ARES Workshop - LaTeX

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What is LaTeX?

Document preparation system

Uses code to edit document format indirectly (as opposed to “what-you-see-is-what-you-get” editors like Word).

Allows greater control of the format once you get good at writing the code

Can make inserting tables, images, mathematical equations and references much easier to manage

LaTeX

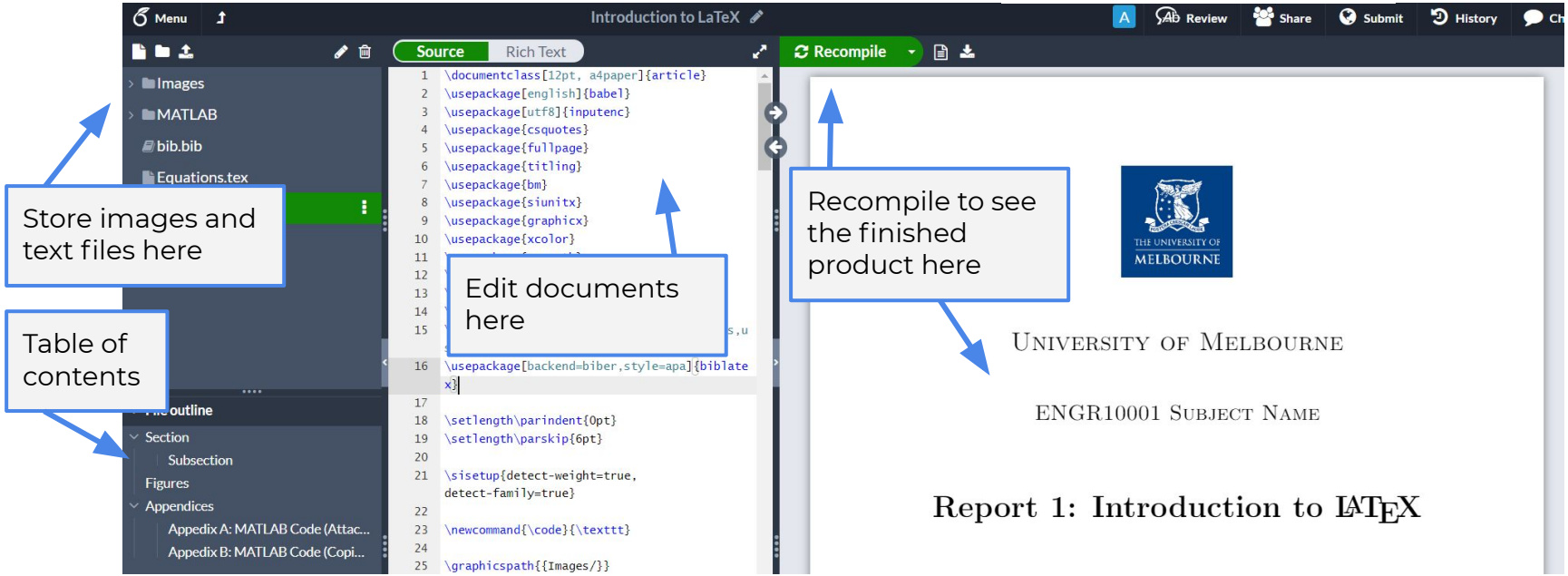
LaTeX is a document preparation system for the TeX typesetting program. It offers programmable desktop publishing features and extensive facilities for automating most aspects of typesetting and desktop publishing, including numbering and cross-referencing, tables and figures, page layout, bibliographies, and much more. LaTeX was originally written in 1984 by Leslie Lamport and has become the dominant method for using TeX; few people write in plain TeX anymore. The current version is LaTeX 2$_\varepsilon$.

$$E = mc^2 \tag{1}$$

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \tag{2}$$

Overleaf - Free LaTeX Editor

Follow today's workshop here:
https://www.overleaf.com/read/dsrbxvjpdtsf



Concepts

- Setting up a document (document class, document, margin)
- Packages
- Title page
  - Headings
  - Spacing (New page, new line)
- Table of content
- Main Content
  - Formatting (bold, italics, colour)
  - Bullet points
  - Making tables
  - Inserting images
  - Making formulas
- Appendix
  - Inserting MATLAB codes
  - Bibliography

Setting Up a Document

Begin by defining your document class - Defines the document to follow the format of an article (aka a report, assignment etc). No need to change this. Other document classes can be found here: https://en.wikibooks.org/wiki/LaTeX/Document_Structure

```
\documentclass[12pt, a4paper]{article}
```

