A Roadmap to Scholarly Excellence: Systematic LaTeX in Thesis and Book Writing

AICTE ATAL FDP on LaTeX and Mathematica-2023

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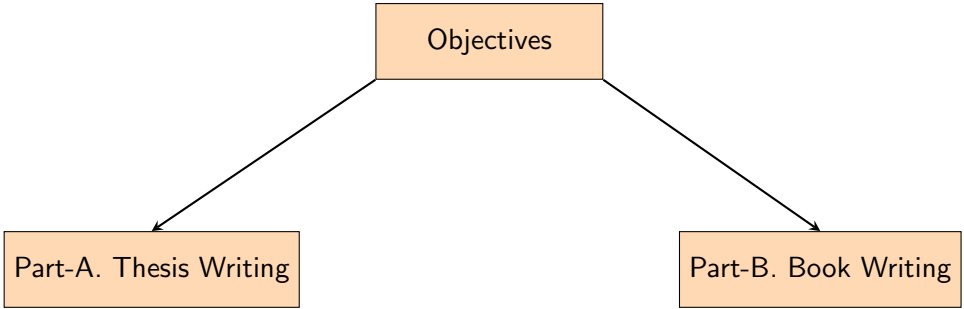
Why Use LaTeX for Thesis and Book Writing?

Enhancing Scholarly Communication with LaTeX

- **Motivations:**
  - Precision and Consistency: accurate formatting and consistent styling.
  - Superior Typesetting: professional-looking documents with high-quality typesetting.
- **Advantages:**
  - Cross-Platform Compatibility.
  - Reference Management.
- **Efficiency:**
  - Automated Formatting: allowing you to focus on content creation rather than layout.
  - Template-based Structure: provide a standardized structure, streamlining the document creation process.

Frame Title



Outline

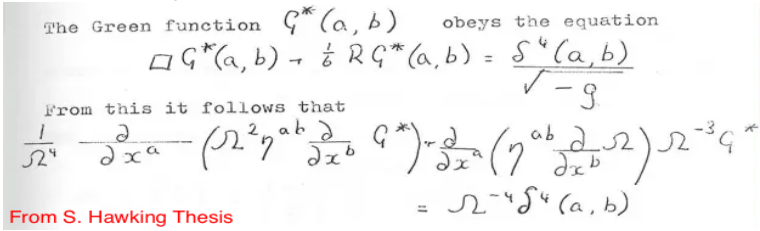
Part:A Thesis Writing using LaTeX

Part:A Thesis Writing using LaTeX

- **Overview**

Evolution of Thesis Writing Process

- Introduction
  - Significance of mathematical typesetting in academic work
  - Challenges before the introduction of TeX
- Before TeX: Traditional Methods
  1. Handwritten Equations


The Green function $G^*(a,b)$ obeys the equation

$$\Box G^*(a,b) + \tfrac{1}{6} R G^*(a,b) = \frac{\delta^4(a,b)}{\sqrt{-g}}$$

From this it follows that

$$\frac{1}{\Omega^4} \frac{\partial}{\partial x^a}\left(\Omega^2 \eta^{ab} \frac{\partial}{\partial x^b} G^*\right) + \frac{\partial}{\partial x^a}\left(\eta^{ab} \frac{\partial}{\partial x^b} \Omega\right) \Omega^{-3} G^* = \Omega^{-4} \delta^4(a,b)$$

From S. Hawking Thesis

2 Typewriters

inhomogeneous modes, $\bar{q}_k$ is given by (Eq. 3.4.26 of Chapter 3)

$$\bar{q}_k = a_k\left(1 - i\frac{k}{HS}\right)e^{i\frac{k}{HS}} + b_k\left(1 + i\frac{k}{HS}\right)^{-i\frac{k}{HS}} \qquad (5.5.7)$$

