## **LaTex for Scientific Writing**

## Day 2

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## Outline

- 1. Graphics, Figures and Tables
- Cross-references text
- Bibliography
- Journal and Thesis
- Presentation Slides

## Creating Tables

Use the tabular environment

## **Creating Tables**

The column data is separated by §,row end is marked as \\ and \hline draw a horizontal line.

Consider the following simple table:

| Parameter     | Value         |
|---------------|---------------|
| Path loss (n) | 2.5           |
| Model         | Okumura-model |
| Cell-radius   | 1km           |

## **Creating Tables**

Latex code for previous simple table

```
\begin{tabular}[t]{||||}
\hline
\textbf{Parameter} & \textbf{Value}\\
\hline
Path loss (n) & 2.5\\
Model & Okumura-model\\
Cell-radius & $1km$\\
\hline
\end{tabular}
```

#### Creating Tables

The booktabs package improve the quality LaTeX tables.

- The horizontal rules are called with \toprule, \midrule and \bottomrule instead of \hline command.
- The \cmidrule is used for mid-rules that span specified columns.
- The content of the tables is filled in the same manner as before.
- To use this package first you need to add this code in preamble. \usepackage{booktabs}

## **Creating Tables**

#### Example:

| Parameter     | Value         |
|---------------|---------------|
| Path loss (n) | 2.5           |
| Model         | Okumura-model |
| Cell-radius   | 1km           |

## **Creating Tables**

#### **Example:** consider the following code:

```
\centering
\begin{tabular}[t]{ll}
\toprule
\textbf{Parameter} & \textbf{Value}\\
\midrule
Path loss (n) & 2.5\\
Model & Okumura-model\\
Cell-radius & $1km$\\
\bottomrule
\end{tabular}
```

## **Creating Tables**

#### To draw multicolumn table like this one:

| Name       |           |       |
|------------|-----------|-------|
| First name | Last Name | Grade |
| John       | Doe       | 7.5   |
| Richard    | Miles     | 2     |

## **Creating Tables**

## **Creating Tables**

```
\begin{tabular}{llr}
\toprule
\multicolumn{2}{c}{Name} \\
\cmidrule(r){1-2}
First name & Last Name & Grade \\
\midrule
John & Doe & $7.5$ \\
Richard & Miles & $2$ \\
\bottomrule
\end{tabular}
```

#### Floating Tables

Latex provides the table environments for typesetting floating tables.

A table environment is set up as follows:

```
\begin{table}
\caption{title}
\label{tab:xxx}
%Place the table here
\end{table}
```

#### Floating Tables

\caption command is optional and used to set table tittle.

**\label** command is also optional and is used to reference the table's number.

Example: To produce the following table

**Table: Simulation Parameters** 

| Parameter     | Value         |
|---------------|---------------|
| Path loss (n) | 2.5           |
| Model         | Okumura-model |
| Cell-radius   | 1km           |

#### Floating Tables

```
\begin{table}
\caption{Simulation Parameters}
\label{tab:model_parameter}
\begin{tabular}[t]{ll}
\toprule
\textbf{Parameter} & \textbf{Value}\\\midrule
Path loss (n) & 2.5\\\Model & Okumura-model\\
Cell-radius & $1km$\\\bottomrule
\end{tabular}
\end{table}
```

Guide to Making nice Table: click here

#### **Include Graphics**

The easiest way to include images in your document is to use the graphicx package.

Load the package graphicx: \usepackage{graphicx}

- The image format available depend on what you're using to compile.
- If you're compiling using pdflatex (recommended), then you can use jpg, png, pdf, or eps files.
- Place the file in the same directory as your tex file, and use the \includegraphics[key-values]{imagefile} command.

**Include Graphics** 

Example: \includegraphics[scale=0.2]{images/bulb}



**Include Graphics** 

The image can be scaled to a specified height and/or width as follows: \includegraphics[height=2in,width=1in]{images/bulb}



Floating images

Use figure environment:

```
\begin{figure}
     \includegraphics{file}
     \caption{title }
     \label{fig:xxx}
\end{figure}
```

# **Graphics** *Floating images*



Figure: Green Bulb

To print the list of figures and tables use \listoffigures and \listoffables respectively.

