

# LaTeX Notes

Adrian P. Robson  
adrian.robson@nepsweb.co.uk

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## 1 Introduction

This is a collection of L<sup>A</sup>T<sub>E</sub>X solutions that the author has found repeatedly useful. Some are problem fixes, but others simply represent the author's preferences. Many involve one or more of the huge collection of L<sup>A</sup>T<sub>E</sub>X packages. All of these examples work with pdfL<sup>A</sup>T<sub>E</sub>X (project page [38] and manual [39]), which is the author's preferred document writing tool.

Tables are not covered in this report. However, a discussion of various ways to layout and format tables can be found in *LaTeX Table Notes* [28].

## 2 Printing Dates

The following uses the `datetime2`<sup>1</sup> package. This can do much more than is described here. For more information consult the package documentation [35]. The `datetime2` package can also be used to help with PDF metadata dates, and §16 discusses this. The package defaults give USA style dates. Much of what follows describes how to get British style dates.

### 2.1 Formatting Dates

The default format for the report date and the `\today` macro give a date that looks like ‘June 15, 2020’. This can be changed with the following to give dates in the British style that looks like ‘15<sup>th</sup> June 2020’.

```
\usepackage[en-GB]{datetime2}
\DTMlangsetup[en-GB]{ord=raise}
```

The `en-GB` option gives time in 12 hour format. The `datetime2` package has a number of style options like `en-GB`. The English versions are described in [36].

An arbitrary date can be printed with the `\DTMdate` macro. So formatting the report date could be done with:

```
\date{\DTMdate{2017-05-12}}
```

Dates can be stored and reused as in the following example, which formats the title page date:

```
\DTMsave{reportdate}{2017-05-12}
\title{...}
\author{...}
\date{\DTMusedate{reportdate}}
\maketitle
```

### 2.2 Date and Filename Tag

It is common for a report’s title date to record when the report was written or the last time it was changed, rather than the time that pdfL<sup>A</sup>T<sub>E</sub>X was used to create a PDF file for the report. Nevertheless, It can be useful to show in the document when a particular PDF file was created, and the name of its source file.

A tag with file name, current date and time, and author initials can be put in the bottom margin of the last page, with the help of the `textpos` [11] package, like this:

```
\usepackage[en-GB]{datetime2}
\DTMlangsetup[en-GB]{ord=raise}
\usepackage{textpos}
...
\vfill % at the bottom of the last page
\begin{textblock}{5}(0,1)
\small\textsf{APR -- \jobname.tex -- \today\ \DTMcurrenttime}
```

---

<sup>1</sup>The `datetime2` package replaces `datetime`, which is now obsolete.

```
\end{textblock}
\end{document}
```

This will print APR – latexNotes.tex – 5<sup>th</sup> June 2020 9:04pm at the end of the report.

Format variations, which can also be used in general, are 24-hour time and numeric dates. Time in 24-hour format without seconds is made with:

```
\begin{textblock}[5](0,1)
\DTMsetup{showseconds=false} % no seconds
\DTMsettimestyle{iso} % 24hr time
\small\textsf{APR -- \jobname.tex -- \today\ \DTMcurrenttime}
\end{textblock}
```

A British style numerically formatted date, such as 18/2/2020, can be obtained by adding the following to the `textblock` environment:

```
\DTMsetdatestyle{en-GB-numeric}
```

An alternative placement puts the tag in the page footer, but only on the last page. This needs the `fancyhdr` package [24]. It does not work for one page documents. In the document preamble we put:

```
\usepackage{fancyhdr}
\pagestyle{fancy}
\lhead{} % do not print header etc ...
\rhead{}
\renewcommand{\headrulewidth}{0pt}
```

and at the end of the document we have

```
\rfoot{\tiny\textsf{[A.P.R, \jobname.tex, \today,
\DTMcurrenttime]}}
\end{document}
```

### 3 Some Symbols

The best source of information about special characters and the packages that provide them is Scott Pakin’s *The Comprehensive L<sup>A</sup>T<sub>E</sub>X Symbol List* [25].

#### 3.1 Euro

If the `textcomp` package is loaded, `\texteuro` can be used for the Euro symbol. However, the `eurosym` package (manual [41] and website [42]) gives the official symbol, and is more versatile. The command `\euro` generates the symbol; and `\EUR{x}` shows an amount with the symbol that has the correct unbreakable thin space in between. Thus the following:

```
\usepackage{eurosym}
\usepackage{textcomp}
...
The software costs \euro 10 (from eurosym).\
The software costs \EUR{10} (from eurosym).\
The software costs \texteuro10 (from textcomp).
```

| package | command                 | symbol |
|---------|-------------------------|--------|
| amsmath | <code>\checkmark</code> | ✓      |
| pifont  | <code>\ding{51}</code>  | ✓      |
| pifont  | <code>\ding{55}</code>  | ✗      |
| pifont  | <code>\ding{52}</code>  | ✓      |
| pifont  | <code>\ding{56}</code>  | ✗      |
| pifont  | <code>\ding{54}</code>  | ✗      |

Table 1: Ticks and Crosses

produces: The software costs €10 (from eurosym).  
The software costs €10 (from eurosym).  
The software costs €10 (from textcomp).

The symbol produced by `\texteuro` depends on the font, and in the example above it is Latin Modern (§13.1). If the `eurosym` package is loaded with its `gen` option, the Euro symbol is also printed in using the current font.

### 3.2 Ticks and Crosses

A useful selection of tick and cross symbols from the `pifont` [33] and `amsmath` [13] packages are given in table 1. The `pifont` commands can be made a little more usable with

```
\newcommand{\tick}{\ding{51}}
\newcommand{\cross}{\ding{55}}
```

There are some more tick and crosses in the `bbding` package [12], but the `pifont` versions given here are better sized.

