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Contributors to the template are welcome. Currently there is no direct input (suggestions, bug fixing, documentation, new features) except from the maintainer himself.

Source
The source code is hosted at https://github.com/pospiech/latex/tree/master/latexthesistemplate. Downloads on www.matthiaspospiech.de contain only the user code including this documentation. The full source is available via the source code repository.

Legal Notes
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User documentation
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2
CHAPTER 1

Introduction

This chapter gives a general introduction to the usage of this template and enables the user to start with the actual work. In the subsequent chapters and other parts of this documentation you will find a wide variety of further information. However, there is no need to read them all. Instead you might find it useful to look at individual sections later, when you are looking specifically for a solution to a problem.

The latest changes in the template are shortly presented in the first section 1.1. The full history can be found in appendix B.

In the second section 1.2 you find a general discussion on the typical user of this template followed by a tutorial (section 1.4) on how to start working with this template. The chapter ends with the introduction of magic comments in section 2.2.

In the next chapter 2 you will find a list of typical questions and answers that are specific for this template followed by a list of known problems in this template (chapter 3). For those who want to change the font in the template there is a short overview on fonts provided in chapter 4.

1.1 Changes in the latest release

These changes were introduced in the latest release:

2018/09 v3.2.5

Minor bug fixes and other changes

- The template failed to compile the \texttt{biblatex} code in the publication list correct. This was due to a change in the code base of \texttt{biblatex}.
- Examples for \texttt{glossaries} were added to the template.
- replaced \texttt{scrpage2} by \texttt{scrlayer-scrpage}

A switch to \texttt{lualatex} is currently not planed. This would mean a major change and would be Version 3.3

See appendix B for all full list of the previous development process of this template.

1.2 Target Users

This template was developed with all sorts of structured documents in mind that require a good citation and reference framework with a customizable layout. It has so far been used for bachelor, master and phd-thesis as well as the thesis of teachers in their practical year. These theses had all a natural science background, which means that also this template
is optimized for the needs of people in natural sciences. Nevertheless it should be easily adaptable to topics in humanities, linguistics or even arts.

Since the code is rather complex one might have objections against this template. Here is a list why there is nevertheless a benefit for all sorts of users.

**Beginners** have the advantage of a ready to use template that covers all major topics. They do not have to load packages therefore and do not need to fiddle with the preamble. This especially saves a lot of time. If the rare case should happen that a modification is necessary the preamble is very well documented. Typical configurations are listed in section 1.4.2.

The other aspect very valuable for beginners is the large list of example codes in part II.

**Advanced \LaTeX users** benefit from all aspects that are listed above for beginners. Furthermore they can make use of all functions and documentation of this template for simple up to extensive modifications. Section 1.3 provides useful information for a start.

Complete different layouts created by significant changes in `preamble/style.tex` and subsequent files could be send to the maintainer of this template for a review and possibly an integration into the template. The same applies for users, who add new functionality to the template that might also be of interest for other users.

**Package authors** can also benefit from this template. The development has shown that it is a valuable project for finding incompatibilities between different packages and for testing of packages in general in a large and complex, but yet realistic project.

This template and its predecessor has been used under the supervision of the maintainer by very early beginners and also advanced \LaTeX users. The experience was that beginners as well as advanced users are more productive with it because ‘it just works’, while the more advanced users additionally know that they can find all options for later modifications because of the code documentation. And some even find bugs . . . .

1.3 Features of the template

This section is structured as follows: section 1.3.1 describes the features and advantages of the template in general, whereas section 1.3.2 summarizes the possibilities for the creation of a document. The subsequent sections provide additional information.

1.3.1 Template features

This template provides a great variety of functionality for creating complex and demanding documents for the user, see section 1.3.2. To provide these the template itself is designed with some special respects:

Separation between function and layout

The packages (functions) are loaded separated from the layout. This makes it possible the exchange the layout of the document while keeping all functionality and makes it easier to test problem without customizations in the layout.
This principle is realized by loading all packages in the file `preamble/packages.tex` and all layout modifications in `preamble/style.tex` and its subsequent files. The only exceptions are packages that are necessary for the template itself and packages that should be configured before using the template, see section 1.4.1

Documentation of the code

All code was included with a minimal documentation. Packages are loaded with a short description and important information about package loading orders (if necessary). The code of the style modifications is also documented to some extent. If a certain code segment should be incomprehensible this should be reported as a bug.

Extensive options

Many packages provide a large number of options. This often means that one has to check the documentation several times for all modifications of the package configuration. To simplify this process this template tries to include all options of a package with a minimal description for each option. This itself is somehow a minimal documentation of a package.

Comprehensive documentation

The documentation of this template is very comprehensive. The code itself is documented as much as possible and necessary. Furthermore this documentation document provides an overview of the features and configuration possibilities (part I), a large collection of \LaTeX application examples (part II) and a complete printout of the code of the template (part III).

Solving Incompatibilities and fixing bugs

Incompatibilities between packages are take into consideration by putting all packages in the correct loading order and by preventing packages to load if this would raise an error.

This is achieved mainly by using commands like `\IfPackageLoaded`, `\IfPackagesNotLoaded`, `\ExecuteAfterPackage`, `\IfFileExists`, `\IfMultDefined` and others mostly defined by the package `templatetools`.

The goal is to let the whole document compile without the inclusion of `preamble/style.tex` and as much as possible to compile without the loading of any or most packages in file `preamble/packages.tex`.

Furthermore the template tries to fix bugs that do not get solved by the package authors. This requires, however, that the problems and its solutions are known. Anyway, this only applies to bugs that do not get solved. In principle all bugs that are encountered are reported to the package authors. It may happen that a bug fix in this template has become obsolete because it was in the meantime fixed in the package. In that case please inform the template maintainer.

1.3.2 Document features

This template provides all methods (commands, environments, work flows) that are required for a complex scientific document. This is realized by loading a large number of relevant and modern packages of \LaTeX. It is difficult to provide a complete list of the resulting features therefore the following lists include only a subset of the most interesting ones.
General
- Automatic detection of document encoding (selinput).
- Support for files with multiple dots, special characters and other pitfalls (grffile).

Math and scientific notations
- Professional math typesetting with a large number of supported symbols and commands using amsmath, mathtools and others.
- Professional display of scientific notations with automated processing of numbers and units and therefore consistent typesetting (siunitx)

Text typesetting
- Multi language support with automatic hyphenation (babel)
- Customizable item and enumeration lists (enumitem)
- Multiple highlighting possibilities (ulem, soul)
- Correct and save display of urls and file path (url)

References
- Enhanced cross-referencing with automatic determination of the type (equation, section, etc.) (cleveref, varioref)

Figure, Images, placement and captions
- Image inclusion (graphicx)
- Figure positioning (flafter, placeins)
- Placement of images inside a paragraph (wrapfig)
- Automatic conversion from eps to pdf (epstopdf)
- Customizable layout of the captions (caption)
- Parallel and stacked layout of multiple images in a single figure with sub-captions (subcaption, floatrow)

Diagrams and scientific plots
- Vector graphics with all features of a professional vector graphics program (pgf, tikz)
- High quality vector based function or data plots in normal or logarithmic scaling (pgfplots, pgfplotstable)

Tables
- Tables with the ability to create them with a professional design (booktabs, tabu, xcolor),
- Table columns with variable width (so called ‘X’ columns) and line break support (tabularx, tabu),
- Multi page tables (tabu, ltxtable),
Citations and Quotes

- Bibliographies and Citations with highly customizable layout with all settings done in \LaTeX{} code. This bibliography system is not only highly customizable but also programmed for the most advanced demands (\texttt{biblatex}).

  Note that all previous packages for bibliographies are incompatible because all their functionality was comprehended in this new package.

- Quotations are typeset in the format of the current language and automatically converted from inline to block quotes. The display of these quotes is customizable (\texttt{csquotes}).

Index, Glossary, Acronym list, Symbol list

- The index created with this template can be modified in several ways and the necessary calls to external programs are automatically done. (\texttt{imakeidx}).

- Several other lists such as Glossary, Acronym list and a Symbol list can be created and special themes for the display are available and can be modified and extended (\texttt{glossaries}).

Code display with syntax highlighting

- Source code can be displayed with word list based syntax highlighting (\texttt{listings}).

Layout

- Most aspects of the layout can be modified due the base classes from koma-script.

- The line spacing can be adjusted in one-half, double or custom spacing (\texttt{setspace}).

- Head and Foot have automatic generated content which can be customized together with the layout of the header and footer (\texttt{scrpage2}).

- The Heading can be fully customized. In this template by default the chapter layout is changed with the provided functions of KOMA-script.

- The page size can be calculated automatically (\texttt{typearea}) or defined in every tiny detail (\texttt{geometry}).

- Many further items can be modified with commands provided by \LaTeX{} itself or any of the packages loaded. All customizations of the layout are done in the file \texttt{preamble/style.tex}.

PDF Features

- Inclusion of complete or partial pdf documents as full pages (\texttt{pdfpages}).

- hyperlinks for all references and citations with backlinks (\texttt{hyperref}).

- Bookmarks in the pdf document (\texttt{bookmark}).
1.3.3 Speed of compilation

Since the preamble of this template is much longer than most other templates the compilation time of the preamble is consequently also longer. This view however is misleading. The compilation time is in the range of 2 to 4 seconds for the preamble\(^1\), however a real document (like a master thesis) with many pictures takes much longer. The templates main file takes about 7 seconds with very few pages. The template documentation with above 200 pages and many pictures takes more than 40 seconds. My own phd-thesis took minutes to compile due to many high resolution pictures. The compilation time of the preamble therefore is in reality negligible or in other words, even though this templates preamble is quote complex it compile fast enough.

The concrete times of each part of the preamble are displayed in fig. 1.1. The code was executed several times and the average of the last three runs was used. This ensures that all files are in the cache of the hard disk or system memory. The execution time was measured with a batch script based on code from stackoverflow.com.

The direct visible result of this survey is, not very surprisingly, that the most complex packages such as \texttt{amsmath}, \texttt{biblatex}, \texttt{glossaries}, \texttt{listings}, \texttt{hyperref} consume most of the time. The loading of \texttt{pgf}, \texttt{tikz} and \texttt{pgfplots} stands out with more than 1000 ms. This can be reduced by removing unused libraries or removing these packages completely, if they are not required.

\footnote{Measured on a Windows System (7, 64 bit) with Intel i5 processor and the file system on a SSD. The times for a standard magnetic hard disk should not differ much, since the files are in the memory cache anyway.}
Figure 1.1: Execution times of the template divided into compilation steps. The largest execution times come from the major packages. The packages loaded in each step are listed in table A.1. Note that these times were measured with the packages loaded by the version of January 2013.
1.4 Tutorial - how to start

If you want to use this template for your work you should follow these three steps to configure everything for your needs.

1.4.1 Configure Editor and System Settings

The template needs to be configured for editor and system specific settings such as the encoding of the documents and the encoding of the file system. Both are configured in the main file in the section called `encoding`. These settings must be configured to ensure that special characters such as: äüößêì are shown correct in the editor and the output pdf-file.

The encoding of the editor must be configured in the editor itself or be set up with magic comments, see section 2.2.4. Anyway, the setting should typically be set up as `utf8`.

\LaTeX{} detects the correct encoding with encoding specific characters (ä, ß, €) in the line with `\SelectInputMappings`. If you find that these characters are not printed correct in the editor reenter these characters. If your keyboard does not allow to enter â and ß try at least if the euro character € is sufficient to detect an encoding.

If file names may have encoding specific characters the encoding of the operating system must be defined as well. Therefore the option `filenameencoding` should be configured for either `latin1` or `utf8`. Both should cover most demands.

