**Frontier Guide to the LaTeX programming language and use of TexMaker**

This guide assumes you are fairly comfortable with using a computer and can be adapted for Windows, Apple or Linux operating systems. This document can also be used as a style guide by copy and pasting the code examples into your LaTeX script.

**Installation**

To programme in LaTeX, you will need two programmes, MikTeX, so that you can publish and create documents, and an editor such as TexMaker. Follow the relevant guides for your operating system in the documentation for the software you are trying to install. Make sure you install MikText before you install TexMaker so it can register the commands first.

You also need to have some sort of PDF viewing software installed. Texmaker is automatically configured to use Adobe Acrobat reader so we recommend using this one. There are alternative programmes available and to set this up, select options and then configure Texmaker from the menu bar at the top. Then change the filepath to the location for your pdf viewer.

**Getting Started**

In Texmaker, press the new script document button in the top left hand corner, this will start a new script. If this is the first LaTeX script you are making, mouse over the Wizard option in the top toolbar and select Quick start. This will automatically set up your scripting environment so that it is ready to start.

Alternatively you can copy and paste the following text at the top of your document. This will configure the document so it is in a consistent format for all reports produced by Frontier:

\documentclass[12pt,a4paper,oneside,titlepage]{article}

\usepackage{amsmath}

\usepackage{amsfonts}

\usepackage{amssymb}

\usepackage{graphicx}

\usepackage{float,rotfloat}

\floatstyle{plain}

\restylefloat{figure}

\usepackage{multirow}

\usepackage{soul}

\usepackage{rotating}

\usepackage[left=2cm,right=2cm,top=2cm,bottom=2cm]{geometry}

\usepackage{booktabs}

\usepackage{siunitx}

\usepackage{pgfplotstable}

\pgfplotsset{compat=1.16}

The first line, “documentclass” sets up the style of the document and includes general formatting options such as font size and paper magins. Currently it is set so that there is a size 12 font, A4 paper margins (2.54cm from the edge of the page), each line of text will fill the width of the page and the first page is a title page so it will have its own unique formatting. The second set of brackets determines the type of document and includes some basic automatic formatting.

The preceding usepackage lines are all commands that are not included in a base LaTeX install and so need to be specified at the start. You need all of these packages to format the document correctly. The final line is a configuration setting for the pgfplotstable package, you should include this if you are using Texmaker 4.5 or earlier. If you get an error about compatibility, use this line even in newer versions of Texmaker.

**Writing the Document**

Once you have set up the document in the “preamble” you can now start to write it. The following text is going to be used for the title page of the report. If you copy and paste the text, all you need to update is the names and dates for you project. You should include a copy of the frontier logo in your project folder and an image if you want to include it.

Your report should always start with \begin{document} and finish with \end{document} and LaTeX will not print anything outside of those two lines.

\begin{document}

\begin{titlepage}

\centering

**\includegraphics**[width=1\textwidth]{frontierlogo.jpg}\par\vspace{1cm}

{\LARGE\bfseries THE NAME OF YOUR PROJECT \par}

\vspace{1cm}

**\includegraphics**[width=0.55\textwidth]{coverphoto.jpg}\par\vspace{1cm}

{\bfseries\Large The location of your study\par}

\vspace{1.5cm}

{\bfseries\Large The number and abbreviation of your report\par}

\vspace{1.5cm}

{\Large A.N. Author, A. NotherAuthor \par}

\vfill

{\Large Study period from - To}

\vfill

% Bottom of the page

\end{titlepage}

At the end of the cover page there is a line that starts with a %, in LaTeX this is a comment symbol and will grey out the line and not run it. You can use this if there are lines you do not want to include in your report.

**Special Symbols**

LaTeX uses certain symbols to perform functions, the main ones that we will use are $, % and & or math mode, comments and column separator. To include the symbol rather than the function type a \ before it.

**Sectioning**

To make sectioning your documents easier, LaTeX can automatically format this for you. There are several commands that you can use to achieve this. We will be using the \section{} command. This will register the section and group any code or text into a collapsible part of your script. To label it, fill out the {} with the name you want to use. LaTeX will automatically include this in your table of contents. If you do not want it to appear in the contents, include an \* before the {}. If you have parts to each main section that you want to include use the command \subsection or \subsubsection depending on how many layers you need. Further layers can be added with \paragraph but these will not be numbered or included in the table of contents.

