

WIAI L^AT_EX TASKS

Hands-on exercises for
typesetting academic texts



Imprint

The L^AT_EX Script (version 1.4.2 from May 15th, 2025) has been assembled by the Student Council of the Information Systems and Applied Computer Sciences Faculty (Fachschaft WIAI) at the University of Bamberg.

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First steps with L^AT_EX

This document¹ contains exercises to practically apply learnings from the Fachschaft WIAI's L^AT_EX workshop. The following instructions will equip you with the programs necessary to create documents with L^AT_EX—they are explained in the workshop and the main script. Please, make sure to install the *compiler first* and the *editor afterwards*.

Compiler

Let's start with the compiler. (Seriously!) We will need it to convert our L^AT_EX documents into PDFs. There are different compilers for different operating systems; for example, MikTeX for Windows,² MacTeX for macOS,³ and T_EXLive for Linux distributions.⁴ In case you get to choose, it is best to install the full version with all packages.

Editor

As soon as you have installed the compiler, you can download an editor that you are going to use to write your L^AT_EX documents. Any editor will do (notepad++, Atom, VS Code, etc.). However, for beginners, we recommend using T_EXstudio,⁵ a program that supports you with L^AT_EX-specific features.

Compiling for the first time

Open up the file `main-exercises.tex` in T_EXstudio. It can be found in our project directory. By pressing ►, it is converted into a file called `main-exercises.pdf`. You should be able to find the latter by looking at the project directory in your file explorer. If your installation is not working yet, T_EXstudio will show you an error message. Feel free to contact us in this case.⁶ Otherwise, you are now ready to go!

¹Find the latest version of this document on Github: <https://github.com/fs-wiai/latex-script/releases>

²<https://miktex.org/download>

³<http://tug.org/mactex/>

⁴On Debian-based Linux distributions, install the compiler by executing `sudo apt install texlive-full`. For other distributions, see <https://tug.org/texlive/doc/texlive-en/texlive-en.html#installation>.

⁵You find the latest version on <https://www.texstudio.org/>.

⁶Find us at <https://www.uni-bamberg.de/wiai/fs>.

E2 Structure your document and text

1. In the directory `exercises/basic-document-structure`, you can find a file named `document-structure.tex`. Wrap the text of the file in a `document` environment and add the following preamble.

```
\documentclass{article}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\usepackage[english]{babel}
```

2. In TeXstudio, right click on the file and select “Set as explicit root document.” Next, compile the file.
3. Congratulations! You have created and compiled your first L^AT_EX document. Maybe you have noticed that paragraphs within the text were created by using `\\`. Replace the two backslashes by real paragraphs.
4. It is time to structure your first document. Use the L^AT_EX commands `\section`, `\subsection`, etc. to structure the text. Also, include a table of contents for your document.

Extra tasks: Make it fit your needs

- Add a **title** to the document.
- Make today’s date appear in a **language of your choice**.
- **Hide** one section title in the table of contents.
- Add a **short title** to a different section title.
- Split the text in **two columns** (keyword: `twocolumn`).
- Add a **header** with the title on the right and a **footer** with the page number on the left.
- Try out what changes when you change the **document class**.
- Research the possibilities of traditional⁷ and modern⁸ **beamer presentation templates**.

Modify the content below

1. Beverages

1.1 Pink Lemonade We all know and love it in summer: a cold lemonade. The pink variant of our favorite summer drink is traditionally achieved by adding food coloring to the lemonade. However, we changed things up a little and decided to go for a variant with berries instead of food coloring, which also makes the drink less sour.

1.1.1 Ingredients For making the lemonade we need 400 g of berries. You can use either frozen or fresh ones. You can, of course, adjust the choice of berries to

⁷<https://hartwork.org/beamer-theme-matrix/>

⁸<https://gitlab.cs.fau.de/i4/tex/i4neo>

your likings: raspberries, blueberries, blackberries, or a mixture work excellently for making the lemonade.

To make the drink sweeter we use 50 ml of maple syrup. Needless to say, you can also use less, if you want your lemonade to be more sour. By the way, other sweeteners, such as agave syrup, or coconut sugar also work fine.

Additionally, we need the juice of four freshly-squeezed lemons, one litre worth of cold water and 400 g of ice cubes to keep the drink cold.

1.1.2 Instructions Put the berries along with the maple syrup into a large bowl and cook them at medium-high heat for around three to four minutes. When the berries start to soften, reduce the heat a little. Now mash the berries with the end of a wooden spoon until there are almost no big chunks anymore. The less chunks the better!