1.4.2 Configure the document

The template is configured by default for language English with double-sided printing and chapters for the highest section level. Suppose you want to configure it instead for German texts with single-sided printing and Sections as the main level:

- The demand of sections as the main level means that neither a book or report like document is intended, but instead an article like document with only few pages that do not require a substantial differentiation with chapters.

  This is realized by changing the document class to `scrartcl` (main file at the `\documentclass` definition). The default class in this template is `scrbook`, which should not be changed for documents such as bachelor, master and phd thesis.

- The language of the text is chosen in the options of the documentclass. The default language is `english`. The setting for new German orthography is `ngerman`. Other language options are documented in the babel documentation: `babel.pdf`

- The double vs. single side printing is a bit more hidden in the file `preamble/style.tex` under the section `Page Layout Options`. To change to single side printing change the option `twoside` from `true` to `false`.

Other configurations of \LaTeX{} are listed in chapter 2. Section 2.1 lists most of the settings with their according options and locations in the template files. Some are further explained, for example the setting of the line spacing in section 2.10.

1.4.3 Start Writing your content

At the beginning, the documents in the front and the end should be adapted to the documents content. For example the users name, institution, title can be inserted in
content/0-title. This file comes with other content files before the actual document start with the front pages (frontmatter):

- content/Z-GlossaryEntries.tex
- content/0-title,
- content/0-Abstract
- content/Z-Declaration.tex.

Next the main files should be renamed according to the chapter organization of the document. The following files are preconfigured for the main content (mainmatter).

- content/0-Introduction
- content/1-Theory
- content/2-Experiments
- content/3-Results
- content/4-Summery

If certain automatic generated lists such as the index, a glossary or others are not needed these should be disabled in the main file. And at the end of the document files are included that belong to the appendix.

- content/Z-Appendix.tex
- content/Z-Publications.tex
- content/Z-CV.tex
- content/Z-Thanks.tex

The naming scheme of these files and their loading mechanism is further explained in section 2.17.

From this point on there is not much more to be done, except writing down the content for the project this template is supposed to be used for.
CHAPTER 2

Settings, locations, questions and solutions

This chapter contains all sorts of answers to typical questions, locations of settings and general solutions with \LaTeX. Further examples of the possibilities of this template are shown with code and examples in part II.

2.1 Layout and style configuration
This template tries to differentiate clearly between functionality (package loading) and configuration of the layout and the packages. The first is done primarily in file \texttt{preamble/packages.tex} the latter mainly in file \texttt{preamble/style.tex}. Nevertheless this separation cannot be fully realized because many options must be specified with the loading of the package.

The following tables 2.1 and 2.2 show links to the most important configuration options and their location in the template files.

Most question of the kind ‘how do I change the layout of …’ can be solved by locating the relevant settings in these tables and playing with their values.

Table 2.1: Links to locations for configurations of the document layout

<table>
<thead>
<tr>
<th>Setting</th>
<th>Option/Value</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>paper size</td>
<td>paper=a4</td>
<td>option of \texttt{\documentclass}</td>
</tr>
<tr>
<td>language</td>
<td>english</td>
<td>option of \texttt{\documentclass}</td>
</tr>
<tr>
<td>font size</td>
<td>fontsize=11pt</td>
<td>option of \texttt{\documentclass}</td>
</tr>
<tr>
<td>color of hyperlinks</td>
<td>\texttt{\UseDefinition{Target}{Web}}</td>
<td>Section: Configurations</td>
</tr>
<tr>
<td>page layout in the pdf view</td>
<td>pdfpagelayout</td>
<td>Section: Configurations</td>
</tr>
<tr>
<td>equation position</td>
<td>fleqn</td>
<td>Section: PackagesMath</td>
</tr>
<tr>
<td>quotation style</td>
<td>german=quotes</td>
<td>Section: PackagesQuotes</td>
</tr>
<tr>
<td>citation style</td>
<td>style=alphabetic</td>
<td>Section: PackagesCitation</td>
</tr>
<tr>
<td>bibliography backend</td>
<td>backend=biber</td>
<td>Section: PackagesCitation</td>
</tr>
</tbody>
</table>

continued on next page
<table>
<thead>
<tr>
<th>Setting</th>
<th>Option/Value</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>header and footer</td>
<td>automark, komastyle</td>
<td>Section: PackagesHeadFoot</td>
</tr>
<tr>
<td>backlinks in the bibliography</td>
<td>backref=page</td>
<td>Section: PackagesPDF</td>
</tr>
<tr>
<td>Settings and options in file: preamble/style.tex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>url font</td>
<td>\urlstyle{tt}</td>
<td>Section: StyleText</td>
</tr>
<tr>
<td>threshold for \texttt{blockquote}</td>
<td>\SetBlockThreshold{2}</td>
<td>Section: StyleQuotes</td>
</tr>
<tr>
<td>numbering of figures</td>
<td>\numberwithin{figure}</td>
<td>Section: StyleCaptions</td>
</tr>
<tr>
<td>paragraph skip or indentation</td>
<td>parskip=false</td>
<td>Section: StyleParagraph</td>
</tr>
<tr>
<td>line spacing</td>
<td>\onehalfspacing</td>
<td>Section: StyleLineSpacing</td>
</tr>
<tr>
<td>size of text body</td>
<td>DIV=11</td>
<td>Section: StylePageLayout</td>
</tr>
<tr>
<td>binding correction</td>
<td>BCOR=10mm</td>
<td>Section: StylePageLayout</td>
</tr>
<tr>
<td>single/two side layout</td>
<td>twoside=true</td>
<td>Section: StylePageLayout</td>
</tr>
<tr>
<td>separate title page</td>
<td>titlepage=true</td>
<td>Section: StyleTitlepage</td>
</tr>
<tr>
<td>sections numbering depth</td>
<td>\setcounter{secnumdepth}{2}</td>
<td>Section: StyleHeadings</td>
</tr>
<tr>
<td>headings size</td>
<td>headings=small</td>
<td>Section: StyleHeadings</td>
</tr>
<tr>
<td>chapter prefix</td>
<td>headings=nochapterprefix</td>
<td>Section: StyleHeadings</td>
</tr>
<tr>
<td>heading fonts</td>
<td>\setkomafont{sectioning}</td>
<td>Section: StyleHeadingsFonts</td>
</tr>
<tr>
<td>toc numbering depth</td>
<td>\setcounter{tocdepth}{3}</td>
<td>Section: StyleLayoutTOC</td>
</tr>
<tr>
<td>bibliography in TOC</td>
<td>bibliography=totoc</td>
<td>Section: StyleLayoutTOC</td>
</tr>
<tr>
<td>index in TOC</td>
<td>index=nottotoc</td>
<td>Section: StyleLayoutTOC</td>
</tr>
<tr>
<td>LOF in TOC</td>
<td>listof=nottoc</td>
<td>Section: StyleLayoutTOC</td>
</tr>
</tbody>
</table>

Table 2.2: Links to files for package configurations

<table>
<thead>
<tr>
<th>Package / Topic</th>
<th>File</th>
</tr>
</thead>
<tbody>
<tr>
<td>siunitx</td>
<td>preamble/style-siunitx.tex</td>
</tr>
<tr>
<td>pgfplots</td>
<td>preamble/style-pgfplots.tex</td>
</tr>
<tr>
<td>biblatex</td>
<td>preamble/style-biblatex.tex</td>
</tr>
<tr>
<td>biblatex style</td>
<td>preamble/style-biblatex-alpha.tex</td>
</tr>
<tr>
<td>caption, subcaption, subfig</td>
<td>preamble/style-caption.tex</td>
</tr>
<tr>
<td>floatrow</td>
<td>preamble/style-floatrow.tex</td>
</tr>
</tbody>
</table>

continued on next page...
### 2.2 Magic comments

Some of the options shown in the previous tables are further discussed in the following sections.

#### 2.2 Magic comments

The *magic comments* discussed in this section present a configuration for the editor, which is saved inside the \LaTeX file (at the beginning). They allow to define the program (pdflatex), the main file, the encoding (utf8) and the spell checking.

They were originally developed within the editor TexShop and are used by the editors TeXWorks and TeXStudio. The following information on these magic comments is based on these publications:

- texworks magic comments (by Joseph Wright)
- TeXworks manual

All these comments have in common that they have to be put in the beginning of each file and have to begin with `\% !\TeX`.

#### 2.2.1 Root file

```latex
\% !\TeX root = manual.tex
```

Defines the main file for typesetting (often called the *master file*). This enables a very basic project management by defining the master file for each file of the project.

#### 2.2.2 Program

```latex
\% !\TeX program = pdflatex
```

Chooses the engine for compilation. Possible values are `pdflatex`, `LuaLaTeX`, `XeTeX`, `LaTeX` (and possibly others). Note that the engine name inserted is case-insensitive.

Unless your code is set up for a different engine and the selection of packages and fonts loaded is adapted for that engine the default should be kept as `pdflatex`.

<table>
<thead>
<tr>
<th>Package / Topic</th>
<th>File</th>
</tr>
</thead>
<tbody>
<tr>
<td>imakeidx</td>
<td>preamble/style-index.tex</td>
</tr>
<tr>
<td>glossaries</td>
<td>preamble/style-glossaries.tex</td>
</tr>
<tr>
<td>listings</td>
<td>preamble/style-listings.tex</td>
</tr>
<tr>
<td>geometry</td>
<td>preamble/style-geometry.tex</td>
</tr>
<tr>
<td>scrlayer-scrpage</td>
<td>preamble/style-scrlayer-scrpage.tex</td>
</tr>
<tr>
<td>hyperref</td>
<td>preamble/style-hyperref.tex</td>
</tr>
</tbody>
</table>
2.2.3 Spell checking

% !TeX spellcheck = en_US

Specifies the spell checking language in the editor for that file. The language of course needs to be installed for the editor! Selection of some languages:

- en_GB - English (Great Britain)
- en_US - English (US)
- de_DE - German (Germany)
- fr_FR - French (France)

2.2.4 Encoding

% !TeX encoding = UTF-8

Sets the file encoding for the current file. The default in current editors is UTF-8.

2.2.5 bibliography tool

% !BIB = biber

The alternative is bibtext, which is no longer recommended and with this template not supported!

2.3 Selection of font(s)

The font selection is made in file fonts/fonts.tex. The standard font in this template is Latin Modern. This selection is done for simplicity. It is the default LATEX font and should be available in every distribution. If you prefer a different font you have a free choice out of many fonts that are installed on most systems and are available for free. See chapter 4 for a short overview. One should take care that for every roman font that a suitable sans serif font must be chosen as well.

2.4 Change of the page layout

Two packages are supported for the page layout. Package typearea is very easy to use and modify and gives well suited results for a thesis document. If however a much customized page layout is demanded the package geometry provides the abilities to implement the page layout.

2.4.1 Package typearea

The page layout is by default set up with the package typearea, which is loaded automatically. It is configured with the DIV parameter, which defines the amount of text on a page (the larger the more space for the text) and the BCOR parameter, which defines the binding correction in millimeters. The basics of this layout mechanism is very well described in scrguien.pdf. The parameters are set up in file preamble/style.tex, see section 7.4.18.

If the layout must be specified with very detailed parameters such as margin width, top and bottom space or exact amount of line numbers the package geometry is providing this functionality.
2.4.2 Package geometry
This package provides ‘a flexible and easy interface to page dimensions’ as stated in its
documentation. One can set up every possible parameter and all unspecified dimensions
are automatically determined by the package accordingly.

To enable this package it must be loaded in file preamble/packages.tex, see sec-
tion 7.3.19 and be configured in preamble/style-geometry.tex.

