

# L<sup>A</sup>T<sub>E</sub>X Crash Course

## GRACE Transferable Skills

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23.05.2023  
09:00-13:00

# Intro

Welcome back!

## Agenda - 23.05.2023

09:00-10:15	Images, tables, formulas
10:15-10:45	Break
10:45-11:15	Exercise
11:15-11:30	Discussing the exercise
11:30-12:15	Bibliographies
12:15-13:00	Specialist packages, self-help competencies

## Images

You begin by uploading your figure/graph/image to Overleaf's file menu on the left.

This works either by clicking the dedicated button or via drag and drop.

For other editors, it's advisable to have everything in the same folder, but it's also possible to use file paths.

## Images

```
122 \begin{figure}
123   \centering
124   \includegraphics[width=0.7\textwidth]{image_name.png}
125   \caption{Your caption}
126   \label{fig:image_label}
127 \end{figure}
128
```

## The classic figure setup

# Images

The classic `\begin{figure}` consists of:

- ▶ `\includegraphics{}`: the name of the image you want to display
- ▶ `\caption{}`: For captioning the image
- ▶ `\label{}`: Label for cross-referencing; can also be added to sections, tables etc.
- ▶ *caption* and *label* are optional, but helpful

## Adjusting figure size

Adjusting figure size:

- ▶ Often, the original size of a figure won't work for the document
- ▶ With the *graphicx* package, you can easily adjust the size
- ▶ To adjust the size, use square brackets in the `\includegraphics{}` command

## Adjusting figure size



*The Fighting Temeraire*, by JMW Turner (Source: [Wikimedia Commons](#))



## Adjusting figure size

In the preceding slide, I used

`\includegraphics[width=0.7\textwidth]{temeraire.jpg}` to fit it neatly onto the slide.

*textwidth* here denotes the general area of text, and `[width=0.7\textwidth]` means the image is scaled down to 70% of *textwidth*.

Another option is to use *scale*, e.g. `[scale=0.5]` to scale a figure down to 50% of its size.

## Adjusting figure size



The picture is rather big, so scaling it down to 10% (scale=0.1) of its original size will look like this.

See [here](#) for a short tutorial.

## Multiple images in one figure

For putting multiple images in one figure, use the *subfigure* environment.

```
\begin{figure}[h]

\begin{subfigure}{0.5\textwidth}
\includegraphics[width=0.9\linewidth, height=6cm]{overleaf-logo}
\caption{Caption1}
\label{fig:subim1}
\end{subfigure}

\begin{subfigure}{0.5\textwidth}
\includegraphics[width=0.9\linewidth, height=6cm]{mesh}
\caption{Caption 2}
\label{fig:subim2}
\end{subfigure}

\caption{Caption for this figure with two images}
\label{fig:image2}
\end{figure}
```

Example taken from the [Overleaf tutorial](#)

# Tables

Creating tables in LaTeX follows a specific formula, but there are many customisation options.

We can start with one of the simplest examples of a table:

```
\begin{center}
\begin{tabular}{c c c}
cell1 & cell2 & cell3 \\
cell4 & cell5 & cell6 \\
cell7 & cell8 & cell9
\end{tabular}
\end{center}
```

🔗 [Open this example in Overleaf.](#)

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

From the [Overleaf tutorial](#)

## Table components

`\begin{tabular}{ c c c }` is the beginning of the tabular environment and `{ c c c }` indicates that I am building a table with three columns.

The elements within each cell are to be centered (l and r are also options).

The elements of each row are separated by a `&`, and you need to put `\\` at the end to skip to the next row, if it exists.

You can add as many rows as you like.

# Tables

If you want the columns separated by vertical lines, you can specify it by adding | in between the c's:

```
\begin{center}
\begin{tabular}{|c|c|c|}
\hline
cell1 & cell2 & cell3 \\
cell4 & cell5 & cell6 \\
cell7 & cell8 & cell9 \\
\hline
\end{tabular}
\end{center}
```

🔗 [Open this example in Overleaf.](#)

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

From the [Overleaf tutorial](#)

# Tables

For horizontal lines, just insert `\hline` in between rows. You can add as many of them as you want.