### 3.3 Backslash, Tilde and URLs

A backslash can be produced with the `\verb` command, and the sequence `x\verb|\|x` gives `x\x`. However, there are some places where verbatim is not allowed. In which case, a backslash can be made with the `\textbackslash` command, but the exact character depends on the font in play. Thus the sequence `x\textbackslash x` gives `x\x`, while `x{\tt\textbackslash}x` gives `x\x` just like the `\verb` command.

The tilde character is generated by the `\textasciitilde` command, but its vertical alignment depends on the font family being used. The default Computer Modern font puts tilde at the top of the line rather like this `~`. Alternatively, the Latin Modern font (§13.1) puts tilde in the middle of the line thus `~`.

Backslashes and tildes are often used in URL, and in this context the `url` package [2] can be used. It behaves like `\verb` but with sensible line breaking of names. For example, `\url{somewhere/users/~adrian}` gives `somewhere/users/~adrian`.

### 3.4 Temperature Degrees

Nicely spaced degrees Celsius and Fahrenheit symbols for use in text mode can be defined like this:

```
\def\degC{${}^\circ\kern-0.06em\rm{C}}
\def\degF{${}^\circ\kern-0.06em\rm{F}}
```

So `10\degC` gives 10°C, and `50\degF` gives 50°F. The `{}` can be omitted if the commands are followed by punctuation.

Similar commands can be defined for use in maths mode by simply removing the `$` characters:

```
\def\degCm{^\circ\kern-0.06em\rm{C}}
\def\degFm{^\circ\kern-0.06em\rm{F}}
```

With these, `$10\degCm=50\degFm$` produces  $10^\circ\text{C} = 50^\circ\text{F}$ .

### 3.5 The Smiley

There are a few ways of printing a smiley. The traditional text smiley `:-)` can be produced with `{\tt :-)}`. Alternatively, the character sequence `$_\ddot{\smile}$` gives ☺, and the `wasysym` package [16] has the symbols `\smiley` and `\frownie`, which look like ☺ and ☹.

### 3.6 Icons as Symbols

The available fonts provide many icon like symbols such as the smiley and frownie described above. However, if the required symbol is not available, an icon graphic can be pressed into service.

Assuming that we have a file called `slrCamera.png` that is a suitable small graphic icon, it can use it like this:

```
\usepackage{graphicx}
...
\newcommand{\camera}
  {\raise-0.6px\hbox{\includegraphics[scale=0.07]{slrCamera}}}
...
... camera icon \camera\ that ...
```

This produces a camera icon 📷 that is embedded in a text line. The `\raise` command and `scale` parameter are used to adjust the icon to a correct fit and position in the line.

## 4 References

### 4.1 Referencing Section Names

The ability to reference numbered items is built into L<sup>A</sup>T<sub>E</sub>X. So

```
\subsection{Programming in Java}\label{sec:java}
...
... \S\ref{sec:java} ...
```

gives a reference to the section's number, which might be '§5.1' for example. To get a reference to the section's name we can use the `nameref` package [26]. This is part of the `hyperref` package (§4.2), but it can be used on its own like this:

```
\usepackage{nameref}
...
... \nameref{sec:java} ...
```

This will print the section command's text, which is 'Programming in Java.'

## 4.2 Hypertext

References, contents entries, index entries, citations and URLs, given using the `\url` command [2], can be hypertexted in pdf<sub>T</sub>E<sub>X</sub> with the `hyperref` package (manual [27] and article [22]), which includes the `nameref` package (§4.1). A non-hypertext URL can be made with the `\nolinkurl` macro.

The `\href` command, provided for textual links, can be used to modify how a URL link is displayed:

```
\usepackage{hyperref}
...
\href{http://www.ctan.org/beamer/doc/beameruserguide.pdf}
{\nolinkurl{www.ctan.org/beamer/doc/beameruserguide.pdf}}
```

The package's default options surrounds each link with a coloured box, which is not shown when the PDF file is physically printed. Sometimes, the default hypertext boxes can make a document rather ugly, particularly if there is a contents list. So instead links can be shown as coloured text without any boxes:

```
\usepackage[colorlinks]{hyperref}
```

This appears to be the method used for the `hyperref` manual. Unfortunately, this option also makes the references coloured when the document is physically printed, which does not work well on non-coloured printers.

The hypertext, including boxes and colour can be disabled with the following, which does not affect the package's other features:

```
\usepackage[draft]{hyperref}
```

There can be problems with using maths mode, L<sup>A</sup>T<sub>E</sub>X asymmetric quotes and some L<sup>A</sup>T<sub>E</sub>X commands in section headers when the `hyperref` package is used. The TOC entry with its hyper-reference will be okay, but the document's PDF bookmarks, which are derived from its section headings, might not be correct. The solution is to use the following method:

```
\section{\texorpdfstring{TOC text}{PDF bookmark text}}
```

Then `TOC text` will appear correctly typeset in the table of contents. The alternative `PDF bookmark text` will be used as a bookmark, and there will be no error if it is suitably typeset.

## 5 Annotations

### 5.1 Margin Notes

Notes that look good in the margins can be made with the following command:

```
\newcommand{\mnote}[1]
  {\marginpar{\scriptsize \raggedright #1 }}
```

which is used like this:

```
\mnote{This is a margin note.}
```

This is a margin  
note.

It is sometimes useful to have ticks and crosses (see §3.2) in the margin. The following commands, which are defined to work on two sided documents, can be used to do this:

```
\newcommand{\mprob}{\marginpar[\Huge \bf !]{\hfill \Huge \bf !}}
\newcommand{\mbad}{\marginpar[\Huge \cross]{\hfill \Huge \cross}}
\newcommand{\mokay}{\marginpar[\Huge \tick]{\hfill \Huge \tick}}
\newcommand{\mused}{\marginpar[\hfill \huge \checkmark]
  {\huge \checkmark}}
```

The `\mused` example puts the symbol close to the text, the others put it as far away as possible. The difference is most noticeable on two sided layout. The `\mused` style looks better with lists that are being checked off.