Place a sieve over the container that you want to store the lemonade in. Put the berries into the sieve. With the end of the wooden spoon, try to press out as much liquid of the berry mixture as possible. Let the juice sit until it is completely cold.

When the liquid is cold, add the lemon juice, the cold water, and the ice cubes and stir everything.

Your lemonade is now ready to enjoy!

1.2 Hot Chocolate Coming soon!

2. Breakfast

2.1 Buckwheat Porridge Coming soon!

E3 A structured project

Within the directory `exercises/project-structure` you can find the file `main.tex`.

Modify the content below

1. Put the sections of the file into separate files, named `section1.tex` and `section2.tex`. Include them using the `\input` command. (In TeXstudio, make sure that you select the main file as the file to be compiled by right-clicking on it and selecting “Select as explicit root document.”)
2. Can the preamble also live in its own file? Find out by moving it analogously to the sections. If no, why? If yes, why can outsourcing the preamble be useful?

E4 Insert special characters

For this task, we are using the file `exercises/special-characters.tex`. To be able to see your results here within the exercise script, compile the `main-exercises.tex` file. This applies for the subsequent tasks, as well.

1. Replace the spaces within abbreviations (e. g., i. a.) by thin spaces.
2. Replace the hyphens within the Erba opening hours by en dashes.
3. Add quotation marks around the words *Studi-Ticket* and *Studi-Karte* using the `\enquote` command.

Modify the content below

What is a semester ticket? It is also known as Studi-Ticket or Studi-Karte and allows you to use the local public transport around Bamberg for free. In Bamberg, your student card (Studierendenausweis) is used, i. a., as a semester ticket. To be able to use it, you should validate the student card in one of the university buildings. This is possible after you have paid the semester fees. Validation printers are located in multiple university buildings, e. g., in the foyer of the Erba building, in front of the library. This building is opened Monday - Friday, 7am - 10pm.

E5 Emphasising text

1. In `exercies/text-markup/markup.tex`, emphasize the words “recursion” and “recursive.”
2. Make the URL clickable.
3. Of course, you can also experiment with the other commands that you learned for text markup. However, you might want to remove them afterwards to keep your document nice and tidy.

Modify the content below

“Recursion (adjective: recursive) occurs when a thing is defined in terms of itself or of its type. Recursion is used in a variety of disciplines ranging from linguistics to logic. The most common application of recursion is in mathematics and computer science, where a function being defined is applied within its own definition.”

Source and more information: <https://en.wikipedia.org/wiki/Recursion>

E6 Adding enumerations

Format the recipe you can find in `exercises/lists/lists.tex` as an unordered list (`itemize`) with sub-lists *Ingredients* and *Instructions*. Within these, there shall be an unordered list of ingredients and an ordered list of instructions, respectively.

Extra tasks: Special enumerations

- Try using **Roman numerals** in the ordered list.
- Make the ordered list **start at 7** (keyword: `\setcounter`).
- Reduce the **white space** between the items in the unordered list.

Modify the content below

Ingredients: 400 g berries, 50 ml maple syrup, 4 lemons, 1 l cold water, 400 g ice cubes

Instructions: Boil and shred the berries, add maple syrup, squeeze the lemons and add their juice, add the remaining ingredients, scramble thoroughly

E7 Typesetting mathematics

Use L^AT_EX's math mode to typeset the following formulas. Pay attention to the size of brackets. Prioritize those formulas that appear to be most useful and/or interesting to you.

Modify the content below

Replace this graphic by the corresponding formulas:

Gravitational acceleration in Germany

$$9,81 \frac{m}{s^2}$$

pq formula

$$x_{1,2} = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$

Quadratic formula

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Catalan numbers

$$C_n = \frac{1}{n+1} \binom{2n}{n} = \frac{(2n)!}{(n+1)!n!}$$

Definition of a factorial

$$n! = \prod_{i=1}^n i$$

Set of all odd natural numbers

$$\{x \mid x \in \mathbb{N}, \text{odd}(x)\}$$

Elimination $\neg\exists x$

$$\neg\exists x.p(x) \Leftrightarrow \forall x.\neg p(x)$$

E8 Inserting graphics

In the `exercises/graphics` directory you can find an image file `latex-logo.png`. Insert the image into the `exercises/graphics/graphics.tex` file. Make sure that the image is placed exactly where you have specified it. On top of that, the picture shall be centered, and a caption shall be added. Adapt the image width to the text width (`\textwidth`). On top of that, add a caption to the image.

Modify the content below

Please insert the image here.