2.5 Change color of (hyper)links
The hyperlinks are introduced by package hyperref. The colors are configured for the links
in preamble/style-hyperref.tex and defined in preamble/style.tex (see section 7.4.2).
This template introduces a simple mechanism to switch between colored and black links
(the latter for printing) using the command \texttt{\textbackslash UseDefinition}. This is configured in the
main file (see section 6.3.4).

2.6 Generation of tables
See the large list of examples in section 5.8 on using the environments \texttt{tabular}, \texttt{tabularx},
\texttt{tabu}, \texttt{table} and further for printing tabular material in principle and how to print beautiful
tables.

2.7 Include, align and position graphics
See the large list of examples on using the \texttt{\textbackslash includegraphics} command, the \texttt{figure}
environment and further commands in section 5.7.

2.8 Draw graphics, diagrams and plots
This template relies on the packages \texttt{pgf}, \texttt{tikz} and \texttt{pgfplots} for the creation of diagrams
and plots, see section 5.16. The \texttt{pstricks} is neither supported nor tested with this template.
It may or may not work together with this template.

2.9 Print code with line numbers and syntax highlighting
Syntax highlighting within \LaTeX{} is provided by the package \texttt{listings}. The syntax
highlighting of this package is defined in file preamble/style-listings.tex. Several
styles are predefined:

\texttt{lstStyleBase} basic code format
\texttt{lstStyleFramed} basic format with frame
\texttt{lstStyleCpp} style for C++ code
\texttt{lstStyleLaTeX} style for \LaTeX{} code.

See section 5.14.2 for examples.

2.10 One-half and double spacing
The line spacing is controlled by \texttt{setspace}. It is configured in file preamble/style.tex
in the section \texttt{StyleLineSpacing}. The code is shown in section 7.4.17.
2.11 Line numbering
The package required for line numbering is not loaded by default, but it can be enabled in \texttt{preamble/packages.tex}, see section 7.3.15. Furthermore the command \texttt{\linenumbers} must be executed. This must be enabled in \texttt{preamble/makeCommands.tex}.

2.12 Creation of a bibliography and citations styles
This template relies for the creation of a bibliography and the related citations styles entirely on the package \texttt{biblatex}. Any historic solution which was popular before \texttt{biblatex} came out is incompatible. For all further information refer to the official documentation \texttt{biblatex.pdf}.

2.12.1 Define bibliography (bib) files
The file format is still the well-known BibTeX format (file ending .bib). These files are loading in the preamble before the beginning of the document, see section 6.3.7 with the command \texttt{\addbibresource}. The file name must be written without the .bib file extension.

2.12.2 Define the citation style
The package is loaded in file \texttt{preamble/packages.tex} and the style for the display of the bibliography and the citations is defined as an option of the package. The default style is \textit{alphabetic}. However, several other styles exists, see section 7.3.12, the package documentation and the website \texttt{biblatex-contrib} for a list of further styles.

Furthermore the basic properties of the package are configured in file \texttt{preamble/style-biblatex.tex} whereas the style is modified for an \textit{alpha} style in file \texttt{preamble/style-biblatex-alpha.tex}.

2.12.3 Ways to insert citations
Citations are inserted basically with the \texttt{\cite} command. Further possibilities are shown in section 5.12.1. For a complete list refer to the official documentation of \texttt{biblatex}. If the citations are supposed to be placed in the footnotes this is realized with the parameter \texttt{autocite} in file \texttt{preamble/style-biblatex.tex}.

2.13 Quoting and citing text
The default quotation environments of \LaTeX (quote and quotation) are enhanced by the commands \texttt{\enquote} and \texttt{\blockquote} which are much better suited for very simple to very complex quotations with citations. See section 5.2 for examples of its usage.

2.14 Tables of contents and other tables
The contents and the style of the table of contents are defined in file \texttt{preamble/style.tex}, see section 7.4.24.

2.15 Index, glossary and other lists
This template can handle an index and the creation of a glossary, an acronym list and a symbol list which are created using the package \texttt{glossaries}. 
2.16 Hyphenation

The style settings for these lists are loaded in file `preamble/style-index.tex` and file `preamble/style-glossaries.tex`. They are printed in the main file, see section 6.4.6.

2.16 Hyphenation

The hyphenation is enabled by default in \LaTeX. In order to function correctly the language must be specified in the document class, see section 6.2. Additional hyphenation patterns are added to file `content/hyphenation.tex`.

In the text itself hyphenation marks can be added. These are however language specific. For German texts an overview is shown in http://de.wikibooks.org/.

2.17 Document management

The default content files of this template are located in the path `content` and named:

- `content/title`
- `content/0-Abstract`
- `content/0-Introduction`
- `content/1-Theory`
- `content/2-Experiments`
- `content/3-Results`
- `content/4-Summary`
- `content/Z-Appendix.tex`
- `content/Z-Publications.tex`
- `content/Z-CV.tex`
- `content/Z-Thanks.tex`
- `content/Z-Declaration.tex`

The prefix is chosen as numbers for all main content files in the sequence in which the chapters are loaded and with a prefix `Z-` for all minor important files that mostly come after the main content. This naming scheme thus shows the files in the order of their appearance in the resulting document.

To speed up the compile times it is recommended to include only those chapters, on which is currently being worked on, into the compilation. This is realized with \LaTeX using the command `\includeonly`. This list contains all files loaded with `\include` that shall be included in the current compilation. All information on those files not included into the compilation, such as labels, is nevertheless included. This only requires that each file was at least once included in the compilation.

2.18 Creation of a minimal working example

This template is complex in terms of its division in different files that makes it rather difficult to track a problem. Due to the deactivatable code section created with the command `\DefineTemplateSection` this can be even easier than in any other large \LaTeX project.

In order to ask people for a solution to a problem with \LaTeX it is generally expected to provide a minimum working example. That means a single file \LaTeX complete document
that illustrates the problem. ‘Complete’ means that it must contain a document class and
the document environment and the relevant code inside the document environment. It
however must not contain any package or code that does not contribute to the problem.

In order to create a minimum document from this template it is absolutely necessary
to copy the whole document code including all sub folders. If these contain too many
images these can be left out. The copy is essential, because next most files are going to be
modified or deleted.

Now first remove or comment out all chapter files that do not contribute to the error. If
it is an error in the preamble, you can as well comment out everything in the document
environment.

Next try to reduce the code in you remaining content file to the part that creates the
error.

To check if the problem is in preamble/style.tex or if this file contributes to the problem
comment out preamble/style.tex. If the error remains do the same for preamble/
packages.tex. This could however introduce further errors because functionality gets lost.
You can however check each section in this file separately or disable them from bottom to
top by changing the section created with \DefineTemplateSection to false. The same
can also be done for preamble/style.tex.

If the code section(s) in preamble/packages.tex or preamble/style.tex that gener-
ates the error is identified copy all these parts to the main document and remove the
loading of these files. Note, that in cases of incompatible packages it could be more than a
single code section that contributes to the error. If still files are included in the main file
remove them or copy their code to the main file if necessary. As a result all code should
not reside in the main file. From this point it should be able to remove all packages, all
options and all remaining content that do not contribute to the problem. As a result the
minimum working example is ready.

Typically most self-created errors are already found while processing these procedure to
track down the problem. If not a good place to ask for further help is tex.stackexchange.com.

Further reading on how to generate a minimum working example can be found at:

- http://meta.tex.stackexchange.com
- What is a minimal working example?
- Creating a LaTeX Minimal Example
- How to make a minimum example
CHAPTER 3

Known problems

This chapter provides a collection a known warnings and possible errors with an assessment of the problem.

3.1 Warnings
3.1.1 biblatex: No file \texttt{<filename>.bbl}
If you have not executed \texttt{biber} you will get the following warning by \texttt{biblatex}. Simply run you bibliography tool to get create bbl file.

Package \texttt{biblatex} Info: Trying to load bibliographic data...
Package \texttt{biblatex} Info: ... file '\texttt{<filename>.bbl}' not found.

No file \texttt{<filename>.bbl}.

3.1.2 tocstyle: This is an alpha version
Package \texttt{tocstyle} prints out the following warning:

Package \texttt{tocstyle} Warning: THIS IS AN ALPHA VERSION!
\texttt{tocstyle} USAGE OF THIS VERSION IS ON YOUR OWN RISK!
\texttt{tocstyle} EVERYTHING MAY HAPPEN!
\texttt{tocstyle} EVERYTHING MAY CHANGE IN FUTURE!
\texttt{tocstyle} THERE IS NO SUPPORT, IF YOU USE THIS PACKAGE!
\texttt{tocstyle} Maybe it would be better, not to load this package.

This package is now in use with this template for several years (of development of the template before its release) and so far no problem has been found. Therefore I do not expect any problem because of this package and consider this warning to be ignorable.

3.1.3 hypennat: You have used the htt option
Package \texttt{hypennat} prints out the following warning:

Package \texttt{hypennat} Warning: ****************************
\texttt{hypennat} * You have used the \texttt{htt} option.
\texttt{hypennat} * You are likely to get many Font Warning messages.
\texttt{hypennat} * These can usually be ignored.
\texttt{hypennat} ****************************

It can be ignored as already stated by the package warning.
3.1.4 pageslts: Package pdfpages detected.

Package \texttt{hypenat} warns about the use of package \texttt{pdfpages}:

\begin{verbatim}
Package pageslts Warning: Package pdfpages detected.
\end{verbatim}

This can be safely ignored, see \url{http://tex.stackexchange.com/questions/73767/warning-about-pdfpages-with-hyperref} for a discussion.

3.2 Errors

3.2.1 No room for new write

TeX uses output registers to write to files. Unfortunately TeX was designed to use only 16 of such registers of which the output registers 0, 1 and 2 are already used by (La)TeX itself. The remaining registers are consumed by additional packages that need to write to external files.

If you come across this error you have reached a fixed limitation of the TeX engine and there is nothing that can directly be done about this error, as you cannot extend the number of available registers without extending TeX itself.

Typical packages that consume output registers are:

- glossaries (acronym list, symbol list, glossary)
- biblatex (bibliography)
- listings (list of listings)
- imakeidx (index)
- fancyvrb
- pgf/tikz
- pgf/tikz with \texttt{external} option
- titletoc

The most promising solution about this problem is to reduce the number of used output registers. So for example if no index is required (package imakeidx) and the package fancyvrb is not needed both could be commented out and instead the list of listings could be activated.

The approach of this template is to use either the package \texttt{morewrites} or \texttt{scrwfile}, which hook at the lowest level (\LaTeX primitives) to solve this problem. These packages however might cause problems since they modify \LaTeX at a very basic level and can thus cause incompatibilities. For \texttt{scrwfile} it is known that \texttt{titletoc} does no longer work. If however \texttt{titletoc} is not required \texttt{scrwfile} is recommended. These packages are loaded in \texttt{preamble/packages-SolutionsNoRoomForNewWrite.tex}.

Further information about this issue can be found at
3.2 Errors

- tex.stackexchange.com
- UK FAQ List
CHAPTER 4

Short fonts overview

The information given here is only a subset of the whole story. A more complete catalogue on \LaTeX fonts can be found at http://www.tug.dk/FontCatalogue/.

The fonts listed in the following sections are not only a list of very common fonts, but also those that are supported within this template. If this should not be the case the commands that are necessary to load the font is provided, so that the font loading can be integrated in this template. The first section (4.1) lists most free fonts, which can be expected to be installed in a complete modern \LaTeX distribution. The second section (4.2) is about packages for commercial fonts. These packages are available for free, however the fonts itself are not. The last section (4.3) is about fonts with math support.

