



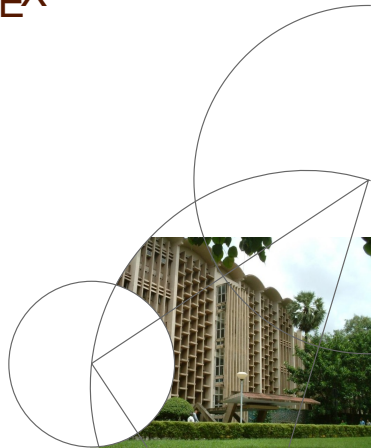
Industrial Engineering and Operations Research

Hands-on Workshop on \LaTeX

(Pronounced as $/l a : t \epsilon k/$)

Sundaravalli Narayanaswami

Reach me: sv.iitb@yahoo.com



What is easy with \LaTeX 2 ϵ ?

- Typesetting; what is this?
- Page set-up / Orientation / Multi-columns
- Figures: Resizing, positioning, captions, rotating ...
- Tables: Position, captions, alignment, merge/split ...
- Lists: several types
- Minipages: what is this?
- Footnote / Headers / Footers / Page borders / Colours / Fonts ...



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...contd...

- Mathematical expressions
- Bibliography and citation
- Indexing
- List of tables, list of figures, glossary, nomenclature
- Labels and referencing: what's this?
- ... And ...
- Need to edit / correct several times



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What is *NOT* easy with \LaTeX 2 ϵ ?

Newspaper typesetting

(6 columns, complex organising, a3 size)

... many of us will not need to know that anyway ...



Document types with \LaTeX 2 $_{\epsilon}$?

Document type	Document class	Command
Letter		
Article		
Report		
Book		
Poster		
Slides		



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Document type	Document class	Command
Letter	letter	<code>\documentclass[.]{letter}</code>
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Poster	poster	<code>\documentclass[.]{poster}</code>
Slides	beamer	<code>\documentclass[.]{beamer}</code>



Document types with $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X} 2_{\epsilon}$?

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Options are given inside square bracket to specify font size, page size, number of columns, document mode

Some document options are 12pt, a4, twocolumn, draft



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Packages

- Included to support different functionalities:
To get mathematical symbols, functions, etc., to
include a figure in the document, to change a default
font, and so on....



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- In **Preamble** part of *file.tex* between `\documentclass` and `\begin{document}`

- Example:

```
\documentclass[12pt,a4paper]{article}  
\usepackage{amsmath,amssymb,amsfonts}  
\usepackage{times,natbib,graphicx}  
\begin{document}
```

...

```
\end{document}
```



Packages

- Included to support different functionalities:
To get mathematical symbols, functions, etc., to include a figure in the document, to change a default font, and so on....
- In **Preamble** part of *file.tex* between `\documentclass` and `\begin{document}`
- `times` changes font to Times Roman.
`natbib` defines citation styles such as ‘W Disney *et al.* (2003)’ and ‘(W Disney *et al.*, 2003)’
`graphicx` supports figures inclusion and there are many more packages ...



Computational Requirements

OS: Windows - any / Unix / Linux - any / Mac

Software: MiKTeX / TeXLive (Bundled) / MacTeX
(iInstaller)

Editors: Several, including a simple Notepad

This session is based on **TexMaker** (Common
to all OS)



How to?

- 1 Create a file in the editor (*file.tex*)



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- 1 Create a file in the editor (*file.tex*)
- 2 Compile the file (*file.tex* — \rightarrow *file.dvi*)
latex *file.tex* ...OR... Keyboard shortcut *F2*



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DVI to PS dvi2ps *file.dvi* ...OR... Keyboard shortcut *F4*

PS to PDF ps2pdf *file.ps* ...OR... Keyboard shortcut *F8*

Final outcome *file.pdf*



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latex *file.tex* ...OR... Keyboard shortcut *F2*
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DVI to PDF dvipdf *file.dvi* ...OR... Keyboard shortcut *F9*

Final outcome *file.pdf*



How to?

