

Lists of Contents and Index

Lists of contents and index are generally prepared in a big document, such as a book or a report. The lists of contents are prepared at the beginning of a book showing page-wise headings of various topics and captions of tables and figures, while the index prepared at the end shows the page numbers of topic-related various terms covered in the book.

16.1 Lists of Contents

L^AT_EX provides the `\tableofcontents`, `\listoftables` and `\listoffigures` commands for automatic generation of three lists in a document, which are contents of sectional units, contents of tables, and contents of figures, respectively. These three lists are produced under the headings of ‘Contents’, ‘List of Tables’, and ‘List of Figures’, respectively. The `\tableofcontents`, `\listoftables`, and `\listoffigures` commands are to be placed in their proper locations in the `document` environment, generally in between the front matter and main matter of a document (detail is in §20.1 on page 191).

16.1.1 Information to the Lists of Contents

Contents of the list of ‘Contents’ are the arguments of various sectional commands (like `\chapter{}`, `\section{}`, etc.), while those of ‘List of Tables’ and ‘List of Figures’ are the arguments of the `\caption{}` command used in different tables and figures, respectively.

Numbered sectional and captioned items, like `\section{}` or `\caption{}`, are automatically included in the respective lists of contents using their arguments. If it happens that the mandatory argument of a command is too long to include in its list of contents, provision is there for printing a shorter information in the list. This is done through the optional argument of a sectional or caption command,

like `\chapter[]{}`, `\section[]{}` or `\caption[]{}1`. For example, if the caption of a table is written as `\caption[caplot]{captab}`, then the table in its position will be captioned with the mandatory `captab`, while it will be included in the ‘List of Tables’ with the optional `caplot` (in the absence of the optional `caplot`, however, it will be listed with the mandatory `captab`). Such examples can be found in many sectional units, tables, and figures of this book.

On the other hand, unnumbered sectional and captioned items, i.e., an item with the starred form of a command, like `\section*{}*` or `\caption*{}*`, are excluded from a list of contents. Such an item, however, can be included in a list of contents through the `\addcontentsline{}{}{}*` command as `\addcontentsline{alist}{atype}{info}`, where `alist` is the list of contents in which the item is to be included (`toc` for ‘Table of Contents’, `lot` for ‘List of Tables’ and `lof` for ‘List of figures’), `atype` is the type of the item (e.g., `chapter`, `table`, or `figure`), and `info` is the information to be entered in the list of contents. For example, the *Preface* of a book is usually written through the `\chapter*{}*` command as a chapter without any serial number, which can be included in the list of ‘Contents’ by inserting the `\addcontentsline{toc}{chapter}{Preface}` command just before the inclusion of the input file containing the *Preface* of the book (refer §20.2 on page 192 for detail). Similarly, as done in this book, the unnumbered lists generated by the `\tableofcontents`, `\listoftables`, and `\listoffigures` commands can be included in the list of ‘Contents’ through the `\addcontentsline{toc}{chapter}{}*` command with the last argument as the heading to be entered in the list of ‘Contents’ (detail is in §20.2). Any fragile command in the last argument of `\addcontentsline{}{}{}*` should be protected through the `\protect` command (§18.6 on page 176 discusses fragile commands).

If an item, included in a list of contents through `\addcontentsline{}{}{}*` as above, is shown on a wrong page in the list of contents (usually the previous page of its actual occurrence), `\phantomsection` command defined in the `hyperref` package may be added before `\addcontentsline{}{}{}*`, e.g., `\phantomsection\addcontentsline{toc}{chapter}{Preface}`. In the case of two such consecutive items, the former item may need to be ended additionally by `\clearpage`.

16.1.2 Formatting Lists of Contents*

Some provisions for altering the default formatting of the lists of contents:

1. The headings produced by `\tableofcontents`, `\listoftables`, and `\listoffigures` can be changed by redefining, respectively, the `\contentsname`, `\listtablename`, and `\listfigurename` commands through the `\renewcommand{}{}*` command as discussed in §13.2 on page 128, e.g., `\renewcommand{\contentsname}{List of Contents}` will replace the default heading ‘Contents’ of `\tableofcontents` with ‘List of Contents’.

