

# Research Method and Report Writing

## Lecture 4: An Introduction to $\LaTeX$

**Farzaneh Abdollahi**

{Thanks to Hamed Rezaee}

Department of Electrical Engineering

Amirkabir University of Technology

Fall 2012

Introduction

Prerequisites

Generate a Document

Graphics

Tables

Cross Referencing

Bibliography and Citation

Math and Equations

Presentations

Useful links

# What is LaTeX?

- ▶ LaTeX is a document preparation system for the TeX typesetting program.
- ▶ It is used for high-quality typesetting for any form of publications.
- ▶ LaTeX encourages authors not to worry too much about the appearance of their documents.
- ▶ It is based on the idea that it is better to leave document design to document designers,
- ▶ And let authors write documents by using designed styles (templates).

# Why LaTeX?

1. It is particularly suited for the production of long articles and books, professionally.
2. It has facilities for the automatic numbering of chapters, sections, theorems, and equations, and has facilities for cross-referencing.
3. It is feasible to use predefined styles.
4. It allows you to focus on the content rather than the appearance of your document.
5. You can switch to another styles easily.
6. It is stable and never be corrupted.
7. It is easy to typeset complex mathematical formulas by using LaTeX.

## Prerequisites: Installing a Distribution

- ▶ The first step to use LaTeX is to install a **TeX distribution**.
- ▶ TeX distributions are packaged collections of packages and programs that enable you to type.
- ▶ The recommended distributions for each of the major operating systems are:
  - ▶ **TeXLive**: is a major TeX distribution for Unix/Linux, Mac OS, and Windows.
  - ▶ **MiKTeX**: is a Windows-specific distribution.
  - ▶ **MacTeX**: is a Mac OS-specific distribution based on TeXLive.

## Prerequisites: Getting a Text Editor

- ▶ You will also need a text editor to write LaTeX codes.
- ▶ A number of editors have been created specifically for working with LaTeX:
  - ▶ [WinEdt](#): MS Windows.
  - ▶ [TeXmaker](#): MS Windows and Mac OS.
  - ▶ [TeXworks](#): MS Windows, Mac OS, and Linux.
  - ▶ etc.
- ▶ Normally LaTeX saves the final document as a `.dvi` file.
- ▶ It is necessary to use a tool to convert DVI files to PDF format.
- ▶ Most editors have this tool.

## Generate a Document: Required Files

- ▶ To generate a document by LaTeX some files should be provided in a *folder*:
  - ▶ **.tex**: The main text should be written in a `.tex` file.
  - ▶ **.cls**: The style of typesetting is defined in a `.cls` file.
  - ▶ **.bib**: The `.bib` file contains the information of references (articles, books, etc.).
  - ▶ **.sty**: To typeset a report you may use some commands. The commands are defined in `.sty` files namely packages.
- ▶ The `.cls`, `.bib`, and `.sty` files should be called in the `.tex` file.
- ▶ Distributions contain a lot of `.sty` files, and it is not necessary to provide all of them in the folder.

# How to Start?

- ▶ LaTeX begins with the `\documentclass` command, which identify the type of the document LaTeX follows.
- ▶ For example, to write an `article` with font size `10` you can use the following command at first:

```
\documentclass[10pt]{article}
```

- ▶ The next step is to call necessary packages.

```
\usepackage{package name}
```

- ▶ Then the title of the report, the name of the author, affiliation, and so on should be added:



# How to Start?

- ▶ See the example below:

```

\title{An Introduction to LaTeX}
\author{Farzaneh Abdollahi}
\institute{Tehran Polytechnic}
  
```

- ▶ `\title{}` is to write the title, and `\maketitle` command adds it.
- ▶ `\author{}` is used to add the author's name .
- ▶ `\institute{}` adds the affiliation.
- ▶ The result is

An Introduction to LaTeX  
 Farzaneh Abdollahi  
 Tehran Polytechnic

# Main Document

- ▶ Everything you type and want to print such as abstract, sections, figures, etc. must appear in the environment below:

```
\begin{document}  
The text goes here...  
\end{document}
```