- 1 Create a file in the editor (*file.tex*)

TEX to PDF `pdflatex file.tex` ...OR... Keyboard shortcut *F6*

Final outcome *file.pdf*



How to?

- 1 Create a file in the editor (*file.tex*)

TEX to HTML `htlatex file.tex`

Final outcome *file.html*



A letter in L^AT_EX

```
\documentclass[12pt]{letter}
\address{SV \\
Address line 1\\
Address line 2}
\date{23 December 2010}
\signature{...SV...}
% % % % % %
\begin{document}
\begin{letter}
% % % % % %
{\TeX\Dabblers\\
IEOR, IITB }
\opening{Dear Sir/Madam,}
Can you serve us some good coffee?
Regards.
\closing{Yours sincerely,}
\cc{\TeX\Users \\IEOR\@IITB}
% % % % % %
\end{letter}
\end{document}
```



A Letter in L^AT_EX

SV

Address line 1

Address line 2

23 December 2010

T_EX Dabblers
IEOR, IITB

Dear Sir/Madam,

Can you serve us some good coffee?

Regards.

Yours sincerely,

...SV ...

cc: T_EX Users
IEOR IITB



Environments: Lists

Bullet List:

```
\begin{itemize}  
\item First item in Bullet List  
\item Second item in Bullet List  
\end{itemize}
```

Will Produce:

- First item in Bullet List
- Second item in Bullet List



Environments: Lists

Enumerated List

```
\begin{enumerate}  
\item First item in Enumerated List  
\item Second item in Enumerated List  
\end{enumerate}
```

Will Produce:

- 1 First item in Enumerated List
- 2 Second item in Enumerated List



Environments: Lists

Description List

```
\begin{description}  
\item[IEOR] Industrial Engineering and  
Operations Research (IEOR) at IIT Bombay.  
\item[IDC] Industrial Design Centre (IDC) at  
the Indian Institute of Technology Bombay.  
\end{description}
```

 Will Produce:

IEOR Industrial Engineering and Operations
Research (IEOR) at IIT Bombay.

IDC Industrial Design Centre (IDC) at the Indian
Institute of Technology Bombay.



Exercise: Lists

- Open a new `article` document class
- Make a bullet list with three items
- Add a `\subitem` under each item
- Compile and observe your `pdf` file
- Edit the above list type to enumerated and description lists
- Compile and produce a `pdf` file



Environments: Tabbing

Set Tab position in the first line using `\=`

Follow tab positions in other lines using `\>`

Example:

```
\begin{tabbing}
```

```
Program\quad \= : \= \TeX\\[5pt]
```

```
Author \> : \> Donald Knuth\\[5pt]
```

```
Manuals \> :\\
```

```
\end{tabbing}
```

Will produce

Program : \TeX

Author : Donald Knuth

Manuals :



Environments: Tabbing

```
\begin {tabbing}
Book Title \hspace{2cm} \= Author \hspace{2cm}
\= Year\\[5pt]
Stochastic Process \> S. M. Ross \>
2007\\[5pt]
Linear Programming \> Robert J. Vanderbei \>
2008
\end{tabbing}
```

Will produce:

Book Title	Author	Year
Stochastic Process	S. M. Ross	2007
Linear Programming	Robert J. Vanderbei	2008



Exercise: Tabbing

Open a new `article` class and using tabbing, produce the following:

Timetable	08:30 - 09:30	10:30 - 11:30	12:30 - 01:30
Monday	IE 610		Lunch
Tuesday		IE 611	Lunch
Wednesday	IE 601	IE 611	IE 601



Environments: Arrays

Arrays are created using

```
\begin{array}{argument}
```

...

```
\end{array}
```

{argument} specifies justification of array elements:

{l} for left aligned column

{c} for centre aligned column

{r} for right aligned column



Environments: Arrays

```

$$
\left(
\begin{array}{rcl}
\alpha i & \beta & \gamma \\
a & ab & abcd \\
1 & 123 & 3
\end{array}
\right)
\right)
$$

```

Will Produce:

$$\left(\begin{array}{rcl} \alpha i & \beta & \gamma \\ a & ab & abcd \\ 1 & 123 & 3 \end{array} \right)$$



Exercise: Arrays

Open a new file array.tex

Write down commands to produce arrays as shown below.

