Workshop On LaTeX for Scientific Writing

Day 1: Activities

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Activity 1: LaTeX Hello word

1. Create a new file in TexStudio say Activity.tex, that contains the following text and LaTeXcommands:

```latex
\documentclass{article}
\begin{document}
Hello world ! % This is your content
This is a simple example to start with \LaTeX.
\end{document}
The first task.
```

2. Run quick build.

Activity 2: Document class

1. Change the document class of Activity.tex from article into beamer.

   `\documentclass{beamer}`

2. Run quick build. What do you see?

Activity 3: Document Tittle

1. Change the document class of Activity.tex from beamer into article class with the a4paper and 12pt options.

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

2. Create the title of your article and put two authors and date.

   ```
   \title{Scintific Writing using LaTeX}
   \author{N.~Mduma \and S.~Mtey}
   \date{\today}
   ```

3. Add `\maketitle` just after `\begin` `{document}`

4. Run quick build. What do you see?.

5. Use geometry packages to set document margin.

   `\usepackage[top=1in,bottom=1in,left=1in,right=1in]{geometry}`

6. Try to change the margin to different numbers, run quick build. What do you see?

7. Try to change the margin to different unit such as centimetres (e.g `top=2.5cm`), run quick build. What do you see?

Activity 4: Sections

1. Open the Activity.tex and create a section structure like shown below:

   1. Introduction

   Hello world ! This is a simple example to start with LaTeX.

   2 Methods

   2.1 Model

   2.1.1 Model Assumption

   3 Results

   4 Conclusion

2. Run quick build. What do you see?

3. What happens if you use the *-version e.g `\subsection*`{Results}.

4. Why is it not possible to use `\chapter` {}, in this document?.

Activity 5: Text Formatting

1. Bold the tittle of your Activity.tex and the font size to `\Large`.

2. Change the font style of author names to italic, use `\textit`{text}

3. Change the text color of date to green.First add `\usepackage`{xcolor} and then use `\textcolor`{green}{text}

4. Produce the following text in the Introduction section. **Hint**: in the itemize environment you can specify what character to use as bullet: `\item`[<optional character>]

   Hello, this is my first attempt at writing in LaTeX. I'm hoping that once I've mastered LaTeX 100%, everyone will be so in awe of my beautiful papers & books that they'll publish them straight away without all that *boring nonsense with referees*. I haven't written very much yet but I think I'm starting to get the hang of it. And this is what I plan to do:

- Practise LaTeX in:

  * Teaching

  * Writing books

  * etc

Activity 6: Cross-reference section

1. Experiment with the section cross-reference in the Activity.tex

2. Try writing **\tableofcontents** in the top of your document just after **\begin**{document} What happens when you typeset?

3. Add **\usepackage**{cleveref} and try to use **\cref**{key} command instead of **\ref**{key} command. What happens? Do there any difference between **\cref**{key} and **\ref**{key}

Activity 7: Math typesetting

Open the Activity.ex file and type the following under Model assumption subsection:

1. In this work we demonstrate that $\alpha^2 + \beta^2 \gg \frac{\pi}{4}$ is only correct if the Euler condition $\nabla x = 0$ is satisfied. **Hint**: To typeset $\gg$ use **\gg** command.

2. We propose a new numerical approach to solve the time-dependent Schrödinger equation as shown in (1);

$$i\hbar\frac{\partial\Psi(t)}{\partial t} = H(t)\Psi(t) \tag{1}$$

where i is the imaginary unit, $\hbar$ is the reduced Planck constant, the symbol $\frac{\partial}{\partial t}$ indicates a partial derivative with respect to time t. **Hint**: To typeset symbols $\hbar$ and Ψ use the following

commands, **\hbar** and **\Psi** respectively. To typeset ancient symbol ö use **\"**○ command.

3. The relation between the golden ratio and the Fibonacci series is given by (2).

$$\phi = 1 + \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{F_n F_{n+1}} \tag{2}$$

where the golden ratio $\phi = \frac{1}{2}(1 + \sqrt{5})$

4. What happens if you use **\ref**{key} instead of **\eqref**{key} to reference an equation.

5. What happens if you use the *-version of equation environment

\begin{equation*}...**\end**{equation*}

Activity 8: Math typesetting

Open the Activity.ex file and type the following under Model subsection:

1. Consider a narrowband point-to-point communication system of M_t transmit and M_r receive antennas. The received signal vector y can be represented by the following discrete time model.

$$\begin{bmatrix} y_1 \\ \vdots \\ y_{M_r} \end{bmatrix} = \begin{bmatrix} h_{11} & \dots & h_{1M_t} \\ \vdots & \ddots & \vdots \\ h_{M_r1} & \dots & h_{M_rM_t} \end{bmatrix} \begin{bmatrix} x_1 \\ \vdots \\ x_{M_t} \end{bmatrix} + \begin{bmatrix} n_1 \\ \vdots \\ n_{M_r} \end{bmatrix}$$