

# Master's Thesis

This Shall be a Great Thesis Paper with an  
Extremely Long Title but who Cares because it is  
just an exemplary title

A Master's Thesis presented to the faculty Konstruktions-, Produktions- und  
Fahrzeugtechnik, University of Stuttgart, in partial fulfillment of the requirements  
for the degree of Master of Science (M.Sc.)

submitted by

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Submitted on: 8th April 2016

Institute for Control Engineering of Machine Tools and Manufacturing Units,  
University of Stuttgart.

April 2016



# Masterarbeit

Dies soll ein langer Titel der Arbeit sein damit er  
extra lang ist aber das macht ja niemandem  
etwas aus

Manche Arbeiten haben sogar Untertitel (und das sogar nur in Deutsch)

Eine Masterarbeit zur Vorlage an der Fakultät Konstruktions-, Produktions- und  
Fahrzeugtechnik, Universität Stuttgart, zur Erlangung des akademischen Grades  
Master of Science (M.Sc.)

eingereicht von

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April 2016



# Eklärung des Autors

Hiermit versichere ich, Maschinen Bauer, Autor der vorliegenden Masterarbeit mit dem Titel

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1. Dass ich meine Arbeit bzw. bei einer Gruppenarbeit den entsprechend gekennzeichneten Anteil der Arbeit selbstständig verfasst habe.
2. Dass ich keine anderen als die angegebenen Quellen benutzt und alle wörtlich oder sinngemäß aus anderen Werken übernommenen Aussagen als solche gekennzeichnet habe.
3. Dass die eingereichte Arbeit weder vollständig noch in wesentlichen Teilen Gegenstand eines anderen Prüfungsverfahrens gewesen ist.
4. Dass ich die Arbeit weder vollständig noch in Teilen bereits veröffentlicht habe.
5. Dass das elektronische Exemplar mit den anderen Exemplaren übereinstimmt.

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Datum

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Autor



# Abstract

The thesis abstract must not be longer than one page and there must still be room for the keywords given by \keywords{a, list, of, keywords}.

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

**Keywords:** a, list, of, keywords





# Zusammenfassung

Die Zusammenfassung der Arbeit darf nicht länger als diese eine Seite sein und es muss noch Platz sein für die Stichwörter angegeben mittels `\keywords{a, list, of, keywords}` bzw. in Deutsch `\keywords{eine, Liste, von, Schlagwörter}`.

Quisque ullamcorper placerat ipsum. Cras nibh. Morbi vel justo vitae lacus tincidunt ultrices. Lorem ipsum dolor sit amet, consectetur adipiscing elit. In hac habitasse platea dictumst. Integer tempus convallis augue. Etiam facilisis. Nunc elementum fermentum wisi. Aenean placerat. Ut imperdiet, enim sed gravida sollicitudin, felis odio placerat quam, ac pulvinar elit purus eget enim. Nunc vitae tortor. Proin tempus nibh sit amet nisl. Vivamus quis tortor vitae risus porta vehicula.

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Suspendisse vel felis. Ut lorem lorem, interdum eu, tincidunt sit amet, laoreet vitae, arcu. Aenean faucibus pede eu ante. Praesent enim elit, rutrum at, molestie non, nonummy vel, nisl. Ut lectus eros, malesuada sit amet, fermentum eu, sodales cursus, magna. Donec eu purus. Quisque vehicula, urna sed ultricies auctor, pede lorem egestas dui, et convallis elit erat sed nulla. Donec luctus. Curabitur et nunc. Aliquam dolor odio, commodo pretium, ultricies non, pharetra in, velit. Integer arcu est, nonummy in, fermentum faucibus, egestas vel, odio.