Font size **Page size**

You can customise your page margin by using the package **geometry**

```
\usepackage{geometry}
 \geometry{
        a4paper,                    Paper size
        total={170mm,257mm},        Body dimensions
        left=20mm,                  Left Margin
        top=20mm,                   Top Margin
}
```

Packages

Packages are used to build up your document. They contain “functions” that we may use in our documents. For starters include the following packages…

1. \usepackage[utf8]{inputenc} → This is the encoding for the document, to allow characters beyond ASCII (e.g. à, ü, č ...) to be used in the text. 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, keep this here

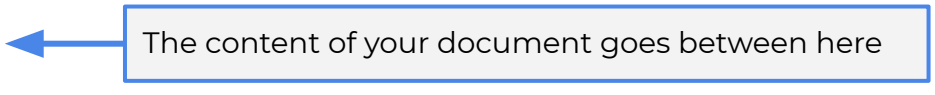
2. \title{Name of Document}
   \author{John Smith}
   \date{April 2021} → Self-explanatory, add a title, author name & date to the cover page of your report

You can add more packages to your LaTeX code to allow it to do different things, such as add colour to your text, format it in different ways etc. The packages in the overleaf document provided to you by us should suffice for now. You will most likely be adding your own as you go. When working on a new document, just copy/paste them into it.

Begin a Document

Begin the document by inserting the lines…

```
\begin{document}
        ⋯
\end{document}
```



\maketitle → This command will print the title, the author and the date in the format shown in the picture above

Title Page

```
28 \begin{document}
29
30 \begin{titlepage}
31     \centering
```

Document must be wrapped in `\begin` and `\end` statements!

So should the title page (and any tables, equations, figures, lists...).

Title Page

```
28 \begin{document}
29
30 \begin{titlepage}
31     \centering
32     \includegraphics[width=0.2\textwidth]{un
       imelb.jpg}\par\vspace{1cm}
```

Puts the current paragraph text in the middle of the page

`\includegraphics` adds a plain old photo which doesn't count as a Figure (no label etc.)

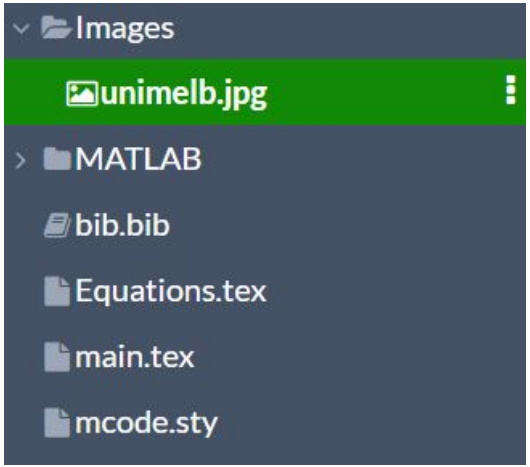
Title Page

```
28 \begin{document}
29
30 \begin{titlepage}
31     \centering
32     \includegraphics[width=0.2\textwidth]{un
       imelb.jpg}\par\vspace{1cm}
```

Puts the current paragraph text in the middle of the page

`[square brackets]` means options, e.g. width of the image
`{braces}` mean inputs (e.g. the picture location)

Make sure the image is uploaded and in the right spot!



Title Page

```
28 \begin{document}
29
30 \begin{titlepage}
31     \centering
32     \includegraphics[width=0.2\textwidth]{un
       imelb.jpg}\par\vspace{1cm}
```

Puts a new paragraph and adds some vertical space

Title Page

```
28 \begin{document}
29
30 \begin{titlepage}
31     \centering
32     \includegraphics[width=0.2\textwidth]{un
       imelb.jpg}\par\vspace{1cm}
33     {\scshape\LARGE University of
       Melbourne\par}
34     \vspace{1cm}
35     {\scshape\Large Aerospace \& Rocket
       Engineering Society \par}
36     \vspace{1.5cm}
```

Title Page

```
37      {\huge\bfseries ARES WS6 - \LaTeX\par}
38      \vspace{2cm}
39      {\Large\itshape Ann Phan \& Cas
        Kent\par}
40      \vspace{0.5cm}
41      \vfill
42      Lecturer/Tutor/Supervisor: Dr John
        Smith\textsc{}
43      \vfill
44      {\large 25th of May 2020\par}
45  \end{titlepage}
```

More ways to change font size and appearance

Regular text goes outside any `{braces}`

Every `\begin` needs an `\end` !!!