- ▶ You can use the following commands to add the abstract of the report.

```
\begin{abstract}  
The abstract goes here...  
\end{abstract}
```

- ▶ The next step is sectioning the text to **Introduction**, **Main Text**, **Conclusions**, and so on.
- ▶ The following sectioning commands are available:

```
\section{section name}  
The text goes here...  
\subsection{subsection name}  
The text goes here...  
\subsubsection{subsubsection name}  
The text goes here...
```

## Graphics: Add a Figure

- ▶ To include a figure namely *figurename* in the text:
  - ▶ It should be copied at the same folder as other files are in.
  - ▶ The following commands should be used:

```
\begin{figure}[!location]
\centering
\includegraphics[size]{figurename}
\caption{caption sentence.}
\end{figure}
```

- ▶ `\centering` locates the figure at the center of the column.
- ▶ `\caption{caption sentence.}` is for captioning the figure by "*caption sentence.*".

## Graphics: Add a Figure

- ▶ `!location` denotes the figure location in the page which can be:
  - ▶ `!h` means hear.
  - ▶ `!t` means top.
  - ▶ `!b` means bottom.
- ▶ `[size]` is used to define the figure size.
- ▶ Various methods can be used for size definition:
  - ▶ `[width= $x$  in]`
  - ▶ `[height=  $x$  in]`
  - ▶ `[scale=  $x$ ]`
  - ▶ `[width= $x$ \text{textwidth}]`
  - ▶ etc.
- ▶ This command can be found in WinEdt in "`Insert/Objects/Figure`".

# Tabular Environment

- ▶ The tabular environment can be used to typeset tables with optional horizontal and vertical lines.
- ▶ The following command can be used for an  $m \times n$  table:

```

\begin{tabular}{|p1|p2|...|pn|}
\hline
a11&...&a1n\\
\hline
:
\hline
a11&...&ann\\
\hline
\end{tabular}

```

# Tabular Environment

- ▶ The `\begin{tabular}\end{tabular}` commands provide the environment.
- ▶  $p_i$  denotes the position of the arrays in the  $i$ th column which can be  $l$  for left,  $c$  for center, and  $r$  for right.
- ▶ `\\` shows the end of each row, and `&` decomposes arrays in a row.
- ▶ `\hline` draws horizontal lines, and `|` between  $p_1, \dots, p_n$  draw vertical lines between columns.
- ▶ `\hline` and `|` can be omitted to not to draw these lines.
- ▶ This command can be found in WinEdt in "Insert/Table/Tabular".

# Cross Referencing

- ▶ To cross-reference to tables, figures, sections, and more.
  - ▶ `\label{marker}` command should be used next to the environment that generates a table, figure, section, etc. which you wish to reference.
  - ▶ *marker* is a label associated to the environment.
  - ▶ To reference the environment you should use the following command in the main text where you wish to reference:

```
Text1+\ref{marker}+Text2
```

- ▶ And to reference the page of the environment:

```
Text1+\pageref{marker}+Text2
```



## Example

- ▶ To make a label for a figure:

```
\begin{figure}  
:  
\label{marker}  
\end{figure}
```

- ▶ To reference to the figure you should use the following command where you wish to reference:

```
Text1+Figure \ref{marker}+Text2
```

- ▶ The environment will be referenced in the text with its number:

```
Text1+Figure 1+Text2
```

## Bibliography and Citation: Create a Database

- ▶ The `.bib` file contains the bibliographic database.
- ▶ Each reference in the `.bib` file has the following form:

```

@type {label,
field1="value 1",
      :
fieldn="value n",
}
  
```

- ▶ `type` defines the type of the reference such as: inproceedings, article, book, ....
- ▶ `field1`, ..., `fieldn` are related to the reference information such as: author, title, pages, ....