Col1	Col2	Col2	Col3
1	6	87837	787
2	7	78	5415
3	545	778	7507
4	545	18744	7560
5	88	788	6344

# Tables

The code for the table on the previous slide looks like this:

```
\begin{center}
\begin{tabular}{|c c c c|}
\hline
Col1 & Col2 & Col2 & Col3 \\\ [0.5ex]
\hline\hline
1 & 6 & 87837 & 787 \\\
\hline
2 & 7 & 78 & 5415 \\\
\hline
3 & 545 & 778 & 7507 \\\
\hline
4 & 545 & 18744 & 7560 \\\
\hline
5 & 88 & 788 & 6344 \\\ [1ex]
\hline
\end{tabular}
\end{center}
```

➔ [Open this example in Overleaf.](#)

From the [Overleaf tutorial](#)



## Table generator

For quickly getting the basic syntax for a table, I recommend the [Table Generator](#) (or ChatGPT).

	A	B	C	D
1	1	2	3	4
2	5	6	7	8
3	a	b	c	d
4	e	f	g	h

Generate

Result (click "Generate" to refresh)

```

1 \begin{table} □
2 \begin{tabular}{l111}
3 1 & 2 & 3 & 4 \\
4 5 & 6 & 7 & 8 \\
5 a & b & c & d \\
6 e & f & g & h \\
7 \end{tabular}
8 \end{table}

```

You can change and add to the template at will

## Placement

There is a range of parameters that will determine a table's (or figure's) placement. First, you wrap the *tabular* environment into a more generic *table* environment.

After `\begin{table}`, put `[h!]` (*h* stands for *here*) if you want to put the table exactly where it appears in the editor (i.e., exactly after one specific paragraph).

The `!` overrides internal LaTeX parameters. Simply putting `[h]` would merely put the table *here, approximately*.

## Placement options

- ▶ h : place table or figure *here*, approximately
- ▶ t : place table or figure at *top* of the page
- ▶ b : place table or figure at *bottom* of the page
- ▶ p : place table on special *page*
- ▶ ! : override internal LaTeX parameters
- ▶ H : roughly equal to h!; from the *float* package
- ▶ You can put multiple options and only exclude those you definitely do not want

# Tables

If you use a statistical software like R, there is likely a package or add-on that will create LaTeX versions of tables, e.g. of regressions.

You can copy them into your document and adjust them as needed.

An example for R is the [stargazer](#) package.

## Tables

[illegible]

Table 4.3.: Negative Binomial Regression for Personalization in Dutch and German Press Release

	Dependent variable:			
	(1)	(2)	PR with Mentions	(4)
Ideological Distance	0.003 (0.003)	0.003 (0.003)	0.006** (0.002)	0.006** (0.002)
Lagged DV 1	0.003** (0.001)	0.003** (0.001)		
Lagged DV 2			0.006** (0.002)	0.006** (0.002)
Junior	0.158** (0.076)	0.161** (0.077)	0.079 (0.050)	0.080 (0.050)
Total PR	0.023** (0.001)	0.023** (0.001)	0.022** (0.001)	0.022** (0.001)
Netherlands	1.691** (0.182)		0.726** (0.151)	
Constant	1.124** (0.176)	1.976** (0.608)	0.775** (0.139)	1.148** (0.266)
Observations	835	835	835	835
Asusir Likelihood	-7,909.968	-3,614.626	-2,593.115	-2,596.541
Asusir Inf. Crit.	7,235.736	7,245.252	5,035.200	5,339.025
Bayesian Inf. Crit.	-7,272.150	-7,283.071	-5,240.044	-5,246.815

*Note:*

\* $p < 0.1$ ; \*\* $p < 0.05$ ; \*\*\* $p < 0.01$

# Formulas

Inline formulas and equations are written using \$ on each side.

E.g.  $f(x) = x^2$  looks like this in an editor: \$f(x) = x^2\$

Use two \$ at the beginning and end to center equations:

$$f(x) = x^2$$

# Formulas

Another option is to use the equation environment from the amsmath package.