When it comes to inputting a table of contents, you can do it with the \tableofcontents command. As these reports can be quite long, you can give the TOCs their own page by using \newpage on the line either side of the TOC command. \tableofcontents will incorporate all of the sections in the document, even if you have sections before the command.

**Formatting text**

To format text with styles such as *italics,* **bold**  or underline, you need to specify this in the code for your section. You can do this by typing \textit{},\textbf{} or \ul{} and writing the text inside the {}. You can combine multiple formats by writing one inside the {} of another, the order does not matter \textit{\textbf{abc}} will produce the same as \textbf{\textit{abc}}. If you have copied and pasted text over from word, you can highlight it in the LaTeX script and then press Ctrl + I or Ctrl + B and it will apply the formatting automatically. There is no shortcut for the underlined text as it is a separate package you have to install. You can still create a custom keyboard shortcut in Texmaker, however that is outside the scope of this tutorial.

**Inserting Images**

To include an image in your report document, you must first make sure it is saved in the same file location as your LaTeX script or ensure you know the file path to where your image is stored. LaTeX handles .png or .jpg files best. Copy and paste the following script to place an image:

\begin{figure}[htb!]

\centering

**\includegraphics**[scale=0.75]{Yourimagename/filepath.png}

\caption{\textit{A caption}}

\end{figure}

LaTeX handles images and tables in a similar manner as it creates a separate environment for each one. Anything between the \begin{figure} and \end{figure} commands will be used to format the image. The [htb!] commands tells LaTeX to place the graphic exactly in the location specified in the text you can also use [H] to force image placement as long as you have the same preamble as above.

The \centering command will place the image in the centre of the page for your document. \includegraphics will pace the image for you. If you need LaTeX to compress or enlarge your image, you can set this with the scale command. LaTeX will then import the image once you specify the name. You can also use the wizard in Texmaker to import it and it will give you a GUI to select the image. You can also include a caption if you wish, LaTeX will automatically place it below the image for figures and above for tables.

**Inserting Tables**

There are 2 ways to insert tables in LaTeX, depending on how comfortable you are with coding and the size of the table. The simplest way is to save your table as an image and import it using the above method. This works quite well for large tables as coding them in LaTeX can require extensive lines of text. For a basic table use this code:

\begin{table}[htb!]

\centering

**\label{tab:Table X}**

\caption{\textit{Another Caption}}

\begin{tabular}{ll}

\hline

1 & 2\\

\hline

A & B\\

C & D\\

& F\\

\hline

\end{tabular}

\end{table}

As it is a separate object you need to tell LaTeX when the code for it starts and ends like an image. You can also give it the \centering command to place it in the middle of your page. To easily catalogue tables you can label them with \label. LaTeX will also use this when referring to them while it is running. You can also include a caption with the table. Make sure the caption goes before you start the table itself with the \begin{tabular} command. The {ll} on this line specifies the number of columns and how each one is to be aligned. If you want to include a vertical line separator, use the | symbol (note not ¦) between the column numbers you need the line for. For the alignment you can either use l,c, or r for left, centre or right aligned respectively. For horizontal lines, use \hline between the rows as necessary. To fill out the cells, you do this one row at a time. LaTeX distinguishes the cell contents with an & symbol and will place text either side of one into separate cells. If you want to leave a cell blank, leave a space before the next &. To end a line use \\ and this will tell LaTeX that the row is finished. You do not need to use the & at the beginning and end of a row unless you are using empty cells. LaTeX will automatically format the cell width so that the text fits onto the page. If there are too many cells or too much information, this will cause the table to bleed off the page. If this happens, you can use the \begin{sidewaystable} command instead of \begin{table} to fit all of the information on the page.

