



First Name and surname, university degree already held, e.g. BSc

**Title and
subtitle of the thesis**
**max.
4 lines**

MASTER'S THESIS

to achieve the university degree of

Diplom-Ingenieur(in)

Master's degree programme: Mechanical Engineering (and Business Economics)

submitted to

Graz University of Technology

Supervisor

University degree, first name and surname of the supervisor
max. 2 lines

Institute of Automotive Engineering
Member of [FSI]

optional field (second supervisor, name of the faculty, etc.)
max. 2 zeilig

Graz, month and year

Restricted access until <month and year>

Acknowledgement

*Note: In the LaTeX template "praeamble" the default value for the page layout is set to "twoside" which layouts the document for **PRINTING** (see below **documentclass** in the praeamble). The consequence is the following: All chapters start at the right side, which is very nice for the printout. Please notice that the "outer" margin is larger than the inner margin (there is no left and right margin for the twoside layout). The reason for that is, when the printout (the thesis book) is opened, the two inner margins add together, therefore the outer margins have been made larger than the inner ones, this improves the appearance. In case that you need to adjust the margins to bind the book, please search for **BCORxmm** in the preamble and adjust the value. It is a good advice to remove the second blank page in the PDF or throw it away after printing. For reading the PDF on the screen, you could change the layout to "oneside" in the praeamble, the difference in the left and right margin looks a bit strange when reading it in "one-page" mode on the screen.*

I would like to thank ...

AFFIDAVIT

I declare that I have authored this thesis independently, that I have not used other than the declared sources/resources, and that I have explicitly indicated all material which has been quoted either literally or by content from the sources used. The text document uploaded to TUGRAZonline is identical to the present master's thesis.

.....
Date

.....
Signature

Abstract

This theses deals with ...

Note: Writing the abstract is one of the most difficult (and important) tasks in your thesis. In your abstract try to answer the following three questions. A typical problem for many abstracts is that when these are not brought across clearly, people outside your field will not understand what it is all about.

- Why did we do it (justify your work, put it into a broader context, wake the interest of the reader)
- What did we do (describe your main results, you can include numbers when appropriate)
- How did you it (mention the experimental/theoretical tools you used)

Please try to limit your abstract to 200-300 words. We will put your abstract in our Yearly Report of the Institute and it needs to be shortened when it is too long. Also for literature reviews, a short and compact abstract has more chances to be found by other people.

Kurzfassung

Diese Arbeit beschäftigt sich ...

Achtung: Das Schreiben des Abstracts ist einer der schwierigsten (und wichtigsten) Teile der Arbeit. Beschreibe die folgenden drei Punkte. Ein häufiges Problem ist, dass wenn diese nicht klar ausgeführt sind, Leute ausserhalb des Fachgebiets den Inhalt der Arbeit nicht verstehen werden.

- Warum habe ich es gemacht ? (Rechtfertige Deine Arbeit, bringe sie in einen größeren Kontext, erwecke das Interesse des Lesers)
- Was habe ich gemacht ? (Beschreibe die wichtigsten Ergebnisse, quantifiziere dies mit Zahlen, wenn möglich)
- Wie habe ich es gemacht ? (Beschreibe die experimentellen/theoretischen Methoden, die verwendet wurden)

Versuche das Abstract auf 200 bis 300 Wörter zu beschränken. Das Abstract kommt in den Jahresbericht des Institutes und müsste dann (suboptimal) gekürzt werden. Auch bei Literaturrecherchen wird deine Arbeit besser gefunden, wenn es kompakt aber interessant beschrieben ist.

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Abbreviations

A	Abkürzung
B	Abkürzung

Symbols

Coordinate systems

\mathcal{O}_g Origin of global coordinate system

Parameters and constants

i imaginary unit

Variables

x Position in x Richtung

Vectors

\mathbf{x}_1 State vector

Matrices

\mathbf{A} Transition matrix

1. Introduction

1.1. Section 1

Figure 1.1 shows bla bla bla as described in [2]¹, ².

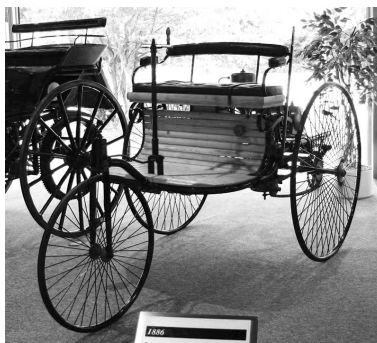


Figure 1.1.: Benz Patent Motorwagen, [1]

It is obvious that, ...