**Stichwörter:** a, list, of, keywords



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# User Documentation

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*In this chapter, the user will get a general introduction to using the thesis template and will be enabled to start his/her work. Further information is given in the subsequent chapters. But don't be afraid, there is no need for you to read through all of it before starting your work. Instead, you might find it useful to just look at the table of contents and decide which sections you need to look at later when looking for a solution to a problem.*

---

## 1.1 Introduction

### 1.1.1 Target Users

Writing a good thesis can be cumbersome if you have never done it before. Even for experienced researches having published a sum of papers, writing up a thesis is not the same. Without underestimating the complexity of writing a thesis, it is cumbersome to get it all nicely wrapped up and in layout that is consistent from start to end. This thesis template tries to fill the gap between content and layout by providing you with certain commonly used packages and styles set to have a consistent layout that you don't have to bother about maintaining.

### 1.1.2 Features of the Class

With this thesis template you write a simple, nicely typeset thesis without the hassle of needing to configure it such that it suits the needs of your department (it should have applied all the necessary style guidelines already).

### 1.1.2.1 Packages Loaded

All the packages loaded and pre-configured by this class are listed below in their order of loading.

- xparse
- etoolbox
- ifthen
- ifdraft
- xkeyval
- xparse
- scrbook
- babel
- sclayer –scrpages
- xspace
- isodate
- lmodern
- amsmath
- amssymb
- float
- setspace
- geometry
- epsfig
- graphicx
- tikz
- pgfplots
- tikz –3dplot
- multirow
- xcolor
- xcolor –solarized
- bm
- titlecaps
- multicol
- colortbl

- tabu
- booktabs
- ragged2e
- nicefrac
- cancel
- siunitx
- marginnote
- footmisc
- listings
- paralist
- caption
- subcaption
- appendix
- todonotes
- etex
- ucs
- lastpage
- mathtools
- empheq
- rotating
- enumitem
- amsthm
- minibox
- nth
- acronym
- flushend
- natbib
- dcolumn
- eurosym
- url
- hyperref
- cleverref

- glossaries
- scrhack

### 1.1.2.2 Class Options

**Table 1.1:** *A brief, to be extended, summary of class options. Defaults are given in slanted text.*

Option	Comment
online	Renders document for online viewing i.e., highlights anchors
print	Renders document for offline viewing i.e., no highlighted anchors
<i>draft</i>	Set document into draft mode
final	Set document into final mode (last thing to be done before handing it in)
coloredtables	Automatically colors the table rows in alternating colors
<i>english</i>	Set document's main language to English
german	Set document's main language to German
<i>a4paper</i>	Typeset A4 paper size
a5paper	Typeset A5 paper size
letter	Typeset letter paper size
oneside	One-sided printing
<i>twoside</i>	Two-sided printing
bachelorproject	Typeset a bachelor's project thesis
bpa	Typeset a bachelor project thesis
description-bachelor	Typeset a bachelor's thesis' description
description-bsc	Typeset a bachelor's thesis' description
<i>bachelor</i>	Typeset a bachelor's thesis
ba	Typeset a bachelor's thesis
description-master	Typeset a master's thesis' description
description-msc	Typeset a master's thesis' description
study	Typeset a master's study thesis
sa	Typeset a master's study thesis
master	Typeset a master's thesis

*Continued on next page*

**Table 1.1:** *A brief, to be extended, summary of class options. Defaults are given in slanted text.*

Option	Comment
msc	Typeset a master's thesis
diplom	Typeset a diploma thesis
da	Typeset a diploma thesis
doctorate	Typeset a doctoral thesis
phd	Typeset a doctoral thesis
report	Typeset a report
requirement	Typeset a product requirements document
requirements	Typeset a product requirements document
specification	Typeset a functional specification document
specifications	Typeset a functional specification document

### 1.1.3 How to Get Started

In order to get your thesis started, there is a few things necessary to set up. One of them being obviously the choice of a good typewriting environment. The list out there for writing your thesis is longer than it should be so we will just briefly mention some of the most common editors (both IDE and simple text editors). Choose by your own needs

#### 1.1.3.1 Configure Editor and System Settings

You must choose a L<sup>A</sup>T<sub>E</sub>X distribution and an editor. For a list of editors, please refer to or the following list (which is only an excerpt from the SO page). We prefer TeXstudio even though its implementation of using some keys can be cumbersome at times.

