



**University of Stuttgart**  
Germany

Bachelor's Thesis

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

*Some Theses Even Have Subtitles Which Should Not be as Long as This Subtitle Is Because  
it is too Long*

submitted by

**Maschinen Bauer**

1234567

on

28th August 2015

**Draft**

A bachelor's thesis presented to the faculty

KONSTRUKTIONS-, PRODUKTIONS- UND FAHRZEUGTECHNIK (MASCHINENBAU)

UNIVERSITY OF STUTTGART

in partial fulfillment of the requirements for the degree of

BACHELOR OF SCIENCE (B.Sc.)

*Examiner:*

Jun.-Prof. Dr.-Ing. Andreas Pott

*Major:*

Mechatronik

*Supervisor:*

Dipl.-Ing. Philipp Tempel

Dipl.-Ing. Martin Wehr







Universität Stuttgart

Bachelorarbeit

**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*

eingereicht von

**Maschinen Bauer**

1234567

am

28. August 2015

**Entwurf**

Eine Bachelorarbeit zur Vorlage an der Fakultät

KONSTRUKTIONS-, PRODUKTIONS- UND FAHRZEUGTECHNIK (MASCHINENBAU)

UNIVERSITÄT STUTTGART

zur Erlangung des akademischen Grades

BACHELOR OF SCIENCE (B.Sc.)

*Prüfer:*

Jun.-Prof. Dr.-Ing. Andreas Pott

*Studiengang:*

Mechatronik

*Betreuer:*

Dipl.-Ing. Philipp Tempel

Dipl.-Ing. Martin Wehr





# Abstract

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

# Zusammenfassung

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



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## Todo list





# User Documentation

In this chapter, the user will get a general introduction to the usage of the thesis template and will be enabled to start with his 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).

tion:get-started

### 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

configure-system

#### 1.1.3.1 Configure Editor and System Settings

You must choose a  $\text{\LaTeX}$  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.**

entation:writing

ntation:settings



# Style Guide

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 if (as the most styles are already set automatically by the compiler), but if you are using any other word processing tool and want to recreate this thesis, follow these guidelines in recreating the layout.

typography

## 2.1 Typography

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

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).

ide:figures

## 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  $0.5\text{\texttt{\texttt{textheight}}}$  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=\texttt{linewidth}` and `height=0.5\texttt{textheight}`.  $\text{\texttt{L\texttt{A}T\texttt{E}X}}$  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 `\texttt{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  $0.49\text{\texttt{linewidth}}$ , 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.

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 ?? of this manual for a thorough discussion of rules for source citation.

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.



lst:figure

LISTING 2.1: Sample code for type setting a figure.

```

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

```

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

## 2.3 Tables

uide:tables

A lot of the guides given in ?? 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.

To help you with proper code for a table, use the code samples from ???? which results are rendered in ???? , respectively.

lst:table-small

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

```

1 \begin{table}
2   \centering
3   \caption{First set the caption, then the table.}
4   \begin{tabular}{ll} \toprule
5     Column 1.1 & Column 2.1 \\
6     Column 2.1 & Column 2.2 \\
7     \bottomrule
8   \end{tabular}
9   \label{tbl:a-sample-table-small}
10 \end{table}

```

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

Column 1.1	Column 2.1
Column 2.1	Column 2.2

mple-table-small

lst:table-large

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

```

1 \begin{table}
2   \centering
3   \caption{This table has its caption above, too.}
4   \begin{tabular}{lll} \toprule
5     Column 1 & Column 2 & Column 3 \\ \midrule
6     Cell 1.1 & Cell 1.2 & Cell 1.3 \\
7     Cell 2.1 & Cell 2.2 & Cell 2.3 \\
8     Cell 3.1 & Cell 3.2 & Cell 3.3 \\
9     Cell 4.1 & Cell 4.2 & Cell 4.3 \\
10    \bottomrule
11  \end{tabular}
12 \label{tbl:a-sample-table-large}
13 \end{table}

```

TABLE 2.2: *This table has its caption above, too.*

Column 1	Column 2	Column 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

mple-table-large

## CHAPTER 3

# 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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# CHAPTER 4

## A Second Chapter

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### 4.1 A First Section

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### 4.1.1 A Sample Subsection

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#### 4.1.1.1 A Sample Subsubsection

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**A Sample Paragraph** 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.

**A Sample Subparagraph** 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

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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 needed)
4. Copyright (not needed)
5. Declaration of Authorship (needed only for student theses)
6. Table of Contents
7. List of Figures
8. List of Tables
9. List of Abbreviations (not needed, textual abbreviations like e.g., CDPR)
10. List of Symbols (not needed, math symbols and alike)
11. Acknowledgments (not needed)
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 (in \chapter)



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

ig:sample-figure

tbl:sample-table

TABLE 5.1: *A sample table*

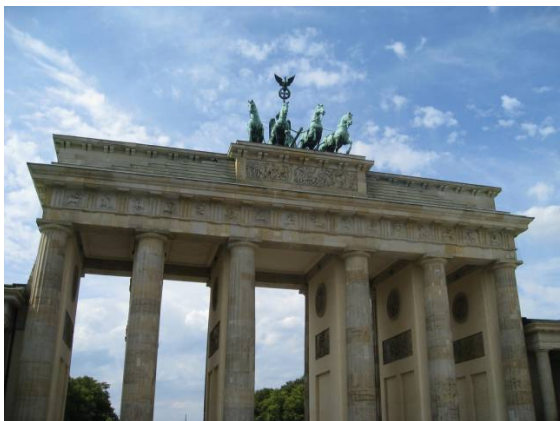
Item		
Animal	Description	Price (\$)
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33
Armadillo	frozen	8.99

15. Appendix or appendices

16. Bibliography

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.



ures-two:1

(A) *Picture 1*  
fig:subfigures-two:2

(B) *Picture 2.*

Figures-two

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



ures-four:1

(A) *Picture 1*  
fig:subfigures-four:2

(B) *Picture 2.*



ures-four:3

(C) *Picture 3*  
fig:subfigures-four:4

(D) *Picture 4.*

Figures-four

FIGURE 5.3: Even subfigures of four figures are possible.

mple-table-large

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

- 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 ?? 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 than confusing or incomplete ones.
- 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 ?? 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.

- very light gray `VLGray`
- light gray `LGray`
- medium gray `MGray`
- dark gray `DGray`
- vary dark gray `VDGray`
- very very dark gray `VVDGray`

## 5.3 Referencing

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. `??` refers to a sample figure at the beginning of a sentence, while `??` refers to a sample figure in text.

- Capitalise 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>

# Appendices







# Appendix One

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

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





## Appendix Two

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

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

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