4.1 Free fonts

<table>
<thead>
<tr>
<th>Font families</th>
<th>Loading command</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin Modern</td>
<td>\usepackage{lmodern}</td>
<td>(see below)</td>
</tr>
<tr>
<td>Bera</td>
<td>\usepackage{bera}</td>
<td>(see below)</td>
</tr>
<tr>
<td>CM-Bright</td>
<td>\usepackage{cmbright}</td>
<td>(see below)</td>
</tr>
</tbody>
</table>

Latin Modern font family

<table>
<thead>
<tr>
<th>Font</th>
<th>Loading command</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM Roman</td>
<td>\renewcommand{\rmdefault}{lmr}</td>
<td>lmr</td>
</tr>
<tr>
<td>LM Sans</td>
<td>\renewcommand{\sfdefault}{lmss}</td>
<td>lmss</td>
</tr>
<tr>
<td>LM Mono</td>
<td>\renewcommand{\ttdefault}{lmtt}</td>
<td>lmtt</td>
</tr>
</tbody>
</table>

Bera font family

<table>
<thead>
<tr>
<th>Font</th>
<th>Loading command</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bera Serif</td>
<td>\usepackage{beraserif}</td>
<td>fve</td>
</tr>
<tr>
<td>Bera Sans</td>
<td>\usepackage{berasans}</td>
<td>fvs</td>
</tr>
<tr>
<td>Bera Mono</td>
<td>\usepackage{beramono}</td>
<td>fvm</td>
</tr>
</tbody>
</table>

CM-Bright font family

<table>
<thead>
<tr>
<th>Font</th>
<th>Loading command</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM-Bright Mono</td>
<td>\renewcommand{\ttdefault}{cmtl}</td>
<td>cmtl</td>
</tr>
<tr>
<td>CM-Bright Sans</td>
<td>\renewcommand{\sfdefault}{cmbr}</td>
<td>cmbr</td>
</tr>
</tbody>
</table>

continued on next page ...
<table>
<thead>
<tr>
<th>Font</th>
<th>Loading command</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fonts in the PSNFSS collection (Type 1 postscript fonts)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Times</td>
<td><code>\usepackage{mathptmx}</code></td>
<td>ptm</td>
</tr>
<tr>
<td>Helvetica</td>
<td><code>\usepackage{helvet}</code></td>
<td>phv</td>
</tr>
<tr>
<td>Courier</td>
<td><code>\usepackage{courier}</code></td>
<td>pcr</td>
</tr>
<tr>
<td>Palantino</td>
<td><code>\usepackage{mathpazo}</code></td>
<td>pplx, pplj</td>
</tr>
<tr>
<td>Charter</td>
<td><code>\usepackage{charter}</code></td>
<td>bch</td>
</tr>
<tr>
<td>Bookman</td>
<td><code>\usepackage{bookman}</code></td>
<td>pbk</td>
</tr>
<tr>
<td>New Century Schoolbook</td>
<td><code>\usepackage{newcent}</code></td>
<td>pnc</td>
</tr>
<tr>
<td>Avantgarde</td>
<td><code>\usepackage{avantgarde}</code></td>
<td>pag</td>
</tr>
<tr>
<td>Zapf Chancery</td>
<td><code>\usepackage{chancery}</code></td>
<td>pzc</td>
</tr>
<tr>
<td><strong>Fonts supplied by the getnonfreefonts script</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arial (URW)</td>
<td><code>\usepackage{arial}</code></td>
<td>ual</td>
</tr>
<tr>
<td>Classico (URW)</td>
<td><code>\renewcommand{\sffamily}{uop}</code></td>
<td>uop</td>
</tr>
<tr>
<td>DayRoman</td>
<td><code>\renewcommand{\rmfamily}{dayrom}</code></td>
<td>dayrom</td>
</tr>
<tr>
<td>GaramondNo8 (URW)</td>
<td><code>\renewcommand{\rmfamily}{ugm}</code></td>
<td>ugm</td>
</tr>
<tr>
<td>LetterGothic (URW)</td>
<td><code>\usepackage{ulgotic}</code></td>
<td>ulg</td>
</tr>
<tr>
<td>Luxi Mono</td>
<td><code>\usepackage{luximono}</code></td>
<td>ul9</td>
</tr>
<tr>
<td><strong>Other Type 1 postscript fonts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fourier</td>
<td><code>\usepackage{fourier}</code></td>
<td>futm</td>
</tr>
</tbody>
</table>

### 4.2 Commercial fonts

In order to use these fonts for documents that shall be published it is absolutely essential to own a license. Most fonts can only be obtained by buying these fonts; others may be installed on the computer by programs. Nevertheless its use is restricted unless a license for using these fonts is owned!

If the fonts are available they need to be renamed and installed using the according manuals provided by Walter Schmidt

<table>
<thead>
<tr>
<th>Font</th>
<th>Loading command</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serif fonts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adobe Optima</td>
<td><code>\usepackage{optima}</code></td>
<td>pop, popm</td>
</tr>
<tr>
<td>Adobe Aldus</td>
<td><code>\renewcommand{\rmfamily}{pasx}</code></td>
<td>pasx, pasj</td>
</tr>
</tbody>
</table>

continued on next page...
<table>
<thead>
<tr>
<th>Font</th>
<th>Loading command</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adobe Garamond</td>
<td>\usepackage{xagaramon}</td>
<td>padx, padj</td>
</tr>
<tr>
<td>Adobe Stempel Garamond</td>
<td>\renewcommand{\rmdefault}{pegx}</td>
<td>pegx, pegj</td>
</tr>
<tr>
<td>Adobe Melior</td>
<td>\renewcommand{\rmdefault}{pml}</td>
<td>pml</td>
</tr>
<tr>
<td>Adobe Minion</td>
<td>\usepackage{minion}</td>
<td>pmnx, pmnj</td>
</tr>
<tr>
<td>Adobe Sabon</td>
<td>\renewcommand{\rmdefault}{psbx}</td>
<td>psbx, psbj</td>
</tr>
<tr>
<td>Adobe Times</td>
<td>\renewcommand{\rmdefault}{ptmx}</td>
<td>ptmx, ptmj</td>
</tr>
<tr>
<td>Adobe Rotis Serif</td>
<td>\renewcommand{\rmdefault}{pro}</td>
<td>pro</td>
</tr>
<tr>
<td>Adobe Rotis Semi-Serif</td>
<td>\renewcommand{\rmdefault}{pr1}</td>
<td>pr1</td>
</tr>
<tr>
<td>Linotype Meridien</td>
<td>\renewcommand{\rmdefault}{lmd}</td>
<td>lmd</td>
</tr>
<tr>
<td>Linotype ITC Charter</td>
<td>\renewcommand{\rmdefault}{lch}</td>
<td>lch</td>
</tr>
<tr>
<td>Sans serif fonts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adobe Frutiger</td>
<td>\usepackage{frutiger}</td>
<td>pfr</td>
</tr>
<tr>
<td>Adobe Futura</td>
<td>\usepackage{futura}</td>
<td>pfu</td>
</tr>
<tr>
<td>Adobe Gill Sans</td>
<td>\usepackage{gillsans}</td>
<td>pgs</td>
</tr>
<tr>
<td>Adobe Myriad</td>
<td>\renewcommand{\sfdefault}{pmy}</td>
<td>pmy, pmyc</td>
</tr>
<tr>
<td>Adobe Syntax</td>
<td>\usepackage{asyntax}</td>
<td>psx</td>
</tr>
<tr>
<td>Adobe Rotis Sans</td>
<td>\renewcommand{\sfdefault}{pr4}</td>
<td>pr4</td>
</tr>
<tr>
<td>Adobe Rotis Semi-Sans</td>
<td>\renewcommand{\sfdefault}{pr3}</td>
<td>pr3</td>
</tr>
<tr>
<td>Linotype ITC Officina Sans</td>
<td>\renewcommand{\sfdefault}{lo9}</td>
<td>lo9</td>
</tr>
</tbody>
</table>

### 4.3 Fonts with math support

The following table lists font packages that do not only load the font but also the according math font. The only exceptions are the packages `mathdesign`, `MnSymbol` and `MdSymbol`, which only load a math font.

Note that the package `MnSymbol` and `MdSymbol` have severe restrictions on the loading order and incompatible packages, which is taken care of in this template.

The package `eulervm` is special in the respect that it does not provide a math font for a specific roman font, but instead provides a math font that fits well to many common (commercial) serif fonts such as Adobe Aldus, Adobe Melior, Adobe Sabon and others for which no \LaTeX math font support exists.
4.4 Font examples
The following pages show examples of several font combinations that were created with this template code. This selection was done with care on similar x-heights and glyph widths, but since this selection was not done by a font expert the resulting combinations might still be not perfect. Further reading on the topic of typeface combinations can be found here: http://www.smashingmagazine.com/. The clear exception is the combination of Times with Arial and Courier. This combination is shown because it is widely used but absolutely not recommendable.

- Latin Modern Family
- Charter, Bera Sans, Luxi Mono
- Garamond, Bera Sans, Luxi Mono
- Fourier (Utopia), Latin Modern (Sans and Typewriter)
- Palantino, Arial, Courier
  Note that Palantino fits very well to Gill Sans, which however is a commercial font.
- Times, Arial, Courier
Latin Modern Family

The text on these pages demonstrates the appearance of the used fonts for serif, sans serif, math and typewriter fonts. The font(s) used in this document are Latin Modern Family. The fonts are loaded with

\usepackage{lmodern}
\input{fonts/fonts-lmodern-sansmath.tex}

Plain text

The following paragraph is text taken from http://www.blindtextgenerator.de to show the appearance of the text. It is a text without any meaning translated from the original German text into English text. The translation was done automatic and thus the text has even less meaning after the translation.

Far far away, behind the word mountains, far from the countries Vokalia and Consonantia live the blind texts. Separated they live in Bookmarksgrove on the coast of the Semantics, a large language ocean. A small river named Duden flows by their place and supplies it with the necessary regelialia. It is a paradisematic country, in which roasted parts of sentences fly into your mouth. Even the all-powerful Pointing the blind texts - an almost unorthographic life. One day however a small line of blind text by the name of Lorem Ipsum was to go out into the wide grammar. The Big Oxmox advised her not to, because there swarming of bad Commas, wild Question Marks and devious Semikoli, but the Little Blind Text did not listen. She packed her seven capitals, pushing her initial into the belt and made herself on the way. When she reached the first hills of the Italic Mountains, she had a last view back on the skyline of her hometown Bookmarksgrove, the headline of Alphabet Village and the subline of her own road, the Line Lane. Pityful was a rhetorical question on the cheek, then she continued her way. Her way she met a copy. The copy warned the Little Blind Text, where it came from it would have been rewritten a thousand times and everything that was left from its origin would be the word ‘and’ and the Little Blind Text should turn around and return to its own, safe country. But nothing the copy said could convince her and so it did not take long until a few insidious Copy Writers ambushed her, made her drunk with Longe and Parole and made it dragged her into their agency, where they abused it for their projects again and again. And if it has not been rewritten, then they are still.

Two fast boxer chasing the vivacious Eva and her pug by Sylt. Fox jumps over the lazy dog Bavaria. Twelve boxer Viktor hunt across the big Sylt dike. Bird Quax tweaks Johnys horse Bim. Sylvia dares quick to joke at Pforzheim. Polyfon Mäxchens twittering birds ate beets, yogurt and cottage cheese. ‘Fix, Schwyz!’ Jürgen squawks stupid from the pass.
Victor chases twelve boxer across the great Sylt dike. Wrong practicing of xylophone music tortures every larger dwarf.

**Math formulas**

These math formulas are taken from [wikipedia.org](https://wikipedia.org). They show well known formulas used in math and physics.