A =

$$\begin{bmatrix} 10 & 12 \\ 14 & 16 \end{bmatrix}$$

B =

$$\begin{bmatrix} 11 & 13 \\ 15 & 17 \end{bmatrix}$$

A + B =

$$\begin{bmatrix} 10+11 & 12+13 \\ 14+15 & 16+17 \end{bmatrix}$$



Floating Environments: Figures and Tables

Floats cannot be split in two pages



Floating Environments: Figures and Tables

Floats cannot be split in two pages

Position specifiers are needed



Floating Environments: Figures and Tables

```
\begin{ ... }[position]  
.....  
\end{ ... }
```

[position] specifiers in floating environments:

[h]: place float exactly here

[t]: place float on top of a page

[b]: place float at the bottom of a page

[p]: place float in a page with only floats

[!]: place float at an immediately available space



Environments: Figures

Graphicx package to be included in the preamble

```
\usepackage{graphicx}
```



Environments: Figures

Graphicx package to be included in the preamble

```
\usepackage{graphicx}  
  
\begin{figure}[position] \centering  
\includegraphics[size]{file name with path}  
\caption{figure caption}\label{figure-label}  
\end{figure}
```



Environments: Figures

Graphicx package to be included in the preamble

```
\usepackage{graphicx}
```

Example:

```
\begin{figure}[h]\centering  
\includegraphics[width=1.2in]{IITB.jpg}  
\caption{IITB - MB}\label{mb}  
\end{figure} produces
```



Figure: IITB - MB



Exercise: Figures

- Insert a picture file in a `article` class file
- Insert different pictures in different sizes and assign **different captions and labels** to each
- Place each picture using `[t]`, `[b]`, `[p]`, `[h]`, `[!]` position specifiers
- Observe the compiled `pdf` file



Environments: Tabular

Tabular is used within a table environment

```
\begin{table}[position]
\begin{tabular}{no. of columns / alignment}
....
\end{tabular}
\caption{table caption}\label{table-label}
\end{table}
```



Environments: Tables

```
\begin{table}[htp]
\begin{tabular}{|r|l|c|}
\hline Roll No. & Name & Grade \\
\hline 0123 & Radha & AA \\
\hline 0124 & Radhika & ABC \\
\hline
\end{tabular}
\caption{First Table}\label{first-table}
\end{table}
```

Will Produce:

Roll No.	Name	Grade
0123	Radha	AA
0124	Radhika	ABC

Table: First Table



Environments: Tables

```
\begin{table} \centering
\begin{tabular}{r||lc}
\Roll No. & Name & Grade \\\
\hline 0125 & Anu & A \\\
0126 & Vinu & BB \\\
\hline
\end{tabular}
\caption{Second Table}\label{second-table}
\end{table}
```

Will Produce:

Roll No.	Name	Grade
0125	Anu	A
0126	Vinu	BB

Table: Second Table



Exercise: Tables

- Edit table in previous slide to the format shown below:

Roll No.	Name	Grade
----------	------	-------

0125	Anu	A
------	-----	---

0126	Vinu	BB
------	------	----

Table: Spacious Table



Merging rows and columns in Tables

Merge Columns:

```
\begin{table}[.]  
\begin{tabular}{.}  
  
...  
\multicolumn{n}{a}{text}  
  
...  
\end{tabular}  
\caption{First Table}\label{first-table}  
\end{table}
```

where **n** is number of columns to merge, **a** denotes alignment and **text** is data within cell



Merging rows and columns in Tables

Merge Rows: Requires `\usepackage{multirow}` in Preamble

```
\multirow{n}{a}{text}
```

where **n** is number of columns to merge, **a** denotes alignment (**a** = *) and **text** is data within cell



Exercise: Merging Tables

- Edit table in previous exercise to a format as shown below:

IE 601 End-sem grades			
Batch	Roll No.	Name	Grade
MTech - 11	0125	Anu	A
	0126	Vinu	BB
	0127	Manu	BC
	0128	Tanu	B

Table: Exercise - Merge Table



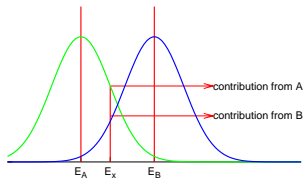
Side by Side Pictures, Tables, Text

Minipages are used to place floats and text side by side.