This also adds numbers to equations by default.

$$f(x) = x^2 \tag{1}$$

# Formulas

```
147 ▾ \begin{equation}
148     f(x) = x^2
149 \end{equation}
150
```

Creating an equation in a dedicated environment

Like for sections etc. you can omit the numbering by adding an asterisk, like this: `\begin{equation*}`



## Other expressions

Fractions:  $\frac{1}{x}$  is `\frac{1}{x}`

Integral:  $\int_b^a \frac{1}{3}x^3$  is `\int^a_b \frac{1}{3}x^3`

Sum:  $\sum_{i=1}^n$  is `\sum_{i=1}^n`

You can use as many of these expressions in one equation as you need.

# Aligning

The amsmath package also allows you to align equations using the *align* environment:

$$\begin{aligned} 2x - 5y &= 8 \\ 3x + 9y &= -12 \end{aligned}$$

```
268 \begin{align*}
269 2x - 5y &= 8 \\
270 3x + 9y &= -12 \\
271 \end{align*}
```

## amsmath documentation

Some helpful resources for writing equations:

- ▶ [User's guide](#)
- ▶ [Wikibooks LaTeX/Mathematics](#)
- ▶ [Intro](#) with common expressions
- ▶ [Overleaf tutorial](#)

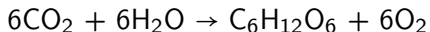
# Formulas

```

173 -----
174 6CO\textsubscript{2} + 6H\textsubscript{2}O $\rightarrow$ C\textsubscript{6}H\textsubscript{12}O\textsubscript{6} + 6O\textsubscript{2}
175

```

becomes



There is an easier way to write chemical equations, see frame 48.

# Bibliographies

## Creating a .bib file

In order to cite works and add a bibliography to the end of your document, you first need to add them to a .bib file in the correct format.

You can do this in Overleaf by creating a new file and naming it with the suffix .bib, e.g. example.bib.

Alternatively, you can also create a .bib file using your text editor of choice, adding references and saving it as with the .bib suffix or export them from reference managers like Zotero (more on that later).

## Adding references

References that are added to a LaTeX file need to be in a specific format.

Luckily, sites like Google Scholar generally have the option of extracting a reference in the proper format; usually labelled as BibTeX.

Then just copy and paste the reference and add it to your .bib file, a.k.a. your bibliography.

## Adding references

×
Zitieren

MLA Einstein, Albert. "The general theory of relativity." *The Meaning of Relativity*. Dordrecht: Springer Netherlands, 1922. 54-75.

APA Einstein, A. (1922). The general theory of relativity. In *The Meaning of Relativity* (pp. 54-75). Dordrecht: Springer Netherlands.

ISO 690 EINSTEIN, Albert. The general theory of relativity. In: *The Meaning of Relativity*. Dordrecht: Springer Netherlands, 1922. S. 54-75.

BibTeX
EndNote
RefMan
RefWorks

```

1 @incollection{einstein1922general,
2   title={The general theory of relativity},
3   author={Einstein, Albert},
4   booktitle={The Meaning of Relativity},
5   pages={54--75},
6   year={1922},
7   publisher={Springer}
8 }
9

```

Access and copy-paste a BibTeX reference

You can change the short name (here: *einstein1922general*) to something else if you don't like the default.



## Bibliography styles

Using the standard BibTeX format, you can cite works by using `\cite{}` in text and choose a bibliography style, see [Bibtex bibliography styles](#).

Standard BibTeX covers styles that use numbering or abbreviations inplace of full names for in-text citations.

# Bibliography styles

In the following example, we use the natbib package to make the bibliography, a sort of add-on standard BibTeX.

To add the bibliography, put `\bibliography{example}` at the end of the document (before `\end{document}`)

There are many different citation and bibliography styles, and each field has its own preferences. You can find an overview [here](#).

You can specify the style by adding e.g.  
`\bibliographystyle{apalike}`, ideally after calling the natbib package.

## Citing in text

Using the natbib package, you can cite works in your text by using `\citet{}` and `\citep{}`.

Different disciplines have different citing standards, but generally, `citet{}` is an “ordinary” citation and `\citep{}` puts the whole reference in parentheses.

E.g. APA style: Einstein (1922) and (Einstein, 1922) respectively.