**Green’s theorem**

\[
\iint_S \left[ u \nabla^2 v + (\nabla u, \nabla v) \right] \, d^3V = \iiint_S \frac{\partial v}{\partial n} \, d^2A
\]  

(0.1)

**Jacobian matrix**

\[
J_f(a) := \frac{\partial f}{\partial x}(a) := \frac{\partial (f_1, \ldots, f_m)}{\partial (x_1, \ldots, x_n)}(a) := \left( \frac{\partial f_i(a)}{\partial x_j} \right)_{i=1,\ldots,m; j=1,\ldots,n}
\]  

(0.2)

**Tables**

The following table lists some properties of the material *fused silica*.

<table>
<thead>
<tr>
<th>Properties of fused silica</th>
<th>Properties of fused silica</th>
</tr>
</thead>
<tbody>
<tr>
<td>description</td>
<td>property</td>
</tr>
<tr>
<td>density</td>
<td>( \rho = 2.2 \text{ g/cm}^3 )</td>
</tr>
<tr>
<td>heat capacity</td>
<td>( c_p = 703 \text{ J/gK} )</td>
</tr>
<tr>
<td>transmission</td>
<td>185 - 2500 nm</td>
</tr>
</tbody>
</table>

The sans serif variant is realized with \texttt{\mathversion{sans}}
The text on these pages demonstrates the appearance of the used fonts for serif, sans serif, math and typewriter fonts. The font(s) used in this document are Charter, Bera Sans, Luxi Mono. The fonts are loaded with:

\usepackage{charter}\linespread{1.05} \% --- Charter
\renewcommand{\sfdefault}{fvs} \% --- Bera Sans
\usepackage[charters]{mathdesign} \% --- Charter (Math)
\usepackage[scaled=0.85]{luximono} \% --- Luxi Mono (Typewriter)
% Note: There is a better Charter font by Linotype
% called 'ITC Charter'

Plain text

The following paragraph is text taken from [http://www.blindtextgenerator.de](http://www.blindtextgenerator.de) to show the appearance of the text. It is a text without any meaning translated from the original German text into English text. The translation was done automatic and thus the text has even less meaning after the translation.

Far far away, behind the word mountains, far from the countries Vokalia and Consonantia live the blind texts. Separated they live in Bookmarksgrove on the coast of the Semantics, a large language ocean. A small river named Duden flows by their place and supplies it with the necessary regelialia. It is a paradisematic country, in which roasted parts of sentences fly into your mouth. Even the all-powerful Pointing the blind texts - an almost unorthographic life. One day however a small line of blind text by the name of Lorem Ipsum was to go out into the wide grammar. The Big Oxmox advised her not to, because there swarming of bad Commas, wild Question Marks and devious Semikoli, but the Little Blind Text did not listen. She packed her seven capitals, pushing her initial into the belt and made herself on the way. When she reached the first hills of the Italic Mountains, she had a last view back on the skyline of her hometown Bookmarksgrove, the headline of Alphabet Village and the subline of her own road, the Line Lane. Pityful was a rhetorical question on the cheek, then she continued her way. Her way she met a copy. The copy warned the Little Blind Text, where it came from it would have been rewritten a thousand times and everything that was left from its origin would be the word 'and' and the Little Blind Text should turn around and return to its own, safe country. But nothing the copy said could convince her and so it did not take long until a few insidious Copy Writers ambushed her, made her drunk with Longe and Parole and made it dragged her into their agency, where they abused it for their projects again and again. And if it has not been rewritten, then they are still.
Two fast boxer chasing the vivacious Eva and her pug by Sylt. Fox jumps over the lazy dog Bavaria. Twelve boxer Viktor hunt across the big Sylt dike. Bird Quax tweaks Johnys horse Bim. Sylvia dares quick to joke at Pforzheim. Polyfon Mäxchens twitting birds ate beets, yogurt and cottage cheese. ‘Fix, Schwyz!’ Jürgen squawks stupid from the pass. Victor chases twelve boxer across the great Sylt dike. Wrong practicing of xylophone music tortures every larger dwarf.

Math formulas
These math formulas are taken from wikipedia.org. They show well known formulas used in math and physics.

Green’s theorem
\[
\iiint_{V} [u \nabla^2 v + (\nabla u, \nabla v)] \, d^3 V = \iint_{\partial V} u \frac{\partial v}{\partial n} \, d^2 A \tag{0.1}
\]

Jacobian matrix
\[
J_f(a) := \frac{\partial f}{\partial x}(a) := \frac{\partial (f_1, \ldots, f_m)}{\partial (x_1, \ldots, x_n)}(a) := \left( \frac{\partial f_i(a)}{\partial x_j} \right)_{i=1,\ldots,m; \ j=1,\ldots,n} \tag{0.2}
\]

Tables
The following table lists some properties of the material fused silica.

<table>
<thead>
<tr>
<th>description</th>
<th>property</th>
</tr>
</thead>
<tbody>
<tr>
<td>density</td>
<td>( \rho = 2.2 \text{ g/cm}^3 )</td>
</tr>
<tr>
<td>heat capacity</td>
<td>( c_p = 703 \text{ J/gK} )</td>
</tr>
<tr>
<td>transmission</td>
<td>185 - 2500 nm</td>
</tr>
</tbody>
</table>
The text on these pages demonstrates the appearance of the used fonts for serif, sans serif, math and typewriter fonts. The font(s) used in this document are Garamond, Bera Sans, Luxi Mono. The fonts are loaded with

\renewcommand{\rmdefault}{ugm} %%% --- URW Garamond
\renewcommand{\sfdefault}{fvs} %%% --- Bera Sans
\usepackage[garamond]{mathdesign} %%% --- Garamond (Math)
\usepackage[scaled=0.85]{luximono} %%% --- Luxi Mono (Typewriter)
% Note: If you can efford it, combine with commercial
% sans fonts like: Syntax, Frutiger or Thesis
% (but then also use the commercial Garamond ...)

Plain text

The following paragraph is text taken from http://www.blindtextgenerator.de to show the appearance of the text. It is a text without any meaning translated from the original German text into English text. The translation was done automatic and thus the text has even less meaning after the translation.

Far far away, behind the word mountains, far from the countries Vokalia and Consonantia live the blind texts. Separated they live in Bookmarksgrove on the coast of the Semantics, a large language ocean. A small river named Duden flows by their place and supplies it with the necessary regelialia. It is a paradisematic country, in which roasted parts of sentences fly into your mouth. Even the all-powerful Pointing the blind texts - an almost unorthographic life. One day however a small line of blind text by the name of Lorem Ipsum was to go out into the wide grammar. The Big Oxmox advised her not to, because there swarming of bad Commas, wild Question Marks and devious Semikoli, but the Little Blind Text did not listen. She packed her seven capitals, pushing her initial into the belt and made herself on the way. When she reached the first hills of the Italic Mountains, she had a last view back on the skyline of her hometown Bookmarksgrove, the headline of Alphabet Village and the subline of her own road, the Line Lane. Pityful was a rhetorical question on the cheek, then she continued her way. Her way she met a copy. The copy warned the Little Blind Text, where it came from it would have been rewritten a thousand times and everything that was left from its origin would be the word ‘and’ and the Little Blind Text should turn around and return to its own, safe country. But nothing the copy said could convince her and so it did not take long until a few insidious Copy Writers ambushed her, made her drunk with Longe and Parole and made it dragged her into their agency, where they abused it for their projects again and again. And if it has not been rewritten, then they are still.

Two fast boxer chasing the vivacious Eva and her pug by Sylt. Fox jumps over the lazy dog Bavaria. Twelve boxer Viktor hunt across the big Sylt dike. Bird Quax tweaks Johnys horse Bim.
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cottage cheese. ‘Fix, Schwyz!’ Jürgen squawks stupid from the pass. Victor chases twelve boxer
across the great Sylt dike. Wrong practicing of xylophone music tortures every larger dwarf.

Math formulas
These math formulas are taken from wikipedia.org. They show well known formulas used in
math and physics.

Green's theorem
\[
\oint_S \left[ u \nabla^2 v + (\nabla u, \nabla v) \right] d^3 V = \iint_S u \frac{\partial v}{\partial n} d^2 A \tag{0.1}
\]

Jacobian matrix
\[
J_f(a) := \frac{\partial f}{\partial x}(a) := \frac{\partial (f_1, \ldots, f_m)}{\partial (x_1, \ldots, x_n)}(a) := \left( \frac{\partial f_i(a)}{\partial x_j} \right)_{i=1, \ldots, m; j=1, \ldots, n} \tag{0.2}
\]

Tables
The following table lists some properties of the material fused silica.

<table>
<thead>
<tr>
<th>description</th>
<th>property</th>
</tr>
</thead>
<tbody>
<tr>
<td>density</td>
<td>( \rho = 2.2 \text{ g/cm}^3 )</td>
</tr>
<tr>
<td>heat capacity</td>
<td>( c_p = 703 \text{ J/gK} )</td>
</tr>
<tr>
<td>transmission</td>
<td>185 - 2500 nm</td>
</tr>
</tbody>
</table>
Fourier (Utopia), Latin Modern (Sans and Typewriter)

The text on these pages demonstrates the appearance of the used fonts for serif, sans serif, math and typewriter fonts. The font(s) used in this document are Fourier (Utopia), Latin Modern (Sans and Typewriter). The fonts are loaded with

\usepackage{lmodern}
\usepackage{fourier}

Plain text

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\[
\iiint_S [u \nabla^2 v + (\nabla u, \nabla v)] \, d^3V = \iint_S u \frac{\partial v}{\partial n} \, d^2A \tag{0.1}
\]

Jacobian matrix
\[
J_f(a) := \frac{\partial f_i(a)}{\partial x_j} := \left( \frac{\partial(f_1, \ldots, f_m)}{\partial(x_1, \ldots, x_n)}(a) \right)_{l=1,\ldots,m; \ j=1,\ldots,n} \tag{0.2}
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4.4 Font examples

Palantino, Arial, Courier

The text on these pages demonstrates the appearance of the used fonts for serif, sans serif, math and typewriter fonts. The font(s) used in this document are *Palantino, Arial, Courier*. The fonts are loaded with

\begin{verbatim}
\usepackage{mathpazo} \% --- Palantino (incl math)
\usepackage[scaled=.95]{helvet} \% --- Helvetica (Arial)
\usepackage{courier} \% --- Courier
\end{verbatim}

Plain text

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\[ \int_S \left[ u \nabla^2 v + (\nabla u, \nabla v) \right] \, d^3V = \oint_S u \frac{\partial v}{\partial n} \, d^2A \] (0.1)

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\[ J_f(a) := \frac{\partial f}{\partial x}(a) := \frac{\partial (f_1, \ldots, f_m)}{\partial (x_1, \ldots, x_n)}(a) := \left( \frac{\partial f_i(a)}{\partial x_j} \right)_{i=1,\ldots,m; \, j=1,\ldots,n} \] (0.2)

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The text on these pages demonstrates the appearance of the used fonts for serif, sans serif, math and typewriter fonts. The font(s) used in this document are Times, Arial, Courier. The fonts are loaded with

\usepackage{mathptmx} \texttt{% --- Times (incl math)}
\usepackage[scaled=.90]{helvet} \texttt{% --- Helvetica (Arial)}
\usepackage{courier} \texttt{% --- Courier}

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Part II

LaTeX Examples
CHAPTER 5

Template demonstration

Originally the code of this chapter served only as a test for the template code. It was used to verify that everything is displayed as expected. It was then extended to a presentation of the possibilities of this template.

All examples are presented together with the creation code side by side or on top of each other. The code can be copied directly from the pdf document and inserted in the content files of this template. The basic \LaTeX{} code example may also work in any other \LaTeX{} template. However, most examples require a special package or even some code defined only in this template. Therefore it is only guaranteed that the examples work in this template. If this should not be the case it should be reported as a bug.

