

Scientific Writing using L^AT_EX

CEPLAS Grad School Classes

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What is L^AT_EX?

*TeX is a low-level markup and programming language created by Donald Knuth to typeset documents **attractively** and **consistently***^[1]

L^ATeX is a macro package based on TeX created by Leslie Lamport. Its purpose is to simplify TeX typesetting^[1]

^[1]<https://en.wikibooks.org/wiki/LaTeX/Introduction>

Why L^AT_EX?

1. You are **forced** to structure your documents correctly
2. Indexes, footnotes, citations and references are generated, maintained, updated **automatically**
3. Once you define the document style, maintaining the layout (fonts, text sizes, line heights, tables, bibliography etc.) **consistent** is not your problem anymore

... using L^AT_EX is an investment!

[1]<https://en.wikibooks.org/wiki/LaTeX/Introduction>

OK, let's get started with L^AT_EX!

Welcome to WYSIWYM

Scientific Writing
using \LaTeX

Dr Antonella
Succurro

Day One: getting
started with \LaTeX

Day Two:
fundamentals+

What *You* See Is What YOU Mean

Welcome to WYSIWYM

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What *You* See Is What YOU Mean

... please go to the classes page

[https://wiki.hhu.de/display/QTBP/Scientific+
Writing+with+LaTeX](https://wiki.hhu.de/display/QTBP/Scientific+Writing+with+LaTeX)

and download the file day1.tex

Commands

```
\command[option1, option2]{argument1}{argument2}
```

\command is different from \Command!

commands can also have no options and no arguments

Special characters

Character	Type	Reserved for
#	\#	arguments
\$	\\$	math
%	\%	comment
&	\&	tab delimiter
\	\textbackslash{}	commands
^	\textasciicircum{}	math
-	\-	math
{	\{	arguments
}	\}	arguments
~	\textasciitilde{}	spacing
>	\textgreater	T1 font encoding
<	\textless	T1 font encoding

Spacing & linebreak 1

In L^AT_EX you will never introduce double spaces unintentionally, same for linebreaks

```
In
\LaTeX
you will
never introduce
double      spaces
unintentionally,
same
for
linebreaks
```

Spacing & linebreak 2

To break a line you can use
or
or you can leave an empty line
like this

```
To break a line you can use\\  
or \newline  
or you can leave an empty line  
  
like this\\[2ex]
```

The empty line in documents will actually start a new paragraph and this kind of gives a direction on how to structure your text:

do not overbreak thoughts!

Spacing & linebreak 3

I'll put two spaces
now three spaces
also three spaces, but these are unbreakable
now I put arbitrary space

now I fill till the end of line
now I fill till the end of line
now I fill till the end of line

can fill vertical space too

Spacing & linebreak 4

```
I'll put two\ \ spaces\\
now three\ \ \ spaces\\
also three~~~spaces, but these are unbreakable\\
now I put arbitrary\hspace{2cm}space\\[2ex]
now I fill till the end of\hfill line\\
now I fill till the end\hfill of line\\
now I fill till the\hfill end of line

\vfill

can fill vertical space too
```

A key concept in L^AT_EX

```
\begin{center}  
  Centered text  
\end{center}
```

is the same as

```
{\centering  
  Centered text  
}
```

Document structure

```
\documentclass{...}  
  
%this is the preamble  
  
\begin{document}  
%here goes your content  
  
\end{document}
```

documentclass

```
\documentclass[option1,option2,...]{class}
```

Classes: article, book, report, letter, beamer, ...

Options: 10pt, 11pt, 12pt, a4paper, openright, twocolumn,
twoside, ...