Margin notes will be automatically moved if they are too close together. Sometimes a note will not print if it is too close to the top of a page, particularly with two sided layouts. Slightly moving the note will fix this.



### 5.2 Stamps

Text can be put anywhere on the page with the `textpos` package [11]. This can be used with the `rotating` package [7] and the `xcolor` package [15] to produce margin stamps like this:

```
\usepackage{textpos}
\usepackage{rotating}
\usepackage[dvipsnames]{xcolor}
...
\begin{textblock}{2}(10,0)
\begin{rotate}{45}
\resizebox{!}{20pt}{\texttt{\textcolor{BrickRed}{STAMP}}}
\end{rotate}
\end{textblock}
```

STAMP

This method can be used to put a ‘draft copy’ stamp at the top of the first page as follows:

```
\usepackage{textpos}
\usepackage{rotating}
\begin{document}
\maketitle
\begin{textblock}{3}(7,-3)
```

```

\begin{rotate}{-45}
\Huge\textsf{\textbf{\textcolor{BrickRed}{DRAFT COPY 1}}}
\end{rotate}
\end{textblock}

```

### 5.3 Watermarks

There are a few ways to add a watermark to a document, but the `draftwatermark` package [4] offers the best combination of simplicity and versatility. Put the following in the document's preamble:

```

\usepackage{draftwatermark}
\SetWatermarkLightness{0.9}
\SetWatermarkText{\textsf{\textbf{DRAFT}}}
\SetWatermarkScale{0.6}

```

This puts see-through text at centre of every page in the document. The `set` commands modify the default behaviour that prints the stamp in the current font, which is normally Roman. They change it to a sanserif bold font, that is a paler grey and slightly smaller than the defaults.

### 5.4 Tracking Change

The `changes` package [17] can be used to mark document changes:

```

\usepackage[ulem=normalem,xcolor={dvipsnames}]{changes}
...
\added[comment={This is a changes remark.}]{added text}
\replaced{new stuff }{replaced text}
\deleted{deleted text}

```

The `ulem` option is needed to preserve normal emphasised text. The `xcolor` option values are use to setup the `xcolor` package (see §12), which does not have to be explicitly loaded.

Text can be marked for different authors, and (see package documentation for details). The above commands have been used in the following: Here is some [added text](#); some [new stuff replaced text](#); and some [deleted text](#).

There are some limitations: Markup cannot span multiple paragraphs; and you cannot markup figures or tables. The package's defaults do not work well with black and white printers. However, the `markup=nocolor` option can be used if this is a problem.

[1] This is a changes remark.

### 5.5 Change Bars

Change bars can be added with the `changebar` package [9] like this:

```

\usepackage{changebar}
...
\setcounter{changebargrey}{0} % make bars black
...
\cbstart Text to be marked. \cbend

```

A deleted marker can be also be added with `\cbdelete`.

Unfortunately, there appears to be a bug: In pdfL<sup>A</sup>T<sub>E</sub>X if a change bar is used for `verbatim` text that crosses a page break, the package fails (!). Apart from arranging for the `verbatim` environment to be all on the same page, there does not appear to be a work around. (This paragraph has a change bar and a delete mark as an example.)

## 6 Footnote Repetition

Printing footnotes whose texts are identical as a single entry on each page can be done in a number of ways, but the `footmisc` package [8] is recommended. It works in the `minipage` environment, and has some other useful features such as comma separated multiple footnote symbols. This is how is is used:

```
\usepackage[multiple]{footmisc} % option for comma separated
                                % footnote markers
...
AAA\footnote{First footnote\label{first_footnote}}
BBB
CCC\footref{first_footnote}
```

Multiple L<sup>A</sup>T<sub>E</sub>X runs might be needed to obtain correctly reference duplicates.

## 7 Superscripts

Text superscript can be formed thus: `text\textsuperscript{super}`, which would print `textsuper`. This can be used for date suffixes like this:

```
\newcommand{\dst}{\textsuperscript{st}}
\newcommand{\dnd}{\textsuperscript{nd}}
\newcommand{\drd}{\textsuperscript{rd}}
\newcommand{\dth}{\textsuperscript{th}}
```

## 8 Format and Styles

### 8.1 Margin Kerning and Font Expansion

The pdfT<sub>E</sub>X engine provides two important micro-typographic extensions: margin kerning and font expansion [40]. *Their use is highly recommended* for documents with significantly large blocks of text.

Although these features are complicated to enable in low level T<sub>E</sub>X, the `microtype` package [32] makes it very easy to use them. Just put the following in the preamble:

```
\usepackage{microtype}
```

The package's default settings work very well with Latin Modern (see §13.1) but might not be so good for other fonts.

### 8.1.1 Problem with verbatim environment

Unfortunately, there is a problem with the `microtype` package and the `verbatim` environment. As the following shows, lines beginning with a `-` are pushed into the left margin:

```
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
-----
```

There are two fixes:

- Disable `microtype` protrusion settings for typewriter fonts by putting `\UseMicrotypeSet[protrusion]{basicmath}` in the preamble.
- Use the `fancyvrb` package and its `Verbatim` environment (see §11.3).

## 8.2 Changing Page Margins

Some documents, such as cheat-sheets or handouts need narrow margins. The `geometry` package [43] gives a simple way to do this:

```
\usepackage[a4paper,scale=0.8]{geometry}
```

The default `scale` setting is 0.7, and values more than this might cause problem with margin notes (§5.1). Values higher than 0.8 might exceed physical printer margin limitations. The `a4paper` option can be omitted if it is included as a `documentclass` option.