#### Emacs with AUCTeX

- *Platforms:* Windows, Mac (incl. Aquamacs fork), Unix
- *License:* Free software (GPL)
- *Languages:* de, dk, fr, is, it, jp, nl, pl, se, sk are supported by AUCTeX language styles
- *Unicode:* Yes, from Emacs 23, characters are represented using Unicode
- *RTL/bidirectional support:* From Emacs 24, through bidi-mode
- *% !TEX directives:* No, but has several realizations of file local variables
- *Syntax highlighting:* Yes, customisable through customize and Elisp

- *Code completion*: Yes, via Emacs Predictive Completion, which supports AUCTeX without further configuration
- *Code folding*: Yes
- *Spell checking*: Yes
- *SyncTeX*: Yes
- *Built-in output viewer*: Yes
- *Project management*: org-mode, reftex-mode, speedbar

### Vim with LaTeX-suite

- *Platforms*: Windows, Mac, Linux and others
- *License*: Open Source Charityware
- *Languages*: ?
- *Unicode*: Yes
- *RTL/bidi support*: partially
- *% !TEX directives*: No, but has modelines
- *Syntax Highlighting*: Yes, customizable
- *Code Completion*: Yes (using Omni Completion, extendable with SnipMate plugin)
- *Code Folding*: Yes
- *Spell Checking*: Yes
- *SyncTeX*: Yes, see e.g. this question
- *Built-in Output Viewer*: No
- *Project Management*: ?

### Texmaker

- *Platforms*: Windows XP/Vista/7/8, OS X 10.5+, Linux
- *License*: GPL license, free
- *Languages*: cs, de, el, en, es, fa, fr, gl, hu, it, nl, pl, pt, pt (bra), ru, se, sr, zh (cn), zh (tw)
- *Unicode*: Yes
- *RTL/bidi*: ?
- *% !TEX directives*: No
- *Syntax Highlighting*: Yes, customizable
- *Code Completion*: Yes, customizable



- *Code Folding*: Yes
- *Spell Checking*: Yes
- *SyncTeX*: Yes
- *Built-in Output Viewer*: Yes, supports PDF
- *Project Management*: Yes

### TeXstudio (formerly TexMakerX)

- *Platforms*: Windows XP/Vista/7, OS X, Linux, FreeBSD
- *License*: GPL v2
- *Languages*: cs, de, en, es, fr, hu, ja, pt\_BR, zh\_CN
- *Unicode*: Yes
- *RTL/bidi*: ?
- *% !TeX directives*: Yes
- *Syntax Highlighting*: Yes, customizable
- *Code Completion*: Yes, customizable and auto-customized
- *Code Folding*: Yes
- *Spell Checking*: Yes
- *SyncTeX*: Yes
- *Built-in Output Viewer*: Yes, supports PDF
- *Project Management*: Yes

### TeXworks

- *Platforms*: Windows XP/Vista/7/8, OS X, Linux all pre-compiled plus source available
- *License*: GPL
- *Languages*: en, af, ar, ca, cs, de, fa, fo fr, it, ja, nl, ko, pl, pl, ru, sl, tr zh
- *Unicode*: Yes
- *RTL/bidi*: Yes
- *% !TEX directives*: Yes
- *Syntax Highlighting*: Yes, regex-based
- *Code Completion*: Yes, customizable based on 'known entry' list
- *Code Folding*: No
- *Spell Checking*: Yes, but have to install by hand

- *SyncTeX*: Yes
- *Built-in Output Viewer*: Yes, PDF (Poppler-based)
- *Project Management*: No

### TeXnicCenter

- *Platforms*: Windows XP/Vista/7/8
- *License*: Open Source
- *Languages*: English, German, more dictionaries for spelling control downloadable
- *Unicode*: Yes (in version 2, which was released mid-september 2013).
- *RTL/bidi*: ?
- *% !TEX directives*: No
- *Syntax Highlighting*: Yes, customizable (also background colour)
- *Code Completion*: Yes
- *Code Folding*: Yes
- *Spell Checking*: Yes
- *SyncTeX*: Yes
- *Built-in Output Viewer*: No. You can config TeXnicCenter to use an external PDF viewer like Acrobat Reader or SumatraPDF with synchronized viewing.
- *Project Management*: Yes