Table of Content

A table of contents can be inserted using the command line: \tableofcontents

The content will automatically populate the heading against the page numbers. To hide a heading from appearing on the table of contents you may use the * command as seen here:

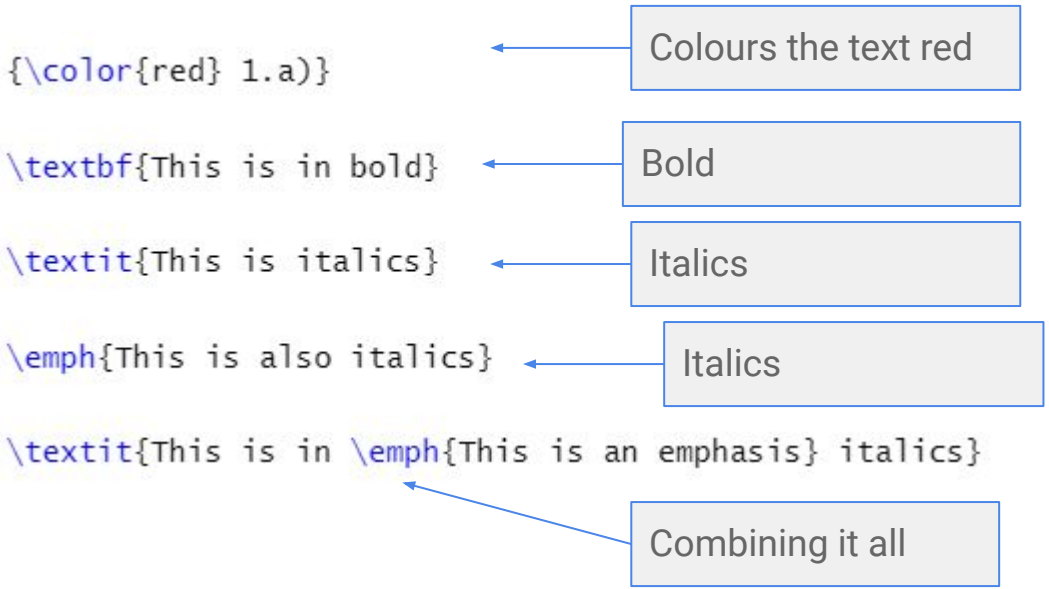
```
\section*{Insert Text Here}
```

A note that this will also cause the heading to not be numbered as well! To include subsection in the table of contents that are not numbered use the command:

```
\addcontentsline{toc}{section}{Insert section name here}
```

Main Content

Customising your text:



Making Lists

Creating a numbered list

```
\begin{enumerate}
    \item First thing
    \item Second
    \begin{enumerate}
        \item First thing
        \item Second
    \end{enumerate}
\end{enumerate}
```

Begin the list

Items are listed

You can make sub lists by nesting

Creating a non-numbered list

```
\begin{itemize}
    \item First thing
    \item Second
    \begin{itemize}
        \item First thing
        \item Second
    \end{itemize}
\end{itemize}
```

Making Tables

```
\begin{table}[h]
    \centering
    \begin{tabular}{|c||c|}
    \hline\hline
    AAA     & BBB  \\
    \hline
    C     & D \\
    \hline
    \end{tabular}
    \caption{Caption}
    \label{table:mylabel}
\end{table}
```

Begin the table

Defines the number of columns and column lines

Inserts the row lines

& Indictes new cell
\\ Indicates next row

Caption your table and label it for referencing

AAA	BBB
C	D

Table 1: Caption

Making Tables

```
\begin{table}[h]
    \centering
    \begin{tabular}{|c|c|c|}
    \hline
    \textbf{Image} & \bm{$x=L$} \textbf{Location} & \bm{$y$}
    \textbf{Location} \\ \hline\hline
    1 & 1530 & 1110 \\ \hline
    2 & 1197 & 1210 \\ \hline
    3 & 1620 & 1372 \\ \hline
    \end{tabular}
    \caption{Pixel location coordinates}
\end{table}
```

Defined 3 columns

Creating a title row by using bold

Image	$x = L$ Location	y Location
1	1530	1110
2	1197	1210
3	1620	1372

Table 2: Pixel location coordinates

Inserting Images (Figures)

```
90  \begin{figure}[h]
91      \centering
92      \includegraphics[width=\textwidth]{unime
        lb.jpg}
93      \caption{The University of Melbourne
        logo.}
94      \label{fig:UnimelbLogo}
95  \end{figure}
96
97  Refer to figure \ref{fig:UnimelbLogo}.
```

`[h]` stops LaTex from moving the Figure around

Caption automatically added under the Figure

You can make **references** to Figures in your main text - Figure **numbers are updated automatically**! Even if you add new Figures or change the order.