More control is possible by explicitly setting margin lengths:

```
\usepackage[a4paper,top=1.5cm,bottom=1.5cm,
            outer=3cm,inner=2cm]{geometry}
```

The options `inner` and `outer` are used instead of the alternatives `left` and `right` because they work with both one-sided and two-sided layout.

## 8.3 Landscape Orientation

The following orients the whole document, including headers and footers to landscape format:

```
\usepackage[landscape,a4paper,textwidth=26cm]{geometry}
```

The `a4paper` option can be omitted if it is included as a `documentclass` option; and the `textwidth` option can be left out for wider side margins. Consult [43] for more information on the `geometry` package.

Reorienting selected pages of a document can be done with the `pdflscape` package [23], where the `landscape` environment is put on separate pages:

```
\usepackage{pdflscape}
...
\begin{landscape}
...
\end{landscape}
```

Page headers and footers are not affected and remain portrait aligned. The `pdfscape` pages are rotated to landscape in a PDF viewer, but they are rendered as portrait pages when printed.

Rotating a figure without affecting page orientation is described in §9; and doing this to tables is discussed in LaTeX Table Notes [28]. Inserting pages from a PDF file is discussed in §8.7.

## 8.4 Disabling Page Numbers

To have no page numbers, change the page style by putting the following in the preamble:

```
\pagestyle{empty}
```

Unfortunately this does not work for the first page in documents that use `\maketitle`. In this case, use the following:

```
\maketitle\thispagestyle{empty}
```

and there will be no numbers on any pages.

## 8.5 Section Headers

The easiest way to change the style of section headers is to use the `sectsty` package [20]. Individual section levels can be changed or global changes can be made. For example, to get underlined sans serif headings we could put this in the preamble:

```
\usepackage{sectsty}
\usepackage[normalem]{ulem} % needed for underline
\allsectionsfont{\sffamily\underline}
```

The font used in all the section headers could be changed to say Augie with:

```
\usepackage{emerald} % needed for Augie
\usepackage[T1]{fontenc}
\usepackage{sectsty}
\allsectionsfont{\ECFAugie}
```

Finally, headers can be moved to the right side of the page with:

```
\allsectionsfont{\raggedleft}
```

## 8.6 Line Spacing

The simplest way to change line spacing from the default is to use the `setspace` package as follows, which causes the document to have double spacing:

```
\usepackage{setspace}
...
\begin{document}
\maketitle
\doublespacing
This is double line spacing
...
```

The spacing can be changed at any place in the document with these commands:

|                              |                             |
|------------------------------|-----------------------------|
| <code>\onehalfspacing</code> | One and a half line spacing |
| <code>\doublespacing</code>  | Double line spacing         |
| <code>\singlespacing</code>  | Single line spacing         |

## 8.7 Assignment Front Page

Sometimes students are required to attach a front sheet to their assignment when it is handed in. This can be a problem if the work is being submitted electronically. Assuming that the front sheet is stored as a PDF file, it can be merged with work's pdfL<sup>A</sup>T<sub>E</sub>X output using a utility. There is however a neater method that uses the `pgfpages` package [19]:

```
1 \usepackage{pdfpages}
2 ...
3 \begin{document}
4 \includepdf [page={1}]{frontsheet.pdf}
5
6 \pagenumbering{arabic}
7 \maketitle
```

Line 4 starts the document with the front sheet. The `page` key is not needed if there is only one page in the PDF file. Line 6 starts the report's page numbering at one, rather than two, since the front page is not actually part of the assignment.

## 9 Graphics

The `graphicx` (bundle [6] and package [5]) works well with pdfL<sup>A</sup>T<sub>E</sub>X and JPEG files:

```
\usepackage{graphicx}
...
\begin{center}
\includegraphics [height=6cm]{mypicture.jpg}
\end{center}
```

As well as the `height` parameter used above, the image can also be sized by `width`. Do not have any spaces in the image's file name even if the operating system allows such file names.

If the image has too much margin it can be cropped by using the `trim` option like this:

```
\includegraphics [clip,
  trim=1.5cm 2cm 1.5cm 2cm,height=6cm]{adrianrobson.jpg}
```

The order of `trim` parameters is left, bottom, right and top. In practice, getting the correct crop is achieved by trial and error.

Rotating from portrait to landscape is sometime needed:

```
% clockwise...
\includegraphics[height=6cm,angle=-90]{adrianrobson.jpg}
% anticlockwise...
\includegraphics[height=6cm,angle=90]{adrianrobson.jpg}
```

A positive angle implies an anticlockwise rotation. The height parameter *must* proceed the angle or there is *sometimes* an error.

## 9.1 Wrapped Text

The `wrapfig` package can be used to create text that is wrapped around images:

```
\usepackage{wrapfig}
...
\begin{wrapfigure}{r}{0.5\textwidth}
  \vspace{-20pt}
  \begin{center}
    \includegraphics[width=0.48\textwidth]{adrianrobson}
  \end{center}
  \vspace{-20pt}
  \caption{Adrian P. Robson}
  \vspace{-10pt}
\end{wrapfigure}
```

The parameter `r` indicates that the figure should be right positioned and non-floating. The full set of values are:

- `r` `R` → the right side of the text
- `l` `L` → the left side of the text
- `i` `I` → the inside edge, near the binding if a two sided document
- `o` `O` → the outside edge, far from the binding

where upper-case implies floating.

## 10 Conditional Text

Using the same  $\text{\LaTeX}$  source in different documents can be very convenient, but this poses problems if different formatting is required. Conditional expressions can be used as a solution.

Define a Boolean variable in the master files and input the shared file. Like this for say a holiday journal:

```
\newif\ifholiday
\holidaytrue
...
\input{shared.tex}
```

and for a personal journal:

```
\newif\ifholiday
\holidayfalse
...
\input{shared.tex}
```

Then we can put the following in the shared text file:

```
\ifholiday % it is in holiday journal
  \hrule
  \section*{Sunday 16th}
\else % it is in personal journal
  \subsection*{16th Sunday}
\fi
```

Shared material here...