Example 1:



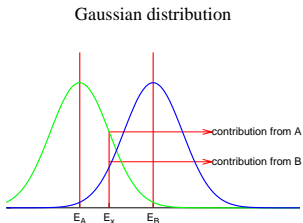
Gaussian distribution



Side by Side Pictures, Tables, Text

Minipages are used to place floats and text side by side.

Example 2:



This is the
Gaussian
distribution
curve.



Codes for Miniframes

```
\begin{center}  
\begin{minipage}[b]{0.4\linewidth}  
\includegraphics[width=4cm]{gauss.pdf}  
\end{minipage}  
\hspace{0.2 cm}  
\begin{minipage}[b]{0.4\linewidth}  
{\huge This is the Gaussian distribution  
curve.}  
\end{minipage}  
\end{center}
```



Exercise: Minipages

- Create a minipage to place two tables as shown:

No.	Name	Grade
0125	Anu	AB
0126	Vinu	BC

Table: Table 1a - IE 601 Grades

No.	Name	Grade
0125	Anu	A
0126	Vinu	BB

Table: Table 1b - IE 611 Grades

Table: Two tables as minipage



End of Session 1: Assignment1

Produce the following table¹ in an article document class.

Hints: 1. Table caption to be placed above table.

2. For horizontal lines spanning fewer columns, use `\cline{a-b}`, where a and b are column numbers between which the line is to be dropped.

Table: Cost of fruits in India

Fruit details		Cost calculations		
Fruit	Type	No. of units	cost/unit	cost (Rs.)
Mango	Malgoa	18	50	1,500
	Alfonso	2	300	
Jackfruit	Kolli Hills	10	50	500
Banana	Green	10	20	200
Total cost (Rs.)				2,200

¹ Adapted from <http://moudgalya.org>



End of Session 1: Assignment2

- Prepare a CV for yourself in an `article` document class.
- Collect a sample CV which is *only* for illustrative purposes.
- Next session will start with a review of assignments.



Maths typesetting: Expressions

Three different procedures to produce Math typesetting

`\usepackage {amsmath, amssymb}` in preamble

- \$...\$** (i) To write math expressions in-between text
- (ii) No equation numbering and alignment

Example 1 The equation for a straight line is

`$ y=mx+c $`

produces

The equation for a straight line is $y = mx + c$



Maths typesetting: Expressions

Three different procedures to produce Math typesetting

`\usepackage {amsmath, amssymb}` in preamble

`\begin{math}...\end{math}`

- (i) To write math expressions without equation numbering and alignment
- (ii) Expressions in multiple lines are possible

Example `\begin{math}`
 $a^2 + b^2 = c^2$
`\end{math}`

produces

$$a^2 + b^2 = c^2$$



Maths typesetting: Expressions

Three different procedures to produce Math typesetting

`\usepackage {amsmath, amssymb}` in preamble

`\begin{math}...\end{math}`

- (i) To write math expressions without equation numbering and alignment
- (ii) Expressions in multiple lines are possible

Example

```
\begin{math}
\varphi=\sqrt[10]{\frac{a}{b}} \quad \backslash\backslash
\lim_{x \rightarrow 0} \frac{\sin x}{x}=1 \quad \backslash\backslash
\end{math}
```

produces

$$\varphi = \sqrt[10]{\frac{a}{b}}$$

$$\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$



Maths typesetting: Expressions

Three different procedures to produce Math typesetting

`\usepackage {amsmath, amssymb}` in preamble

`\begin{equation}...\end{equation}`

- (i) Equations are numbered, center aligned
- (ii) Expressions in multiple lines are possible
- (iii) Sub-equation numbers are possible