#### 1.1.3.2 Configuring the Document

Configuring your document to work should be quite easy. Once you open the file given to you by your supervisor (`thesis.tex`) you will find some pre-defined values for the documentclass. These need not be changed before you are actually submitting your thesis. Further down you will find several commented commands, namely

- `\title{}` Your thesis title as chosen by you and your advisor.
- `\subtitle{}` Theses may also have subtitles which can be set using this command.
- `\date{}` The date that you will be handing in your thesis.
- `\author{}` Your name. Obvious, right?
- `\matriculation{}` Your matriculation identification.
- `\examiner{}` The professor being the final examiner of your thesis.
- `\supervisor{}` Whoever helped you with the thesis. If you had multiple supervisors e.g., from a university and a company then you can separate them using. `\and` to have them type set correctly on the title page.

- `\partner{}` Name of the partner department of company that enabled your thesis.
- `\renewcommand{partnerlogo}{logo-partner}` Path to your partner's logo which will be placed on the very top of the title page next to the university's logo.

### 1.1.3.3 Start Writing your Content

## 1.2 Conventions, Settings, Typesetting, etc.



## Style Guide

---

*In order to ensure consist style throughout your thesis and throughout all theses handed in at the department, there is a set of styles that has to be obeyed to. If you use  $\text{\LaTeX}$ , there is not so much for you to think of (as the most styles are already set automatically by the style sheet and typeset by  $\text{\LaTeX}$  itself), but if you are using any other word processing tool and want to recreate this thesis, follow these guidelines in recreating the layout.*

---

### 2.1 Typography

According to the definition on Wikipedia, typography can be defined as:

Typography is the art and technique of arranging type to make written language readable, appealing, and legible when displayed. The arrangement of type involves selecting typefaces, point size, line length, line-spacing (leading), letter-spacing (tracking), and adjusting the space within letters pairs (kerning).

### 2.2 Figures

Whether figures are used to visualize data acquired somehow (through simulation or experiments) or to show examples of applications, figures are an important part to every thesis. Besides what a figure must show, typesetting figures is also important.

Figures must always be centered on the page i.e., the distance left and right of the image must be equal (in terms of the printable area, not the page dimensions). To quickly accomplish this, use `\centering` as the very first command after you have opened a new figure (or subfigure) environment.

Make sure to set the width of your figure explicitly with the `width=` option to the `\includegraphics[]{}` command when including an image or to set the lengths `\figurewidth` and `\figureheight` when including figures that have to be type set i.e., TikZ pictures.

When setting the width of your figures, make sure to not enlarge them i.e., do not print them larger than they were designed for. A good estimate to the actual size of a picture in cm can be to multiple the number of pixels by 72. On the other hand, do not shrink images too much otherwise you run into troubles with text written onto them.

Figure heights are limited to  $0.5\text{\texttt{\textbackslash textheight}}$  in order to not stretch them past half the page (no one wants to see a figure that is taller than half a page). If you happen to have images at odd dimensions and are not sure whether they will fit the available space, use the `keepaspectratio` option together with `width=\linewidth` and `height=0.5\texttt{\textbackslash textheight}`. L<sup>A</sup>T<sub>E</sub>X will automatically determine the proper dimensions for your image included.

A standalone figure i.e., not part of a subfigure (matrix), must be set to a maximum width of  $0.75\text{\texttt{\textbackslash linewidth}}$  to not stretch it farther than the line width, the height can be chosen arbitrarily.

Figures can also be arranged in subfigures but no more than two per row. You can achieve this by setting each subfigure's width to be no larger than  $0.475\text{\texttt{\textbackslash linewidth}}$ , the height can be chosen arbitrarily.

It's always best to use scalable graphics which will not be over- or undersampled when integrated into a document. This means, that you should use vector graphics wherever possible i.e., `*(e)ps` or `*.tikz` files.

Captions are a must to every figure and subfigure. These need to be placed below the image and must be self-explanatory so that the figure can be understood without its reference in the text. Not sure if your caption is too detailed or too short? Rule of thumb: Try to present the table or figure so that it would make sense even if ripped from the paper. Additionally, do not be afraid to use lengthy figure captions over confusing or incomplete ones.