For the case of the inverted oscillator potential, we are interested only in the case when $\omega \ll H$. For reason explained in Section 5.3 of this chapter we need to consider only the case of $\omega \ll k/S$. In this limit, we have computed $\bar{q}_k$ in Section 3.4 of Chapter 3. (Ref. equation 3.4.26). It is given by

$$\bar{q}_k = a_k\left(1 - i\frac{k}{HS}\right)e^{ik/HS} + b_k\left(1 + i\frac{k}{HS}\right)e^{-ik/HS} \qquad (5.5.8)$$

From T.R. Seshadri Thesis

Introduction

- Challenges Faced
  - Difficulties in creating and reproducing mathematical content
  - Time and effort required for manual typesetting
- Transition to TeX: Revolutionizing Typesetting
- Key Features of TeX
  - Precision, scalability, flexibility
  - Impact on mathematical typesetting

Document Class

The Document Class: The most suitable to write a thesis is **book class**

- font size (12pt)
- paper size (typically a4paper or letterpaper)
- text on page: twoside or oneside
- chapter titles position: openright or openany

```
\documentclass[12pt, a4paper, twoside, openright]{book}
```

Thesis Structure

Frontmatter

Mainmatter

Backmatter

Part:A Thesis Writing using LaTeX

- **Frontmatter**

Sections of the Thesis

A thesis can have the following structure:

- Frontmatter:
  - Title Page
  - Certificate
  - Dedication
  - Acknowledgement

..cont.

Sections of the Thesis

- Frontmatter:
  - Abstract
  - Table of Contents
  - List of Figures
  - List of Tables
  - Table of Abbreviation
  - Table of Notation

Frontmatter: Title Page

```latex
\begin{titlepage}
    \centering
    {\LARGE \textbf{Title of Your Thesis or Dissertation} \par}
        \vspace{1cm}
    {\includegraphics[width=0.25\textwidth]{figures/du_logo_new} \par}
    \vspace{1cm}
    \vspace{1cm}
    {\Large \textbf{Author's Full Name} \par}
    {\Large \underline{Name of Your Department} \par}
    {\Large \underline{Name of Your University or Institute} \par}
    \vspace{1cm}
    {\Large {A thesis submitted in partial fulfillment of the requirements for the degree of} \par}
    {\Large \textbf{Doctor of Philosophy} \par}
    {\Large {in the \underline{Name of Faculty}} \par}
    \vspace{2cm}
    {\Large \monthyeardate{\today} \par} % Use the submission date here
\end{titlepage}
```

Frontmatter: Certificate Page

```
\chapter*{Certificate of Originality}

\vspace*{3ex} \noindent {\large I herewith declare that the research work performed in the Ph.D. thesis entitled \textbf{``Title of your Thesis''}, has been carried out by me at the \textbf{\underline{Name of your department}}, \underline{Name of your university}, \underline{City Name}, \underline{Country Name}. The manuscript has been subjected to plagiarism check by using the \textbf{\underline{Software Name}} plagiarism detection software. My Ph.D. thesis is based on original research and may be considered for the award of Ph.D. degree by the \underline{Name of your university}.
\vspace{2cm}

\begin{flushright}
{\bf \underline{Author's Full Name}}
\end{flushright}
```

Frontmatter: Dedication, Acknowledgement

- Dedication

```
\chapter*{Dedication}
To my \underline{XYZ}, who supported me throughout this journey.
```

- Acknowledgement

```
\chapter*{Acknowledgement}
I would like to express my gratitude to...
```

Frontmatter: Table of Contents, List of Figure, List of Tables

- Table of Contents

```
\tableofcontents
```

- List of Figure

```
\listoffigures
```

- List of Tables

```
\listoftables
```

Frontmatter: Table of Abbreviations, Table of Symbol

- Table of Abbreviations

```
\chapter*{Table of Abbreviations}
\addcontentsline{toc}{chapter}{Table of Abbreviations} %manually add to the table of contents.
 \begin{acronym}
  \acro{QM}{Quantum Mechanics}
  \acro{EM}{Electromagnetism}
  \acro{GR}{General Relativity}
\end{acronym}
```

- Table of Symbol

```
\chapter*{Table of Symbols}
\addcontentsline{toc}{chapter}{Table of Symbols}
\begin{tabular}{ll}
    $c:$ & Speed of Light \\
    $G:$ & Gravitational Constant \\
    $R:$ & Ricci Scalar \\
\end{tabular}
```

Part:A Thesis Writing using LaTeX

- **Mainmatter**

Mainmatter

- Inner Chapters
  - Chapter 1
  - Chapter 2
  - ....
- Appendices
  - Appendix A
  - Appendix B
  - ....