All the examples are designed not to raise an error if some functionality is not available, but instead to display why they were not included in the document. One example for this is the code for package subfloat in section 5.7.7, which was intentionally removed because of incompatibilities and better alternatives. Therefore these ‘error’ messages do not indicate an error of the template. They only inform why an example could not be included.

This document (content/demo/demo.tex) could also be used in other templates provided that all depending packages\footnote{codesection, templatetools and latexdemo} are loaded. In the case of glossaries some definitions need to be loaded from an extra file content/demo/glossariesEntries.tex. All users and package authors are encouraged to extend and improve the examples as well as use this file for testing of their own commands and packages.

5.1 Text markup

5.1.1 \LaTeX{} standard commands

Code:

\begin{verbatim}
\textbf{bold}, \textit{italic}, \textsl{slanted}, \\
\textsf{sans serif}, \textsc{small caps} and \\
\texttt{monospaced typewrite}.
And any combination of them:
\textit{\textbf{bold italic}}, \\
\textsl{\textbf{bold slanted}}, \\
\textsf{\textbf{bold sans serif}},
\end{verbatim}
5.1.2 package: soul

Commands of package soul:

Code:
\so\{letterspacing\}, \ul\{underlining\}, \st\{overstriking\}
and \hi\{highlighting\}.

Result:
letterspacing, underlining, overstriking
and highlighting.

5.1.3 package: ulem

Commands of package ulem:

Code:
\uline\{single underlining\}, \uline\{double underlining\}, \uwave\{waved underlining\},
\sout\{crossed out\} and \xout\{emphasized crossed out\}.

Result:
single underlining, double underlining, waved underlining, crossed out
and emphasized crossed out.

5.1.4 package: url

The url package provides a failsafe way to print urls with characters not allowed by \LaTeX.

Code:
\url\{http://www.dante.de\}

Result:
http://www.dante.de

The font used for this command can be set up in the preamble.

5.2 Quotes

5.2.1 quote

This standard environment can be used for quotes. Its text is indented from both sides. For quotes with citations the \textquotesingle{}\textquotesingle{} environment of packages csquotes is much better
suited.

Code:

\begin{quote}
The \LaTeX{} document preparation system is a special version of Donald Knuth's \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.
\end{quote}

Result:

The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.

5.2.2 \enquote{} and \blockquote{} (csquotes)

The \csquotes{} package provides advanced facilities for inline (\inline{}) and display quotations (\blockquote{}).

Code:

Normal quotes inside a sentence: \enquote{This sentence contains a second quote \enquote{with different quotation marks}}. The style of quotations can be set up and is depended on the language setting. Quotes over several lines can be set as one block: \blockquote{[Lorem Ipsum, P. 50]}{Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur.}

Result:

Normal quotes inside a sentence: “This sentence contains a second quote “with different quotation marks”. The style of quotations can be set up and is depended on the language setting. Quotes over several lines can be set as one block:

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. (Lorem Ipsum, P. 50)
5.3 References

Code:

Some text with a normal reference to section-\ref{sec:references}.

Result:

Some text with a normal reference to section 5.3.

5.3.1 variable references using vref

vref prints out the referenced number together with the page number, if the reference is not on the same page.

Code:

Some text with a vref reference to section-\vref{sec:references}.

Result:

Some text with a vref reference to section section 5.3.

5.3.2 variable references with the cleveref package

Code:

Some math formulas to reference:
\begin{equation}
a = b + c \label{eqn:abc}
\end{equation}
and another math formula
\begin{equation}
z = y + x \,. \label{eqn:zyx}
\end{equation}
\Cref{sec:references} contains a reference to a section whereas the formulars \cref{eqn:abc,eqn:zyx} reference equations.

Result:

Some math formulas to reference:

\[ a = b + c \tag{5.1} \]
and another math formula

\[ z = y + x \,. \tag{5.2} \]

Section 5.3 contains a reference to a section whereas the formulars eqs. (5.1) and (5.2) reference equations.

5.3.3 references with the reference name

The template provides the commands \eqnref, \figref, \tabref, \secref and \chapref which print out the name of the object to reference to (similar) to cleveref and include
5.4 Other environments

5.4.1 abstract environment

Error: Environment abstract not available

5.4.2 addmargin environment (Koma Script)

The addmargin-environment allows to enlarge or shrink the textwidth in both sides of the textbody. It is however recommended to let the wide parts span into the outer margin. The environment addmargin has the options [⟨left⟩]{⟨right⟩}, whereas the starred version addmargin differs in a two-sided layout by using the arguments as [⟨inner⟩]{⟨outer⟩}. For further information refer to the KOMA-script documentation.

Code:

\begin{addmargin*}[0cm]{-0.5\marginwidth}
The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text. 
\end{addmargin*}

Result:

The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.
5.5 Paragraph alignment

5.5.1 \LaTeX{} standard alignment

Code:

\begin{center}
The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.
\end{center}

Result:

The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.

If the alignment was not intentionally changed \LaTeX{} prints text as justified and with hyphenation.

5.5.2 centered text

Environment for centering of text. Not to be used with floating environments such as \texttt{table} or \texttt{figure}!

Code:

\begin{FlushLeft}
The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.
\end{FlushLeft}

Result:

The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.

5.5.3 package: ragged2e

The \texttt{ragged2e} improves typesetting of ragged text. Compared with the standard commands (\texttt{centering}, \texttt{raggedleft}, and \texttt{raggedright}) it includes hyphenation. Each environment is also available as a switch. \texttt{justifying} switches back to justified text after ragged text has been switched on.

\texttt{FlushLeft}

Code:

\begin{FlushLeft}
The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.
\end{FlushLeft}

Result:

The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.
5.5 Paragraph alignment

FlushRight

Code:

\begin{FlushRight}
The \LaTeX{} document preparation system is a special version of Donald Knuth's \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text. \end{FlushRight}

Result:

The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.

Centering

Code:

\begin{Centering}
The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text. \end{Centering}

Result:

The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.

5.5.4 Multiple columns (multicol)

Code:

\begin{multicols}{3}[Text with three columns created with package multicol]

Result:

5.6 Lists
5.6.1 itemize
This is the standard list of \LaTeX{}. It has a separation between each item, to improve the reading of texts spanning several lines.

Code:
\begin{itemize}
  \item Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
  \item Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
  \item Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
\end{itemize}

Result:

- Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
- Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
- Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

These lists can also be nested (list within list)

Code:
\begin{itemize}
  \item Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
  \\
  \begin{itemize}
    \item Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
    \\
    \begin{itemize}
      \item Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
      \\
      \item Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
      \\
      \item Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
    \end{itemize}
  \end{itemize}
\end{itemize}

Result:

- Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
  - Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
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    * Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
  - Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
  - Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
5.6.2 enumerate

Same as the itemize list, but enumerated.

Code:

```latex
\begin{enumerate}
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua.
\begin{enumerate}
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do
eiusmod tempor incididunt ut labore et dolore magna aliqua.
\begin{enumerate}
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed
do eiusmod tempor incididunt ut labore et dolore magna aliqua.
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed
do eiusmod tempor incididunt ut labore et dolore magna aliqua.
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed
do eiusmod tempor incididunt ut labore et dolore magna aliqua.
\end{enumerate}
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do
eiusmod tempor incididunt ut labore et dolore magna aliqua.
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do
eiusmod tempor incididunt ut labore et dolore magna aliqua.
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do
eiusmod tempor incididunt ut labore et dolore magna aliqua.
\end{enumerate}
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do
eiusmod tempor incididunt ut labore et dolore magna aliqua.
\end{enumerate}
```

Result:

1. Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor
   incididunt ut labore et dolore magna aliqua.
   a) Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor
      incididunt ut labore et dolore magna aliqua.
      i. Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua.
      ii. Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua.
      iii. Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod
tempor incididunt ut labore et dolore magna aliqua.
   b) Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor
      incididunt ut labore et dolore magna aliqua.
5.6 Lists

c) Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

5.6.3 Compact lists (with enumitem package)
The `enumitem` package provides many options to change the layout of a list. One of these is to create compact lists with the option `noitemsep`.

Code:
\begin{itemize}[noitemsep]
\item This environment
\item should only be used in the
\item case of single line items
\end{itemize}

Result:
• This environment
• should only be used in the
• case of single line items

5.6.4 Arbitrary labels (enumitem package)
Furthermore labels can be changed using `enumitem`, here for example using the label option.

Code:
\begin{enumerate}[label=(\alph{enumi})]
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
\item Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
\end{enumerate}

Result:
(a) Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
(b) Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
5.6.5 description environment
The description environment is used to describe items.

Code:
\begin{description}
\item[Rivers] Elbe, Rhine
\item[Seas] Indian Ocean, Pacific Ocean, Mediterranean Sea
\end{description}

Result:
Rivers Elbe, Rhine
Seas Indian Ocean, Pacific Ocean, Mediterranean Sea

5.6.6 labeling environment (Koma Script)
The labeling environment is an extension of the description environment. It provided correct alignment using the width of the largest element as a parameter.

Code:
\begin{labeling}[ --]{Rivers}
\item[Rivers] Elbe, Rhine
\item[Seas] Indian Ocean, Pacific Ocean, Mediterranean Sea
\end{labeling}

Result:
Rivers – Elbe, Rhine
Seas – Indian Ocean, Pacific Ocean, Mediterranean Sea
5.7 Figures and captions

5.7.1 figure environment

Code:

\begin{figure}[H]
\centering
\includegraphics[width=0.3\textwidth]{images/testimage.png}
\caption{Long figure caption displayed in the document.}
\label{fig:figures:1}
\end{figure}

Result:

Figure 5.1: Long figure caption displayed in the document.

5.7.2 caption without figure environment using \captionof (caption)

Code:

\begin{center}
\includegraphics[width=0.3\textwidth]{images/testimage.png}
\captionof{figure}{An example for a caption without a figure environment}
\end{center}

Result:

Figure 5.2: An example for a caption without a figure environment
5.7.3 caption without figure environment using captionsetup (caption)

Code:

\begin{center}
\captionsetup{type=figure}
\includegraphics[width=0.3\textwidth]{images/testimage.png}
\caption{Another example for a caption without a figure environment}
\end{center}

Result:

Figure 5.3: Another example for a caption without a figure environment

5.7.4 parallel figures with minipages

The minipage environment can be used to display figures in parallel. However if the floatrow package is loaded the standard \LaTeX behaviour must be restored using \RawFloats at the beginning of the figure.

Code:

\begin{figure}[H]
  \IfDefined{RawFloats}{\RawFloats} % required if floatrow is loaded
  \begin{minipage}[b]{0.5\linewidth}
    \centering
    \includegraphics[width=0.5\linewidth]{images/testimage.png}
    \caption{A figure}
    \label{fig:figures:2}
  \end{minipage} %
\hspace{2em}
  \begin{minipage}[b]{0.5\linewidth}
    \centering
    \includegraphics[width=0.5\linewidth]{images/testimage.png}
    \caption{Another figure}
    \label{fig:figures:3}
  \end{minipage}
\end{figure}

Result:
5.7.5 subcaption in minipages (caption)
The \subcaption command allows to define subfigure captions independent of the code used to display the pictures.

Code:

\begin{figure}[H]
\begin{minipage}[b]{.5\linewidth}
\centering
\includegraphics[width=0.5\linewidth]{images/testimage.png}
\subcaption{A subfigure}\label{fig:1a}
\end{minipage}\
\begin{minipage}[b]{.5\linewidth}
\centering
\includegraphics[width=0.5\linewidth]{images/testimage.png}
\subcaption{Another subfigure}\label{fig:1b}
\end{minipage}
\caption{A figure}\label{fig:1}
\end{figure}

Result:

(a) A subfigure  
(b) Another subfigure

\begin{figure}
\centering
\begin{minipage}{.5\linewidth}
\includegraphics[width=\linewidth]{images/testimage.png}
\caption{A figure}
\end{minipage}
\end{figure}

5.7.6 subfigure environment (caption)
The \subfigure environment has a syntax equal to the normal figure environment, enhanced with the width and positioning arguments of a minipage environment.