This will produce different section headings for the two types of journal.

## 11 Listing Program Code

Program code is traditionally printed using a non-proportional (monospaced) font. This and the use of special characters in programs mean that the `verbatim` or `Verbatim` environments are normally used for program listings.

### 11.1 Straight Verbatim Apostrophes

Using `verbatim` environments or `\verb` to list program code mostly works, but standard L<sup>A</sup>T<sub>E</sub>X quotes and apostrophes need some help. The `"` character can be used in preference to normal text ``` and `'`, which produce “ and ”. The apostrophe however needs more intervention. Without help `verbatim` apostrophes print as `'` instead of the more appropriate `'`. Straight apostrophes can be obtained by invoking the `upquote` package thus:

```
\usepackage{upquote}
```

The package does not affect the rendering of the grave accent symbol in `verbatim`, which will print as ```.

### 11.2 Alternative Typewriter Fonts

Computer Modern and Latin Modern typewriter fonts do not have a crossed zero as the following, which is in Latin Modern typewriter, shows. (This and the following examples have the `upquote` package invoked.)

```
abcdefghijklmnopqrstuvwxyZ ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789 []() ``'+-/* <>= ~&|% ;, .?! \
5S 00 2Z 11I
```

However, there are three easily available alternatives, `TXTT` [31], `Bera Mono` [30] and `Inconsolata` [34], which are used as follows:

**TXTT:** To make this the default typewriter font, use the following in the document's preamble:

```
\usepackage[T1]{fontenc}
\renewcommand*\ttdefault{txtt}
```

```

abcdefghijklmnopqrstuvwxyz ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789 []() ``'+-/* <=> ~&|% ;:,.?!\
5S 00 2Z 11I

```

**Bera Mono:** To make this the default typewriter font, use the following in the preamble:

```

\usepackage[T1]{fontenc}
\usepackage[scaled]{beramono}

abcdefghijklmnopqrstuvwxyz ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789 []() ``'+-/* <=> ~&|% ;:,.?!\
5S 00 2Z 11I

```

**Inconsolata:** To make this the default typewriter font, use the following in the preamble:

```

\usepackage{inconsolata}
\usepackage[T1]{fontenc}

abcdefghijklmnopqrstuvwxyz ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789 []() ``'+-/* <=> ~&|% ;:,.?!\
5S 00 2Z 11I

```

The TXXTT, Bera Mono and Inconsolata fonts used above can be reviewed in *The L<sup>A</sup>T<sub>E</sub>X Font Catalogue* [14], which has lots of other free fonts. You might also look at *Fonts for Displaying Program Code in L<sup>A</sup>T<sub>E</sub>X* [29] for more information.

### 11.3 A Better Verbatim

The `fancyvrb` [46] package provides a better environment for program listings. It can be used for things like changing font family and size, framing code examples, colouring text and conditionally processing text. Here is a simple example:

```

\usepackage{fancyvrb}
...
\begin{Verbatim}[xleftmargin=10mm, numbers=left]
int sum = 0;
for( i = 1; i <= 4; i++ ) {
    sum = sum + i;
}

```

This produces the following output:

```

1  int sum = 0;
2  for( i = 1; i <= 4; i++ ) {
3      sum = sum + i;
4  }
```

Used without options, it behaves the same as the built-in `verbatim` environment.

The `fancyvrb` package also has a command that inputs a whole file and prints it verbatim:

```

\VerbatimInput[numbers=left]{helloworld.c}

```

## 12 Coloured Text

Text can be coloured using the `xcolor` package [15]. This `red text` is produced by the following:

```
\usepackage{xcolor}
```

```
...
```

```
This \textcolor{red}{red text} is produced by the following
```

or

```
This {\color{red} red text} is produced by the following
```

The package's `\colorbox` macro colours the background `like this`, but it prevents line breaking, just like the standard `\mbox` macro. This can be corrected with `\parbox` as in the following:

```
\colorbox{yellow}{\parbox{\textwidth}{Lorem ipsum dolor sit amet,  
consectetur adipiscing elit. Maecenas maximus sapien ligula.}}
```

If a `dark colour` is used for the background then the text needs to be a light colour:

```
\colorbox{teal}{\color{white} white text in a teal box}
```

Coloured frames can be made with `\fcolorbox` as the following shows:

```
{\setlength{\fboxrule}{1.5pt}  
\setlength{\fboxsep}{5pt}  
\fcolorbox{red}{white}{Text in a thick red frame}}
```

Text in a thick red frame

The lengths `\fboxrule` and `\fboxsep` control the frame's thickness and space around the enclosed box respectively.

There are 19 predefined colours in the `xcolor` package, which include `black` and `white`. For more named colours use the package options: `dvipsnames` for 68 colours, `svgnames` for 151 colours and `x11names` for 317 colours. In addition custom colours can be defined as described in the package's documentation.

The `changes` package loads `xcolor`. If `changes` is used, `xcolor` should not be explicitly loaded. Any options for `xcolor` can be passed to the package using a `changes` option (see §5.4). The `tikz` package also loads `xcolor`, but in this case `xcolor` options can be set by explicitly loading `xcolor before tikz`.

Text can be highlighted with the `soul` package [10]. The default colour is `yellow`, but it can be `changed`:

```
\usepackage{soul}
```

```
...
```

```
The default colour is \hl{yellow}, but it can be  
{\sethlcolor{green}\hl{changed}}:
```

The outer braces for the green highlight preserve the yellow default colour. The `\hl` macro handles line breaks.