Mainmatter: Inner Chapters

- Chapter-1.

```
\chapter{Introduction}\label{Chapter_1}
```

- Chapter-2.

```
\chapter{Basics of Cosmology}\label{Chapter_2}
```

Mainmatter: Appendices

- Appendix-A and Appendix-B.

```
\begin{appendices}
    \chapter{Derive the Einstein Field Equations} % Appendix-A
    \chapter{Derive the Friedmann Equations}      % Appendix-B
\end{appendices}
```

Part:A Thesis Writing using LaTeX

- Backmatter

Backmatter

- Bibliography
- Index

Backmatter: Bibliography

- Create a file with .bib extension

```
@article{sweinberg1989,
title = {The cosmological constant problem},
author = {Weinberg, Steven},
journal = {Rev.  Mod.  Phys.},
volume = {61},
issue = {1},
pages = {1--23},
numpages = {0},
year = {1989},
month = {Jan},
publisher = {American Physical Society},
doi = {10.1103/RevModPhys.61.1},
url = {https://link.aps.org/doi/10.1103/RevModPhys.61.1}
}
```

Backmatter: Index

- Index: `\printindex`

Summary

Frontmatter

i). Title Page
ii). Certificate
iii). Dedication
iv). Acknowledgement
v). Abstract
vi). Table of Contents
vii). List of Figures
viii). List of Tables
ix). Table of Abbreviations
x). Table of Symbol

Mainmatter

i). Inner Chapters
ii). Appendices

Backmatter

i). Bibliography
ii). Index

Master Tex File: Managing Page Layout in LaTeX

- Ensure chapters or files start on right-hand side (odd-numbered) pages:
  - Use \cleardoublepage before each new chapter.
  - Add \thispagestyle{empty} to suppress page numbers on blank pages.
  - Optionally, use \mbox{} to insert an empty box for spacing.

```
% Define a command to add a blank page
\newcommand{\blankpage}{
\clearpage
\thispagestyle{empty}
\mbox{}
\clearpage
}
```

Master Tex File: Add Table in LaTeX

```
\begin{table}[ht]
  \centering
 \renewcommand{\arraystretch}{2}
  \begin{tabular}{|c|c|c|}
    \hline
    \textbf{Column 1} & \textbf{Column 2} & \textbf{Column 3} \\
    \hline
    Row 1, Cell 1 & Row 1, Cell 2 & Row 1, Cell 3 \\
    \hline
    Row 2, Cell 1 & Row 2, Cell 2 & Row 2, Cell 3 \\
    \hline
    Row 3, Cell 1 & Row 3, Cell 2 & Row 3, Cell 3 \\
    \hline
    Row 4, Cell 1 & Row 4, Cell 2 & Row 4, Cell 3 \\
    \hline
  \end{tabular}
  \caption{A Simple Table with 4 Rows and 3 Columns}
  \label{tab:simple-table}
\end{table}
```

- **h (here):** Place approximately at the same point in the document
- **t (top):** Place at the top of a page
- **b (bottom):** Place at the bottom of a page
- **ht (here, top):** Place at the current location if there is enough space, or at the top of the next page
- **!ht (override, here, top):** For determining "good" float positions.

Master Tex File: Add Figure in LaTeX

```
\begin{figure}[ht]
  \centering
  \includegraphics[width=1.0\linewidth]{example-image}
  % \includegraphics[width=130mm]{Chapter_4/figure/str6.png}
  \caption{A Sample Figure}
  \label{fig:sample}
\end{figure}
```

Thank you!