega\$ \$\Delta\$.

Mathematical operators are prefixed with a backslash as \$\sin(\beta)\$, \$\cos(\alpha)\$, \$\log(x)\$ etc. Subscripts in math mode are written as a_b and superscripts are written as a^b . These can be combined an nested to write expressions such as

$$T^{i_1i_2...i_p}_{j_1j_2...j_q} = T(x^{i_1},...,x^{i_p},e_{j_1},...,e_{j_q})$$

We write integrals using \int and fractions using $\frac{a}{b}$. Limits are placed on integrals using superscripts and subscripts:

$$\int_0^1 \frac{dx}{e^x} = \frac{e-1}{e}$$

Lower case Greek letters are written as $\omega \delta$ etc. while upper case Greek letters are written as $\Omega \Delta$.

Mathematical operators are prefixed with a backslash as $sin(\beta)$, $cos(\alpha)$, log(x) etc.

Basic Formatting

We will now look at how to write abstracts, as well as how to format a LaTeX document into different chapters, sections and paragraphs.

Abstracts

In scientific documents it's a common practice to include a brief overview of the main subject of the paper. In LaTeX there's the **abstract** environment for this. The **abstract** environment will put the text in a special format at the top of your document.

```
\begin{document}
\begin{abstract}
This is a simple paragraph at the beginning of the
document. A brief introduction about the main subject.
\end{abstract}
\end{document}
```

Abstract

This is a simple paragraph at the beginning of the document. A brief introduction about the main subject.

Paragraphs and newlines

\begin{document}

\begin{abstract}
This is a simple paragraph at the beginning of the
document. A brief introduction about the main subject.
\end{abstract}

Now that we have written our abstract, we can begin writing our first paragraph.

This line will start a second Paragraph. \end{document}

Abstract

This is a simple paragraph at the beginning of the document. A brief introduction about the main subject.

Now that we have written our abstract, we can begin writing our first paragraph.

This line will start a second Paragraph.

When writing the contents of your document, if you need to start a new paragraph you must hit the "Enter" key twice (to insert a double blank line). Notice that LaTeX automatically indents paragraphs.

To start a new line without actually starting a new paragraph insert a *break line* point, this can be done by \mathcal{N} (a double backslash as in the example) or the **\newline** command.

Care should be taken that multiple \\ or \newline's are not used to "simulate" paragraphs with larger spacing between them, as this can interfere with LaTeX's typesetting algorithms. The recommended method to do so is to keep using double blank lines to create new paragraphs without any \\, and then add **\usepackage{parskip}** to the preamble.

Chapters and Sections

Commands to organize a document vary depending on the document type, the simplest form of organization is the sectioning, available in all formats.

```
\chapter{First Chapter}
```

```
\section{Introduction}
```

```
This is the first section.
```

```
Lorem ipsum dolor sit amet, consectetuer adipiscing
elit. Etiam lobortisfacilisis sem. Nullam nec mi et
neque pharetra sollicitudin. Praesent imperdietmi nec ante.
Donec ullamcorper, felis non sodales...
```

```
\section{Second Section}
```

```
Lorem ipsum dolor sit amet, consectetuer adipiscing elit.
Etiam lobortis facilisissem. Nullam nec mi et neque pharetra
sollicitudin. Praesent imperdiet mi necante...
```

```
\subsection{First Subsection}
Praesent imperdietmi nec ante. Donec ullamcorper, felis non sodales...
```

```
\section*{Unnumbered Section}
Lorem ipsum dolor sit amet, consectetuer adipiscing elit.
Etiam lobortis facilisissem
```

Chapter 1

First Chapter

1.1 Introduction

This is the first section.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortisfacilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdietmi nec ante. Donec ullamcorper, felis non sodales...

1.2 Second Section

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisissem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi necante...

1.2.1 First Subsection

Praesent imperdietmi nec ante. Donec ullamcorper, felis non sodales...

Unnumbered Section

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisissem

The command **\section{}** marks the beginning of a new section, inside the braces is set the title. Section numbering is automatic and can be disabled by including a ***** in the section command as **\section*{}**. We can also have **\subsection{}** s, and indeed **\subsubsection{}** s. The basic levels of depth are listed below:

-1	\part{part}
0	\chapter{chapter}
1	\section{section}
2	\subsection{subsection}
3	\subsubsection{subsubsection}
4	\paragraph{paragraph}
5	\subparagraph{subparagraph}

Note that **\part** and **\chapter** are only available in *report* and *book* document classes.