`\citep{}` can be used to cite multiple works.

## Citing in footnotes

You can either redefine the behaviour of your `\cite` command or use a package like `jurabib` for specific citation behaviour in the Humanities.

```
\jurabibsetup
{authorformat=smallcaps,
commabeforerest,
ibidem=strict,
idem=strict,
titleformat=all,colonsep, % cite always author and title
citefull=first,
lookforgender,
pages=always,
authorformat=firstnotreversed, % Ed.: First name, surname
see, %"Vgl."
super % always as footnote}
```

## Citing in footnotes

You can also use bib styles developed by others or create one yourself (it's actually not that hard!) to change the behaviour of the default cite settings, using the package biblatex.

```
\usepackage[backend=biber, style=mytry-footnote-dw,
edsuper=true,
editionstring=true,
edbyidem=true,
firstfull=false,
namefont=smallcaps,
...
shorthandibid=true,
isbn=false]{biblatex}
```

## Multiple bibliographies

In Humanities, you might need multiple bibliographies – archival and printed sources, manuscript catalogues, research literature and whatnot.

For this you can either use the package `multibib` and define the different bibliographies using the command `\newcites`, e. g.:

```
\newcites{prime,sec,third,fourth,fifth}{Quelleneditionen,
Forschungsliteratur,Handschriften und ungedruckte
Quellen,Inkunabeln und alte
Drucke,Handschriftenkataloge}
```

## Multiple bibliographies

Or you can declare multiple bibliographies in the preamble:

```
\DeclareBibliographyCategory{sec}
\defbibheading{sec}{\section*{Forschungsliteratur}
\newcommand*{\citesec}[3]{\addtocategory{sec}{3}
\cite[1][2]3
```

## Multiple bibliographies

Using the first option looks like this:

Here I am citing a source edition.\citeprime[S.  
230–498]{hegel\_chroniken\_1870}

In the document :

<sup>2</sup>HEGEL (1870), S. 230–498

At the end of the document in the bibliography:

### Gedruckte Quellen

BADISCHE HISTORISCHE COMMISSION (HRSG.): Regesten der Markgrafen von Baden und Hachberg 1050–1515. Bd. 1: Markgrafen von Hachberg 1218–1428. Innsbruck 1900.

BARTSCH, KARL (HRSG.): Konrads von Würzburg Partonopier und Meliur. Aus dem Nachlasse von Franz Pfeiffer. Wien 1871. (Nachdruck mit einem Nachwort von Rainer Gruenter. Berlin 1970).

HEGEL, CARL (HRSG.): Die Chroniken der oberrheinischen Städte. Straßburg 1 (Die Chroniken der deutschen Städte vom 14. bis ins 16. Jahrhundert 8). Leipzig 1870.



## Multiple bibliographies

Using the second option looks like this:

```
Here I am citing research literature.\footnote{Zu
mittelalterlichen Reiseberichten als Gattung
\citesec{vgl.}\}{achnitz_reiseberichte_2012}. ...}
```

In the document :

285 Zu mittelalterlichen Reiseberichten als Gattung vgl. ACHNITZ: Reiseberichte und Geschichtsdichtung. Zu anonymen Pilgerreiseberichten vgl. HUSCHENBETT: Art. Pilgerreiseberichte über Palästina.

At the end of the document in the bibliography:

### Forschungsliteratur

ACHNITZ, WOLFGANG (Hrsg.): Reiseberichte und Geschichtsdichtung. Mit einführenden Essays von GERHARD WOLF und CHRISTOPH FASBENDER, Berlin 2012 (Deutsches Literatur-Lexikon. Das Mittelalter Bd. 3).

# Resources

- ▶ Bibliography management in LaTeX
- ▶ BibTeX bibliography styles
- ▶ Bibliography management with natbib
- ▶ natbib citation styles
- ▶ Jurabib for law and humanities
- ▶ For citations in a document in the form specified by a BibTeX style

## Integration with other bibliography software

You can directly link your Overleaf account to Zotero or Mendeley - but that is a premium feature, unfortunately.

Luckily, there are other ways of combining utilizing LaTeX in addition to other reference management software.

