

T_EX and L^AT_EX

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1 Introduction

L^AT_EX is the *standard program used to produce scientific papers in physics and astronomy*. In this course, you may write your “papers” in L^AT_EX. L^AT_EX is not a WYSIWYG (what you see is what you get) word processor (like MS Word). Instead, it is a typesetting program that is designed to produce beautiful, and high quality technical documents containing mathematics. The original program is T_EX (pronounced like “tech”), which forms the basic guts of the typesetting program. L^AT_EX (“lay-tech”) is a program shell consisting of a collection of predefined document styles, etc., that sits “on top of” T_EX, and makes the process of typesetting your document relatively easier. You will deal directly with L^AT_EX.

To produce a document you first make a file in a plain text editor, inserting various L^AT_EX commands to specify the format of your document, and inserting your content (e.g., text). Then L^AT_EX is run on the text file, producing a new, final document file which can be displayed or printed. The standard filename for a L^AT_EX file has a .tex extension (e.g., paper1.tex). The final document file might be a PDF file (you should produce PDF files for your papers in this course).

In practice, if you want to produce a L^AT_EX paper for this course, you should start with the example L^AT_EX paper I provide at the course website, and simply insert your content (title, authors, text, . . .) in place of my content. You should not have to think about formatting!

You will need to download and install a T_EX distribution. T_EX is free and available for many machines and operating systems. The distribution will also contain L^AT_EX, of course. In addition, people often download an editor customized to handle L^AT_EX files, to make it easier to compose L^AT_EX files. However, any editor that can save files in plain text will work.

2 Installing T_EX and L^AT_EX

For a Windows machine, I recommend that you install the MikTeX distribution of T_EX and the TeXnicCenter editor. If you need to install T_EX on a Mac, see the link under Quick Links on the course webpage. Or, go to the Comprehensive

TeX Archive Network (<http://www.ctan.org>), CTAN, where you will find other TeX and editor options, including options for other operating systems.

The TeXnicCenter editor has many useful features for TeX users. It has menu items to insert the syntactically correct LaTeX commands where you want them. Or, as you start typing a LaTeX command, it will remind you of the appropriate syntax. It features one-button commands for running LaTeX on your file, and producing various output files, including PDF files, and displaying the result. Also included is a spellchecker that can ignore TeX formatting commands, a useful feature.

If you don't have Acrobat Reader you will also want to install. It is free and will enable you to view your PDF files produced by LaTeX.

3 A Simple Example LaTeX File

The following lines are the contents of a very simple LaTeX file. The example paper file has more detail, and the correct formatting for this course. Here you can see how text is put into a LaTeX file.

```
\documentclass{article}
\title{My First \LaTeX{} Document}
\author{Jane Doe}
\date{\today}

\begin{document}

\maketitle

\section{Introduction}
```

Here is the first paragraph of my introduction. It contains a number of sentences. It does not matter how many spaces

I put between each word or when I move to the next line. LaTeX knows what to do to make the words and sentences spaced and aligned as if a professional typesetter was setting up your text to appear in a published book of high quality.

I began a new paragraph by skipping a line. Notice that LaTeX formatting commands and LaTeX commands for specific symbols (such as the name of the program itself!) start with a backslash symbol. Otherwise, you simply type in the words, sentences, and paragraphs you need in order to tell your story.

```
\section{Conclusion}
```

So, it's easy to use LaTeX, since you don't need to

```
concentrate on the formatting and appearance of the document
(because the ‘‘professional’’ typesetter hidden inside \TeX{}
takes care of all that). You can just concentrate on the
\textit{content} of your document!
```

```
\end{document}
```

4 Putting Images into Your L^AT_EX Document

You will need to add figures (pictures, perhaps, but certainly images of the sky, and plots) to your document. The example L^AT_EX paper file contains the lines

```
\usepackage{graphicx}
```

at the beginning of the file, just after the documentclass command line. This enables you to insert .jpg or .png image files into your paper file.

You can best add an image by first saving the image as a .bmp file (bitmap file) from the software producing it (CCDOps, SIP, Excel,...), then opening the image in IrfanView and saving a second copy in .jpg or .png format. Only .jpg and .png formats will work in L^AT_EX (unless you can produce an encapsulated postscript image — if you don’t know what a postscript image is, then forget about it). I suggest you use .png files for plots, or other drawn images — .jpg files of plots are “blurred” in various ways. You will probably notice that .png files are better for sky images also. The .jpg files are really only best for photos of very bright scenes with lots of detail and color.

To put an image in your document, insert the lines

```
\begin{figure}
\begin{center}
\includegraphics[width=50mm]{image.png}
\caption{Here is my caption.}
\end{center}
\end{figure}
```

into your L^AT_EX file, where image.png is the filename of image file containing the image of the sky or a plot (this could be image.jpg also). Of course, you should alter the caption to contain more appropriate text. And, you should alter the “width” option to whatever works best for you. The image file must be in the same folder as the L^AT_EX file. The figure will not appear in the finished document exactly where this insertion has occurred, but will appear where the software decides it will best fit. To produce the final document, you must now use the command which produces a PDF file from a L^AT_EX file. In TeXnicCenter, this command is “LaTeX => PDF”.¹

¹When I use this command in TeXnicCenter, it calls my Adobe Acrobat reader to display the file. Something I’ve learned from experience: I need to close the current Acrobat window in order to have the newly updated version of my L^AT_EX output appear. Otherwise, I just see the old version!

5 Adding More Advanced Content to your L^AT_EX Document

You can learn more about entering L^AT_EX commands into your file for various effects (e.g., tables, mathematics, Greek letters, . . .), from online L^AT_EX tutorials. A very nice website is the L^AT_EX wiki book (<http://en.wikibooks.org/wiki/LaTeX>). Other tutorials and articles on L^AT_EX are available at CTAN and at the L^AT_EX website <http://www.latex-project.org/>. Very short summaries, like the nice two page cheat-sheet on L^AT_EX at <http://www.stdout.org/~winston/latex/> are also available. Of course, you can always use Google to search for more tutorials, examples, or explanations.