## Outline

- Graphics, Figures and Tables
- 2. Cross-references text
- Bibliography
- Journal and Thesis
- Presentation Slides

#### Cross-reference text

Use \label and \ref for automatic numbering.

The amsmath package provides \eqref for referencing equations.

#### Example

```
\section{Introduction}\label{sec:intro}
In Section \ref{sec:method}, we \ldots
\section{Method}\label{sec:method}
```

#### Cross-reference text

Example: Cross-reference figure and table.

Figure 1 show a green bulb.

⇓

Figure \ref{fig:bulb} show a green bulb

The simulation data are shown in table 1

⇓

The simulation data are shown in table \ref{tab:parameter}

#### Cross-reference text

#### **Example: Cross-reference equation**

$$e^{i\pi} + 1 = 0 \tag{1}$$

By (1), we have ...

 $\downarrow \downarrow$ 

```
\begin{equation} \label{eq:euler}
e^{i\pi} + 1 = 0
\end{equation}
By \eqref{eq:euler}, we have \ldots
\begin{center}
```

#### Notes with todonotes

The \todo command from the todonotes package is great for leaving notes to yourself and your collaborators.

```
Include this package in preamble:
\usepackage[colorinlistoftodos] {todonotes}
Example:
\todo{Plain todonotes.}
```

\todo[color=blue!40]{Todonote with a different color.}

#### Notes with todonotes

- Only inline notes are supported with beamer, but margin notes are supported for normal documents.
- There is also a handy \listoftodos command.
  - To use this load: \usepackage[colorlinks]{hyperref}before \usepackage[colorinlistoftodos]{todonotes}

## Outline

- Graphics, Figures and Tables
- Cross-references text
- 3. Bibliography
- Journal and Thesis
- Presentation Slides

To manage and include references in a LATEX document use BibTeX.

- A BibTeX user creates a bibliography file with .bib extension.
- The .bib file is called a BibTEX database ⇒ a text file containing data in a structured format.
- Each entry in the .bib file is formatted with a certain structure and is given a "key" by which the author can refer to it in the source file.

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The BibTEX Format

The generic form of a BibTEX entry is

```
@type{key, field1 = " " or {} or none,
  field2 = " " or {} or none,
    ...
  fieldn = " " or {} or none
}
```

The BibTEX Format

#### Example:

```
@article{Gettys90,
author = {Jim Gettys and Phil Karlton and Scott McGregor},
title = {The {X} Window System, Version 11},
journal = {Software Practice and Experience},
volume = {20},
number = {52},
year = {1990},
abstract = {A technical overview of the X11 functionality. This
of the X10 TOG paper by Scheifler \& Gettys.}
}
```

#### Export .bib file from Mendeley

- Open Mendeley, and within "My Library" found on the left, select references that you would like to texport to BibTeX.
- In the drop-down menu in the toolbar at the top of the screen click "File → Export.
- In the dropdown list of filetypes chose "BibTeX (\*.bib)" and save to the same location as the LaTeX file.

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Auto-syncing from Mendeley to BibTeX

Mendeley has the built-in capability to auto sync a BibTeX file when changes have been made to your Mendeley library.

To set up the Mendeley auto sync:

- Go to Mendeley Desktop preferences.
- Select the BibTeX tab.
- Select the box labeled "Enable BibTeX syncing" and select the BiBTeX file option you prefer.
- Select the location where you want the generated .bib file(s) to be stored (this should be the same location as your LaTeX file(s)).

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## Using BibTEX in your LATEX Document

- We can use natbib packages with \citet and \citep commands ⇒ Reference sheet for natbib usage.
- Load with
   \usepackage [options]{natbib}
   See list of at the end of Reference sheet for natbib usage
- Example: \usepackage [round]{natbib}
- Include .bib file at the end of document with \bibliography {bib file} and specify a bibliographic styles \bibliographystyle {stylename}.

