

Introduction

This book originally accompanied a two-day course on using the \LaTeX typesetting system. It was extensively revised and updated for publication, so that it could be used for self-study as well as in the classroom. For those with sufficient prior knowledge of computing and authoring, it has also successfully been used as the basis for a 1-day intensive introductory course. It is aimed at users of Unix & GNU/Linux, including Apple Macintosh OS X, and Microsoft Windows systems, but it can be used with \LaTeX on any platform, especially online systems such as *Overleaf*, but also including other Unix workstations, mainframes, Android and Apple smartphones, and even some older Personal Digital Assistant (PDAs).

Who needs this book?

The course was originally designed for computer-literate but non-IT professionals in business, academic, and nonprofit organisations. You may be in a similar position, but you may also come from another background entirely; you may be a hobbyist, a school or college student, a home computer user or a volunteer worker, or you might just be interested in high-quality automated typesetting. However, it's likely that you have one or more of the following or similar objectives:

- producing consistent, typeset-quality formatting;
- formatting long *or* complex *or* highly-structured *or* repetitive *or* automatically-generated documents;
- saving time and effort by automating common tasks;
- gaining independence from expensive and restrictive proprietary hardware, software, or file formats;
- creating robust, durable documents which will survive changes in technology;
- having fun playing around with fonts and formatting.

Table 1: Using your computer — essential skills

| Subject | Detail | ECDL |
|---------------------|---|----------------------------------|
| Using the mouse | know how to point and click with your mouse to run programs, pick from a menu, and highlight text (or how to use keyboard shortcuts to do the same) | 1.1.4–1.1.6, 1.3.1, 1.4.1–1.4.2, |
| Handling files | know how to create, open, save, close, rename, copy, move, and delete files and folders (directories) using a directory browser (Windows: <i>My Computer</i> or just <i>Computer</i> ; Mac: <i>Finder</i> ; Linux: <i>Nautilus</i> , <i>Thunar</i> , or <i>Dolphin</i> , etc) or a typed command | 2.3 |
| Handling characters | know where to find all 95 of the printable (ASCII) characters on your keyboard, plus accents and symbols, if you need them | 3.2.1.2 |
| Using an editor | know how to use a good plaintext editor (<i>not</i> a wordprocessor like Microsoft <i>Word</i> , <i>Libre Office</i> , Lotus <i>Notes</i> , Apple <i>Pages</i> , or Corel <i>WordPerfect</i> ; and <i>not</i> a context-insensitive editor like Apple <i>TextEdit</i> or Microsoft <i>Notepad</i>). | 2.1.3 |

Skills needed

L^AT_EX is a very easy system to learn, and requires no specialist knowledge to get started, although it's useful if you understand a little about writing, formatting, and readability. However, you do need to be completely familiar with using your computer, which means knowing the following topics thoroughly. Note that none of these is in any way specialist; they're all basic, fundamental, standard computer skills that everyone should know.

If you don't know how to do these things yet, it's important to go and learn them first, at least the essential ones. Trying to become familiar

Table 2: Using software (programs) — useful skills

| Subject | Detail | ECDL |
|-------------------|--|-----------------|
| Downloading files | know how to use your Web browser and/or file transfer program to download and save files from the Internet | 7.1.6 [7.3.1.6] |
| Unzip files | know how to uncompress and unwrap compressed 'archive' (zip) files | 2.3.8 |
| Install software | know how to install software, both manually and using automated installers | 2.6 |
| RTFM | know how to read and follow instructions and how (and where) to ask for help | 1.7 |

with basic computer skills *at the same time* as learning \LaTeX is not going to be as effective as doing them in the right order.

It is really important to understand that these are *not* specialist skills — they are standard for anyone who uses a computer, and they form a fundamental part of the basic knowledge of computers which everyone needs to be familiar with.

With the exception of software installation, they are all included in the 2000 European Computer Driving Licence (ECDL) (now ICDL) course: the relevant module and section numbers of the original ECDL syllabus are noted in parentheses or in the margin above (Kelly & O'Connor, 2005).

Objectives of this book

By the end of this book or course, you should be able to undertake the following tasks:

1. use your editor to create and maintain your documents;
2. use \LaTeX markup to identify your document structure and formatting requirements;
3. typeset \LaTeX documents, correct simple formatting errors, and display or print the results;

4. identify and use additional \LaTeX packages (using the Internet for downloading where necessary and installing them);
5. recognise the limitations of procedural markup systems and choose appropriate generic markup methods where appropriate.