## 13 Fonts

### 13.1 An Alternative to Computer Modern

The default font in L<sup>A</sup>T<sub>E</sub>X is Computer Modern, but Latin Modern font family has better metrics and glyphs. To use it, put the following in the document's preamble:

```
\usepackage[T1]{fontenc}
\usepackage{lmodern}
```

Latin Modern and other alternative fonts are reviewed in *The L<sup>A</sup>T<sub>E</sub>X Font Catalogue* [14]; For more information on how to manage fonts in L<sup>A</sup>T<sub>E</sub>X have a look at *L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> font selection* [18].

The Latin Modern font works well with margin kerning and font expansion (§8.1).

### 13.2 Big Fonts

Arbitrary sized Computer Modern text can be printed if the `fix-cm` package [21] is used. The package was written to correct some problems with the Computer Modern fonts, not just to provide large characters. The following technique also works for Latin Modern and at least some other fonts.

This is Huge: Big but this is even bigger **Big**

In this case, the extra large text was made with

```
\usepackage{fix-cm} % in preamble
...
{\fontsize{35}{40}\selectfont Big}
```

The `fontsize` command has two parameters [18]. The first is the required *size* in points (pt), and the second is *baselineskip*. The *baselineskip* is not important unless the text spans lines; and to get it to work sometimes needs this trick with `\par`:

```
{\fontsize{35}{40}\selectfont
  Big\
  More
\par}
```

## 14 Table of Contents

### 14.1 Unnumbered Sections

The asterisk versions of the section commands, such as `\section*`, produce header titles without numbers. These unnumbered titles are not included in the document's table of contents.

If unnumbered sections and a table of contents are both required for a document, use the normal form of the section commands, such as `\section`, and put the following in the document's preamble:

```
\setcounter{secnumdepth}{0}
```

## 14.2 TOC Spacing Problem

Sometimes, when there is deep nesting of numbered sections, the title and number can overlap in the table of contents like this:

|                         |    |
|-------------------------|----|
| 10 Chapter              | 19 |
| 10.1 Section .....      | 19 |
| ...                     |    |
| 10.1.1 Subsection ..... | 25 |

An easy solution is to use the `tocloft` package [45]:

```
\usepackage[titles]{tocloft}
\setlength{\cftsecnumwidth}{4em}
```

The `titles` option stops `tocloft` overriding the TOC headings defined by the `book` class, or `fancychap` and `fancyhdr` packages. Leave it out if this is not an issue.

There are lengths for each type of TOC entry. The general form of the length name is:

```
\cft<entry>width
```

Where `<entry>` is one of the following:

- `part` for `\part` titles
- `chap` for `\chapter` titles
- `sec` for `\section` titles
- `subsec` for `\subsection` titles
- `subsubsec` for `\subsubsection` titles
- `para` for `\paragraph` titles
- `subpara` for `\subparagraph` titles
- `fig` for figure `\caption` titles
- `subfig` for subfigure `\caption` titles
- `tab` for table `\caption` titles
- `subtab` for subtable `\caption` titles

## 15 Writing Presentations

Here we give some help with two methods for writing presentations: the `seminar` [47] and `Beamer` [37] classes. The `seminar` class's style is rather old fashioned, and it does not work well with pdfL<sup>A</sup>T<sub>E</sub>X. Presentations made with `Beamer` have a more modern look. The `Beamer` class is much more flexible than `seminar`, and it works well with pdfL<sup>A</sup>T<sub>E</sub>X. Another alternative, which is not discussed here, is the `powerdot` [1] class.

There is not enough room in this document to give a detailed description of how to use these classes. So consult the references given above for instructions.

## 15.1 Seminar Class

The `seminar` class [47] is the old way of writing presentations in  $\text{\LaTeX}$ . It has a dated style, and there are problems using it with  $\text{pdf}\text{\LaTeX}$ . If however you have some legacy material that uses the `seminar` class, you might get a usable presentation with  $\text{pdf}\text{\LaTeX}$  by including the following kludge in your preamble:

```
\documentclass[a4paper]{seminar}
...
\pdfpagewidth=11.69 truein
\pdfpageheight=8.27 truein
\pdfhorigin=1truein
\pdfvorigin=1truein
\slideheight 15.2cm
\slidewidth 22cm
```

For portrait slides the following should be used:

```
\documentclass[portrait,a4paper]{seminar}
...
\pdfpagewidth=8.27 truein
\pdfpageheight=11.69 truein
\pdfhorigin=1truein
\pdfvorigin=1truein
\slideheight 15.2cm % This is width
\slidewidth 23.5cm % This is height
```

## 15.2 Beamer Class

The `Beamer` class [37] is excellent for writing presentations and lectures. However, there are some problems with table of contents and footers that are discussed below.

The choice of Beamer theme is often a personal matter, but the following is recommended as a simple style with plenty of room on its slides.

```
\usetheme[secheader]{Boadilla}
\usecolortheme{seagull}
\setbeamertemplate{navigation symbols}{} % loose navigation bar
\setbeamersize{text margin left=0.6cm}
\setbeamersize{text margin right=0.6cm}
```

This is a rather plain theme that is compatible with black and white printing. The navigational buttons are disabled.

### 15.2.1 Contents Format

Automatically printing a highlighted table of contents at the beginning of each section with `\AtBeginSection` is a good facility but the standard layout is poor. A kludge is to put it in a quotation, thus

```
\AtBeginSection []
{
```

```

\begin{frame}<beamer>
  \frametitle{Outline}
  \begin{quotation} % Kludge to compress contents
    \tableofcontents[currentsection]
  \end{quotation}
\end{frame}
}

```

### 15.2.2 Footer Problems

The Boadilla and other themes put the tile page’s ‘institute’ in the footer in parenthesis, which is nice. But it might not fit, or we get ‘air brackets’ if it is blank. To fix this, an abbreviated version that will be a better fit can be given in [] brackets as follows:

```
\institute[NEPSweb]{adrian.robson@nepsweb.co.uk}
```

If there is no suitable abbreviation or no institute then a copyright notice could be used as a plausible filler, like this:

```
\institute[\copyright{} 2020]{}
```

If these methods are no good, and the brackets *must* be removed then the file `beamerouterthemeinfolines.sty` must be copied to the presentation’s folder and edited to remove the relevant code. Look for (`\insertshortinstitute`) and delete.