E9 Typesetting tables

The following list shows some key data about a few courses of the WIAI faculty. However, the overview is not as clear as it could be. To improve it, convert the list into a table with columns for *name*, *abbreviation* and *term*. Insert an additional *centered column* that numbers the courses. Add a caption to the table. You find the table in `exercises/tables/tables.tex`.

Modify the content below

- Foundations of Software Engineering
abbreviation: SWT-FSE-B
term: summer
- Information Retrieval
abbreviation: MI-IR-M
term: summer
- International Outsourcing Management
abbreviation: ISM-IOM-M
term: winter

E10 Footnotes and references

1 Inserting footnotes

Make the text “released in September 2023” of the file `exercises/footnotes/-footnotes.tex` appear as a footnote instead of in parentheses. Additionally, insert a clickable URL to the Java Development Kit as footnote:
`https://www.oracle.com/java/technologies/javase-downloads.html`

Modify the content below

Java is an object-oriented programming language that appeared in 1995. The most recent long-term support version of the programming language is Java SE 21 (released in September 2023). In order to write Java programs, one needs to install the so-called *Java Development Kit (JDK)*. Java programs can be written independently from the operating system that one uses.

2 Inserting references

In file `exercises/references/references.tex`, replace “in the figure” and “the following source code listing” with suited references. Use the command `\cref`. Do not forget to first introduce labels for the elements that you want to reference. Make sure to use suitable prefixes before the labels.

For source code listings, adding labels and captions is a bit different. Try to apply the knowledge you gained so far to retrieve the correct version of the command.

Modify the content below

C# is an object-oriented programming language that was developed by Microsoft in 2011. In the figure we can see the logo of the programming language.



Figure 1: The logo of C#

The following source code listing shows a program that prints the text “Hello LaTeX friends!” to the console. Like Java, C# makes use of classes and main methods to build executable applications.

```
public class HelloLaTeXFriends {  
    public static void Main() {  
        System.Console.WriteLine("Hello_LaTeX_friends!");  
    }  
}
```

E11 Listings

In the folder `exercises/source-code-listings`, you will find a file called `Source.java`. We will now include it into our document and adjust its display to fit our needs. If you have questions, consult the `minted` or `listings` package documentation.

Minted tasks

1. Include the file into
`exercises/source-code-listings/source-code-listings.tex`.
2. Enable special characters via the `literate` option.
3. Activate syntax highlighting by stating the programming language Java.
4. Add line breaks and line numbers.
5. Use the theme `native`.
6. This theme is optimized for a dark background. Change the background color to dark blue.
7. Include only lines 5 to 7.
8. Delete the spaces at the beginning of the lines. (Hint: The documentation speaks of `autogobble`.)

Listings tasks

1. Include the file into
`exercises/source-code-listings/source-code-listings.tex`.
2. Activate syntax highlighting by stating the programming language Java.
3. Set the `basicstyle` to a proper mono-spaced font (`\ttfamily \small`)
4. Add line numbers.
5. Change the keyword color to blue.
6. Don't show special characters for spaces in strings.

Modify the content below

Your listings go here.

E12 Creating and inserting references

1. Create a new BibTeX file called `literature.bib` in the `exercises/literature` folder.
2. Use Google Scholar or `dblp.org` to retrieve BibTeX entries for the following L^AT_EX handbooks:
 - Dilip Datta (2017): L^AT_EX in 24 Hours. A Practical Guide for Scientific Writing.
 - Frank Mittelbach / Michel Goossens (2010): Der L^AT_EX-Begleiter.
3. Add the BibTeX entries to the newly created BibTeX file.
4. Assign unique and meaningful BibTeX keys.
5. Add the bibliography file to the project's preamble.
6. Make use of the `alpha` bibliography style.
7. Cite the two handbooks in the file `exercises/literature/literature.tex`.
8. Ensure that the bibliography is listed.

Note: If compiling fails, it may help to remove all auxiliary files (`main.aux/bbl/blg/loc/out/pdf/soc/toc`) before compiling again.

Modify the content below

An introductory L^AT_EX course can be found in “L^AT_EX in 24 Hours” (Datta, 2017). There is a plethora of further handbooks (e.g., Goossens, Mittelbach and Samarin, 2002).

Literatur

[Datta 2017] Datta, Dilip: LaTeX in 24 Hours - A Practical Guide for Scientific Writing. Springer, 2017. <http://dx.doi.org/10.1007/978-3-319-47831-9>. – ISBN 978-3-319-47830-2

[Goossens u. a. 2010] Goossens, Michel ; Mittelbach, Frank ; Samarin, Alexander: Der LaTeX Begleiter. Addison-Wesley, 2010. – ISBN 978-3-8273-7044-0