Code:
\begin{figure}[H]
\begin{subfigure}[b]{.5\linewidth}
\centering
\includegraphics[width=0.5\linewidth]{images/testimage.png}
\caption{A subfigure}\label{fig:2a}
\end{subfigure}\%
\begin{subfigure}[b]{.5\linewidth}
\centering
\includegraphics[width=0.5\linewidth]{images/testimage.png}
\caption{Another subfigure}\label{fig:2b}
\end{subfigure}
\caption{A figure}\label{fig:2}
\end{figure}

Result:

(a) A subfigure  (b) Another subfigure

\textbf{Figure 5.7:} A figure

5.7.7 \textit{subcaption with subfloat command (subfig)}

\textbf{Error:} Command \texttt{subfloat} not available

5.7.8 \textit{parallel figures (floatrow)}

The \texttt{floatrow} package provides many ways to layout pictures and tables and any other floating content. Here is an example with the \texttt{\ffigbox} command inside the \texttt{floatrow} environment using the figure width for the first figure and the remaining width for the second figure.

\begin{figure}[H]
\begin{floatrow}
\ffigbox[\FBwidth]
{\includegraphics[width=0.3\textwidth]{images/testimage.png}}
{\caption{caption spanning the width of the picture}\label{fig:floatrow:example:3:a}}
\%
\ffigbox[\Xhsize]
{\includegraphics[width=0.3\textwidth]{images/testimage.png}}
{\caption{caption spanning the remaining width of the text width}}
\end{floatrow}
\end{figure}
5.7 Figures and captions

5.7.9 parallel figures with vertical alignment (floatrow)

The general `\floatbox` command allows vertical alignment in the third optional parameter. Here `[t]op and [b]ottom alignment is demonstrated.

Code:

```latex
\begin{figure}[H]
  \begin{floatrow}
    \floatbox[figure][0.3\textwidth][FBheight][t]
    {\caption{first image positioned at the top}
      \label{fig:floatrow:example:4:a}}
    {includegraphics[width=0.25\textwidth]{images/testimage.png}}
  \end{floatbox}
  \begin{floatbox}[figure][0.3\textwidth][FBheight][t]
    {\caption{second image positioned at the top}
      \label{fig:floatrow:example:4:b}}
    {includegraphics[width=0.18\textwidth]{images/testimage.png}}
  \end{floatbox}
  \begin{floatbox}[figure][0.3\textwidth][FBheight][b]
    {\caption{third image positioned at the bottom}
      \label{fig:floatrow:example:4:c}}
    {includegraphics[width=0.15\textwidth]{images/testimage.png}}
  \end{floatbox}
\end{floatrow}
\end{figure}
```

Result:
5.7.10 subfigures with subfloatrow environment (floatrow)

The figure placement and layout of \texttt{floatrow} can be changed to subfigures by using the \texttt{subfloatrow} environment.

Code:

```latex
\begin{figure}[H]
\ffigbox[\FBwidth]
{\begin{subfloatrow}
\ffigbox[1.5\FBwidth]
{\includegraphics[width=0.2\textwidth]{images/testimage.png}}
{\caption{first image}\label{fig:floatrow:example:5:a}}
%
\ffigbox[1.5\FBwidth]
{\includegraphics[width=0.2\textwidth]{images/testimage.png}}
{\caption{second image}\label{fig:floatrow:example:5:b}}
\end{subfloatrow}
}
{\caption{subcaptions using subfloatrow environment}\label{fig:floatrow:example:5}}
\end{figure}
```

Result:

(a) first image  
(b) second image

\textbf{Figure 5.13:} subcaptions using subfloatrow environment
5.7.11 caption beside the figure (floatrow)

Using the first optional argument of \texttt{\texttt{\textbackslash floatbox}} one can define a caption which is placed beside the figure with \texttt{\textbackslash capbeside}.

Code:

\begin{figure}\[H\]
\texttt{\texttt{\textbackslash floatbox}}\{\texttt{\textbackslash capbeside}\}\{\texttt{\texttt{\textbackslash figure}}\}\{\texttt{\texttt{\textbackslash FBwidth}}\}
\{\texttt{\texttt{\textbackslash caption}}\{\texttt{\textbackslash capbeside the figure}\}\{\texttt{\textbackslash caption beside the figure with some more text and a bit more text and a little more text to fill space}\}\}
\{\texttt{\texttt{\textbackslash label}}\{\texttt{\texttt{\textbackslash fig:floatrow:example:6:a}}\}\}
\{\texttt{\texttt{\textbackslash includegraphics}}\{\texttt{\texttt{\textbackslash width=0.3\texttt{\textbackslash textwidth}}\}\{\texttt{\texttt{\texttt{\textbackslash images\texttt{/testimage.png}}}}\}\}
\end{figure}

Result:

\begin{figure}
\centering
\includegraphics[width=0.3\textwidth]{images/testimage.png}
\caption{caption beside the figure with some more text and a bit more text and a little more text to fill space}
\label{fig:floatrow:example:6:a}
\end{figure}

\textbf{Figure 5.14:} caption beside the figure with some more text and a bit more text and a little more text to fill space

5.7.12 caption beside the figure with captionbeside (koma script)

If the \texttt{floatrow} package is loaded the standard \LaTeX{} behaviour must be restored using \texttt{\texttt{\textbackslash RawFloats}} at the beginning of the figure.

Code:

\begin{verbatim}
\KOMAoptions{captions=bottombeside} \% topbeside
\begin{figure}\[H\]
\IfDefined{RawFloats}{\RawFloats} \% required if floatrow is loaded
\begin{captionbeside} \% Example of captionbeside, with inside caption and with some more text and a bit more text and a little more text to fill space.\%
\includegraphics[width=0.3\textwidth\textwidth]{images/testimage.png}
\end{captionbeside}
\label{fig:captionbeside:example}
\end{figure}
\end{verbatim}

Result:
Figure 5.15: Example of caption beside, with inside caption and with some more text and a bit more text and a little more text to fill space.
5.7 Figures and captions

5.7.13 figure inside the paragraph (wrapfigure)
Non floating figure inside the paragraph. Note that this can cause wrong placed free space in the text body. If so one must remove this by adding appropriate $\verb|\vspace|$ commands at the top and/or bottom of the figure.

Code:

```
\begin{wrapfigure}{r}{0.3\textwidth}
\includegraphics[width=0.8\linewidth]{images/testimage.png}
\caption{A wrapfigure example}
%\vspace{-2\baselineskip}
\end{wrapfigure}
```

Result:

```
Fig. 5.16: A wrapfigure example
```


5.7.14 floating figure (or table) inside the paragraph (wrapfigure)
The $\texttt{wrapfloat}$ environment in contrast to the $\texttt{wrapfigure}$ environment is a floating environment and can be used for not only figures but any floating content.

Code:

```
\begin{wrapfloat}{figure}{r}{0.3\textwidth}
\includegraphics[width=0.8\linewidth]{images/testimage.png}
\caption{A wrapfloat example}
%\vspace{-2\baselineskip}
\end{wrapfloat}
```

Result:

5.7.15 floating figure inside the paragraph (floatflt)

**Error:** Environment `floatingfigure` not available

5.7.16 Koma Script: addmargin (default)

In this example the caption is as wide as the figure, which means that the caption spans into the margin.

Code:

\captionsetup{parboxrestore=default}

\begin{figure}[H]
\IfDefined{RawFloats}{\RawFloats} % required if floatrow is loaded
\begin{addmargin*}[0pt]{-0.6\marginwidth}\
centering
\includegraphics[width=0.22\linewidth]{images/testimage} \hfill
\includegraphics[width=0.22\linewidth]{images/testimage} \hfill
\includegraphics[width=0.22\linewidth]{images/testimage} \hfill
\includegraphics[width=0.22\linewidth]{images/testimage}
\caption[pictures extended into the margin]{pictures extended into the margin -- Pellentesque mollis nunc sed mauris tempor molestie. Aliquam adipiscing nisi eu metus. Proin viverra odio ac lorem consequat condimentum. Suspendisse bibendum tellus.}
\label{fig:maincls.addmargin.default}
\end{addmargin*}
\end{figure}

Result:


**Figure 5.18:** pictures extended into the margin – Pellentesque mollis nunc sed mauris tempor molestie. Aliquam adipiscing nisi eu metus. Proin viverra odio ac lorem consequat condimentum. Suspendisse bibendum tellus.


5.7.17 Koma Script: addmargin (with parboxrestore)

Here the caption is only as wide as the textwidth, which is corrected using the code \captionsetup{parboxrestore=full}.

Code:

```latex
\captionsetup{parboxrestore=full}

\begin{figure}[H]
\begin{addmargin*}[0pt]{-0.6\marginwidth}\centering
\includegraphics[width=0.22\linewidth]{images/testimage} \hfill
\includegraphics[width=0.22\linewidth]{images/testimage} \hfill
\includegraphics[width=0.22\linewidth]{images/testimage} \hfill
\includegraphics[width=0.22\linewidth]{images/testimage}
\caption{pictures extended into the margin -- Pellentesque mollis nunc sed mauris tempor molestie. Aliquam adipiscing nisi eu metus. Proin viverra odio ac lorem consequat condimentum. Suspendisse bibendum tellus.}
\label{fig:maincls.addmargin.full}
```

\end{figure}

Result:


Figure 5.19: pictures extended into the margin – Pellentesque mollis nunc sed mauris tempor molestie. Aliquam adipiscing nisi eu metus. Proin viverra odio ac lorem consequat condimentum. Suspendisse bibendum tellus.


5.7.18 caption inside the margin (mcaption)

Code:

\begin{figure}[H]
\IfDefined{RawFloats}{\RawFloats} % required if floatrow is loaded
\begin{margincap}
\centering
\includegraphics[width=0.4\textwidth]{images/testimage}
\caption[short caption text]{long caption text with some more text and a bit more text and a little more text to fill space.}
\label{fig:picmargincap}
\end{margincap}
\end{figure}

Pellentesque mollis nunc sed mauris tempor molestie. Aliquam adipiscing nisi eu metus. Proin viverra odio ac lorem consequat condimentum. Suspendisse
5.7 Figures and captions


Result:


5.7.19 document sizes

This template defines the commands `\doctextwidth` and `\doctextheight` which maintain their size even if the surrounding `\textwidth` changes.

These sizes can be used in figures to specify the width in fixed paper depended sizes.

<table>
<thead>
<tr>
<th>0.8\textwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.38\doctextwidth</td>
</tr>
<tr>
<td>0.38\textwidth</td>
</tr>
</tbody>
</table>

Fig. 5.20: long caption text with some more text and a bit more text and a little more text to fill space.
5.8 Tables
This section about tables is organized as follows:

- In section 5.8.1 different styles to create a table are shown:
  - using booktabs line commands (5.8.1 and 5.8.1),
  - with custom commands for the style and the colors (5.8.1),
  - and with the package \texttt{tablestyles} (5.8.1).
- Section 5.8.2 is about the alignment of columns in a table, the usage of column specifiers and the alignment of numbers using \texttt{siunitx}.
- In section 5.8.3 the usage of \texttt{\textbackslash multicolumn} and \texttt{\textbackslash multirow} commands is shown.
- Section 5.8.4 shows how to correct the indentation for itemize lists.
- Section 5.8.6 demonstrates the coloring of rows.
- Section 5.8.7 introduces the creation of tables with the \texttt{tabu} package.
- How to create and present very large tables is introduced in section 5.8.8.