Creating tables

Creating a simple table in LaTeX

Below you can see the simplest working example of a table

```
\begin{center}
\begin{tabular}{ c c c }
cell1 & cell2 & cell3 \\
cell4 & cell5 & cell6 \\
cell7 & cell8 & cell9
\end{tabular}
\end{center}
```

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

The **tabular** environment is the default LaTeX method to create tables. You must specify a parameter to this environment, in this case $\{c \ c \ c\}$. This tells LaTeX that there will be three columns and that the text inside each one of them must be centred. You can also use **r** to align the text to the right and **l** for left alignment. The alignment symbol **b** is used to specify the breaks in the table entries. There must always be one less alignment symbol in each line than the number of columns. To go to the next line of your table, we use the *new line* command N. We wrap the entire table inside the **center** environment so that it will appear in the center of the page.

Adding borders

The tabular environment is more flexible, you can put separator lines in between each column.

```
\begin{center}
\begin{tabular}{ |c|c|c| }
\hline
cell1 & cell2 & cell3 \\
cell4 & cell5 & cell6 \\
cell7 & cell8 & cell9 \\
\hline
\end{tabular}
\end{center}
```

cell2	cell3
cell5	cell6
cell8	cell9
	cell2 cell5 cell8

You can add borders using the horizontal line command **\hline** and the vertical line parameter **|**.

- { |c|c|c| }: This declares that three columns, separated by a vertical line, are going to be used in the table. The | symbol specifies that these columns should be separated by a vertical line.
- **\hline**: This will insert a horizontal line. We have included horizontal lines at the top and bottom of the table here. There is no restriction on the number of times you can use **\hline**.

Below you can see a second example.

```
\begin{center}
\begin{tabular}{||c c c c||}
\hline
Col1 & Col2 & Col2 & Col3 \\ [0.5ex]
\hline\hline
1 & 6 & 87837 & 787 \\
\hline
2 & 7 & 78 & 5415 \\
\hline
3 & 545 & 778 & 7507 \\
\hline
4 & 545 & 18744 & 7560 \\
\hline
5 & 88 & 788 & 6344 \\ [1ex]
```

\hline \end{tabular} \end{center}

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, labels and references

You can caption and reference tables in much the same way as images. The only difference is that instead of the **figure** environment, you use the **table** environment.

```
Table \ref{table:data} is an example of referenced \LaTeX{} elements.
\begin{table}[h!]
\centering
\begin{tabular}{||c c c c||}
\hline
Col1 & Col2 & Col2 & Col3 \\ [0.5ex]
\hline\hline
1 & 6 & 87837 & 787 \\
2 & 7 & 78 & 5415 \\
3 & 545 & 778 & 7507 \\
4 & 545 & 18744 & 7560 \\
5 & 88 & 788 & 6344 \\ [1ex]
\hline
\end{tabular}
\caption{Table to test captions and labels}
```

Table 1 is an example of referenced LAT_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: Table to test captions and labels

Adding a Table of Contents

To create the table of contents is straightforward, the command **\tableofcontents** does all the work for you:

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\title{Sections and Chapters}
\author{Gubert Farnsworth}
\date{ }
\begin{document}

\maketitle
\tableofcontents
\section{Introduction}
```

```
This is the first section.

Lorem ipsum dolor sit amet, consectetuer adipiscing

elit. Etiam lobortisfacilisis sem. Nullam nec mi et

neque pharetra sollicitudin. Praesent imperdietmi nec ante.

Donec ullamcorper, felis non sodales...

\section*{Unnumbered Section}

\addcontentsline{toc}{section}{Unnumbered Section}

Lorem ipsum dolor sit amet, consectetuer adipiscing elit.

Etiam lobortis facilisissem. Nullam nec mi et neque pharetra

sollicitudin. Praesent imperdiet mi necante...

\section{Second Section}

Lorem ipsum dolor sit amet, consectetuer adipiscing elit.