Having a caption that is too long for the list of figures? There's an easy way to circumvent long captions in the list of figures: usage of the optional `lof-caption` argument to the `\caption` command which looks like `\caption[This short caption shows up in the list of figures or tables, respectively]{While this very long long caption actually shows up under the caption just to show that it would be too long and spans multiple lines in the list of figures or tables, respectively.}`.

Do not crowd a table or figure, neither within itself nor within your text; give it room to breathe. When it appears amidst your body text, skip at least one line above and below it.

If possible, label the axes of graphs with full words: "Temperature versus time" rather than "T versus t".

Always cite the figure or table if it—or its data—came from a source, using the same citation style that you have used throughout the paper. The most logical place for the citation to appear is at the end of the caption. See Section 5.3 of this manual for a thorough discussion of rules for source citation.

**Listing 2.1:** Sample code for type setting a figure.

---

```

1 \begin{figure}
  \centering
  \includegraphics[%
    width=\linewidth,%
5    height=0.5\textheight,%
    keepaspectratio%
  ]{imagename-without-extension}
  \caption{Note figure captions always end with a fullstop.}
  \label{fig:a-sample-figure}
10 \end{figure}

```

---

Be certain that your legend—that part of the figure where you define any symbols or other visual markers that appear—is readable, clear, and meaningfully placed. As long as it does not overwhelm the rest of the figure, do not be afraid to make the legend large to enhance its readability.

Use footnotes (a simple asterisk to indicate them will do) for explanatory material such as the number of respondents to a survey or the fact that certain values were estimated.

To help you with the proper code for typesetting a figure, refer to Listing 2.1.

## 2.3 Tables

A lot of the guides given in Section 2.2 must be applied to tables as well. However, a few amendments have to be made.

Tables have their caption set above the table content i.e., before `\begin{tabular}`. This is due to the fact that the table caption is used to introduce the content of the table. And it looks better.

If you use any units of properties listed in the table’s body, then specify the units in the column headings. Make especial use of the `\si{}` command to properly set the units.

Spare with rules in your tables. There is no need to have a column rule between every column and a row rule between every row. Lines of demarcation are used to set legend, headers, data, and footnotes apart from one another. Just use two to three rules depending on the style of your table. At least you should be using `\toprule` and `\bottomrule` right after the definition of the columns and after the last row, respectively. If you have a table header, separate it by a `\midrule` from the table’s body.

Footnotes are used to clarify points in the table, or to convey repetitive information about entries. They may be set inside the table body cells or the header cells and shown at the bottom of the page. Footnotes may also be used to denote statistical differences among groups.

Columns can be ragged differently, but spare with mixing the column ragging. Tables are most easily read if all columns are set left. In case you put your table header in the first column and not the first row, you may rag this column right and all other columns left.

Tables, or parts of tables, may be colored, but must be keep to a minimum. A table header may be colored by triggering `\rowcolor{TableHeader}` before giving your definition of the table header. Coloring columns is as easy is using the `\columncolor{color}` command where its syntax is

`\columncolor[<color model>]{<color>}[<left overhang>][<right overhang>]`.

If you need to highlight a single cell, then use the following code snippet to get you started for a left-aligned cell colored in the primary cell highlighting color

`\multicolumn{1}{>{\rowcolor{TableCellHighlight}}}`.

However, there are some caveats to using colored rows as the rows are colored independent of their meaning to the table. Since this approach has some caveats especially when it comes to tables with headers, we provide you with two commands to be run before you are setting tables. The commands are `\tablecolorwithouthead` to trigger the correct colors for tables with out a header and `\tablecolorwithhead` to, obviously, trigger the correct coloring for tables with a header. Additionally, you can use the commands `\theadbegin` and `\theadend` before and after you have defined your table head to trigger the appropriate style changes. To apply an even better header style, use `\thead{arg1}` to type set your table header cells (this is quite similar to HTML's markup for a table).