## 16 PDF Metadata

Metadata can be set if pdfTeX is used. However, two methods are required depending on whether or not the `hyperref` package is used. The `dates2` package can help.

### 16.1 Just pdfTeX

With pdfTeX on its own, the `\pdfinfo` command [39] can be used to set file metadata, like this:

```

\pdfinfo{
  /Author(Adrian Robson)
  /Title(Latex Notes)
  /Subject(A collection of useful LaTeX methods.)
  /Keywords(LaTeX,hints,tricks)
}

```

By default, a PDF file’s metadata creation and modified dates are set to the time when the file is generated by pdfL<sup>A</sup>T<sub>E</sub>X. This can be a problem if we want the creation date to stay at the time when the document was first written. Also we might want the modified date to represent the last time the L<sup>A</sup>T<sub>E</sub>X source text was changed rather than the last time it was turned into a PDF file with pdfL<sup>A</sup>T<sub>E</sub>X. If this is the case, then PDF creation and modified dates can be set with the `pdfinfo` command.

Dates are stored in the PDF metadata exactly as given in the `\pdfinfo` command, but PDF viewers treat the dates as Coordinated Universal Time (UTC) and then convert them to local time for display. So for example, 1pm 25<sup>th</sup> March 2018 will be reported as 2pm 25<sup>th</sup> March 2018 in the United Kingdom. This is because the date is in British Summer Time (BST), which is one hour behind Greenwich Mean Time (GMT) and UTC.

To solve this you have to include your countries time zone in the date with the following format:

$$D:\langle YYY Y\rangle\langle MM\rangle\langle DD\rangle\langle hh\rangle\langle mm\rangle\langle ss\rangle\pm\langle zz\rangle'00'$$

where  $\pm\langle zz\rangle$  is the time zone hour offset, which is minus westward and positive eastward from the meridian. The '00' at the end are the time zone minutes offset, which in this context are normally zero. So GMT (Newcastle UK) hours is +00, and AST (New York USA) is -04. In some parts of the world a summertime correction also applies. In the UK when it is BST the time zone is +01. So taking all of this into account, we can use the following to set the PDF dates of a document in the UK:

```
\pdfinfo{
  /CreationDate(D:20170326133000+00'00') % GMT
  /ModDate(D:20180619133000+01'00') % BST
}
```

## 16.2 With hyperref package

Alternatively, if the `hyperref` package [27] is being used (see §4.2), then the document's PDF information must be set like this:

```
\usepackage[
  pdftitle={LaTeX Notes},
  pdfauthor={Adrian Robson},
  pdfsubject={A collection of useful LaTeX methods.},
  pdfkeywords={LaTeX;hints;tricks}]{hyperref}
```

However, the dates must still be set using the `\pdfinfo` command (see §16.1). Title, author, subject and keyword information in `\pdfinfo` will be ignored. PDF metadata will not be stored if the `hyperref` package's `draft` option is used.

## 16.3 Synchronising Title and PDF data

The following, which uses the `datetime2` package [35], can be put in the preamble to synchronise a report's printed title, author and date, and PDF metadata title, author and modification date. It will have to be modified if the `hyperref` package [27] is used (see §16.2).

```
1 \usepackage[en-GB]{datetime2}
2 \DTMLangsetup[en-GB]{ord=raise}
3 \newcommand{\reportTitle}{LaTeX Notes}
4 \newcommand{\reportAuthor}{Adrian Robson}
5 \DTMsavetimestamp{createTimestamp}
6                               {2014-03-01T12:00:00+00:00} % GMT
```

```

7 \DTMsavetimestamp{modifyTimestamp}
8                               {2018-06-17T12:00:00+01:00} % BST
9 { \DTMsetstyle{pdf}
10   \pdfinfo{
11     /Author(\reportAuthor)
12     /Title(\reportTitle)
13     /CreationDate(\DTMuse{createTimestamp})
14     /ModDate(\DTMuse{modifyTimestamp})
15     /Subject(A collection of useful LaTeX methods.)
16     /Keywords(LaTeX;hints;tricks)
17   }
18 }
19 \title{\reportTitle}
20 \author{\reportAuthor}
21 \date{\DTMusedate{modifyTimestamp}}

```

Lines 1–2 set up the `datetime2` package for British dates.

Lines 3–4 define macros for the report’s author and title.

Lines 5–8 define timestamps for the report’s creation and modification dates. The timestamp data has the following format:

$$\langle\text{YYYY}\rangle-\langle\text{MM}\rangle-\langle\text{DD}\rangle\text{T}\langle\text{hh}\rangle:\langle\text{mm}\rangle:\langle\text{ss}\rangle\pm\langle\text{zz}\rangle:00$$

The  $\pm\langle\text{zz}\rangle$  part gives the time zone hour offset, which is used to get the correct time in PDF timestamps.

Lines 9–17 set the PDF metadata as discussed in §16.1. The timestamps and macros defined in lines 4–7 are used. Line 9 ensures that the time stamps are used in PDF date format.

Lines 19–21 set the reports title, author and date using timestamps and macros defined in lines 4–7.

## 17 List Formatting

The easiest way to change the layout of the standard `itemize`, `enumerate` and `description` lists is to use the `enumitem` package [3]. For example:

```

\usepackage{enumitem}
...
\begin{description}[itemsep=-1ex,labelindent=1cm,leftmargin=2cm]
  \item [First item] ...
  \item [Second item] ...
\end{description}

```

This reduces the line space between items; indents the whole list, and adjusts the item body indentation, to produce the following:

**First item** Lorem ipsum dolor sit amet, consectetur adipiscing elit. Velit felis, mollis id pretium at, dignissim eget nulla.

