Department of Computer and Software Engineering

SE100L: Information and Communication Technologies Lab

Course Instructor: Mr. Hamza Shaukat	**Dated: 14 – 11 – 2023**
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Batch: BSSE23	

LAB 11 Introduction to LaTeX: Math Expressions and Tables

Name	Roll. No.	Total Marks (35)
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Checked on: _____

Signature: _____

11.1. Objective

After learning the fundamentals of LaTeX in the previous lab, this lab introduces the students to some advanced LaTeX features such as inserting equations and tables in a document.

11.2. Bold, Italics and Underlining

This lab explores some of the advanced LaTeX features such as inserting Mathematical equations which are easily incorporated into the document with great ease in LaTeX. In the beginning, however, we introduce different text formatting styles that make the document easily readable by highlighting some key works. To achieve this purpose, bold or italic style text is very commonly used. The following three commands are very useful for achieving the previously mentioned desired goal.

- **\textbf** : command for making the text bold
- **\underline** : command is used for underlining text
- **\textit** : command is used for emphasizing some text

11.3. Bulleted List

In LaTeX, the **itemize** environment provides a straightforward and effective way to create bulleted lists. Within this environment, each item is denoted by the **\item** command, allowing users to easily structure and organize information. The resulting output features round bullets by default, making the content visually distinct. LaTeX's inherent flexibility extends to customization; users can modify the bullet style or use alternative symbols through the optional inclusion of packages. Bulleted lists are particularly useful for presenting information in a concise and readable manner, aiding in the organization of content across various document types, such as reports, articles, or presentations. The simplicity and versatility of the itemize environment make it an essential tool for users seeking an efficient means of incorporating bulleted lists into their LaTeX documents.

The bulleted list in list is created through the following command:

\begin{itemize}

\item

\end{itemize}

11.4. Mathematical Exressions

Furthermore, LaTeX excels in facilitating the integration of mathematical content with the surrounding text. Its efficient handling of mathematical symbols and equations ensures that they seamlessly blend into the document, enhancing the overall coherence of the written material. The system provides robust support for cross-referencing and numbering equations, simplifying the process of referring to specific mathematical expressions within the document. This level of organization and structure is crucial, especially in technical and scientific documentation where clarity and accuracy are paramount. LaTeX's ability to produce high-quality mathematical typesetting, coupled with its versatility in accommodating various mathematical notations, makes it an indispensable tool for anyone tasked with conveying complex mathematical ideas in a clear and visually appealing manner within their documentation.

11.4.1. Mathematical Modes

LaTeX allows two writing modes for mathematical expressions: the inline math mode and display math mode:

- inline math mode is used to write formulas that are part of a paragraph

- display math mode is used to write expressions that are not part of a paragraph, and are therefore put on separate line

11.4.1.1. Commands

- \(…\), $...$, \begin{math}…\end{math} are the commands used for inserting equations that are part of the paragraph
- \[…\], \begin{displaymath}…\end{displaymath}, are the commands used for inserting equations in display mode.

11.5. Tables

In LaTeX, inserting tables is a straightforward process that allows for the creation of structured and organized tabular content within documents. The "tabular" environment is commonly used for this purpose. Below is a basic example demonstrating how to insert a simple table into a LaTeX document:

```
\documentclass{article}

\begin{document}

\begin{table}[h]  % "h" stands for "here"; you can use "t" for top, "b" for bottom, or omit for LaTeX to decide
   \centering
   \begin{tabular}{|c|c|c|}  % "c" stands for center; use "l" for left-aligned, "r" for right-aligned
      \hline
      Header 1 & Header 2 & Header 3 \\
      \hline
      Cell 1 & Cell 2 & Cell 3 \\
      \hline
      Cell 4 & Cell 5 & Cell 6 \\
      \hline
   \end{tabular}
   \caption{Example Table}
   \label{tab:example}
\end{table}

\end{document}
```

11.6. Lab Tasks

11.6.1. Task 1

- Create a bulleted list using **itemize** environment.
- Create an ordered list using **enumerate** environment.

11.6.2. Task 2

- Insert an inline equation such $a^2 + b^2 = c^2$.
- Add a numbered equation for the Pythagorean theorem $\sqrt{a^2 + b^2} = c$.
- Include a fraction in your document.

11.6.3. Task 3

- Utilize LaTeX commands to insert three different Greek letters into your document.
- Create a mathematical expression involving summation $\sum$ or product symbol ($\prod$).

11.6.4. Task 4

- Add a 2x2 matrix with arbitrary elements.
- Create a system of linear equations using the align environment.

11.6.5. Task 5

- Create a table using **tabular** environment.
- The table should have three rows and columns.