To help you with proper code for a table, use the code samples from Listings 2.2 and 2.3 which results are rendered in Tables 2.1 and 2.2, respectively.

---

**Listing 2.2:** *Sample code for type setting small table.*

---

```
1 \begin{table}
   \centering
   \caption{First, set the caption, then the table.}
   \tablecolorwithouthead
5   \begin{tabular}{ll} \toprule
      Column 1.1 & Column 2.1 \\
      Column 2.1 & Column 2.2 \\
      \bottomrule
   \end{tabular}
10  \label{tbl:a-sample-table-small}
   \end{table}
```

---

**Table 2.1:** *First, set the caption, then the table.*

Column 1.1	Column 2.1
Column 2.1	Column 2.2



**Listing 2.3:** Sample code for type setting table with a header.

---

```

1 \begin{table}
  \centering
  \caption{This table has its caption above, too, and%
4      has a header and colors and all that fancy%
      stuff (plus a caption that spans multiple lines).}
  \tablecolorwiththead
  \begin{tabular}{lll}%
    \theadbegin%
9      \thead{Col 1} & \thead{Col 2} & \thead{Col 3} \\
    \theadend
      Cell 1.1 & Cell 1.2 & Cell 1.3 \\
      Cell 2.1 & Cell 2.2 & Cell 2.3 \\
      Cell 3.1 & Cell 3.2 & Cell 3.3 \\
14     Cell 4.1 & Cell 4.2 & Cell 4.3 \\
    \bottomrule
  \end{tabular}
  \label{tbl:a-sample-table-large}
\end{table}

```

---

**Listing 2.4:** Sample code for proper typesetting of math equations.

---

```

1 \begin{align}
  E &= mc^2 \quad \label{eq:einsteins-equation}
\end{align}

```

---

**Table 2.2:** This table has its caption above, too, and has a header and colors and all that fancy stuff (plus a caption that spans multiple lines).

Col 1	Col 2	Col 3
Cell 1.1	Cell 1.2	Cell 1.3
Cell 2.1	Cell 2.2	Cell 2.3
Cell 3.1	Cell 3.2	Cell 3.3
Cell 4.1	Cell 4.2	Cell 4.3

## 2.4 Math Equations

In many cases, there will be some math equations in your thesis. Even though  $\text{\LaTeX}$  allows many different formats of inputting your equations, there are preferred environments. One of these, apparently, is the `align` environment which can be used as shown in Listing 2.4 and renders as follows.

$$(2.1) \qquad E = mc^2$$

Do not leave an empty line in your source code *before* or *after* the align-environment. Doing so might create an unwanted page-break – use it only to create a page-break in case you happen to run into too wide spread paragraphs. If you end a paragraph with a math-environment, then it is fine to leave an empty line after such environments but not if you continue the next text block with words like *where*, *in which*, or *with*. In this case you have to think of the math-environment as being a sub-clause. Textual sub-clauses are not separated by a newline from the main clause thus a math-environment must not be separated either.

The same concept applies for `itemize` or `enumerate`-environments.

## The Very First Chapter With a Very Long Title Just to See What it Looks Like Since it Spans Multiple Lines in the ToC

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## Another Chapter

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## 4.1 A First Section

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### 4.1.1 A Sample Subsection

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# The Main Template

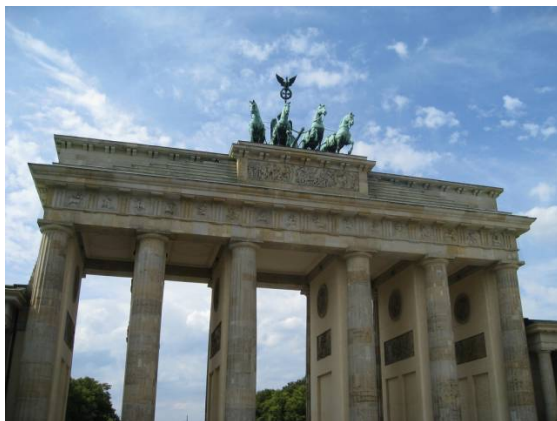
## 5.1 Document Structure

You are free in organizing your document, however, it is recommended that a certain order of chapters is always obeyed to. The chapters must be given in the following order