Synopsis

The original course covered the following topics as separate sessions. Earlier versions of this document kept to this structure in the book as chapters, but the current version has moved Installation (originally chapter 1) to Appendix A and merged it with the details of configuration; and Typesetting, viewing, and printing (originally chapter 4) to a new Appendix; as the procedure in both cases has been so much simplified that the previous level of detail is no longer needed.

1. How to create \LaTeX documents (with a Quick-Start Guide for the impatient);
 2. Basic document structures (the Document Class Declaration and its layout options; the `document` environment with sections and paragraphs);
 3. Using packages and CTAN to adapt formatting to your needs;
 4. Other document structures (lists, tables, figures, images, and verbatim text);
 5. Textual tools (footnotes, marginal notes, cross-references, indexes and glossaries, and bibliographic citations);
 6. Typographic considerations (white-space and typefaces; inline markup and font changes; extra font installation and automation);
 7. Programmability and automation (macros and modifying \LaTeX 's behaviour);
 8. Conversion and compatibility with other systems (`XML`, `Word`, etc).
- A Where to get and how to install \LaTeX (using the `TeX Users Group's TeX Collection DVD`);
- B How to install new fonts;

- C Typesetting, viewing, and printing (largely obsolete now that editors are better integrated with viewers and printers);
- D User groups and the benefits of membership;
- E The ASCII character set;
- F The GNU Free Documentation License.

I have made a few other changes in the transition to printed and online form, but the basic structure is the same, and the document functions as a workbook for the course as well as a standalone self-teaching guide.

Where's the math?

Please understand that this document *does not cover* mathematical typesetting, complex tabular material, the design of large-scale macros and document classes, or the finer points of typography or typographic design, although it does refer to these topics in passing on a few occasions.

There are several other guides, introductions, and 'get-started' documents on the Web and on CTAN which cover these topics and more in great detail. Among the more popular are:

- Getting Started*, where all beginners should start;
- A (Not So) Short Introduction to L^AT_EX 2_ε* is a good beginner's tutorial;
- Gentle Intro* is a classic tutorial on Plain T_EX (not L^AT_EX);
- Imported graphics* shows you how to do (almost) anything with graphics: side-by-side, rotated, etc;
- Short Math Guide* gets you started with the American Math Society's extensions;
- T_EX Symbol List* shows over 2,500 symbols available.

This list was taken from the CTAN search page. There are also lots of books published about T_EX and L^AT_EX: the most important of these for users of this document are listed at the end of the on page xi.

Availability of L^AT_EX systems

The standard implementations of T_EX and related systems are in the T_EX Collection, published annually on Digital Versatile Disc (DVD) and online by the T_EX Users Group. These are all derived from Knuth's master versions, and adapted for all major platforms (Unix & GNU/Linux, including Apple Mac OS X; and Microsoft *Windows*). The DVD is sent free to all TUG members and can be obtained from your local user group. You can also download the DVD image file in the International Organization for Standardization (ISO) format from CTAN to burn your own copy.

Rather than install T_EX Live on your laptop, desktop, or tablet, many users prefer to use one of the online systems such as *Overleaf* via a web browser. These provide an editor and typeset display in the same way as installed systems, but contained inside your web browser. L^AT_EX still works identically no matter which way you choose to use it.

There are no longer any commercial implementations of T_EX that I am aware of. The most recently available ones are listed in 'Commercial implementations' on page xxix.

Systems included on the T_EX Collection DVD

MIK_TE_X (Windows): This is the *MiK_TE_X* implementation plus the *T_EXStudio* editor with its own built-in PDF viewer.

MacT_EX (OS X): This is *T_EX Live* for Mac plus the *T_EXshop* editor (the Mac's own built-in *Preview* is used for the PDF display).

T_EX Live (Unix & GNU/Linux, including Apple Macintosh OS X; and Windows): The full *T_EX Live* system from TUG.

The T_EX Collection DVD also includes a screenshot of the whole CTAN archive.

Because the T_EX program (the internal 'engine' which does the actual typesetting) is independent of any other software, it doesn't have its own editor like a wordprocessor does. Instead, you get to choose whichever editor you prefer: there are lots available, and you can switch between them to find one you like: see 'Graphical interfaces (editors)' on page xxvii and section A.3 on page 250 for details.