Inserting Images (Figures)

```
101 \begin{figure}[H]
102     \centering
103     \begin{minipage}[b]{0.32\textwidth}
104         \includegraphics[width=\textwidth]{u
            nimelb.jpg}
105     \end{minipage}
106
107
108
109
110
111
112
113
114     \caption{Subfigures.}
115     \label{fig:UnimelbLogo2}
116 \end{figure}
```

Can add multiple Subfigures (`minipages`) next to each other in one Figure.

Making Equations - see the LaTeX code!

Inserting MATLAB

To insert MATLAB code you will need to include the package:

```
\usepackage[framed,numbered,autolinebreaks,useliterate]{mcode}
```

And the mcode.sty document (copy and paste it from here: LaTeX Quick Guide - Google Docs)

Attach your MATLAB .m code into a folder and use the following command to insert the code into your Appendix

```
\subsection*{Appedix A: MATLAB Code (Attached)}
\addcontentsline{toc}{subsection}{Appendix A: MATLAB Code (Attached)}
\lstinputlisting{MATLAB/Q3b.m}
```

Appendix Heading

Inserting MATLAB script

Inserting MATLAB (Alternative Method)

You can also use the command: `\begin{lstlisting}`

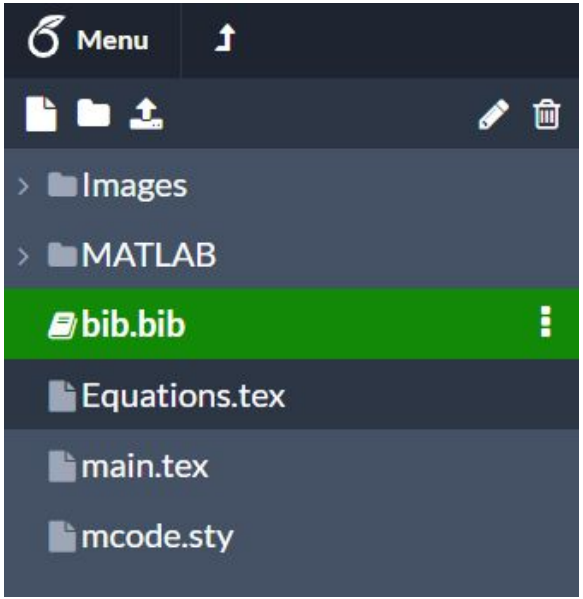
Copy and paste your MATLAB code in here

```
\clearpage
\subsection*{Appedix B: MATLAB Code (Copied In)}
\addcontentsline{toc}{subsection}{Appendix B: MATLAB Code (Copied In)}
\begin{lstlisting}
%% RK2Stability.m

function RK2Stability()
clear all;
close all;

%initial guess value of p
theta=0:0.1:4*pi;
p=0;

for n=1:length(theta)
    gp=1+p+p^2/2.0-exp(i*theta(n));
    dgdp=1+p;

    while abs(gp)>1.0e-6
        p=p-gp/dgdp
        gp=1+p+p^2/2.0-exp(i*theta(n));
        dgdp=1+p;
    end
    lamdt(n)=p;
end

plot(real(lamdt),imag(lamdt),'b-','linewidth',3);
xlabel('\lambda_{Re}\Delta t');ylabel('\lambda_{Im}\Delta t');
axis([-4 2 -3 3]);
daspect([1 1 1]);
\end{lstlisting}
```

Making a Bibliography

```
16  \usepackage[backend=biber,style=apa]{biblatex}
17
18  \addbibresource{bib.bib} %Import the bibliography file
```

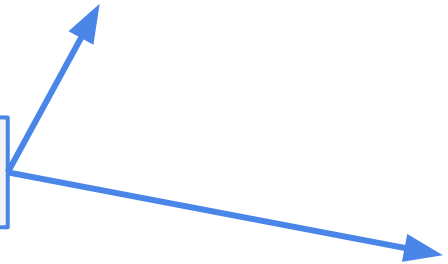
Can specify the style of referencing option.
bib file contains info about each reference in the list



Making a Bibliography

```
149  \addcontentsline{toc}{section}{References}
150  \printbibliography
```

Adds the references section to the document



References

Mazzaracchio, A. (2018). One-dimensional thermal analysis model for charring ablative materials. *Journal of Aerospace Technology and Management*, *10*. https://doi.org/10.5028/jatm.v10.965

Walker, J. G. (1984). Satellite constellations. *Journal of the British Interplanetary Society*, *37*(12), 559–571.

Next week - Onshape (CAD)

See you next week! :)