1.2. Examples for citations

- **Book**
On page 11 in [6], Mitschke defines³
- **Journal article**
In the journal article of Evans et al. [4] it is ...
- **Inbook**
Donges [2] defines

¹Always mention the number of the figure AND explain it in the text. The *floating figure* function of LATEX might place the figure somewhere else

²In academic thesis it is enough to cite a picture when you do not own the copyright, however this copyright is necessary when you write an article or a book, then the copyright is usually transferred from you to the publisher

³Books references need to address the corresponding page numbers or chapters in order to allow the reader to find the relevant text.

- **Conference contribution**

In his SAE conference paper of 2009, Jansson [5] shows ...

- Technical report

In the technical report of Young et al. [8] it is ...

- Standard

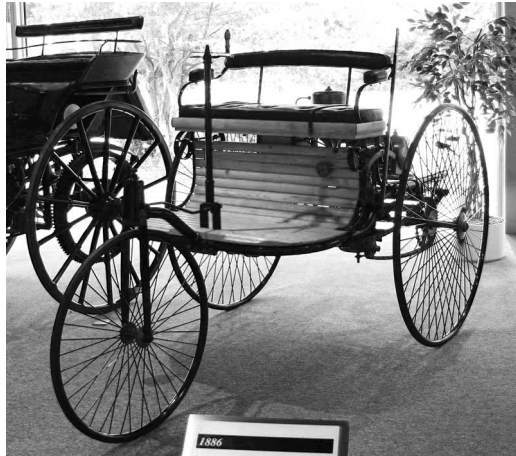
Standard [7] defines ...

- Reference for webpages

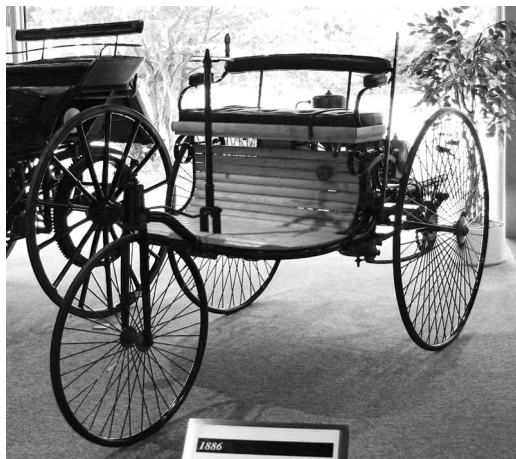
Further information can be accessed in [3].

1.3. Examples for paragraphs

[illegible][illegible]



(b) Bild 2

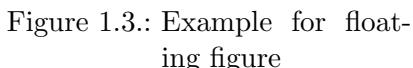


(d) Bild 4

Figures (a) and (b) depict bla bla where (c) and (d) depict bla bla

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2. Methodology

2.1. Section 1

*Note In this chapter, correct writing of equations is explained by examples. It is based on **ISO 31**. Please note that **bold** symbols are usually used in physics for matrices and vectors. However this is not so common in mathematics and control theory. You always have the option to describe the vector or matrix size separately such as written below.*

Vector $\mathbf{x}_k \in \mathbb{R}^4$ denotes the state vector which reads

$$\mathbf{x}_k = [x_k \ y_k \ v_{x,k} \ v_{y,k}]^T, \quad (2.1)$$

where $x_k \in \mathbb{R}$ and $y_k \in \mathbb{R}$ are the positions; and $v_{x,k} \in \mathbb{R}$ $v_{y,k} \in \mathbb{R}$ the velocities. The state vector as defined in (2.1) is ... The relationship between the derivative of the position vector ${}_g\dot{\mathbf{y}}(t) \in \mathbb{R}^n$ and the generalised velocity vector ${}_e\mathbf{z}(t) \in \mathbb{R}^n$ is denoted in

$${}_g\dot{\mathbf{y}} = \mathbf{T}_{ge}(\mathbf{y}) \cdot {}_e\mathbf{z},$$

$$\text{with } \mathbf{T}_{ge} = \begin{bmatrix} \cos \psi & -\sin \psi & 0 & 0 & 0 \\ \sin \psi & \cos \psi & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \end{bmatrix}, \quad (2.2)$$

where $\mathbf{T}_{ge} \in \mathbb{R}^{3 \times 5}$ is the transformation matrix.