1. Titlepage
2. Titlepage in second language (in German or English if thesis written in English or German, respectively)
3. Dedication (not mandatory)
4. Copyright (not mandatory)
5. Declaration of Authorship (mandatory only for student theses)
6. Table of Contents
7. List of Figures
8. List of Tables
9. List of Abbreviations (textual abbreviations like e.g., CDPR; not mandatory)
10. List of Symbols (math symbols and alike; not mandatory)
11. Acknowledgments (not mandatory)
12. Abstract (with keywords)
13. Abstract in second language (in German or English if thesis written in English or German, respectively)
14. The main content (separate them by use of `\chapter`)
15. Appendix or appendices
16. Bibliography



**Figure 5.1:** *A sample figure of the New York Hotel at Las Vegas, NV, USA showing the effect of a looooong loooooong caption.*



**(a)** *Picture 1.*



**(b)** *Picture 2.*

**Figure 5.2:** *Even subfigures of two figures are possible and the left one is referenced like (a) so, while the right one is referenced like (b) so.*





(a) Picture 1.



(b) Picture 2.



(c) Picture 3.



(d) Picture 4.

**Figure 5.3:** Even subfigures of four figures are possible.**Table 5.1:** A sample table

Item		
Animal	Description	Price (\$)
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33
Armadillo	frozen	8.99

**Table 5.2:** *Tables can look nice, even for many many data to display*

$m$	$\operatorname{Re}\{\mathfrak{X}(m)\}$	$-\operatorname{Im}\{\mathfrak{X}(m)\}$	$\mathfrak{X}(m)$	$\frac{\mathfrak{X}(m)}{23}$	$A_m$	$\varphi(m) / ^\circ$	$\varphi_m / ^\circ$
1	16.128	8.872	16.128	1.402	1.373	-146.6	-137.6
2	3.442	-2.509	3.442	0.299	0.343	133.2	152.4
3	1.826	-0.363	1.826	0.159	0.119	168.5	-161.1
4	0.993	-0.429	0.993	0.086	0.08	25.6	90
5	1.29	0.099	1.29	0.112	0.097	-175.6	-114.7
6	0.483	-0.183	0.483	0.042	0.063	22.3	122.5
7	0.766	-0.475	0.766	0.067	0.039	141.6	-122
8	0.624	0.365	0.624	0.054	0.04	-35.7	90
9	0.641	-0.466	0.641	0.056	0.045	133.3	-106.3
10	0.45	0.421	0.45	0.039	0.034	-69.4	110.9
11	0.598	-0.597	0.598	0.052	0.025	92.3	-109.3

For figures, the guidelines are:

- Always center images using `\centering` as the very first command of the figure-environment.
- Make sure to set the width of your included images explicitly using the `width=` option. Have a single figure's width set to `width=0.75\linewidth`, while two figures side by side must be set to `width=\linewidth` as long as you set the width of the surrounding minipage or subfigure to `0.49\linewidth`.
- Don't forget to keep the aspect ratio of images if you change their width.
- Never ever under sample images. In other words: never ever enlarge images.
- It's best to use vector graphics i.e., `*.eps` or `*.tikz` for proper quality in both PDFs as well as on screen.
- Add a caption to your image. Captions must be below the image.
- Let the labels be handled automatically by L<sup>A</sup>T<sub>E</sub>X. A best practice is to set the prefix of figures' labels to `fig:`.
- For a good example see Fig. 5.1 and its code at ?? (this reference was created using the `\cref{}` command).
- Always add a full stop to your figure captions like so.
- Do not be afraid to use lengthy figure and table captions-better that than confusing or incomplete ones.
- Figure and table captions must be elaborative i.e., do not fear having captions that span multiple lines. No really, don't.