The preamble

Here you can declare the packages needed, set styles, or even define your own commands

```
\usepackage[option1, option2, ...]{package}
```

Some useful packages are

```
\usepackage[english]{babel}  
\usepackage[utf8]{inputenc}  
\usepackage{graphicx}  
\usepackage{multirow,bigdelim}  
\usepackage[hdivide={2cm, *, 2cm}, vscale=0.85,  
  bindingoffset=1cm]{geometry}  
\usepackage{booktabs}
```


Article example

```
\documentclass[10pt]{article}
\usepackage{booktabs}
\usepackage[english]{babel}
\usepackage[utf8]{inputenc}
\usepackage{lipsum}%just for text generation
\usepackage{multirow}
\usepackage{graphicx}
\author{Your Name}
\title{A first article with \LaTeX}
\begin{document}
\maketitle
\begin{abstract}
  \lipsum[1]
\end{abstract}
\section{Introduction}\label{sec:intro}
  \lipsum[2-3]
\end{document}
```

Lists

- ▶ bullet list first item
 - ▶ bullet list second item
1. numbered list first item
 2. numbered list second item

```
\begin{itemize}
\item bullet list first item
\item bullet list second item
\end{itemize}

\begin{enumerate}
\item ordered list first item
\item ordered list second item
\end{enumerate}
```

Change bullet style

- + bullet list first item
 - bullet list second item
- bullet list first item
- bullet list second item
- * bullet list first item
- * bullet list second item
- \$ bullet list first item
- \$ bullet list second item

```
\begin{itemize}
\item[+] bullet list first item
\item[-] bullet list second item
\end{itemize}

\begin{enumerate}[-]
\item bullet list first item
\item bullet list second item
\end{enumerate}

\begin{enumerate}[*]
\item bullet list first item
\item bullet list second item
\end{enumerate}

\begin{enumerate}[\$]
\item bullet list first item
\item bullet list second item
\end{enumerate}
```

Change ordering label

- a) ordered list first item
- b) ordered list second item
- A- ordered list first item
- B- ordered list second item
- (i) ordered list first item
- (ii) ordered list second item
- (iii)
- (iv)
- (v) ...

```
\begin{enumerate}[a]  
\item ordered list first item  
\item ordered list second item  
\end{enumerate}  
  
\begin{enumerate}[-A-]  
\item ordered list first item  
\item ordered list second item  
\end{enumerate}  
  
\begin{enumerate}[(i)]  
\item ordered list first item  
\item ordered list second item  
\item  
\item  
\item \dots  
\end{enumerate}
```

Floating environments

```
\begin{floatenv}[placement specifier]
...
\end{floatenv}
```

specifier	meaning
h	float here, i.e., approximately at the same point it occurs in the source text (however, not exactly at the spot)
t	top of the page
b	bottom of the page
p	on a special page for floats only
!	Override internal parameters LaTeX uses for determining “good” float positions

Table : placement specifier parameters

. . . usually, so try to

- ▶ be careful with floats to text ratio
- ▶ use reasonable sized floats within the text
- ▶ consider devoting an appendix to large tables/pictures (yes, you can have many-pages-long tables; no, they do not look good in the middle of a chapter)
- ▶ use commands that “clean” the page to avoid figures going to other sections/chapters (e.g. `clearpage`)

Tables 1

```
\begin{table}[htb]\centering
\begin{tabular}{cp{.6\textwidth}}\toprule
specifier & meaning\\\midrule
h & float here, i.e., approximately at the same
    point it occurs in the source text (however, not
    exactly at the spot)\\
t & top of the page \\
b & bottom of the page \\
p & on a special page for floats only \\
! & Override internal parameters LaTeX uses for
    determining ‘good’ float positions\\
\bottomrule\end{tabular}\caption{placement
specifier parameters}\end{table}
```

Tables 2

	Col1	Col2	Col2
row1	left	right	center
row2	a	b	c
row3	d	e	f

Table : dummy table for example

```
\begin{table}[htb]\centering
\begin{tabular}{clrc}\toprule
& Col1 & Col2 & Col2 \\ \midrule
row1 & left & right & center \\
row2 & a & b & c \\
row3 & d & e & f \\
\bottomrule\end{tabular}\caption{dummy table for
example}\end{table}
```