3. Results

3.1. Section Figures

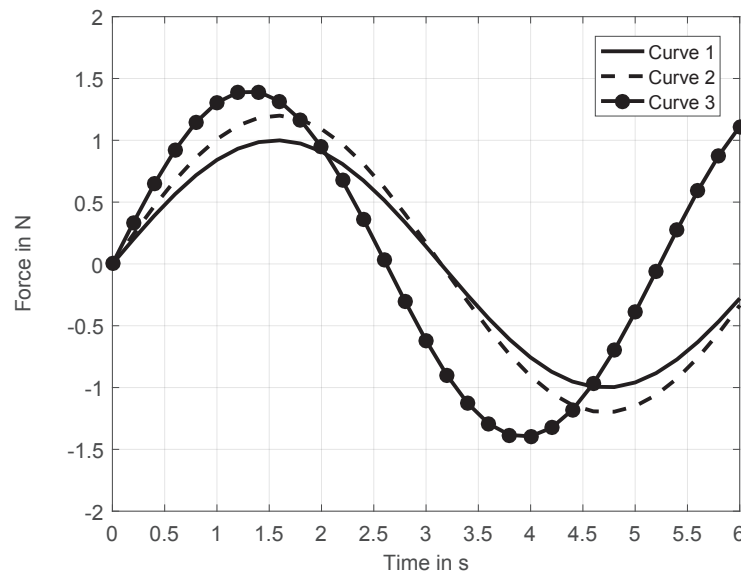


Figure 3.1.: Diagram

In Fig. 3.1 three different measurements are presented.

The following criteria should be applied to figures:

- *The font size of all numbers and text in the figure should correspond to the font size of the text in the thesis.*
- *Figures should be readable in black and white print (use markers and line styles).*
- *Denote all axes and their units.*
- *Use legends when having multiple graphs in your figure.*
- *Be careful when selecting ticks and tick marks.*

3.2. Section 1

Note: The results section shall present results of your experimental/theoretical approach. It is a good practice to objectively describe the outcome of the experiment/simulation and wait for subjective interpretations for the discussion section.

Table 3.1 shows the results of the experiment ...

Table 3.1.: Results of experiment

Time [s]	Result 1 [m]	Result 2 [kg]
1	1	2
2	3	4

3.3. Section Tables

Table 3.2 ...

Table 3.2.: Longtable

Überschrift	Überschrift	Überschrift
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Ende der Tabelle		

4. Discussion

4.1. Section 1

Note: the discussion shall interpret results according to your opinion. Please argument your opinion and do not speculate.

In section 3.2 the most important results were presented and analyzed. If you compare experiment 1 and 23 you see that ... which could be interpreted in the following way: ...

5. Summary

5.1. Section 1

Note: The summary is much more than the abstract. It shall summarize your work in detail. A summary in a master thesis can have 3 pages and more. A often seen method is to summarize your thesis chapter by chapter. It is advisable to write the summary in PAST tense, whete the rest of the thesis should be written in PRESENT tense.

This section summarizes the research on ...

Chapter 1 introduced to the topic and described the main motivation. Driven by global warming, technologies with a low carbon footprint ...

Chapter 2 described the methodical approach to the topic. A single track model was used ...

Chapter 3 described the results of the numerical simulations. It was found that ...

Chapter 4 interpreted the analyzed data. It was found that the correlation between ...

Note: A final statement helps to end your story:

This thesis found a potential for a reduction of fossil fuel by 10 %. ...

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Bibliography

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- [7] Normenausschuß Automobiltechnik. DIN 70010: System of road vehicles - Vocabulary of power-driven vehicles, combinations of vehicles and towed vehicles. Standard, Deutsches Institut für Normung (DIN), April 2001.
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A. Appendix

Note: The appendix contains complementary information which is inconvenient for the reader to place in the main body text. Examples are:

- Derivation of equations who is helpful but not necessary for the understanding of the thesis.
- Plots and graphs which make the data complete, but destroy the readability of the main text.
- Listings of software codes.