Etiam lobortis facilisissem. Nullam nec mi et neque pharetra

sollicitudin. Praesent imperdiet mi necante...
```

\end{document}

Sections and Chapters

Gubert Farnsworth

Contents

1	Introduction	1
U	nnumbered Section	1
2	Second Section	2

1 Introduction

This is the first section.

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Præsent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue, a dignissim nibh lectus placerat pede. Vivamus nunc nunc, molestie ut, ultricies vel, semper in, velit. Ut porttitor. Præsent in sapien. Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Duis fringilla tristique neque. Sed interdum libero ut metus. Pellentesque placerat. Nam rutrum augue a leo. Morbi sed elit sit amet ante lobortis sollicitudin. Præsent blandit blandit mauris. Præsent lectus tellus, aliquet aliquam, luctus a, egestas a, turpis. Mauris lacinia lorem sit amet ipsum. Nunc quis urna dictum turpis accumsan semper.

Unnumbered Section

Lorem ipsum dolor sit amet, consectetuer adipiscing elit. Etiam lobortis facilisis sem. Nullam nec mi et neque pharetra sollicitudin. Praesent imperdiet mi nec ante. Donec ullamcorper, felis non sodales commodo, lectus velit ultrices augue,

Bibliography management with natbib

When it comes to bibliography management in LaTeX, the package **natbib** is a package for customising citations (especially author-year citation schemes) when using <u>BibTeX</u>. This article explains how to use natbib to format and cite bibliographic sources.

Note: If you are starting from scratch it's recommended to use <u>biblatex</u> because that package provides localization in several languages, it's actively developed and makes bibliography management easier and more flexible. However, note that most journals still use <u>bibtex</u> and <u>natbib</u>.

A minimal working example is presented below:

\usepackage{natbib} \bibliographystyle{unsrtnat}

```
\title{Bibliography management: \texttt{natbib} package}
\author{Overleaf}
\date {April 2021}
\begin{document}
\maketitle
This document is an example of \texttt{natbib} package using in bibliography
management. Three items are cited: \textit{The \LaTeX\ Companion} book
\cite{latexcompanion}, the Einstein journal paper \cite{einstein}, and the
Donald Knuth's website \cite{knuthwebsite}. The \LaTeX\ related items are
\cite{latexcompanion,knuthwebsite}.
```

```
\bibliography{sample}
```

 $end{document}$

Bibliography management: **natbib** package

Overleaf

April 2021

References

- Albert Einstein. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. Annalen der Physik, 322(10):891–921, 1905. doi: http://dx.doi.org/10.1002/andp.19053221004.
- Donald Knuth. Knuth: Computers and typesetting. URL http://www-cs-faculty.stanford.edu/~uno/abcde.html.

In this example there are four basic commands to manage the bibliography:

• \usepackage{natbib}

Imports the package **natbib**.

\bibliographystyle{unsrtnat}

Sets the bibliography style *unsrtnat*. See the article about <u>bibliography styles</u> for more information.

• \cite{labelcompanion}

Prints a reference to the citation entry, what is printed depends on the <u>citation style</u>. The word inside the braces corresponds to a particular entry in the <u>bibliography file</u>.

bibliography{sample}

Imports the file *sample.bib* that contains bibliography sources. See <u>the bibliography file</u> section. <u>Open an example of the natbib package in Overleaf</u>

Basic usage

A simple working example was shown at the introduction, there are more bibliography-related commands available.

```
\documentclass{article}
\usepackage[english]{babel}
\usepackage[square,numbers]{natbib}
\bibliographystyle{abbrvnat}
\title{Bibliography management: \texttt{natbib} package}
\author{Overleaf}
\date {April 2021}
\begin{document}
\maketitle
This document is an example of \texttt{natbib} package using in bibliography
management. Three items are cited: \textit{The \LaTeX\ Companion} book
\cite{latexcompanion}, the Einstein journal paper \citet{einstein}, and the
Donald Knuth's website \cite{knuthwebsite}. The \LaTeX\ related items are
\cite{latexcompanion,knuthwebsite}.
\medskip
\bibliography{sample}
```

 $\ensuremath{\mathsf{document}}\$

Bibliography management: **natbib** package

Overleaf

April 2021

References

- A. Einstein. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. Annalen der Physik, 322(10):891–921, 1905. doi: http://dx.doi.org/10.1002/andp.19053221004.
- [2] M. Goossens, F. Mittelbach, and A. Samarin. The LATEX Companion. Addison-Wesley, Reading, Massachusetts, 1993.
- [3] D. Knuth. Knuth: Computers and typesetting. URL http://www-cs-faculty.stanford.edu/~uno/abcde.html.

There are a few changes in this example:

- The options square and numbers in \usepackage[square,numbers]{natbib} enable squared brackets and numeric citations respectively. See the <u>reference guide</u> for a list of package options
- The styles *abbrvnat* is used here, see <u>bibliography styles</u>
- The command \citet adds the name of the author to the citation mark, regardless of the <u>citation</u> <u>style</u>.

Open another example of the natbib package in Overleaf

The bibliography file

The bibliography files must have the standard bibtex syntax and the extension .bib. They contain a list of bibliography sources and several fields with information about each entry.