- If your table or figure caption is too long in the list of figures or list of tables, respectively, use the short-caption option to `\caption` which looks like `\caption[This short caption shows up in the list of figures/tables]{While this very long long caption actually shows up under the caption just to show that it would be too long and spans multiple lines in the list of figures/tables.}`.
- If your figure or table is essentially the same as or based on another authors, but you recreated or adapted it, it is standard to include the words “Adapted from” or “After” followed by the authors name and a citation at the end of the caption.
- Always cite the figure or table if it—or its data—came from a source, using the same citation style that you have used throughout the paper. The most logical place for the citation to appear is at the end of the caption. See Section 5.3 of this manual for a thorough discussion of rules for source citation.
- Do not crowd a table or figure, neither within itself nor within your text; give it room to breathe. When it appears amidst your body text, skip at least one line above and below it.
- Rule of thumb: Try to present the table or figure so that it would make sense even if ripped from the paper.
- If possible, label the axes of graphs with full words: “Temperature versus time” rather than “T versus t.”
- Be certain that your legend—that part of the figure where you define any symbols or other visual markers that appear—is readable, clear, and meaningfully placed. As long as it does not overwhelm the rest of the figure, do not be afraid to make the legend large to enhance its readability.
- Use footnotes (a simple asterisk to indicate them will do) for explanatory material such as the number of respondents to a survey or the fact that certain values were estimated.

For tables, the guidelines are

- The legend (sometimes called the caption) goes above the Table.
- Units are specified in column headings wherever appropriate.
- Lines of demarcation are used to set legend, headers, data, and footnotes apart from one another.
- Footnotes are used to clarify points in the table, or to convey repetitive information about entries.
- Footnotes may also be used to denote statistical differences among groups.

## 5.2 Coloring

There are a few basic colors that are set for some default coloring of tables and should be used primarily for other things, where applicable. For all the available color commands and a sample of the rendered color, please see Table 5.3.

## 5.3 Referencing

Referencing may be done using `\ref{label}` even though usage of `\cref{label}` is encouraged for that it automatically typesets the appropriate type like **Eqn.** or **Fig.**, **Tbl.**, or **Listing** to whatever is being reference. At the beginning of a sentence, `\Cref{label}` must be used to fully give the referenced type in words. Figure 5.1 refers to a sample figure at the beginning of a sentence, while Fig. 5.1 refers to a sample figure in text.

- Capitalize and write in words the reference object at the beginning of a sentence.
- Otherwise use the abbreviated forms of **Fig.**, **Eqn.**, and **Tbl.** for referencing figures, equations, and tables, respectively.
- Refer to the `cleveref` package documentation at <http://www.ctan.org/pkg/cleveref>.

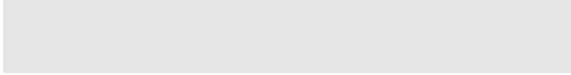








### 5.3.1 Subsection

#### 5.3.1.1 Subsubsection

#### Paragraph

#### Subparagraph

**Table 5.3:** List of available color codes and a sample colored box

Color Code	Color Sample
MainColorVeryLight	
MainColorLight	
MainColor	
MainColorDark	
MainColorVeryDark	
PrimaryColorVeryLight	
PrimaryColorLight	
PrimaryColor	
PrimaryColorDark	
PrimaryColorVeryDark	
SecondaryColorVeryLight	
SecondaryColorLight	
SecondaryColor	
SecondaryColorDark	
SecondaryColorVeryDark	



## ToDos and Known Bugs

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*This is a collaborative lists of ToDos and known bugs in this thesis.*

---

### 6.1 ToDos

This is the comprehensive list of ToDos .

Deal with  
todo list

- Make opening page of environment “Appendix” obey to style rules.
- Ensure that in the appendix, chapters don’t read “Chapter” but “Appendix” (*Fixed in version 0.5.6; XTL*)
- Brief chapter intros have weird distances between upper rule and text and lower rule and text (see this chapter as an example).



## Bibliography





# Appendices





## Some Lengthy Mathematical Equations

### **A.1 First Section of Appendix One**

### **A.2 Second Section of Appendix One**





## Some Lenghty Source Code Listings

### **B.1 First Section of Appendix Two**

### **B.2 Second Section of Appendix Two**

### **B.3 Third Section of Appendix Two**