¹If the heading/title of a numbered unit (like `\chapter{}*`, `\section{}*`, or `\caption{}*`) is too long to include in lists of contents, a shorter heading/title can be generated through an optional argument of the command.

2. By default all the numbered sectional units are listed in the Contents of a document. This may increase the size of the Contents, particularly when the depth of sectional units is increased as mentioned in §4.1 on page 27. In that case also, however, the size of the Contents can be controlled by suppressing some lower level of sectional units. This suppression is accomplished through the `tocdepth` counter. For example, `\setcounter{tocdepth}{2}` (in the preamble) will restrict the list of Contents of a document only up to the third level of sectional units, e.g., `\part{}`, `\chapter{}`, and `\section{}` in the case of a book divided into parts, or `\chapter{}`, `\section{}`, and `\subsection{}` in a book without any part. Similar to `tocdepth`, the levels of depth to be incorporated in the List of Tables and List of Figures can be increased or decreased by changing the values of `lotdepth` and `lofdepth`, respectively.
3. Notice in the lists of contents on pages (ix)–(xxvii) of this book that the gap between an entry and its page number is filled by dots. The gap between two dots can be adjusted by redefining the value of the `\@dotsep` command, e.g., `\renewcommand{\@dotsep}{3.5}`. A very large value may be assigned to `\@dotsep` if dots are not required at all, e.g., `\renewcommand{\@dotsep}{500}` will eliminate the dots in the lists of contents of this book.
4. Notice on pages (ix)–(xxvii) of this book that the page numbering column in each of the Contents, List of Tables, and List of Figures has the heading of ‘Page’. It is not default, but produced using the `\addtocontents{alist}{\~\hfill Page\par}` command three times with values of `alist` as `toc`, `lot`, and `lof`, respectively. The commands are inserted at the start of the `document` environment, before inserting any unit that will be included in the lists of contents.
5. Further notice in the List of Tables and List of Figures on pages (xvii)–(xxvii) of this book that the entries (i.e., captions) of each Hour is preceded by the corresponding Hour heading. It is also not default, but produced by inserting `\addcontentsline{lot}{chapter}{\thechapter\ atitle}` and `\addcontentsline{lof}{chapter}{\thechapter\ atitle}` just after the `\chapter{}` command of each applicable Hour, where `atitle` is the heading of the Hour.
6. By default the appendices in the list of Contents are marked by uppercase alphabets, like A, B, etc. However, the only appendix of this book is marked as ‘Appendix A’, i.e., ‘A’ is preceded by the word ‘Appendix’. This is obtained by including the appendix file in the root file (Table 20.5 on page 196 discusses in detail) through the `appendices` environment as follows:

```

\begin{appendices}
\renewcommand{\chaptername}{Appendix}
\include{appsymp}
\end{appendices}

```

Since the appendix file (named as `appsymp.tex`) is prepared under the `\chapter{}` command, the `\chaptername` command is renamed as ‘Appendix’ before including the appendix file. The `appendices` environment is defined in the `appendix` package, which is loaded in the preamble as `\usepackage[titletoc]{appendix}` instructing through the `titletoc` option to put the title of the appendix in the list of Contents.

16.1.3 Multiple Lists of Contents*

Sometime the list of Contents in a book may need to be generated chapter-wise, instead of a single global one or in addition to that. This may be required particularly in an edited book or a conference proceedings, where its chapters are written by different authors. Such chapter-wise lists of Contents are generated through the `minitoc` package.

A sample L^AT_EX input file for an edited book with chapter-wise lists of Contents is shown in Table 16.1 along with its output in Table 16.2 on the next page.