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The BibTEX Format

## Example:

```
\bibliographystyle{apa} %\bibliographystyle{apacite}
\newpage
\bibliography{bib/References_NILM}
```

The BibTEX Format

#### Example:

- According to Barker et al. (2015) ...⇒
   According to \cite{Alcala2015} \ldots
- ...energy is important (Barker et al., 2015) ⇒
   \ldots energy is important \citep{Barker2015}

## Outline

- Graphics, Figures and Tables
- Cross-references text
- Bibliography
- 4. Journal and Thesis
- Presentation Slides

## Folder structure: create a new folder (your project directory).

• Add some additional folders within this folder:

**images** ⇒ will contain all images.

 $tex \Rightarrow$  will contain .tex file.

**bib** ⇒ will contain bibliography files

This will help you keep the overview about your files

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This will help you keep the overview about your files.

Creating the main LaTeX document: create a main tex file using document class report and save it into tex folder as Thesis.tex.

```
\documentclass[a4paper,12pt]{report}
\begin{document}
Hello World!
\end{document}
```

Document structure: Let's create the main document structure for our thesis as shown below.

- Title page
- Abstract
- Table of contents
- List of Algorithms
- List of Figures
- List of Tables
- Introduction

- Literature Review
- Research Methodology
- Discussion
- Conclusion
- Acknowledgment
- Appendices
- Bibliography

- First create the table of contents inside the begin and end document: \tableofcontents ⇒ a headline with Content will appear.
- To organize your files, create a new .tex file for each chapter of your thesis.
  - Lets create a new file and save it as Introduction.tex into the tex subfolder.

```
\chapter{Introduction}
\lipsum[2]
\section{Motivation}
\lipsum[4]
\section{Problem Statement}
\lipsum[3]
\section{Objectives}
\lipsum[2]
```

- Import the file into you main document (Thesis.tex) after \tableofcontents as: \input {tex/Introduction}
- Great, we just started creating our document structure.
- Lets put all the other chapters in there as well.

```
\input {tex/Literature}
\input {tex/Methodology}
\input {tex/Results}
\input {tex/Conclusion}
```

- Import the file into you main document (Thesis.tex) after \tableofcontents as: \input {tex/Introduction}
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\input {tex/Conclusion}
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- Great, we just started creating our document structure.
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```
\input {tex/Literature}
\input {tex/Methodology}
\input {tex/Results}
\input {tex/Conclusion}
```

 Next add the additional lists just after \tableofcontents \listoffigures

\listoftables \listofalgorithms

• The list of algorithms needs package: \usenackage {algorithm2e}

More details on how to typeset algorithms here.

Next add the additional lists just after \tableofcontents

```
\listoffigures
\listoftables
\listofalgorithms
```

The list of algorithms needs package:

```
\usepackage {algorithm2e}
```

More details on how to typeset algorithms here.

- Auto-sync your Mendely bibliography library to bib subfolder.
- Add it to your main tex file and define a bibliography style just before \end {document} \bibliographystyle {apa} \bibliography {bib/References}
- Include the natbib package in preamble for citation \usepackage [round]{natbib}
- For example to cite, write in any of you chapter files:
   We refer to \citet {Mvuma2016} for things you ...

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## The title page

- Add a title page. Most universities require to use a predefined title page.
- page as title page by inserting;
  - \begin {titlepage} tittle page contents \end {titlepage
- Input the file just after \begin {document} as follows:

#### The title page

- Add a title page. Most universities require to use a predefined title page.
- Create a title.tex file and save it in tex subfolder. Define the title page as title page by inserting;
  - \begin {titlepage} tittle page contents \end {titlepage}
- Input the file just after \begin {document} as follows:

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- Create a title.tex file and save it in tex subfolder. Define the title page as title page by inserting;
  - \begin {titlepage} tittle page contents \end {titlepage}
- Input the file just after \begin {document} as follows:

## Sample Tittle Page

