

Introduction to LATEX

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At the end of the day... hopefully,

- You will understand what is LATEX
- You will know how to write a document using LATEX
- You will learn how to install and use packages
- You will learn how to insert figures, tables, equations and references
- You will prepare a FULL UTM Thesis in 15 mins(?) using utmthesis class (without contents, of course).
- And you may either *love* or *hate* LATEX... or both..

What is LATEX?

- LATEX is pronounced as “Lay-tech” or “Lah-tech.”
- It uses the TEX formatter as its type-setting engine.
- TEX is a typesetting program designed specifically for text and mathematical formulae.
- Word is word processor - a type of WYSIWYG (WIZ-ee-wig) text editor.

LaTeX is not a WYSIWYG editor

1. The text is entered into the computer as codes.
2. The codes are compiled and an output file is created where, the text is formatted into lines, paragraph, and pages.
3. The output text is displayed on the computer screen/printed.

You only perform task #1.

Task #2 is automated.

Task #3 is done by your monitor/printer.

Due to some reasons, we normally have compile around 3-4 times.

Microsoft Word or LATEX?

My personal opinion

LATEX is good for:

- Big documents i.e. stability
- Mathematical equations
- Automated formatting
- Automatic numbering e.g. (table of contents, chapter/section numbering, references, etc.)
- Ideal for scientific documents.

Word is good for:

- Short and simple documents i.e. simplicity
- Easier to use and easier to solve problems
- Intuitive control over many aspect of a document.
- Documents with many images, especially click-n-drag images
- Drawing images
- Tables

Required Software

- LATEX (For Windows, you can install MikTeX or proTeXt)
- A text editor (Notepad, Tekworks, Notepad++, Emerald Editor, etc.)
- A PDF viewer (Adobe Reader, PDF X-Change Viewer, etc.)
- An EPS image editor (inkscape, adobe illustrator, etc.)

- A good manual (“The Not So Short Introduction to LATEX2e”)
- Internet access for help... troubleshoot, know-how and prepare tables.

Before we start...

- Preparing a LATEX document is like writing a program code.
- There are two types of commands:
 - a code and an “environment” consisting of at least two codes
- It has an “opening” and a “closure” e.g.

```
\chapter{Write your chapter title here}
```

OR

```
\begin{document}
```

```
Bla..
```

```
Bla..
```

```
Bla..
```

```
\end{document}
```

Nested commands

- You will use “nested” commands but they must be arranged properly..
e.g.

Correct

```
\begin{document}
  \begin{tabular}
    Bla..
    bla..
    bla..
  \begin{tabular}
\end{document}
```

Wrong

```
\begin{document}
  \begin{tabular}
    Bla..
    bla..
    bla..
  \begin{document}
\end{tabular}
```


Some basic information

- Spaces: multiple consecutive spaces will appear as one space.
- Special characters:

\$ % ^ _ { } ~ \

are replaced by

\# \ \$ \% \^{} _ \{ \} \~{} \backslash

- Quotation mark: ` and ' And similarly `` and ""
- Break a line: “\\” or \newline
- A new page: \newpage
- \hyphenation{} prevents special words from breaking up.
- Italic text is \emph{} and bold text are \bold{ }

My First LaTeX Document

```
\documentclass{article}
% This is a comment, which will
not appear in the text.

\begin{document}
This is my \emph{first} document
\textbf{prepared} in \LaTeX.
\end{document}
```



Save this as a “.tex” file.

Layout of a Document

```
\documentclass{article}
```

Type of document

```
% This is a comment, which will  
not appear in the text.
```

Preamble – where various codes are inserted.

```
\begin{document}
```

```
This is my \emph{first} document  
\textbf{prepared} in \LaTeX.
```

Contents

```
\end{document}
```

Types of compiler

- latex.exe
- pdfLaTeX.exe
- Bibtex.exe
- MakeIndex.exe

When there is an error...

- Try to see what/where is the error... Line number?
- Exit the error mode by typing “x” or “q” and enter to exit/quit.

Let's try this

```
\documentclass[a4paper, 11pt]{article}
\author{Y.~S.~Yap} %The tilde adds a non-breakable space.
\title{Pulse EPR K$_{\u}$-band}
\begin{document}
\maketitle %Creates a title page
\tableofcontents
\section{History}
```

Electron paramagnetic resonance relies on manipulation and detection of unpaired electron spins in a sample.\\

Some of the common applications include detecting spin probes and spin labels in biological samples.