Table 16.1 Book with chapter-wise lists of Contents

```

\documentclass[a4paper,openany]{book}
\usepackage{minitoc}
\setcounter{tocdepth}{0}
\setcounter{minitocdepth}{2}
%
\begin{document}
\dominitoc
\tableofcontents
% \faketableofcontents
%
\chapter[Introduction to \LaTeX\{\it Dr.\_D.\_Datta\}]{Introduction to \LaTeX}
\begin{flushright} Dr.\_D.\_Datta \end{flushright}
\minitoc
\section{What is \LaTeX?}
\LaTeX is a macro package ...
\subsection{Commands and environments}
A document is prepared by interspersing ...
\subsection{How to write a document?}
The simplest \LaTeX document is started ...
%
\chapter[Basic Formatting Tools\{\it Dr.\_P.\_Das\}]{Basic Formatting Tools}
\begin{flushright} Dr.\_P.\_Das \end{flushright}
\minitoc
\section{Formatting page size}
The \backslash$documentclass[\{ \} command allows ...
\section{Formatting page numbering}
As seen in the figure ...
\section{Sectional units}
Various sectional units ...
%
\chapter[Mathematical Expressions\{\it Dr.\_R.\_Rana\}]{Mathematical Expressions}
\begin{flushright} Dr.\_R.\_Rana \end{flushright}
\minitoc
\section{Mathematical notations}
Different mathematical notations are the basic tools for writing mathematical expressions ...
\section{Mathematical operators}
In order to form a mathematical expression, various terms are connected by some operators ...
\end{document}

```

Table 16.2 Book with chapter-wise lists of Contents (output of the input file of Table 16.1)

<h2 style="text-align: center;">Contents</h2> <p>1 Introduction to L^AT_EX <i>Dr. D. Datta</i> 2</p> <p>2 Basic Formatting Tools <i>Dr. P. Das</i> 3</p> <p>3 Mathematical Expressions <i>Dr. R. Rana</i> 4</p> <p style="text-align: center;">1</p>	<h2 style="text-align: center;">Chapter 2</h2> <h3 style="text-align: center;">Basic Formatting Tools</h3> <p style="text-align: right;">Dr. P. Das</p> <hr/> <h4 style="text-align: center;">Contents</h4> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: left;">2.1 Formatting page size</td><td style="text-align: right;">3</td></tr> <tr><td style="text-align: left;">2.2 Formatting page numbering</td><td style="text-align: right;">3</td></tr> <tr><td style="text-align: left;">2.3 Sectional units</td><td style="text-align: right;">3</td></tr> </table> <hr/> <p>2.1 Formatting page size The <code>\documentclass[]{} </code> command allows ...</p> <p>2.2 Formatting page numbering As seen in the figure ...</p> <p>2.3 Sectional units Various sectional units ...</p> <p style="text-align: center;">3</p>	2.1 Formatting page size	3	2.2 Formatting page numbering	3	2.3 Sectional units	3				
2.1 Formatting page size	3										
2.2 Formatting page numbering	3										
2.3 Sectional units	3										
<h2 style="text-align: center;">Chapter 1</h2> <h3 style="text-align: center;">Introduction to L^AT_EX</h3> <p style="text-align: right;">Dr. D. Datta</p> <hr/> <h4 style="text-align: center;">Contents</h4> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: left;">1.1 What is L^AT_EX?</td><td style="text-align: right;">2</td></tr> <tr><td style="text-align: left;"> 1.1.1 Commands and environments</td><td style="text-align: right;">2</td></tr> <tr><td style="text-align: left;"> 1.1.2 How to write a document?</td><td style="text-align: right;">2</td></tr> </table> <hr/> <p>1.1 What is L^AT_EX? L^AT_EX is a macro package ...</p> <p>1.1.1 Commands and environments A document is prepared by interspersing ...</p> <p>1.1.2 How to write a document? The simplest L^AT_EX document is started ...</p> <p style="text-align: center;">2</p>	1.1 What is L ^A T _E X?	2	1.1.1 Commands and environments	2	1.1.2 How to write a document?	2	<h2 style="text-align: center;">Chapter 3</h2> <h3 style="text-align: center;">Mathematical Expressions</h3> <p style="text-align: right;">Dr. R. Rana</p> <hr/> <h4 style="text-align: center;">Contents</h4> <table style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: left;">3.1 Mathematical notations</td><td style="text-align: right;">4</td></tr> <tr><td style="text-align: left;">3.2 Mathematical operators</td><td style="text-align: right;">4</td></tr> </table> <hr/> <p>3.1 Mathematical notations Different mathematical notations are the basic tools for writing mathematical expressions ...</p> <p>3.2 Mathematical operators In order to form a mathematical expression, various terms are connected by some operators ...</p> <p style="text-align: center;">4</p>	3.1 Mathematical notations	4	3.2 Mathematical operators	4
1.1 What is L ^A T _E X?	2										
1.1.1 Commands and environments	2										
1.1.2 How to write a document?	2										
3.1 Mathematical notations	4										
3.2 Mathematical operators	4										