Example

```
\begin{equation}
\xi_n =
\sqrt{\sum_{d=0}^5 \big[\hat{\zeta}_{n+1}(d) -
\hat{\zeta}_{n-1}(d) \big]^2} \end{equation}
```

produces

$$\xi_n = \sqrt{\sum_{d=0}^5 [\hat{\zeta}_{n+1}(d) - \hat{\zeta}_{n-1}(d)]^2} \quad (1)$$



Maths Typesetting: Matrix

The following code:

```
$ \begin{Bmatrix}
a & b & \cdots & z \\
a^2 & b^2 & \cdots & z^2 \\
\vdots & & \ddots & \\
a^n & b^n & \cdots & z^n
\end{Bmatrix}$
```

produces:

$$\begin{Bmatrix} a & b & \cdots & z \\ a^2 & b^2 & \cdots & z^2 \\ \vdots & & \ddots & \\ a^n & b^n & \cdots & z^n \end{Bmatrix}$$



Maths Typesetting: Equation array

The following code:

```
\begin{displaymath}
\left(\frac{a}{b} \right)=\left \{
\begin{array}{ll}
1 & \text{if } \{d_i\}^j \geq 100 \} \\
0 & \text{otherwise}
\end{array} \right
\end{displaymath}
```

produces:

$$\left(\frac{a}{b}\right) = \begin{cases} 1 & \text{if } d_i^j \geq 100 \\ 0 & \text{otherwise} \end{cases}$$



Labels and References

References are assigned by adding tag

`\label{label_name}` to

Figure

Table

Equation

Section

Part / Chapter



Labels and References

References are assigned by adding tag

`\label{label_name}` to

Figure Between `\begin{figure}` and
`\end{figure}`

Table Between `\begin{table}` and `\end{table}`

Equation Between `\begin{equation}` and
`\end{equation}`

Section After `\begin{section}`

Part / Chapter After `\begin{part}` and
`\begin{chapter}`



Labels and References

References are assigned by adding tag

`\label{label_name}` to

Figure

Table

Equation

Section Available only in article, report and book document classes

Part / Chapter Available only in report and book document classes



Labels and References

References are assigned by adding tag

`\label{label_name}` to

Figure

Table

Equation

Section

Part / Chapter

Note `label_name` has to be unique (non-repetitive)
in your entire document

One of our most common mistakes in \LaTeX



Bibliography

- To add a list of references at the end of your document as Bibliography



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- Mainly required in article, report and book classes



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- Create a new `bib` file, say `mybib.bib`



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- Mainly required in article, report and book classes
- Create a new `bib` file, say `mybib.bib`
- Populate this with all your reference material



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- Populate this with all your reference material
- In TexMaker, use the Bibliography menu available at the top of window



Bibliography

- To add a list of references at the end of your document as Bibliography
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- Type a **unique** key after each reference
Example: `@Article{unique_key,`



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- In TexMaker, use the Bibliography menu available at the top of window
- Type a **unique** key after each reference
Example: `@Article{unique_key,`
- After all references are included, save your `bib` file



Citation ...

In `main_file.tex`, wherever a reference is to be cited, type as follows:

`\citet{unique_key}` to produce

Author_Name (Year)

`\citep{unique_key}` to produce

(Author_Name Year)



Bibliography ...

- In Preamble of your `main_file.tex`, add
`\usepackage{natbib}`



Bibliography ...

- In Preamble of your `main_file.tex`, add
`\usepackage{natbib}`
- At the end of your document, before
`\end{document}` type the following
`\bibliographystyle{plain}`
`\bibliography{mybib}`



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- At the end of your document, before
`\end{document}` type the following
`\bibliographystyle{plain}`
`\bibliography{mybib}`
- Open `main_file.tex` and `latex main_file.tex`
(Press F2)



Bibliography ...