Tables 3

	Col1	Col2	Col2
row1	0	0	0
row2	a	b	c
	a	b	c
row3	d	e	f
row4		g	
row5	h		
row6	j		i

```
\begin{tabular}{cccc}\toprule
& Col1 & Col2 & Col2 \\ \midrule
row1 & 0 & 0 & 0 \\ \midrule
\multirow{2}{*}{row2} & a & b & c \\
& a & b & c \\ \midrule
row3 & d & e & f \\ \midrule
row4 & \multicolumn{3}{c}{g} \\ \midrule
row5 & h & \multicolumn{2}{c}{\multirow
{2}{*}{i}} \\
row6 & j & & \\ \bottomrule\end{tabular}
```

Figures 1

```
\begin{figure}[htb]\begin{center}  
\includegraphics[width=0.8\textwidth]{LaTeX_diagram  
.png}  
\caption{From \url{https://en.wikibooks.org/wiki/  
LaTeX/}\label{figcompilation}}  
\end{center}\end{figure}
```

Figures 2

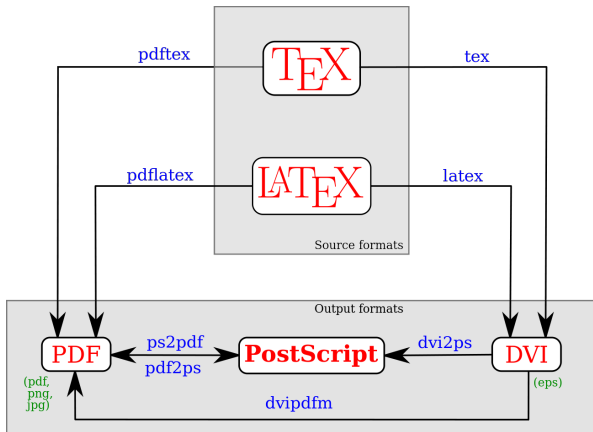


Figure : From <https://en.wikibooks.org/wiki/LaTeX/>

Subfigures 1

Needs the subfigure package

Day One: getting
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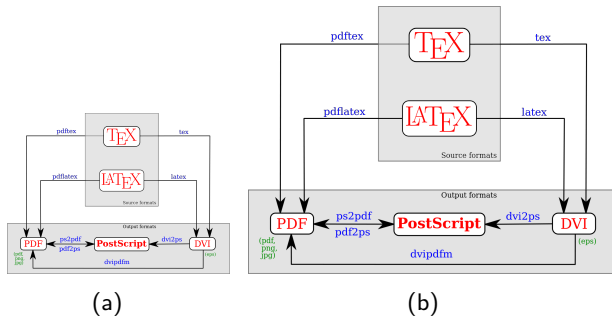


Figure : Dummy example, (a) is the same as (b) just smaller

Subfigures 2

Needs the subfigure package

```
\begin{figure}[htb]\begin{center}  
\subfigure[]{\label{fig:a}  
\includegraphics[width=0.3\textwidth]{LaTeX_diagram  
.png}}  
\subfigure[]{\label{fig:b}  
\includegraphics[width=0.5\textwidth]{LaTeX_diagram  
.png}}  
\caption{Dummy example, (a) is the same as (b) just  
smaller}  
\end{center}\end{figure}
```

Exercise!

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Day two with L^AT_EX

Welcome to “fundamentals+”!

- we now know how to write in L^AT_EX
- getting familiar with the syntax is a matter of exercise (practice makes perfect!)
- we can play with two fundamental environments: tables and figures

Load your draft document and let's move further!

Load the hyperref package in your preamble

```
\usepackage{hyperref}
```

in case you did not have it already, add the table of content and the list of figures and tables:

```
\tableofcontents  
\listoffigures  
\listoftables
```

and recompile two times your document (you might have to delete the .aux file)

Referencing

Label things like:

```
...  
\end{tabular}\caption{This is an example}\label{tab  
:example}  
\end{table}  
...
```

and reference them like:

```
as seen in Table~\ref{tab:example}
```

Link styles

the hyperref package has a lot of customizable options,
e.g.:

```
\usepackage[ocgcolorlinks,bookmarks=true,  
bookmarksnumbered=false,bookmarksopen=false,  
colorlinks=true,linkcolor=webred]{hyperref}
```

google for instance “latex hyperref nice colors”!