Choice of T_EX Live for Linux users

Users of Linux (Red Hat/CentOS/Fedora, Debian/Ubuntu, and their derivative systems) can choose between the TUG T_EX Live from the DVD are their system-supplied package (`texlive-full` for Debian (DEB) systems or `texlive-scheme-full` for RedHat Package Manager (RPM) systems). These system packages can be installed using the system's package manager (eg `dnf` or `yum` for RPMs; `apt-get` or `apt` for DEBS; or a graphical installer like *Synaptic* or *Software* etc), as these provide tighter integration with other software such as editors and viewers, but the version is usually tied to the version of the operating system. The T_EX Live from TUG can be updated independently of the operating system, and SHOULD be used where the latest features are always required (in which case any system-installed packaged version MUST be removed first, to avoid conflicts and unresolved dependencies — see the notes in Appendix 1 starting on page 219).

Graphical interfaces (editors)

Most users run L^AT_EX with a graphical plaintext editor which has a toolbar and menus like other windowing applications. These usually include all the common formatting features of L^AT_EX plus writing tools like spellchecking, thesaurus, indexing, and bibliographic citation, and generally all work in a very similar way. Text-only interfaces are available for use on servers and automated production systems (see 'Command-line interfaces' on page xxviii).

The Windows and Mac systems described in 'Availability of L^AT_EX systems' on page xxvi come with a recommended editor (*T_EXStudio* and *T_EXshop* respectively), but you can install any other suitable editor you prefer (see section A.3 on page 250). The Unix & GNU/Linux distribution does not install any editor because these systems usually have their own software repositories with suitable editors already available for installation, such as *Emacs*, *vi*, *T_EXStudio*, or *Kile*.

Some fully synchronous typographic interfaces (editors) were available as commercial products, but so far as is known none of these is available any more: see the list item 'Synchronous typographic displays' on page xxix.

Command-line interfaces

While you would use a graphical interface to *set up* an automated system like a web server or e-commerce environment, it is useless where systems have to run in the background, unattended, with no human to click on buttons. In fact, the \TeX typesetting engine is a Command-Line Interface (CLI) program, which can be used from any script or console or 'Command' window. You can type the command `xelatex` followed by the name of your document file (see Figure C.2 on page 274 for an example).

Commands like these let you run \TeX in an automated or scripted environment like a Common Gateway Interface (CGI) script on a web server or a batch file on a document publishing system. All the popular distributions for all systems include this CLI interface as standard.

WYSIWYG displays

\TeX usually displays your typeset results in a separate window such as a PDF viewer, updated automatically every time the document is retypeset, because the typesetting is kept separate from the editing. This is called an 'asynchronous' display. Some systems, however, can format the typesetting while you type each character, like a wordprocessor, although at the expense of some flexibility. These are called 'synchronous' displays.

Asynchronous typographic displays: The WYSIWYG display is updated when the document is reprocessed, rather than *while* you are still typing, as it would with a wordprocessor. To update the display, just click on the button which reformats the document. You are probably already familiar with this idea if you have used HTML, where you reload the page in a browser to see it, or if you have used a spreadsheet, where the ReCalc button (F9) does something similar.

\TeX systems typeset the whole document at one go, including all indexing, cross-references, tables of contents, bibliographic citations, and the placement of figures and tables. \TeX also formats whole paragraphs at a time, rather than line-by-line as wordprocessors do, in order to get the quality of spacing, hyphenation, and justification right. This approach makes it

much faster than a wordprocessor in dealing with typical complex documents, as it can be done without holding the whole document in memory.

Synchronous typographic displays: The WYSIWYG display is the editing window, and it updates while you type, like a wordprocessor (for example $V\text{T}_{\text{E}}\text{X}$, see Table 3 on page xxx).

With a synchronous display you get Instant Textual Gratification™, but like a wordprocessor, your level of control is restricted to that of the system you use, which cannot provide access to everything that $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ can do. For complete control of complex material you may still need to use separate editing and display windows as for asynchronous implementations.

Near-synchronous displays: There are a few systems for very-close-to-synchronous WYSIWYG display. These include Jonathan Fine's *Instant Preview* with the $\text{T}_{\text{E}}\text{X}$ daemon, and David Kastrup's [preview-latex](#) package for embedding typographic fragments from the typeset display back into the editor window.

What You See Is What You Get (WYSIWYG) refers to the accuracy of the typographical display. Most modern ones are pretty good, given the fact that your screen is probably only a fraction of the accuracy of your printer — from 96 dots per inch (DPI) on an old desktop screen, 140 DPI on a small laptop, 240 DPI on a high-end 4k laptop or desktop, and up to around 300 DPI on some phones and tablets; as opposed to 600 DPI on your printer, or 1200 DPI or more in photo-quality, and 3,600 DPI up to well over 5,000 DPI on industrial digital printers and laser phototypesetters.