```
@article{einstein,
                   "Albert Einstein",
    author =
                   "{Zur Elektrodynamik bewegter K{\"o}rper}. ({German})
    title =
        [{On} the electrodynamics of moving bodies]",
                   "Annalen der Physik",
    journal =
    volume =
                   "322",
                   "10",
    number =
                   "891--921",
    pages =
                   "1905",
    year =
    DOI =
                   "http://dx.doi.org/10.1002/andp.19053221004"
}
@book{latexcompanion,
    author
             = "Michel Goossens and Frank Mittelbach and Alexander Samarin",
    title
              = "The \LaTeX\ Companion",
              = "1993",
    year
    publisher = "Addison-Wesley",
             = "Reading, Massachusetts"
    address
}
@misc{knuthwebsite,
            = "Donald Knuth",
    author
    title
             = "Knuth: Computers and Typesetting",
              = "http://www-cs-faculty.stanford.edu/\~{}uno/abcde.html"
    url
}
```

This file contains records in a special format, for instance, the first bibliographic reference is defined by:

• @article{...}

This is the first line of a record entry, <code>@article</code> tells BibTeX that the information stored here is about an article. The information about this entry is enclosed within braces. Besides the entry types shown in the example (article, book and misc there are a lot more, see the reference guide.

• einstein

The label einstein is assigned to this entry, is a unique identifier that can be used to refer this article within the document.

• author = "Albert Einstein",

This is the first field in the bibliography entry, indicates that the author of this article is Albert Einstein. Several comma-separated fields can be added using the same syntax key = value, for instance: title, pages, year, URL, etc. See the <u>reference guide</u> for a list of possible fields.

The information in this file can later be printed and referenced within a LaTeX document, as shown in the previous sections, with the command \bibliography{sample}. Not all the information in the .bib file will be displayed, it depends on the bibliography style set in the document.

Adding the bibliography in the table of contents

If you want the bibliography to be included in the table of contents, importing the package **tocbibind** in the preamble will do the trick:

```
\documentclass{article}
\usepackage[english]{babel}
%Includes "References" in the table of contents
\usepackage[nottoc]{tocbibind}
%Import the natbib package and sets a bibliography style
\usepackage[square,numbers]{natbib}
\bibliographystyle{abbrvnat}
%Title and author
\title{Bibliography management: \texttt{natbib} package}
\author{Overleaf}
\date {April 2021}
\begin{document}
\maketitle
\tableofcontents
\section{First Section}
This document is an example...
```

%Imports the bibliography file "sample.bib" \bibliography{sample}

 $\ensuremath{\mathsf{document}}\$

Contents

1 First Section

References

1 First Section

This document is an example of natbib package using in bibliography management. Three items are cited: *The* ETEX Companion book [2], the Einstein journal paper Einstein [1], and the Donald Knuth's website [3]. The ETEXrelated items are [2, 3].

References

- A. Einstein. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. Annalen der Physik, 322(10):891–921, 1905. doi: http://dx.doi.org/10.1002/andp.19053221004.
- [2] M. Goossens, F. Mittelbach, and A. Samarin. The LATEX Companion. Addison-Wesley, Reading, Massachusetts, 1993.
- [3] D. Knuth. Knuth: Computers and typesetting. URL http://www-cs-faculty.stanford.edu/~uno/abcde.html.

Open an example of natbib and table of contents in Overleaf

Adding the line

\usepackage[nottoc]{tocbibind}

1

1

to the preamble will print the "References" or "Bibliography" in the table of contents, depending on the document type. Be careful, it will also add other elements like the Index, Glossary and list of Listings to the table of contents. For more information see <u>the tocbibind package documentation</u>.

Beamer (Slides)

Beamer is a powerful and flexible LaTeX class to create great looking presentations. This article outlines the basis steps to making a Beamer slideshow: creating the title page, adding a logo, highlighting important points, making a table of contents and adding effects to the slideshow.

A minimal working example of a simple **beamer** presentation is provided below.