# Bibliography and Citation:Style

- ▶ To cite the references and create a section of references we should define a style.
- ▶ Various publishers use various styles for citation.
- ▶ To use a style the following command should be added at the end of document in the .tex file.

```
\bibliographystyle{stylename}
```

- ▶ And finally the following command should be used to add a .bib file namely *bibfilename*:

```
\bibliography{bibfilename}
```

- ▶ The command to create a reference in the .bib file can be found in WinEdt in "Insert/BibTex Items"

## Example

- ▶ See the following example:

```
@book{Spo:05,  
author=M. W. Spong and S. Hutchinson and M.  
Vidyasagar,  
title=Robot Modeling and Control,  
edition= 1st,  
publisher=John Wiley and Sons,  
year= 2005}
```

- ▶ To cite the reference we should use the following command in the main text where we want to cite:

```
Text1 + \cite{Spo:05} + Text2
```

## Example Cont'd

- ▶ The reference will be cited in the text with a number:

Text1+[1]+Text2

- ▶ And it will be added in the References section with that number:

**References:**

[1] M. W. Spong, S. Hutchinson, and M. Vidyasagar, *Robot Modeling and Control*, 1st ed. John Wiley and Sons, 2005.

# Math and Equations: Single Equations

- ▶ A lot of methods exist to write equations in LaTeX.
- ▶ To write single equations the following environment is useful:

```
\begin{equation}
a=b+c
\end{equation}
```

- ▶ The above commands result in:

$$a = b + c \quad (1)$$

- ▶ In case of no numbering, you should use:

```
\begin{equation*}
\end{equation*}
```

# Math and Equations: Multi Equation

- ▶ In case of multi equations a useful environment is:

```
\begin{eqnarray}
a&= &b + c \\
d&= &e + f
\end{eqnarray}
```

- ▶ The above commands yields:

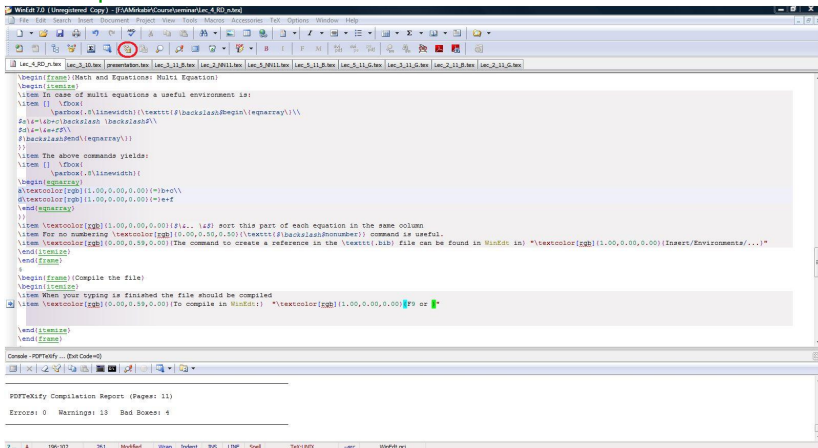
$$a=b + c \quad (2)$$

$$d=e + f \quad (3)$$

- ▶ **&..&** sort this part of each equation in the same column
- ▶ For no numbering `\nonumber` command is useful.
- ▶ The command to create a reference in the `.bib` file can be found in WinEdt in "Insert/Environments/..."