- In Preamble of your `main_file.tex`, add
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- At the end of your document, before
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`\bibliographystyle{plain}`
`\bibliography{mybib}`
- Open `main_file.tex` and `latex main_file.tex`
(Press F2)
- Now `bibtex main_file` (Press F11)



Bibliography ...

- In Preamble of your `main_file.tex`, add
`\usepackage{natbib}`
- At the end of your document, before
`\end{document}` type the following
`\bibliographystyle{plain}`
`\bibliography{mybib}`
- Open `main_file.tex` and `latex main_file.tex`
(Press F2)
- Now `bibtex main_file` (Press F11)
- Again `latex main_file.tex` twice (Press F2)



Bibliography ...

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- At the end of your document, before
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- Open `main_file.tex` and `latex main_file.tex`
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- Again `latex main_file.tex` twice (Press F2)
- Your `main_file.dvi` and a couple of other files are
available now



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(Press F2)
- Now `bibtex main_file` (Press F11)
- Again `latex main_file.tex` twice (Press F2)
- Your `main_file.dvi` and a couple of other files are
available now
- Convert your `main_file.dvi` to `main_file.pdf`
(Press F9)



Other essential parts of a document

The following are applicable to `article` and `report` classes

- Title of the document: `\title{Your Title}`
:assigns a document title



Other essential parts of a document

The following are applicable to `article` and `report` classes

- Title of the document: `\title{Your Title}`
- Name(s) of the author(s): `\author{Your Name(s)}`
:assigns author (s) name(s) to document



Other essential parts of a document

The following are applicable to article and report classes

- Title of the document: `\title{Your Title}`
- Name(s) of the author(s): `\author{Your Name(s)}`
- Affiliation, date of creation etc.: `\date{any date}`
:assigns a document date

If kept blank, no date will be assigned

`\date{\today}` assigns last date of compilation as document date



Other essential parts of a document

The following are applicable to article and report classes

- Title of the document: `\title{Your Title}`
- Name(s) of the author(s): `\author{Your Name(s)}`
- Affiliation, date of creation etc.: `\date{any date}`
- Acknowledgement and Title notes:
`\thanks{Acknowledgement}`
:inserts acknowledgements as footnote to title or author, depending on where it is typed



Other essential parts of a document

The following are applicable to article and report classes

- Title of the document: `\title{Your Title}`
- Name(s) of the author(s): `\author{Your Name(s)}`
- Affiliation, date of creation etc.: `\date{any date}`
- Acknowledgement and Title notes:
`\thanks{Acknowledgement}`
- Type all the above details before `\begin{document}` in your document



Other essential parts of a document

The following are applicable to article and report classes

- Title of the document: `\title{Your Title}`
- Name(s) of the author(s): `\author{Your Name(s)}`
- Affiliation, date of creation etc.: `\date{any date}`
- Acknowledgement and Title notes:
`\thanks{Acknowledgement}`
- Type all the above details before `\begin{document}` in your document
- Type `\maketitle` immediately after `\begin{document}`



Other essentials ... contd ...

Table of contents and Abstract

- Include an abstract immediately after `\maketitle`



Other essentials ... contd ...

Table of contents and Abstract

- Include an abstract immediately after `\maketitle`
- Write the abstract between `\begin{abstract}` and `\end{abstract}`

Not in `book` document class



Other essentials ... contd ...

Table of contents and Abstract

- Include an abstract immediately after `\maketitle`
- Write the abstract between `\begin{abstract}` and `\end{abstract}`
- Include a table of contents after `Abstract`



Other essentials ... contd ...

Table of contents and Abstract

- Include an abstract immediately after `\maketitle`
- Write the abstract between `\begin{abstract}` and `\end{abstract}`
- Include a table of contents after `Abstract`
- Type `\tableofcontent`, where `Content` table is required; only in `report` and `book` document classes



Other essentials ... contd ...

Table of contents and Abstract

- Include an abstract immediately after `\maketitle`
- Write the abstract between `\begin{abstract}` and `\end{abstract}`
- Include a table of contents after `Abstract`
- Type `\tableofcontent`, where `Content` table is required;
- Type `\listoffigures`, where list of figures is required; only in `report` and `book` document classes



Other essentials ... contd ...