**Second item** Nulla vel velit sed arcu tempor tempus. Duis quis sem tellus, ut mattis lacus.

Alternatively, all the `description` lists in a document could be modified with the global command:

```
\setlist[description]{itemsep=-1ex,labelindent=1cm,
                      leftmargin=2cm}
```

## 17.1 Compact Lists

Commonly, reducing the vertical spacing of a list is all that is required, and this can be done with the `enumitem` package's `nosep` option. This also takes out vertical space above the list, so we might want to put some back as the following does:

```
\usepackage{enumitem}
...
\medskip
\begin{description}[nosep]
  \item [First item] ...
  \item [Second item] ...
\end{description}
```

This gives us the following compact list format that does not have a blank line between items:

**First item** Lorem ipsum dolor sit amet, consectetur adipiscing elit. Velit felis, mollis id pretium at, dignissim eget nulla.  
**Second item** Nulla vel velit sed arcu tempor tempus. Duis quis sem tellus, ut mattis lacus.

## 17.2 Resuming List Counters

Starting an enumerated list with numbers continuing from the last list, rather than 1, can also be achieved with the `enumitem` package. It is done with the `resume` option like this:

```
\begin{enumerate}
  \item First item           1. First item
  \item Second item         2. Second item
\end{enumerate}
Some text.                  Some text.
\begin{enumerate}[resume]
  \item Third item          3. Third item
\end{enumerate}
```

## 18 C++, $\mu$ C/OS and pdf $\text{\TeX}$ logos

Logos for C++ and  $\mu$ C/OS<sup>2</sup> can be made with the following definitions:

---

<sup>2</sup> $\mu$ C/OS is a real-time operating system kernel.

```
\def\CPP{C\kern-.05em\raise.23ex\hbox{+\kern-.05em+}}
\def\uCOS{\mu$C\kern-.14em/\kern-.12emOS}
```

They are invoked with `\CPP` and `\uCOS`, and produce the better formed C++ and  $\mu$ C/OS instead of the plain text C++ and uC/OS.

There are no official pdfLaTeX or pdfTeX logos, and the simple `pdf\TeX`, for example, makes pdfTeX, which needs more space between its f and T. So the following macros can be defined:

```
\def\pdfTeX{pdf\kern0.07em\TeX}
\def\pdfLaTeX{pdf\kern0.07em\LaTeX}
```

Then `\pdfTeX` and `\pdfLaTeX` will produce the nicer pdfTeX and pdfLaTeX logos.

Like all such L<sup>A</sup>T<sub>E</sub>X commands, they might need to be followed by `{}` to introduce a space. So instead of `\CPP code`, which makes ‘C++code’, we use `\CPP{ } code`, which produces the correctly spaced ‘C++ code’.

To use these logos in section headers with the hypertext package, the method shown in §4.2 must be employed like this:

```
\section{\texorpdfstring{\CPP{ } and \uCOS{ } logos}
          {C++ and uC/OS logos}}
```

## References

- [1] Hendri Adriaens, *The powerdot class*. Downloadable from [mirror.ox.ac.uk/sites/ctan.org/macros/latex/contrib/powerdot/doc/powerdot.pdf](http://mirror.ox.ac.uk/sites/ctan.org/macros/latex/contrib/powerdot/doc/powerdot.pdf)
- [2] Donald Arseneau and Robin Fairbairns, *url.sty version 3.4*. Downloadable from [www.ctan.org/tex-archive/macros/latex/contrib/url/url.pdf](http://www.ctan.org/tex-archive/macros/latex/contrib/url/url.pdf)
- [3] Javier Bezos, *Customizing lists with the enumitem package*. Download from [www.ctan.org/tex-archive/macros/latex/contrib/enumitem/enumitem.pdf](http://www.ctan.org/tex-archive/macros/latex/contrib/enumitem/enumitem.pdf)
- [4] Sergio Callegari, *The draftwatermark package*. Download from [www.ctan.org/tex-archive/macros/latex/contrib/draftwatermark/draftwatermark.pdf](http://www.ctan.org/tex-archive/macros/latex/contrib/draftwatermark/draftwatermark.pdf)
- [5] D. P. Carlisle and S. P. Q. Rahtz, *The graphicx package*. Download from [texdoc.net/texmf-dist/doc/latex/graphics/graphicx.pdf](http://texdoc.net/texmf-dist/doc/latex/graphics/graphicx.pdf)
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- [9] Michael Fine and Johannes Braams, *The Changebar Package*. Download from [www.ctan.org/tex-archive/macros/latex/contrib/changebar/changebar.pdf](http://www.ctan.org/tex-archive/macros/latex/contrib/changebar/changebar.pdf)
- [10] Melchior Franz, *The soul package* Download from [www.ctan.org/tex-archive/macros/latex/contrib/soul/soul.pdf](http://www.ctan.org/tex-archive/macros/latex/contrib/soul/soul.pdf)
- [11] Norman Gray, *Textpos: absolute positioning of text on the page*. Download from [www.ctan.org/tex-archive/macros/latex/contrib/textpos/textpos.pdf](http://www.ctan.org/tex-archive/macros/latex/contrib/textpos/textpos.pdf)
- [12] Karel Horak, Peter Moller Neergaard and Serguei Dachian, *The bbding package*. Download from [www.ctan.org/tex-archive/fonts/bbding/bbding.pdf](http://www.ctan.org/tex-archive/fonts/bbding/bbding.pdf)
- [13] David M. Jones, *The amsfonts package*. Download from [www.ctan.org/tex-archive/fonts/amsfonts/doc/amsfonts.pdf](http://www.ctan.org/tex-archive/fonts/amsfonts/doc/amsfonts.pdf)
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