```
\documentclass{beamer}
%Information to be included in the title page:
\title{Sample title}
\author{Anonymous}
\institute{Overleaf}
\date{2021}
\begin{document}

\frame{\titlepage}
\begin{frame}
\frametitle{Sample frame title}
This is some text in the first frame. This is some text in the first frame. This is
some text in the first frame.
\end{frame}
```

\end{document}



Sample frame title

This is some text in the first frame. This is some text in the first frame. This is some text in the first frame.

・ロト (母) (言) (言) (曰)

After compilation, a two-page PDF file will be produced. The first page is the titlepage, and the second one contains sample content.

The first statement in the document declares this is a Beamer slideshow: \documentclass{beamer}

The first command after the preamble, \frame{\titlepage}, generates the title page. This page may contain information about the author, institution, event, logo, and so on. See <u>the title page</u> section for a more complete example.

The *frame* environment creates the second slide, the self-descriptive command \frametitle{Sample frame title} is optional.

It is worth noting that in beamer the basic container is a **frame**. A frame is not exactly equivalent to a slide, one frame may contain more than one slides. For example, a frame with several bullet points can be set up to produce a new slide to reveal each consecutive bullet point.

Beamer main features

The Beamer class offers some useful features to bring your presentation to life and make it more attractive. The most important ones are listed below.

The title page

There are some more options for the title page than the ones presented in the <u>introduction</u>. The next example is a complete one, most of the commands are optional.

```
\title[About Beamer] %optional
{About the Beamer class in presentation making}
\subtitle{A short story}
\author[Arthur, Doe] % (optional, for multiple authors)
{A.~B.~Arthur\inst{1} \and J.~Doe\inst{2}}
\institute[VFU] % (optional)
{
    \inst{1}%
    Faculty of Physics\\
    Very Famous University
    \and
    \inst{2}%
    Faculty of Chemistry\\
    Very Famous University
```



}

\logo{\includegraphics[height=1cm]{overleaf-logo}}

About the Beamer class in presentation making A short story

A. B. Arthur¹ J. Doe²

¹Faculty of Physics Very Famous University

²Faculty of Chemistry Very Famous University

Very Large Conference, April 2021



The distribution of each element in the title page depends on the theme, see the <u>Themes</u> subsection for more information. Here is a description of each command:

• \title[About Beamer] {About the Beamer class...}

This is important, the title of your presentation must be inside braces. You can set an optional shorter title in the square brackets: in the example, this is *About Beamer*.

• \subtitle

Subtitle for you presentation. This can be omitted if unnecessary.

• \author[Arthur, Doe]{A.~B.~Arthur\inst{1} \and J.~Doe\inst{2}}

First, a short version of the authors' names, comma separated, can be added inside square brackets. This is optional, if omitted the full name is displayed (at the bottom of the title page in the example). Then, inside braces, are the full names of the authors, separated by an \and command. There's also a $\inst{1}$ command that puts a superscript to reference the institution where each author works; it's optional and can be omitted if there is only one author or the listed authors work at the same institution.

• \institute[VFU]{\inst{1}Faculty...

In the argument of this command, you can declare the institute each author belongs to. The parameter inside brackets, the acronym of the institute/university, is optional. Then the name of the institute is added inside braces; if there's more than one institute they must be separated with an <u>\and</u> command. The <u>\institute</u> command is optional, but it is required for the superscripts inserted by the <u>\inst</u> commands in the previous code.

\date[VLC 2021]{Very Large Conference, April 2021}

In this declaration, you can set the *name* and *date* of the event where you are going to present your slides. The parameter inside brackets is an optional shorter name, in this example is displayed at the bottom of the title page.

• \logo{\includegraphics...}

This adds a logo to be displayed. In this theme, the logo is set at the lower right corner. You can use text, or include an image.

Creating a table of contents

Usually when you have a long presentation, it's convenient to divide it into sections or even subsections. In this case, you can add a table of contents at the beginning of the document. Here is an example:

\begin{frame}
\frametitle{Table of Contents}
\tableofcontents
\end{frame}

Tab	le	of	Contents
Tab			contents



As you see, is simple. Inside the *frame* environment you set the title and add the command \titlepage.

It's also possible to put the table of contents at the beginning of each section and highlight the title of the current section. Just add the code below to the *preamble* of your LaTeX document:

```
\AtBeginSection[]
{
    \begin{frame}
    \frametitle{Table of Contents}
    \tableofcontents[currentsection]
    \end{frame}
}
```

Table of Contents

First section		
First section		
2 Second section		
		6
Atthur Dee (VEU)	About Beamer	□ ▶ < @ ▶ < 콜 ▶ < 콜 ▶ : 콜 · 의 Q (~ \/ C 2021 2 / 9
Arthur, Doe (VFU)	About Beamer	VLC 2021 3/8

If you use \AtBeginSubsection[] instead of \AtBeginSection[], the table of contents will appear at the beginning of each subsection.

Adding effects to a presentation

In the <u>introduction</u>, we saw a simple slide using the \begin{frame} \end{frame} delimiters. It was mentioned that a *frame* is not equivalent to a *slide*, and the next example will illustrate why, by adding some effects to the slideshow. In this example, the PDF file produced will contain 4 slides—this is intended to provide a visual effect in the presentation.

```
\begin{frame}
\frametitle{Sample frame title}
This is a text in second frame.
For the sake of showing an example.
\begin{itemize}
\item<1-> Text visible on slide 1
\item<2-> Text visible on slide 2
\item<3> Text visible on slide 3
\item<4-> Text visible on slide 4
\end{itemize}
\end{frame}
```

Sample frame title

This is a text in second frame. For the sake of showing an example.

- Text visible on slide 1
- Text visible on slide 2
- Text visible on slide 4

< □ > < □ > < □ > < □ > < □ > < □ >

In the code there's a list, declared by the \begin{itemize} \end{itemize} commands, and next to each item is a number enclosed in two special characters: < >. This will determine in which slide the element will appear, if you append a - at the end of the number, the *item* will be shown in that and the subsequent slides of the current **frame**, otherwise it will appear only in that slide. Check the animation for a better understanding of this.

These effects can be applied to any type of text, not only to the *itemize* environment. There's a second command whose behaviour is similar, but it's simpler since you don't have to specify the slides where the text will be unveiled.

\begin{frame}
In this slide \pause
the text will be partially visible \pause
And finally everything will be there
\end{frame}



This code will generate three slides to add a visual effect to the presentation. \pause will prevent the text below this point and above the next \pause declaration to appear in the current slide.

Highlighting important sentences/words

In a presentation is a good practice to highlight the important points to make it easier for your audience to identify the main topic.

```
\begin{frame}
\frametitle{Sample frame title}
```

In this slide, some important text will be \alert{highlighted} because it's important. Please, don't abuse it.

```
\begin{block}{Remark}
Sample text
\end{block}
```

\begin{alertblock}{Important theorem}
Sample text in red box
\end{alertblock}

```
\begin{examples}
Sample text in green box. The title of the block is ``Examples".
\end{examples}
\end{frame}
```

Sample frame title

In this slide, some important text will be highlighted because it's important. Please, don't abuse it.

```
Remark
```

Sample text

Important theorem

Sample text in red box

Examples

Sample text in green box. The title of the block is "Examples".

200

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If you want to highlight a word or a phrase within a paragraph, the command \alert{} will change the style of the word inside the braces. The way the enclosed text will look depends on the theme you are using.

To highlight a paragraph with concepts, definitions, theorems or examples, the best option is to put it inside a box. There are three types of box, and it's up to you to decide which one better fits in your presentation:

\begin{block}{Remark} \end{block}

A block box will wrap the text in a box with the same style as the rest of the presentation. The text inside the braces after the \begin{block} code is the title of the box.

\begin{alertblock}{Important theorem} \end{alertblock}

The same as *block* but the style contrasts the one used by the presentation.

• \begin{examples} \end{examples}

Again, is very similar to *block*, the box has a different style but less contrasting than *alertblock*.

Customizing your presentation

There are some aspects of a **Beamer** presentation that can be easily customized. For instance, you can set different themes, colours and change the default text layout into a two-column format.

[Open an example of the beamer package in Overleaf

Themes and colorthemes

It's really easy to use a different theme in your slideshow. For example, the Madrid theme (most of the slideshows in this article use this theme) is set by adding the following command to the preamble:

\usetheme{Madrid}

Below are two more examples.

Berkeley theme



Remark

Sample text

Examples

Important theorem

Sample text in red box

Sample text in green box. The title of the block is "Examples"

Arthur, Doe About Beau

Arthur, Doe About Bear

A. B. $Arthur^1$

¹Faculty of Physics

Very Famous University

²Faculty of Chemistry Very Famous University

Very Large Conference, April 2021

J. Doe²

Using a colortheme

A theme can be combined with a colortheme to change the colour used for different elements.

\documentclass{beamer} \usetheme{Madrid} \usecolortheme{beaver}

Fonts

You can change several parameters about the fonts. Here we will mention how to resize them and change the type of font used.

Font sizes

The font size, here 17pt, can be passed as a parameter to the beamer class at the beginning of the document preamble: \documentclass[17pt]{beamer}. Below is an example showing the result of using the 17pt font-size option:

```
\documentclass[17pt]{beamer}
\usepackage{tikz}
\usetheme{Madrid}
\usecolortheme{beaver}
\title[About Beamer] %optional
{Madrid theme + beaver}
\subtitle{Demonstrating larger fonts}
\author[Arthur, Doe] % (optional)
{A.~B.~Arthur\inst{1} \and J.~Doe\inst{2}}
\institute[VFU] % (optional)
ł
  \sum_{1}%
  Faculty of Physics\\
  Very Famous University
  \and
  \sum{2}
  Faculty of Chemistry\\
  Very Famous University
\date[VLC 2021] % (optional)
{Very Large Conference, April 2021}
% Use a simple TikZ graphic to show where the logo is positioned
\logo{\begin{tikzpicture}
\filldraw[color=red!50, fill=red!25, very thick](0,0) circle (0.5);
\node[draw,color=white] at (0,0) {LOGO HERE};
\end{tikzpicture}}
\begin{document}
\frame{\titlepage}
%Highlighting text
```

```
\begin{frame}
\frametitle{Demonstrating large fonts}
```

In this slide, some important text will be
\alert{highlighted} because it's important.
Please, don't abuse it.

```
\begin{block}{Remark}
Sample text
\end{block}
```

\end{frame}
\end{document}

		Demonstrati	ing large fo	onts	
Madrid theme + Demonstrating larger	Deaver fonts	In this slide, som	ne important te:	xt will be	
A. B. Arthur ¹ J. C ¹ Faculty of Physics Very Famous University	00e ²	highlighted beca abuse it. Remark	use it's importa	ant. Please, do	on't
² Faculty of Chemistry Very Famous University Very Large Conference, A	pril 2021	Sample text		(0) (0) (2) (2)	
Arthur, Doe (VFU) About Beamer	VLC 2021 1/2	Arthur, Doe (VFU)	About Beamer	VLC 2021	2/2

Available font sizes are 8pt, 9pt, 10pt, 11pt, 12pt, 14pt, 17pt, 20pt. Default font size is 11pt (which corresponds to 22pt at the full screen mode).

Font types

To change the font types in your beamer presentation there are two ways, either you use a *font theme* or import directly a *font* from your system. Let's begin with a font theme:

```
\documentclass{beamer}
\usefonttheme{structuresmallcapsserif}
\usetheme{Madrid}
```

The \usefonttheme{} is self-descriptive. The available themes are: structurebold, structurebolditalic, structuresmallcapsserif, structureitalicsserif, serif and default.

You can also import font families installed in your system.

\documentclass{beamer}
\usepackage{bookman}
\usetheme{Madrid}

The command \usepackage{bookman} imports the *bookman* family font to be used in the presentation. The available fonts depend on your LaTeX installation, the most common are: mathptmx, helvet, avat, bookman, chancery, charter, culer, mathtime, mathptm, newcent, palatino, and pifont.

Columns

Sometimes the information in a presentation looks better in a two-column format. In such cases use the *columns* environment:

```
\begin{frame}
\frametitle{Two-column slide}
\begin{columns}
\column{0.5\textwidth}
This is a text in first column.
$$E=mc^2$$
\begin{itemize}
\item First item
\item Second item
\end{itemize}
column{0.5}textwidth}
This text will be in the second column
and on a second thoughts, this is a nice looking
layout in some cases.
\end{columns}
\end{frame}
```

After the *frame* and *frametitle* declarations start a new *columns* environment delimited by the \begin{columns} \end{columns}. You can declare each column's width with the \column{0.5\textwidth} code, a lower number will shrink the width size.

Reference guide

Below is a table with screenshots of the *title page* and a normal slide in Beamer using different combinations of **themes** (rows) and **colorthemes** (columns). To have a complete list of themes and colorthemes see the <u>further reading</u> section for references.

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Source: https://www.overleaf.com/learn/latex)

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