Add one line of space

Quantum information processing using electron spins and paramagnetic defects has attracted additional interest in using pulse EPR as a means of qubit control.

```
\end{document}
```

Task

- Try adding a new section and a little bit of text before the `\end{document}`.

\documentclass{}

Types of documents:

- Article
- Report
- Book
- Slides

Options:

- 10pt, 11pt, 12pt – font size
- A4paper, letterpaper – paper size
- onecolumn, twocolumn – one or two columns
- oneside, twoside – single or double sided
- Landscape – portrait (default) or landscape
- Openany, openright – Chapters open on right side only (works only for books).
- Titlepage, notitlepage – Places a blank new page after the document title (works only for books).

Task

- Try changing the documentclass from “article” to “book”
- Try adding several chapters using `\chapter{title of chapter here}`

Inserting packages

- Packages are like “additional features” or “plugins” for LaTeX.
- To use a package, insert the code into the preamble:

```
\usepackage[options]{packagename}
```

- My frequently used packages:

```
\usepackage{graphicx}
```

```
\usepackage{epstopdf}
```

- **Caution:** Some packages are not compatible with one another.

Installing packages

- Depending on your installation setting, you may have to install some packages.
- For Windows, click “Start”, find for the MiKTeX folder and click “MiKTeX Package Manager”.
- In that software, you can monitor the status of the package (version, installed, etc..)
- You can select the source of your package from “Repository”.

Using packages

- To insert images/graphics such as JPEG, EPS, etc. you would need to use a graphic package such as graphic.

```
\usepackage{graphicx}
```

And the code/command:

```
\includegraphics[width=0.9\linewidth]{image_1}
```

Inserting Figures

```
\begin{figure} [!hbp]  
\centering  
\includegraphics [width=0.9\linewidth] {image_1}  
\caption[A short caption.]{A really, really long  
caption that wont fit somewhere.}  
\label{fig:bb1_150mK}  
\end{figure}
```

Inserting Tables

```
\begin{table} [!h]
\centering
\caption[Short title.]{A much, much more longer
title.}
\begin{tabular}{|c c|}
\hline
Parameter & Limit \\
\hline
\emph{Time resolution} & 1 ns \\
\end{tabular}
\label{table:spec}
\end{table}
```

Inserting Equations

- There are two forms of mathematical environments: within paragraph or in an environment.

The BB1 pulse sequence for θ rotation around x axis is described as below:

```
\begin{equation}
E = g_e \mu_B m_s B_0,
\label{eq:energy}
\end{equation}
```

where g_e is the electron gyromagnetic ratio, μ_B is Bohr magneton, m_s is spin magnetic quantum number, $m_s = \pm \frac{1}{2}$ and B is the externally applied magnetic field strength.

Referencing

- Labels are used as “markers” and can be placed anywhere..
- Labels are written as:

```
\label{eq:energy}
```

- And referencing to them are done by:

```
As seen in Eq.~\ref{eq:energy}, as the magnetic  
field increases, the energy gap increases.
```

Citing

You will need to do 3 things:

- Create a [.bib] file that contains the reference.
- Next link the bib file into your [.tex] file using the following code:

```
\bibliography{mybib}
```

where `mybib` is the name of your [.bib] file

- Insert or select bibliography style, for example:

```
\bibliographystyle{plain}
```

Citing in text

- In your [.tex] file, you can add `~\cite{citationlabel}`
- For example, in your [.bib] file:

```
@article{yap2013strongly,  
  title={Strongly driven electron spins using a K u band  
  stripline electron paramagnetic resonance resonator},  
  author={Yap, Yung Szen and Yamamoto, Hiroshi and  
  Tabuchi, Yutaka and Negoro, Makoto and Kagawa, Akinori  
  and Kitagawa, Masahiro},  
  journal={Journal of Magnetic Resonance},  
  volume={232},  
  pages={62--67},  
  year={2013},  
  publisher={Elsevier}  
}
```

- And in your [.text] file, you should add `~\cite{yap2013strongly}`

Troubleshooting

- Many of our problems in LaTeX are not unique.
- There are solutions on the internet... All one has to do is to...