The `\setcounter{tocdepth}{0}` command is used in the L^AT_EX input file of Table 16.1 for producing a global list of Contents only with the chapter headings of the book. On the other hand, the `\setcounter{minitocdepth}{2}` command will generate a list

of Contents for a chapter covering up to the second level of sectional units, i.e., up to the `\section{}` and `\subsection{}` commands. The `\dominitoc` command, used immediately after starting the `document` environment, is a mandatory command for initializing the `minitoc` system. The next command is `\tableofcontents` for producing the global list of Contents. If the global list of Contents is not to be produced, the `\tableofcontents` command should be replaced by the `\faketableofcontents` command, which is shown commented in Table 16.1. Then the actual contents of the book is inserted as usual, with the only difference that each `\chapter{}` command is followed by the `\minitoc` command for producing a list of Contents for that chapter. Since the example is for an edited book, whose chapters are usually written by different authors, the author of each chapter is inserted through the `flushright` environment between its `\chapter{}` and `\minitoc` commands. Moreover, the name of the author is also included in the optional argument of the `\chapter[{}]{}` command for printing it in the global list of Contents, if it is opted.

16.1.4 Compiling L^AT_EX Input File Having Lists of Contents

A L^AT_EX input file, which is to produce lists of contents also, is to be compiled twice through the `latex` command as stated in §14.3 on page 140. The first `latex` command compiles the L^AT_EX input file and generates some additional files related to the lists of contents, while the second `latex` command links the generated lists of contents with L^AT_EX. If only the global lists of contents are to be produced, the compilation generates four files with `dvi`, `aux`, `log`, and `toc` extensions. The compilation of the `minitoc` system generates some more files, one with `bmt` extension, one with `mtc` extension, and one with `mtc<N>` extension against each chapter, where `<N>` is the serial number of a chapter.

16.2 Making Index

The L^AT_EX command for indexing a term is `\index{}`, which is defined in the `makeidx` package. The index of a document is always produced on a new page under the heading ‘Index’. In order to produce the index in the output, besides loading the `makeidx` package, the `\makeindex` and `\printindex` commands are also required to be inserted in the L^AT_EX input file. The `\makeindex` command is inserted in the preamble (after all the `\usepackage{}` commands) instructing to prepare index, while `\printindex` is inserted in the body of the document (usually just before the `\end{document}` command) for producing the index in the output (refer Table 16.3 on the next page). A term in the index list in the output is followed by the page number of the document on which the term appears.

Table 16.3 Document having index

L ^A T _E X input	Output
<pre> \documentclass[a4paper,12pt]{article} \usepackage{makeidx} \makeindex % \begin{document} Dynamics\index{Dynamics} is a part of mechanics\index{Mechanics}. It is divided into kinematics and kinetics. The kinematics\index{Dynamics!Kinematics} deals with motions\index{Dynamics!Kinematics!Motion} only, while the kinetics\index{Kinetics} \index{Kinetics!seealso{Kinematics}} deals with both motions and forces\index{Force see{Kinetics}}. % \printindex \end{document} </pre>	<p>Dynamics is a part of mechanics. It is divided into kinematics and kinetics. The kinematics deals with motions only, while the kinetics deals with both motions and forces.</p> <p style="text-align: right;">1</p>
	<p>Index</p> <p>Dynamics, 1 Kinematics, 1 Motion, 1</p> <p>Force, <i>see</i> Kinetics</p> <p>Kinetics, 1, <i>see also</i> Kinematics</p> <p>Mechanics, 1</p> <p style="text-align: right;">2</p>