Web links

You can use the package `url` or `hyperref`

```
\url{https://en.wikibooks.org/wiki/LaTeX}\\  
\href{https://en.wikibooks.org/wiki/LaTeX}{With  
  href you can link a text}
```

<https://en.wikibooks.org/wiki/LaTeX>
With `href` you can link a text

Bibliography

Managing the bibliography is easy!

- ▶ your collection goes into a file .bib, e.g. biblio.bib
- ▶ you load your preferred (e.g. unsrt) style with

```
\bibliographystyle{unsrt}
```

- ▶ and insert the bibliography in the document environment with

```
\bibliography{biblio}
```

The bib file

```
@article{Loughlin1964a,  
author = {Loughlin, Richard E. and Elford, Howard L  
    . and Buchanan, John M.},  
journal = {J. Biol. Chem.},  
month = sep,  
number = {9},  
pages = {2888--2895},  
title = {{Enzymatic Synthesis of the Methyl Group  
    of Methionine. VII. ISOLATION OF A COBALAMIN-  
    CONTAINING TRANSMETHYLASE (5-  
    METHYLTETRAHYDROFOLATE-HOMOCYSTEINE) FROM  
    MAMMALIAN LIVER}},  
url = {http://www.jbc.org/cgi/content/long  
    /239/9/2888},  
volume = {239},  
year = {1964}  
}
```

Cite in the text like:

```
the results from~\cite{Loughlin1964a}
```

then you will have to

- ▶ compile once the pdf (pdflatex namefile.tex)
- ▶ compile once the bib (bibtex namefile.aux)
- ▶ compile twice the pdf

to have the references correctly linked

Citations 2

You can also cite more references:

```
the results from~\cite{ref1ID, ref2ID, ref3ID}
```

or specific parts:

```
the results from~\cite[Chapter 3]{ref1ID}
```

You can also add references to your final bibliography without citing it in the document by adding

```
\nocite{refXID, refYID, refZID}
```

Bibliography styles

Items are cited: *The L^AT_EX Companion* book [2], the Einstein journal paper [1], and The L^AT_EX related items are [2, 3].

References

acm

- [1] EINSTEIN, A. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. *Annalen der Physik* 322, 10 (1905), 891–921.
- [2] GOOSSENS, M., MITTELBACH, F., AND SAMARIN, A. *The L^AT_EX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.
- [3] KHUTH, D. Knuth: Computers and typesetting.

Items are cited: *The L^AT_EX Companion* book [GMS93], the Einstein journal paper [Ein05], and The L^AT_EX related items are [GMS93, Kun].

References

alpha

- [Ein05] Albert Einstein. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. *Annalen der Physik*, 322(10):891–921, 1905.
- [GMS93] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The L^AT_EX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.
- [Kun] Donald Knuth. Knuth: Computers and typesetting.

Items are cited: *The L^AT_EX Companion* book [Goossens et al., 1993], the Einstein journal paper [Einstein, 1905], and The L^AT_EX related items are [Goossens et al., 1993, Knuth,].

References

apalike

- [Einstein, 1905] Einstein, A. (1905). Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. *Annalen der Physik*, 322(10):891–921.
- [Goossens et al., 1993] Goossens, M., Mittelbach, F., and Samarin, A. (1993). *The L^AT_EX Companion*. Addison-Wesley, Reading, Massachusetts.
- [Knuth,] Knuth, D. Knuth: Computers and typesetting.

Items are cited: *The L^AT_EX Companion* book [1], the Einstein journal paper [2], and The L^AT_EX related items are [1, 3].

References

plain

- [1] Albert Einstein. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. *Annalen der Physik*, 322(10):891–921, 1905.
- [2] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The L^AT_EX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.
- [3] Donald Knuth. Knuth: Computers and typesetting.