# Compile the file

- ▶ When your typing is finished the file should be compiled
- ▶ To compile in WinEdt: "F9 or "



```

WinEdt 2.0 (Unregistered Copy) - [F:\Amirkabir\Course\summar\Lec-4_KD_n.tex]
File Edit Search Insert Document Project View Tools Macros Accessories TeX Options Window Help
[Toolbar icons]
Lec_4_KD_n.tex Lec_3_10.tex presentation.tex Lec_3_11_B.tex Lec_3_1011.tex Lec_3_11_11.tex Lec_3_11_G.tex Lec_2_11_B.tex Lec_2_11_G.tex

\begin{frame}{Math and Equations: Multi Equation}
\begin{itemize}
\item In case of multi equations a useful environment is:
\item [] \fbox{
\parbox{.8\linewidth}{\texttt{\backslashbegin{eqnarray}}\
\begin{eqnarray}
a&+&b&=&c\backslashbackslash\backslashbackslash
\end{eqnarray}
\backslashbackslash\backslashbackslash}
}}
\item The above commands yields:
\item [] \fbox{
\parbox{.8\linewidth}{
\begin{eqnarray}
a&+&b&=&c
\end{eqnarray}
}}
\item \textcolor{rgb}{1.00,0.00,0.00}{\fcolor{1.00,0.00,0.00}} sort this part of each equation in the same column
\item For no numbering \textcolor{rgb}{1.00,0.59,0.00}{\texttt{\backslashnonumber}} command is useful.
\item \textcolor{rgb}{0.00,0.59,0.00}{The command to create a reference in the \texttt{bib} file can be found in WinEdt in: \textcolor{rgb}{1.00,0.00,0.00}{Insert/Environments/...}}
\end{itemize}
\end{frame}
\begin{frame}{Compile the file}
\begin{itemize}
\item When your typing is finished the file should be compiled
\item \textcolor{rgb}{0.00,0.59,0.00}{To compile in WinEdt: \textcolor{rgb}{1.00,0.00,0.00}{F9 or }
\end{itemize}
\end{frame}
\end{pre>


Console - PDFTeXify ... [Exit Code=0]



PDFTeXify Compilation Report (Pages: 11)



Errors: 0 Warnings: 13 Bad Boxes: 4


```



# Presentations: BEAMER

- ▶ `beamer` is a useful package to for presentations with LaTeX.
- ▶ This package is provided with most LaTeX distributions.
- ▶ The first step is to add the beamer as follows:

```
\documentclass{beamer}
```

- ▶ The first slide in the presentation is dedicated to author's name and affiliation by using mentioned command before.
- ▶ The other slides are created in the `\begin{document}\end{document}` environment.
- ▶ A useful environment to create slides is as follows:

```
\begin{frame}{frame title}  
the text goes here... \end{frame}
```

# Itemize

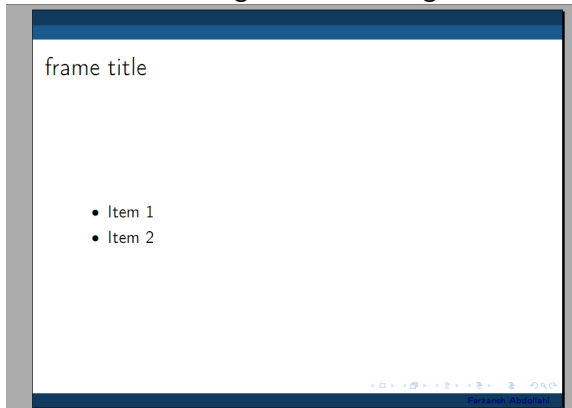
- ▶ To itemize the slides:

```
\begin{frame}{frame title}  
\begin{itemize}  
\item Item 1  
\item Item 2  
\end{itemize}  
\end{frame}
```

- ▶ The items will be numerated if you use `enumerate` instead `itemize`.
- ▶ These commands can be found in WinEdt in "insert/list/..."

# Example

- ▶ Therefore, we can get the following slide:



- ▶ You should use a theme to create a presentation by using `\usetheme{theme name}` command.

## Useful links for more details

- ▶ Everything about LaTeX commands, packages, math equations, and so on can be found in the following web  
[en.wikibooks.org/wiki/LaTeX](http://en.wikibooks.org/wiki/LaTeX)  
[www.ctan.org/what\\_is\\_tex.html](http://www.ctan.org/what_is_tex.html)  
<http://www.math.harvard.edu/texman/>
- ▶ To type in Persian you may use **Xepersian**  
<http://ctan.org/tex-archive/macros/xetex/latex/xepersian>