Degree in Industrial Technologies

Bachelor's or Master's final project

This is the title of your project

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Thank yous

And other important information

Abstract

Abstract content

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Notation	Description
x_t	Value of variable x at time step t

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Chapter 1

An overview of LaTeX

In this section, a few basic tools will be presented. In following sections more advance functionality and complex tools will be showcased. Use this to your advantage!

1.1 Basics of LaTeX

1.1.1 Text styles

The following table showcases some of the more common text styles in LaTeX.

Style	Code	Ouput
Quotes	``Quotes''	"Quotes"
Boldface	\textbf{Boldface}	**Boldface**
Italics	\textit{Italics}	*Italics*
Emphasis	\emph{Emphasis}	*Emphasis*
Underline	\underline{Underline}	Underline
Typewriter	\texttt{Typewriter}	`Typewriter`
Mathematical	$Mathematical^{\pi\cdot i}$	$Mathematical^{\pi \cdot i}$

Table 1.1: Text styles in LaTeX.

1.1.2 Structure of a LaTeX document

For this template, which is based in the `book` class, we have the following major sections:

1. `\part{}`: Parts are fully self-contained portions of information. They leave a full blank page with only the title of the part. **This is not used and not recommended!**

2. `\chapter{}`: Your normal chapters, as you can see above. We are in the "*An overview of LaTeX*."

3. `\section{}`: Normal sections for a chapter. We are in "*Basics of LaTeX*."

4. `\subsection{}`: Subsections. We are in "*Structure of a LaTeX document*."

5. `\subsubsection{}`: Subsubsections. This level tends to be quite deep and will most likely not appear in the index unless we include `\setcounter{secnumdepth}{3}` in the preamble[1].

6. `\paragraph{}`: One step deeper. By default paragraphs are not numbered.

You jus have to write what you want between the `{}` for each command, and LaTeX does the rest. It typsets the titles/sections, it adds them to the table of contents and numbers them consistently!

1.1.3 Mathematical notation

LaTeX provides several way to include symbols and write maths. The most basic way is to include mathematical notation or symbols into the text. This is known as *inline* and can be done with `$...$`. Whatever is between the $ symbols, is typeset in mathematical notation. This is an example: $2 = \frac{4}{2}$. This is produced using `$2 = \frac{4}{2}$`.

Another method is to write mathematical formulas in *display* mode, which is separated from the text. This can be done by wrapping the text in `\[...\]`. **This is not recommended** as the next method is better. Here is an example:

$$2 = \frac{4}{2}$$

Normally, the best way is to use mathematical environments. This environments will provide more functionality and generally number the equations and allows them to be labelled. Here are a few examples:

$$2 = \frac{4}{2} \tag{1.1}$$

The equation above, eq. (1.1), is produced by writing:

[1]The preamble is the part before `\begin{document}`, basically, the setup section.

```
\begin{equation} \label{eq:simpleeq}
    2 = \frac{4}{2}
\end{equation}
```

Lets showcase some more environments that help us write beautiful formulas! The `\begin{array}` environment helps us write vertically aligned formulas!

$$f(t) = \begin{cases} A_0 + A \cdot e^{-\frac{t - t_0}{t_d}} & for \quad t \geq t_0 \\ A_0 & for \quad t < t_0 \end{cases} \tag{1.2}$$

```
\begin{equation} \label{eq:abaqus-exponential-decay}
    f(t) = \left\{
    \begin{array}{lcc}
        A_0 + A\cdot e^{-\dfrac{t - t_0}{t_d}} & for & t \geq t_0 \\
        A_0 & for & t < t_0
    \end{array}
    \right.
\end{equation}
```

The `\begin{aling}` environment may be easier to use, but it has a few quirks. Read the documentation[2] for more information.

$$a_{11} = b_{11} \qquad a_{12} = b_{12} \tag{1.3}$$
$$a_{21} = b_{21} \qquad a_{22} = b_{22} + c_{22} \tag{1.4}$$

```
\begin{align}
    a_{11}& =b_{11}&
    a_{12}& =b_{12}\\
    a_{21}& =b_{21}&
    a_{22}& =b_{22}+c_{22}
\end{align}
```

The `\begin{subequations}` allows us to have several formulas numbered into the same reference. As shown in eq. (1.5), with the first entry being eq. (1.5a).

$$\texttt{XSYMM} \equiv U1 = UR2 = UR3 = 0 \tag{1.5a}$$
$$\texttt{ZSYMM} \equiv U3 = UR1 = UR2 = 0 \tag{1.5b}$$

[2] http://tug.ctan.org/info/short-math-guide/short-math-guide.pdf

```
\begin{subequations} \label{eq:symmetry-bc}
    \begin{equation} \label{eq:x-symmetry-bc}
        \text{\texttt{XSYMM}} \equiv U1 = UR2 = UR3 = 0
    \end{equation}
    \begin{equation}
        \text{\texttt{ZSYMM}} \equiv U3 = UR1 = UR2 = 0
    \end{equation}
\end{subequations}
```

1.1.4 References

One of the strongest points of LaTeX is its wonderful and powerful referencing system. We can reference whatever we want by putting on a "tag" with the command `\label{xxx}`. Wherever the `\label` is, it will refer to it. You can see some examples above where we refered to a few equations by their labels, which are inside the `\begin{equation}` environment. This way, LaTeX knows automatically what type of thing they are referring.

Here, lets see what types of refences we can generate!

Package	Command	Result
LaTeX	`\ref{eq:simpleeq}`	1.1
	`\pageref{eq:simpleeq}`	2
`hyperref`	`\autoref{eq:simpleeq}`	Equation 1.1
	`\autoref{fig:textstyles}`	Table 1.1
	`\autopageref{eq:simpleeq}`	page 2
`cleveref`	`\cref{eq:simpleeq}`	eq. (1.1)
	`\Cref{eq:simpleeq}`	Equation (1.1)
	`\cpageref{eq:simpleeq}`	page 2
	`\cref{eq:simpleeq,eq:symmetry-bc}`	eqs. (1.1) and (1.5)
	`\crefrange{eq:simpleeq}{eq:symmetry-bc}`	eqs. (1.1) to (1.5)

Table 1.2: Different reference mechanisms. **The author recommends `cleveref`!**. It is included in this template.

1.1.5 Bibliography

Bibliography management is another strong point of LaTeX!

Appendix A

This is an appendix