Items are cited: *The L^AT_EX Companion* book [2], the Einstein journal paper [1], and The L^AT_EX related items are [2, 3].

References

siam

- [1] A. EINSTEIN, *Zur Elektrodynamik bewegter Körper.* (German) [On the electrodynamics of moving bodies], *Annalen der Physik*, 322 (1905), pp. 891–921.
- [2] M. GOOSSENS, F. MITTELBACH, AND A. SAMARIN, *The L^AT_EX Companion*, Addison-Wesley, Reading, Massachusetts, 1993.
- [3] D. KHUTH, *Knuth: Computers and typesetting*.

Items are cited: *The L^AT_EX Companion* book [1], the Einstein journal paper [2], and The L^AT_EX related items are [1, 3].

References

unsrt

- [1] Michel Goossens, Frank Mittelbach, and Alexander Samarin. *The L^AT_EX Companion*. Addison-Wesley, Reading, Massachusetts, 1993.
- [2] Albert Einstein. Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]. *Annalen der Physik*, 322(10):891–921, 1905.
- [3] Donald Knuth. Knuth: Computers and typesetting.

https://www.sharelatex.com/learn/Bibtex_bibliography_styles

Obtain a bib file - Mendeley

The screenshot shows the Mendeley Desktop application interface. The main window displays a list of documents with columns for Authors, Title, Year, Published In, and Added. An 'Options' dialog box is open, showing the 'BibTeX' tab. The dialog has several sections:

- General**: Includes tabs for General, Document Details, File Organizer, Watched Folders, BibTeX, Zotero, and Connection.
- BibTeX Export Preferences**:
 - Escape LaTeX special characters (#)%& etc.)
 - Use Journal Abbreviations
- BibTeX Syncing**:
 - BibTeX syncing keeps one or several BibTeX files up to date with the documents in your library. Documents in the 'Needs Review' collection will not be exported.
 - Enable BibTeX syncing
 - Create one BibTeX file for my whole library
 - Create one BibTeX file per group
 - Create one BibTeX file per document
 - Path:
- Citation Keys**:
 - Citation keys for documents are automatically generated in the format [AuthorYear]. To edit citation keys manually, enable the 'Citation Key' field on the Document Details tab

Buttons at the bottom of the dialog are 'Apply', 'Cancel', and 'OK'.

Authors	Title	Year	Published In	Added
Aad, G.; Abajyan, T.; Abbott, B.; Ab...	Search for pair production of heavy top-like quarks decaying to a high-W boson and a b quark in the lepton plus jets final state at with the ATLA...	2013	Physics Letters B	6/2/14
Aad, G.; Abbott, B.; Abdallah, J.; A...	Sea...			6/2/14
Abedi, Elahe; Sahari, Mohammad Ali	Lor...			10/8/15
Abou-Zeid, A A; Shehata, Y M; El-S...	Mic...			12/8/14
Abram, Florence	Sys...			Mar 9
Adadi, Roi; Volkmer, Benjamin; Mi...	Pre...			11/25/15
Adamska, I; Ohad, I; Klopstech, K	Syn...			Feb 15
Aebersold, Ruedi; Mann, Matthias	Ma...			10/1/15
Ahmadinejad, Nahal; Dagan, Tal; ...	Ger...			10/11/15
Ainala, S. K.; Somasundar, A.; Park...	Cor...			10/11/15
Al-Wahaibi, Mohamed H.	Pla...			Feb 8
Allakhverdiev, Suleyman; Padua, P...	Edi...			6/2/14
Allen, John F; Santabarbara, Stefa...	Dis...			6/18/15
Allen, John F; Santabarbara, Stefa...	Dis...			9/25/14
ALLEN, TIMOTHY E.; PALSSON, BE...	Sec...			12/15/14
Alric, Jean	Red...			9/25/14
Alric, Jean; Lavernge, Jérôme; Rap...	Redox and ATP control of photosynthetic cyclic electron flow in Chlamydomonas reinhardtii (l) aerobic conditions.	2010	Biochimica et biophysica acta	9/25/14

Obtain a bib file - EndNote

- ▶ Open EndNote, and open the library of references that you would like to export to BibTeX.
- ▶ In the drop-down menu in the toolbar at the top of the screen, click “Select Another Style...” and in the list that appears, chose BibTeX Export.
- ▶ Now you should see the BibTeX-formatted citation in the preview screen.
- ▶ From the File menu, select Export.
- ▶ Navigate to the directory where your main document is or will be saved.
- ▶ Change the name of the file that you are saving to filename.bib. Then click Save.