In some cases, you may want certain cells to cover multiple rows or columns, you can do this with the \multirow{}{}{} or \multicolumn{}{}{} commands respectively. Simply include the command on the row of the table you need to use it for. Inside the first set of {}, specify the number of rows or columns it will span, the second set will have the alignment {you can leave blank with an \* in multirow) and the third will be the text for that cell where the multi-command will start. For example, you could have a table whose environment looked like this:

\begin{tabular}{llccc}

\hline

Zones & Sites & \% Cover & $\pm SE$ & $\pm SD$\\

\hline

\multirow{2}{\*}{CZ} & CZ Fore-reef & 20.8 & 1.29 & 7.20\\

& CZ Back-reef & 36.3 & 3.27 & 18.23\\

\multirow{2}{\*}{GUZ} & GUZ Fore-reef & 23.3 & 0.18 & 6.30\\

& GUZ Back-reef & 16.3 & 0.18 & 7.17\\

\multirow{2}{\*}{PZ} & PZ Fore-reef & N/A & 0 & 0.00\\

& PZ Back-reef & 11.8 & 0.18 & 4.67\\

\hline

\end{tabular}

While the table headings do not have multiple rows to them, they are included in the rest of the table. In the cells that form part of the multicell in the first column, there is a blank space so that LaTeX will not put anything in these cell locations. Similarly for \multicolumn, you need to make sure that the number of columns adds up to the amount specified next to \begin{tabular}. In a multicolumn row you can also include single columns. Each \multicolumn counts as the number of columns specified in its first {}. You can include \multicolumn inside the third set of {} for \multirow but not the other way around.

**Math mode**

For some studies, you may want to show the maths that you used to calculate your results. LaTeX has another separate environment to show this. There are two different ways to set this up. Firstly, if you want to include the maths as part of your text, you can use $. Anthing between two $ will be used in the equation. You also have to use this if you are including symbols such as m2 ($m^{2}$ or ± ($\pm a number$). If you are going to write out an equation, you can use the \[ \] symbol. As an example \[D = 1 - (\frac{\sum n(n-1)}{N(N-1)}) \] gets you:

**Bibliographies**

To insert a bibliography and use references, you need to create a bibtex file. You can either do this yourself and write it in Texmaker, or you can auto generate one using your reference manager program, Mendely, Evernote or Refworks can be used to generate the file correctly. You can set the style of referencing you want use with the \bibliographystyle{} command. LaTeX comes with the most common versions programmed in and if you want to use a specific style, add the package for it to your preamble.

To create a bibliography, create a new document in the text editor of your choice and save it as a .bib file. It should be saved in the same directory as your LaTeX document and should be included in your preamble as shown:

\usepackage[backend=bibtex,style=authoryear, maxbibnames = 50]{biblatex}

\bibleography{YourBibleographyName}

In the .bib file, citations can be set out as follows:

@article{Citekey2000,

author = {Uthor, A. and Therauthor, O.}, %Note, multiple authors should be separated with “and”

title = {Your Article Title},

journaltitle = {Your Journal Title},

year = {2000},

OPTissue = {x},

OPTvolume = {y},

OPTpages = {0-100}

}

This will produce a bibliography entry that can be cited with the \parencite{CiteKey2000} command. Texmaker will automatically insert the author name and year published inside () in the text. Multiple references can be cited in the same \parencite{} by separating the keys with a comma (,). Common resources that are cited at frontier include @article, @book, @inBook and @online. To find the names of the fields used by Biblatex, choose an entry from the bibliography menu in Texmaker and fill out the fields you have information for. You can then delete any empty ones.

To cite a reference in you document use \parencite{} and include the name of your reference object in the {}. To insert the bibliography, use \printbibliography[header = References] and it will automatically populate the list as you go.

Once you have written a section of code and you want to see how it looks, press the F1 key, this will run all of your script and LaTeX will give you errors if there are any mistakes. If there are none, press the arrow next to view pdf and Texmaker will display your pdf in the right hand panel. You can also press F6 and it will update any attached files such as bibliographies or .csv tables. Make sure that you have pdf viewer enabled in the bottom left hand corner. If the button is not there, enable it in Options>Configure Texmaker and check the box on the right labelled “Embed”.

**Additional Resources:**

If there is a specific package that you use and you want to configure it for a specific purpose, you can find it’s documentation on the LaTeX CTAN site: <https://ctan.org/pkg> . You can use this site to view package readmes and usage guides, or find new packages if you want to perform a function not covered by the ones included in this document.