Commercial implementations

Although the $\text{T}_{\text{E}}\text{X}$ Collection is available free of charge, there were some excellent commercial implementations of $\text{T}_{\text{E}}\text{X}$ and $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$, listed in Table 3 on page xxx, which provided enhanced support and additional features. These companies, founders, and staff were good friends of the $\text{T}_{\text{E}}\text{X}$ and $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ communities for many years; however, all the products listed are

Table 3: Commercial distributions of T_EX systems

| Product | Platform | Company | URI |
|-------------------------|---------------------|--------------------------------|---------------------|
| PCT _E X | MS-Win | Personal T _E X, Inc | no longer supported |
| BaKoMa T _E X | MS-Win | Basil K Malyshev | no longer supported |
| TrueT _E X | MS-Win | True T _E X | no longer supported |
| Textures | Mac | Blue Sky Research | no longer supported |
| VT _E X | MS-Win, Linux, OS/2 | MicroPress, Inc | no longer supported |

now at end-of-life, although they are in some cases still available for download (links in footnote).⁵

Symbols and conventions

There are several typographic conventions about how you represent computer-related material in print which are shown in Table 4 on page xxxi. Typed commands, keywords, examples of input, and related text are in a fixed-width (monospace) font, like a typewriter, because that's how program code is usually displayed and edited (this also helps avoid ambiguities, as explained in section 4.7.1.1 on page 114). Special values, like numeric quantities represented by a name or symbol, are in italics, as in mathematics. Terms or references to products, programs, packages, and other components of L^AT_EX have their own typographic form. Finally there are some symbols like keyboard keys and menus, which are shown graphically.

⁵ Y&Y, Mackichan Software, PC-T_EX, Blue Sky, True T_EX, and BaKoMa T_EX [RIP Basil K Malyshev], who produced T_EX distributions for many years, all appear to have ceased trading. Some of the Y&Y add-on fonts are still distributed by the T_EX Users Group (see Appendix 4 starting on page 289), or have been replaced by Open Source implementations, and there is a mailing list at the TUG web site for the support of former Y&Y users.

Table 4: Typographic notations used in this document

| Notation | Meaning |
|--|---|
| MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, MAY, and OPTIONAL | These keywords have a specific mandatory meaning when shown in THIS STYLE (usually small capitals), according to RFC 2119 (Bradner, 1997). |
| <code>\command</code> | L ^A T _E X commands (control sequences) that you type which perform an action like <code>\clearpage</code> , or identify your text like <code>\footnote{...}</code> |
| <code>\length</code> | Control sequences which store a dimension (a measurement in units), like <code>\textwidth</code> |
| <code>counter</code> | Values used for counting (whole numbers only), like <code>section</code> |
| <code>term</code> | The defining instance of a new technical term |
| <code>environment</code> | A L ^A T _E X formatting or identification environment, like <code>quotation</code> |
| <code>class</code> | A L ^A T _E X document class (available from CTAN), like <code>memoir</code> |
| <code>package</code> | A L ^A T _E X add-on package (available from CTAN), like <code>footmisc</code> |
| <code>product</code> | A program or product name |
| <code>typewriter type</code> | Literal examples |
| <code>value</code> | Mnemonic examples of things you must type, where you have to supply real-life values of your own, like <code>\author{your name}</code> means you must replace <code>your name</code> with your own real name. |
| <code>x</code> | A specific key on your keyboard |
| <code>Ctrl+x</code> | Two or more keys pressed together, not separately |
| <code>Esc q</code> | Two keys pressed one after another |
| <code>Submit</code> | An on-screen button to click |
| <code>Menu >> Submenu >> Item</code> | A drop-down menu with items to select |
| <code> </code> | A normal space, just so it's visible |

Production note

This document is written and maintained in XML, using a customized version of the *DocBook 5* DTD. Conversions are made to HTML and L^AT_EX using XSLT2 scripts and Michael Kay's *Saxon* processor.

The complete source, with all ancillary files, is available online at www.ctan.org/tex-archive/info/beginlatex/src/. If you want to try processing it yourself you will need *Java* and *Saxon* in addition to a full installation of L^AT_EX.

This document is published under the terms and conditions of the GNU Free Documentation License. Details are in Appendix 6 starting on page 303.