The following example uses Zotero, but most reference managers should work along those same lines.

# Zotero

The easiest way to re-use your Zotero database is to export libraries to BibTeX format (i.e. a .bib file)

To do that, just go to *File* → *Export Library* to create a .bib file that you can then upload to Overleaf or add to your LaTeX editor of choice.

If you only want to export some but not all references, you can select them, then right click and choose *Export...*

## Chapter bibliographies

I do not have personal experience with this, but there is a package called *chapterbib* that allows you to put a select bibliography based on the same `.bib` file after each chapter.<sup>1</sup>

You can find a reproducible example [here](#).

---

<sup>1</sup>It's also possible to create different bibliographies for each chapter.

## Common Issues

- ▶ No capitalization: put curly brackets around either the capitalized letter or the whole word to make sure appears properly in the bibliography
- ▶ ? instead of reference in text: sometimes it takes a while to sync, so best option is to recompile; typo; missing info in reference
- ▶ Style suddenly changes: probably something off with the last reference you added to your .bib file

# Specialist packages

# mhchem

**mhchem** offers a range of tools to write chemical expressions and reactions.

$\text{CO}_2 + \text{C} \longrightarrow 2 \text{CO}$  and  $\text{Sb}_2\text{O}_3$  can be written as

`\ce{CO2 + C -> 2 CO}` and `\ce{Sb2O3}`



## Non-Latin alphabets

Some languages do not require much extra work, and packages like *fontenc* and *inputenc* are enough, for example Greek.

You can see an example [here](#).

## Non-Latin alphabets

Some languages may require you to change the *compiler*. The standard is pdfL<sup>a</sup>T<sub>E</sub>X, but in Overleaf, you can easily change to XeL<sup>a</sup>T<sub>E</sub>X or LuaL<sup>a</sup>T<sub>E</sub>X.

If you're working with multiple languages, it is recommended to additionally use the *polyglossia* package.

Generally, you can create dedicated sections/environments for most languages that also take *direction* into account (left to right or vice versa)

## Non-Latin alphabets

package **allrunes**

- ▶ Germanic Runes: ƿ ʀ ʁ ʂ ʃ ʄ ʅ
- ▶ Anglo-Frisian Runes: ƿ ʀ ʁ ʂ ʃ ʄ ʅ
- ▶ Normal Runes: ƿ ʀ ʁ ʂ ʃ ʄ ʅ
- ▶ Medieval Runes: ƿ ʀ ʁ ʂ ʃ ʄ ʅ

# Non-Latin alphabets

## Middle High/Low German(ic) characters

- ▶ Superscripts, with `\usepackage[safe]{tipa}`
  - ▶ zů mînem brüder
  - ▶ r<sup>e</sup>ömsche künge
- ▶ Special characters:
  - ▶ þǷ æ Æ ð Ð, with `\usepackage[icelandic]{babel}` and `\usepackage[T1]{fontenc}`
  - ▶ Use the [symbols list](#) or the xunicode package (with another compiler, XeLaTeX).

## Special fonts

A lot of special fonts are available online – you can even produce documents using **Comic Sans** (with a bit of passion and installation), or **Gothic script**.

## Non-Latin alphabets

Helpful resources:

- ▶ [General overview](#) for multilingual typesetting & polyglossia
- ▶ [Unicode reference list](#)
- ▶ [Change the compiler](#)
- ▶ [Chinese](#): compiler change recommended
- ▶ [Japanese](#): *CJKutf8* package, no compiler change needed
- ▶ [Korean](#): compiler change required

## Evaluation



Scan the code or go here:

<https://k11331.evasys.de/evasys/online.php?p=6L5LE>

Google is your friend – seriously!

It's in no way bad to look for help online. StackOverflow and other forums are particularly useful for LaTeX questions.



Screenshot taken on March 29th 2023, 15:35

- ▶ (Re-)Use templates – your own or other people's (and materials from this course 😊)
- ▶ Overleaf has many [templates](#) and useful [tutorials](#)
- ▶ [Wikibooks](#) on L<sup>A</sup>T<sub>E</sub>X
- ▶ Practice, practice, practice