This will save your references in the correct format for BibTeX to read and create a bibliography from.

Obtain a bib file - single citation

Directly from the journal web page

The screenshot shows the ScienceDirect website interface. At the top, there is a green navigation bar with 'ScienceDirect' on the left and 'Journals Books' on the right. Below this, there are buttons for 'Download PDF', 'Export', and a search bar labeled 'Search ScienceDirect'. A 'Help' link is also visible. The main content area shows an article outline for 'Sequence-Based Analysis of Metabolic Demands for Protein Synthesis in Prokaryotes' by Timothy E. Allen and Bernhard Ø. Palsson. A modal dialog box is open over the article, titled 'You have selected 1 citation for export.' It offers options for 'Direct export' (Save to Mendeley, Save to RefWorks) and 'Export file' (RIS, BibTeX, Text). Under 'Content', 'Citation and Abstract' is selected. An 'Export' button is at the bottom of the dialog.

```
science.bib x
@article{ALLEN20031,
title = "Sequence-Based Analysis of Metabolic Demands for Protein Synthesis in Prokaryotes ",
journal = "Journal of Theoretical Biology ",
volume = "220",
number = "11",
pages = "1 - 18",
year = "2003",
note = "",
issn = "0022-5193",
doi = "http://dx.doi.org/10.1006/jtbi.2003.3087",
url = "http://www.sciencedirect.com/science/article/pii/S0022519303930876",
author = "TIMOTHY E. ALLEN and BERNHARD Ø. PALSSON"
}
```

Exercise

OK, let's now work on document structure!
Open `latex_class_CEPLAS-main_file.tex`

Sectioning etc

```
\chapter{title of chapter}
...
\section[Short section title for ToC]{Long section
    title too long for ToC}
...
\subsection{}
...
\subsubsection{}
...
```

An * will make the section numberless (and not in ToC)

Book class

```
%preamble

\begin{document}

\frontmatter

\maketitle

% Introductory chapters
\phantomsection
\addcontentsline{toc}{chapter}{Introduction}
\chapter*{Introduction}
\input{intro.tex}
\clearpage{\pagestyle{empty}\cleardoublepage}
```

Book class

```
%index and list of figures and list of tables
\pdfbookmark[1]{Index}{Index}
\tableofcontents
\clearpage{\pagestyle{empty}\cleardoublepage}

\phantomsection
\addcontentsline{toc}{chapter}{List of Figures}
\listoffigures
\clearpage{\pagestyle{empty}\cleardoublepage}

\phantomsection
\addcontentsline{toc}{chapter}{List of Tables}
\listoftables
\clearpage{\pagestyle{empty}\cleardoublepage}
```

Book class

```
\mainmatter
\chapter{First chapter}
\input{chap01.tex}
\clearpage{\pagestyle{empty}\cleardoublepage}
/etc...

\phantomsection
\addcontentsline{toc}{chapter}{Conclusions}
\chapter*{Conclusions}
\input{conclusions}
\clearpage{\pagestyle{empty}\cleardoublepage}

\appendix
\chapter{First Appendix}
\input{app01.tex}
\clearpage{\pagestyle{empty}\cleardoublepage}
/etc...
```


Book class

```
\backmatter  
  
%\nocite{}  
\phantomsection  
\addcontentsline{toc}{chapter}{Bibliography}  
  
\bibliographystyle{unsrt}  
\bibliography{biblio}  
  
\clearpage{\pagestyle{empty}\cleardoublepage}
```