11.6.6. Task 6

- Insert a 3x3 table with arbitrary content, including headers.
- Add horizontal lines to separate the header row and the table body.

11.6.7. Task 7

- Expand your existing table by merging two adjacent cells in the second row using the \multicolumn command.
- Merge cells vertically in the first column of the third row using the **\multirow** command from the multirow package.
- Ensure proper alignment of content within merged cells

CODE FOR THE LAB TASKS

```
\documentclass{article}
\usepackage{graphicx}
 \usepackage{amsmath}
\usepackage{multirow}
\title{LAB 11}
\author{Zunaira Abdul Aziz}
\date{November 2023}
```

```
\begin{document}
\maketitle
\section{Task 1}
\subsection{Best Universities in Pakistan}
\begin{itemize}
  \item FAST NUCES
  \item ITU
  \item GIKI
  \item COMSATS
\end{itemize}
\subsection{Courses I take in ITU}
\begin{enumerate}
  \item Programming Fundamentals
  \item ICT
  \item Calculus and Analytical Geometry
\end{enumerate}
\section{Task 2}
\subsection{Equation 1}
\begin{equation}
  a^2 + b^2 = c^2
\end{equation}
\subsection{Equation 2}
\begin{equation}
  \sqrt {a^2+b^2} = c
\end{equation}
\section{Task 3}
\subsection{Greek Letters}
$\alpha$
$\beta$
$\gamma$
\subsection{Mathematical Expression}
\[
\sum_{n=2}^{10} n \quad \text{or} \quad \prod_{i=2}^{20} x
\]
\section{Task 4}
\subsection{Matrices}
\[
```

```
\begin{matrix}
  x & y \\
  z & z
\end{matrix}
\]
\subsection{Linear Equations}
\begin{align}
    y=2x+5 \\
    y=5x-4
\end{align}
\section{Task 5}
\subsection{Table 1}
\begin{tabular}{|c|c|c|}
\centering
  R1, C1 & R1, C2 & R1, C3 \\
  R2, C1 & R2, C2 & R2, C3 \\
  R3, C1 & R3, C2 & R3, C3 \\
\end{tabular}
\section{Task 6}
\subsection{Table 2}
\begin{table}[h]
    \centering
    \begin{tabular}{|c|c|c|}
    \hline
    \multicolumn{2}{|c|}{Calculus score} & ICT score \\
    \hline
    85.5 & 45 & 100 \\
    100 & 60 & 140 \\
    \hline
    90 & 55 & 80 \\
    \hline
    \end{tabular}
    \caption{Updated Table 1}
    \label{table:scores_updated}
\end{table}
\section{Task 7}
\subsection{Table 3}
```

```
\begin{table}[h]
    \centering
    \begin{tabular}{|c|c|c|}
    \hline
    Calculus score & Physics score & ICT score \\
    \hline
    85.5 & 45 & 100 \\
    \multicolumn{2}{|c|}{\textbf{Merged Lab scores}} & 140 \\
    \multirow{2}{*}{\textbf{Score}} & 90 & 80 \\
    & 55 & \\
    \hline
    \end{tabular}
    \caption{Table with Merged Cells}
    \label{table:table1}
\end{table}
\end{document}
```

LAB 11

Zunaira Abdul Aziz

November 2023

1 Task 1

1.1 Best Universities in Pakistan

- FAST NUCES
- ITU
- GIKI
- COMSATS

1.2 Courses I take in ITU

1. Programming Fundamentals
2. ICT
3. Calculus and Analytical Geometry

2 Task 2

2.1 Equation 1

$$a^2 + b^2 = c^2 \tag{1}$$

2.2 Equation 2

$$\sqrt{a^2 + b^2} = c \tag{2}$$

3 Task 3

3.1 Greek Letters

α β γ

3.2 Mathematical Expression

$$\sum_{n=2}^{10} n \quad \text{or} \quad \prod_{i=2}^{20} x$$

4 Task 4

4.1 Matrices

$$\begin{matrix} x & y \\ z & z \end{matrix}$$

4.2 Linear Equations

$$y = 2x + 5 \tag{3}$$
$$y = 5x - 4 \tag{4}$$

5 Task 5

5.1 Table 1

R1, C1	R1, C2	R1, C3
R2, C1	R2, C2	R2, C3
R3, C1	R3, C2	R3, C3

6 Task 6

6.1 Table 2

Calculus score		ICT score
85.5	45	100
100	60	140
90	55	80

Table 1: Updated Table 1

7 Task 7

7.1 Table 3

Calculus score	Physics score	ICT score
85.5	45	100
Merged Lab scores		140
Score	90	80
	55	

Table 2: Table with Merged Cells