```
\begin{titlepage}
\centering
{\Large \textbf{ MAXIMIZING LTE PERFORMACE WITH MIMO SYSTEMS}} \\
\vspace{0.5in}
\includegraphics[width=0.4\textwidth]{images/logo} \\
\vspace{1in}
{\large \textbf {\textbf{BY}}} \\
\vspace{.5in}
{\large \textbf {\textbf{JAMES KALUMUNA}}} \\
\vspace{1in}
{\large A dissertation in (partial) fulfillment of the requirements for
Master of Science in Telecommunications Engineering of the University of
\vspace{0.5in}
{\large University of Dodoma } \\
\vspace{0.1in}
{\large Jun 2015}
\end{titlepage}
```

Add certification Page: Create a Certification.tex file and save it in tex subfolder, define it by inserting:

```
\begin{center}
{\large \textbf{CERTIFICATION}} \\
\vspace{2in}
\end{center}
```

The undersigned certify that they have read and hereby recommend for acceptance by the University of Dodoma dissertation entitled \textbf{Maximizing LTE performance with MIMO Systems} in fulfillment of the requirements for the degree of \textbf{Master of Science in Telecommunications Engineering} of the University of Dodoma.

Input the file just after \input{tex/tittle}.

## Add certification Page

\vspace{1in}

Includes supervisors approval as follows

```
\centering
Approved by:
\bigbreak
\noindent\begin{tabular}{ll}
\makebox[2.5in]{\hrulefill} & \makebox[2.5in]{\hrulefill}\\
Prof A.N Mvuma (First Supervisor) & Date\\[8ex]\% adds space between the \makebox[2.5in]{\hrulefill} & \makebox[2.5in]{\hrulefill}\\\
Dr. Hector Mongi (Second Supervisor) & Date\\\end{tabular}
```

Add empty pages between the title, abstract and table of contents and change the numbering to be roman. The real Arabic page numbering of the thesis should start with the first page of the introduction.

• First include the following commands into the preamble:

```
\setcounter{secnumdepth}{3}
  % determines up to what level the sectioning titles are numbered
\setcounter{tocdepth}{3}
\pagenumbering{roman}
```

Then add \newcounter{rom} just after the \begin{document}.

 Also add the following commands just before \tableofcontents.

```
\addtocounter{rom}{1}\setcounter{page}{2}~
\newpage\thispagestyle{plain}\setcounter{page}{3}
```

 Finally add the following command just before \input{tex/introduction}.

```
\newpage\thispagestyle{plain}~
\clearpage
\pagenumbering{arabic}
```

```
documentclass[a4paper,12pt]{report}
\usepackage{lipsum} %Generate dummy text (lorem ipsum) in your
\usepackage{algorithm2e}
\usepackage[round]{natbib} %for citation
\usepackage{graphicx} % for images and figures
\setcounter{secnumdepth}{3}
\setcounter{tocdepth}{3}
\pagenumbering{roman}
\begin{document}
\newcounter{rom}
\input{tex/tittle} % The tittle page
\input{tex/Certification}
\addtocounter{rom}{1}\setcounter{page}{2}~
\newpage\thispagestyle{plain}\setcounter{page}{3}
                                                           48/53
```

```
\listoffigures % list of figures
\listoftables % list of tables
\listofalgorithms % list of algorithms
\newpage\thispagestyle{plain}~
\clearpage
\pagenumbering{arabic}
\input{tex/introduction}
\input{tex/Literature}
\input{tex/Methodology}
\input{tex/Results}
\input{tex/Conclusion}
\bibliographystyle{apa}
\bibliography{bib/References}
\end{document}
```

# Outline

- Graphics, Figures and Tables
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- 5. Presentation Slides

# **THANK YOU**

# References I

## References II

Barker, S., Musthag, M., Irwin, D., and Shenoy, P. (2015).

Non-intrusive load identification for smart outlets. In *Proceeding* of the 2014 IEEE International Conference on Smart Grid Communications, SmartGridComm 2014, pages 548–553.