16.2.1 Indexing Terms

The term to be indexed is immediately followed by the `\index{}` command with the term or its required form as the argument of the command. In order to avoid access blank space in the output, there should not be any gap between the term to be indexed and the `\index{}` command, e.g., ‘`composite\index{Composite}`’ for indexing the word ‘`composite`’ by its capitalized form ‘`Composite`’.

A maximum of three-tier index can be prepared using a `!` sign before each sub-index. These are shown in Table 16.3 through `\index{Dynamics}`, `\index{Dynamics!Kinematics}` and `\index{Dynamics!Kinematics!Motion}` for indexing ‘`Dynamics`’ alone (first tier), ‘`Kinematics`’ under ‘`Dynamics`’ (second tier), and ‘`Motion`’ under ‘`Kinematics`’ which is again under ‘`Dynamics`’ (third tier), respectively (see their printing formats in Table 16.3).

An index can also be referred to another index using the `see{}` or `seealso{}` command, whose argument is the referred index. The `see{}` command (used for `Kinetics` in Table 16.3) is preceded by a `|`, while the `seealso{}` command (used for `Kinematics` in Table 16.3) is preceded by `!`. Note that the word ‘`Kinetics`’ is indexed twice, the first one is for putting the page number, and the second one is for referring it to the word ‘`Kinematics`’ through the `seealso{}` command.

16.2.2 Some Guidelines on Indexing

The following are some guidelines to be obeyed while indexing a term:

1. Special L^AT_EX characters, like #, \$, %, or &, are to be indexed in the same way as they are produced in the body of a document, e.g., `\index{$}` for indexing \$.
2. To index a character having a special meaning to `\makeindex`, such as !, ", @, or |, the character is to be preceded by " in the argument of `\index{}`². For example, `\index{"@article{}}` for indexing `@article{}`, `\index{"!|$}` for indexing !|, or `\index{\verb" " "}` for indexing `\verb" "`.
3. If the term to be produced in the index list is not exactly the same with the argument of `\index{}` (i.e., if the indexed term is to be produced through another L^AT_EX command), the other command may be preceded by @, e.g., `\index{Boldface@textbf{Boldface}}` to index `Boldface` as **Boldface**, or `\index{sigma@$sigma$}` for indexing `sigma` as σ . Without @, the entry in the index list will be alphabetized wrongly, e.g., σ as `$sigma$` in the previous example.
4. To include a range of pages for an indexed term, the `\index{aterm|}` command is to be used at the beginning and `\index{aterm|}` at the end of the range, where `aterm` is the term to be indexed.

16.2.3 Compiling a L^AT_EX Input File Having Index

Like the `bibtex` command used for compiling a document with a BIB_TE_X based bibliographic reference list (refer §15.4 on page 149), the `makeindex` command is required for compiling a document with an index list. In this case, a L^AT_EX file is to be compiled using the following four lines of commands:

```
$ latex myarticle
$ makeindex myarticle
$ latex myarticle
$ latex myarticle
```

where ‘`myarticle`’ is the L^AT_EX input file with ‘`tex`’ extension. The ‘`makeindex`’ command compiles the `\index{}` commands included in `myarticle.tex`. The last two ‘`latex`’ commands link the generated list of index with L^AT_EX. The above four lines of commands will produce six files, namely `myarticle.aux`, `myarticle.log`, `myarticle.dvi`, `myarticle.idx`, `myarticle.ilg`, and `myarticle.ind` (§20.4.1 on page 199 discusses in detail). Out of these six files, `myarticle.dvi` can be used for producing a ‘`.ps`’ or a ‘`.pdf`’ file as mentioned in §1.4 on page 4.

²To index a character having a special meaning to `\makeindex`, such as !, ", @, or |, the character is to be preceded by " in the argument of `\index{}`.