Table of contents and Abstract

- Include an abstract immediately after `\maketitle`
- Write the abstract between `\begin{abstract}` and `\end{abstract}`
- Include a table of contents after `Abstract`
- Type `\tableofcontent`, where Content table is required;
- Type `\listoffigures`, where list of figures is required;
- Type `\listoftables`, where list of tables is required; only in **report** and **book** document classes



Other essentials ... contd ...

Table of contents and Abstract

- Include an abstract immediately after `\maketitle`
- Write the abstract between `\begin{abstract}` and `\end{abstract}`
- Include a table of contents after `Abstract`
- Type `\tableofcontent`, where Content table is required;
- Type `\listoffigures`, where list of figures is required;
- Type `\listoftables`, where list of tables is required;
- **Compile `main_file.tex` at least twice repeatedly to get references and page numbers right**



Bits and Pieces of an article

```
\documentclass[12pt, a4paper]{article}
\usepackage{amsmath, amssymb, amsfonts}
\usepackage{times, graphicx, natbib}
% % % % % % % % % % % %
\title{Document title}
\author{Author(s) name(s)}
\date{Document date}
% % % % % % % % % % % %
\begin{document}
\maketitle
\begin{abstract} ... \end{abstract}
\section{Section name1} ...
\bibliographystyle{plain}
\bibliography{Bib file name}
\end{document}
```



Bits and Pieces of a report

```
\documentclass[12pt, a4paper]{report}
...
\begin{document}
\maketitle
\begin{abstract} ... \end{abstract}
\tableofcontent
\listoffigures
\listoftables
\input{Section name1.tex} ...
\input{Section name2.tex} ...
\bibliographystyle{plain}
\bibliography{Bib file name}
\end{document}
```



End of Session 2: Assignment1

- Open a new `article` document class
- Write down mathematical expressions given in the next slide
- Your output should be exactly like the next slide



$f(x, y)$ is a measurable function and f is differentiable over y for $x \in E$, such as the partial derivative is measurable in E . If

$$\exists g \in L_1(E)$$

such as

$$\left| \frac{\partial f(x, y)}{\partial y} \right| \leq g \in L_1(E)$$

then we get:

$$\frac{\partial}{\partial y} \int_E f(x, y) dx = \int_E \frac{\partial f(x, y)}{\partial y} dx \quad (2)$$

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} \quad (3)$$

$$\lim_{x \rightarrow +\infty} \frac{\ln x}{x} = 0 \quad (4)$$

$$\sum_{k=1}^n k = \frac{n(n+1)}{2} \quad (5)$$

$$\int_0^{+\infty} x^n e^{-x} dx = n! \quad (6)$$



End of Session 2: Assignment2²

- Open a new `article` document class and a `bib` file
- Complete the article shown in the next slide and populate the `bib` file with three references shown in the next slide
- Compile to a `pdf` file, exactly as shown

²Adapted from Source: Amèlie Anglade, QMUL



Simple Example

Gàbor Maròti

August 2, 2011

Abstract

Here goes the abstract which summarizes the content of the document.

1 First section

1.1 Subsection with numbering

In [2] it has been shown that ... On the contrary in [3] ... Finally [1] ...

References

- [1] Gàbor Maròti. *Operations Research Models for Railway Rolling Stock Planning*. PhD thesis, Technische Universiteit, Eindhoven, Amsterdam, September 2006.
- [2] P. Resnick, N. Iacovou, M. Suchak, P. Bergstrom, and J. Riedl. Grouplens: An open architecture for collaborative filtering of netnews. In *Proc. of the Conference on Computer Supported Cooperative Work*, pages 175–186, New York, 1994. ACM.
- [3] D.J. Watts. *Six Degrees: The Science of a Connected Age*. Norton, 2003.





Resources³

Web <http://www.ieor.iitb.ac.in/resource/latex>

Human Anu Thomas, Anirban, Bijulal, SV

³Indicative; innumerable, better resources are available, elsewhere