5.8.1 Table styles
There a many ways to design a table in terms of its lines (grid), sizes, fonts and colors. Most of these can be regarded as personal taste. However the simplest on, the grid design, is regarded as a style which should be avoided by any means, since it makes it difficult for the eye to read the table. Here some of the most common approaches to style a table are presented.

Booktabs package

Code:

```
\begin{table}[H]
% style
\small\sffamily\renewcommand{\arraystretch}{1.4}
% caption
\caption{above}{table in booktabs style}
\begin{tabular}{lll}
\toprule
header & header & header \\
\midrule
content & content & content \\
content & content & content \\
content & content & content \\
\bottomrule
\end{tabular}
\end{table}
```

Result:
Table 5.1: table in booktabs style

<table>
<thead>
<tr>
<th>header</th>
<th>header</th>
<th>header</th>
</tr>
</thead>
<tbody>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
</tbody>
</table>

Note that here the style of the table was further changed by the commands:

\begin{table}[H]\small\sffamily\renewcommand{\arraystretch}{1.4}
\begin{tabular}{lll}
\toprule
header & header & header \\
\cmidrule(r){1-1}
\cmidrule(lr){2-2}
\cmidrule(l){3-3}
content & content & content \\
content & content & content \\
content & content & content \\
\bottomrule
\end{tabular}
\end{table}

Cmidrule (booktabs)

Code:

\begin{table}[H]\small\sffamily\renewcommand{\arraystretch}{1.4}\begin{tabular}{lll}
\toprule
\begin{tabular}{l}
header & header & header \\
\cmidrule(r){1-1}
\cmidrule(lr){2-2}
\cmidrule(l){3-3}
content & content & content \\
content & content & content \\
content & content & content \\
\bottomrule
\end{tabular}
\end{tabular}\end{table}

Result:

<table>
<thead>
<tr>
<th>header</th>
<th>header</th>
<th>header</th>
</tr>
</thead>
<tbody>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
</tbody>
</table>

Custom style with alternating row colors

Here a custom style is applied

- \small \renewcommand{\arraystretch}{1.4} tables are more compact.
- \sffamily \renewcommand{\arraystretch}{1.4} better readability of rows.
- \sffamily \renewcommand{\arraystretch}{1.4} tables are better distinguished from the main text.
Code:
\begin{table}[H]
  % style
  %small\sffamily\centering\renewcommand{\arraystretch}{1.4}
  % caption
  \captionabove{table with style changes and zebra colored rows}
  \rowcolors{1}{tablebodycolor}{tablerowcolor}
  \begin{tabular}{ccc}
    \hline
    \rowcolor{tableheadcolor}
    \bfseries header & \bfseries header & \bfseries header \\
    \hline
    content & content & content \\
    content & content & content \\
    content & content & content \\
    \hline
  \end{tabular}
\end{table}

Result:

\begin{table}[H]
\captionabove{table with style changes and zebra colored rows}
\begin{tabular}{ccc}
  \theadstart
  \bfseries header & \bfseries header & \bfseries header \\
  \theadend
\end{tabular}
\end{table}

Tablestyles package

This package unifies the application of a style to a table. The following styles are predefined: default, roman (serif instead of sans fonts), sansbold (bold header), sansboldbw (white text on black background)

Code:
\begin{table}[H]
  \tablestyle[sansbold]
  \captionabove{table with bold header font using the styles by this package}
  \begin{tabular}{*{2}{p{0.45\textwidth}}}
    \theadstart
    \thead header & \thead header & \thead header \\
    \theadend
    content & content & content \\
    content & content & content \\
    content & content & content \\
  \end{tabular}
\end{table}
5.8 Tables

\begin{tabular}{lcr}
left & center & right \ & \ % or \texttt{tabularnewline}
A & B & C \\
\end{tabular}

Result:

\begin{table}
\centering
\begin{tabular}{|l|l|}
\hline
\textbf{header} & \textbf{header} \\
\hline
content & content \\
content & content \\
content & content \\
content & content \\
content & content \\
\hline
\textbf{subhead} & \textbf{subhead} \\
content & content \\
content & content \\
\end{tabular}
\end{table}

Table 5.3: table with bold header font using the styles by this package

One should note, that these commands do not work together with the package \texttt{tabu}, since in that package most row color command do not work as expected or need to be replaced by color commands from the \texttt{tabu} package, see section 5.8.7.

5.8.2 Column types and column specifiers

Simple table (only alignment)

Code:

\begin{verbatim}
\begin{tabular}{|l|l|}
left & center \ % or \texttt{tabularnewline}
A & B \ C \\
\end{tabular}
\end{verbatim}
Result:

<table>
<thead>
<tr>
<th>left</th>
<th>center</th>
<th>right</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>

**Column types: p**

p-columns have a fixed width and align the text as justified.

Code:

```latex
\begin{center}
% Style changes
\small\renewcommand{\arraystretch}{1.4}
% tabular
\begin{tabular}{|l|p{0.1\linewidth}|p{0.2\linewidth}|p{0.4\linewidth}|}
\hline
header l & header p & header p & header p \\
\hline
left & text which is considerably longer than the width of the column & text which is considerably longer than the width of the column & text which is considerably longer than the width of the column \\
\hline
end{tabular}
\end{center}
```

Result:

<table>
<thead>
<tr>
<th>header l</th>
<th>header p</th>
<th>header p</th>
<th>header p</th>
</tr>
</thead>
<tbody>
<tr>
<td>left</td>
<td>text which is considerably longer than the width of the column</td>
<td>text which is considerably longer than the width of the column</td>
<td>text which is considerably longer than the width of the column</td>
</tr>
</tbody>
</table>

Note, that such a grid should not be applied to a table. It is here only to demonstrate the size of the columns.

**Column types: p, m, b**

The p, b and m columns all behave the same expect for their vertical alignment:

- p means normal cells, they aligned at the top line
- b means alignment at the bottom, so the baseline is at the bottom line
• m means alignment in the vertical center, i.e. the baseline is in the center.

Therefore b-columns are on top of p-columns because their baselines are aligned.

Code:

\begin{center}
% Style changes
\small\renewcommand{\arraystretch}{1.4}
% tabular
\begin{tabular}{|p{0.3\linewidth}|m{0.3\linewidth}|b{0.3\linewidth}|}
\hline
\centering header p & \centering header m & \centering header b \\
\hline
text which is considerably longer than the width of the column & text which is considerably longer than the width of the column & text which is considerably longer than the width of the column \\
\hline
\end{tabular}
\end{center}

Result:

<table>
<thead>
<tr>
<th>header p</th>
<th>header m</th>
<th>header b</th>
</tr>
</thead>
<tbody>
<tr>
<td>text which is considerably longer than the width of the column</td>
<td>text which is considerably longer than the width of the column</td>
<td>text which is considerably longer than the width of the column</td>
</tr>
</tbody>
</table>

Note, that such a grid should not be applied to a table. It is here only to demonstrate the alignment.

Column types: X (tabularx)

The package \texttt{tabularx} defines a new tabular environment, which requires the total width of the tabular as a mandatory argument. The new X-columns take the remaining space to fill the tabular. Each column is aligned as justified.

Code:

\begin{center}
% Style changes
\small\renewcommand{\arraystretch}{1.4}
% tabular
\begin{tabularx}{0.9\textwidth}{llXX}
\hline
\end{center}
Note, that such a grid should not be applied to a table. It is here only to demonstrate the size of the columns.

**Custom column types: L, C, R**

The predefined custom column types L, C and R all have a fixed width (they are based on the p-columns) but are aligned as left (L), centered (C) and right (R). All columns include hyphenation.

**Code:**

```latex
\begin{center}
  % Style changes
  \small\renewcommand{\arraystretch}{1.4}
  % tabular
  \small
  \begin{tabular}{|L{0.3\linewidth}|C{0.3\linewidth}|R{0.3\linewidth}|}
    \hline
    fixed width (L: left) & fixed width (C: center) & fixed width (R: right) \\
    \hline
    text which is considerably longer than the width of the column & text which is considerably longer than the width of the column & text which is considerably longer than the width of the column \\
    \hline
  \end{tabular}
\end{center}
```

**Result:**

<table>
<thead>
<tr>
<th>L</th>
<th>l</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>left column</td>
<td>left column</td>
<td>text which is considerably longer than the width of the column</td>
<td>text which is considerably longer than the width of the column</td>
</tr>
</tbody>
</table>
5.8 Tables

<table>
<thead>
<tr>
<th>fixed width (L: left)</th>
<th>fixed width (C: center)</th>
<th>fixed width (R: right)</th>
</tr>
</thead>
<tbody>
<tr>
<td>text which is considerably longer than the width of the column</td>
<td>text which is considerably longer than the width of the column</td>
<td>text which is considerably longer than the width of the column</td>
</tr>
</tbody>
</table>

Note, that such a grid should not be applied to a table. It is here only to demonstrate the size and alignment of the columns.

**Custom column types: W, Y, Z**

The predefined custom column types W, Y and Z all have a variable width (they are based on the X-columns) but are aligned as left (W), centered (Z) and right (Y). All columns include hyphenation. The standard X column is left aligned but justified.

The choice of the character W, Y and Z is only based on the available characters. There is no hidden meaning behind them.

Code:

```latex
\begin{center}
% Style changes
\small\renewcommand{\arraystretch}{1.4}
% tabular
\small
\begin{tabularx}{\textwidth}{|W|Z|Y|}
\hline
variable (W: left) & variable (Z: center) & variable (Y: right) \hline
% text which is considerably longer than the width of the column & text which is considerably longer than the width of the column & text which is considerably longer than the width of the column \hline
\end{tabularx}
\end{center}
```

Result:

<table>
<thead>
<tr>
<th>variable (W: left)</th>
<th>variable (Z: center)</th>
<th>variable (Y: right)</th>
</tr>
</thead>
<tbody>
<tr>
<td>text which is considerably longer than the width of the column</td>
<td>text which is considerably longer than the width of the column</td>
<td>text which is considerably longer than the width of the column</td>
</tr>
</tbody>
</table>

Note, that such a grid should not be applied to a table. It is here only to demonstrate the size and alignment of the columns.
Usage of special column specifiers ($>\{\ldots\}, !\{\ldots\}$)

In this code the $!\{\ldots\}$ specifier is used to replace the cell separation by the equal sign ($!\{=\}$) and the preceding and following column are specified using $>\{$\ldots$\}<\{$\}$ to define the columns as math mode cells. With this combination an alignment of the properties at the equal sign is achieved.

Code:

\begin{center}
% Style changes
\small\renewcommand{\arraystretch}{1.4}
% tabular
\begin{tabular}{l>{$}r<{$}!{=}>{$}l<{$}}
\hline
\bfseries Description & \multicolumn{2}{l}{\bfseries Property} \\
\hline
density & \rho & \SI{2.2}{g/cm^3} \\
heat capacity & c_{\text{p}} & \SI{703}{J/gK} \\
transmission & \multicolumn{2}{c}{185 - 2500\,\text{nm}} \\
\hline
\end{tabular}
\end{center}

Result:

<table>
<thead>
<tr>
<th>Description</th>
<th>Property</th>
</tr>
</thead>
<tbody>
<tr>
<td>density</td>
<td>$\rho = \SI{2.2}{g/cm^3}$</td>
</tr>
<tr>
<td>heat capacity</td>
<td>$c_{\text{p}} = \SI{703}{J/gK}$</td>
</tr>
<tr>
<td>transmission</td>
<td>$185 - 2500,\text{nm}$</td>
</tr>
</tbody>
</table>

Note that here the style of the table was further changed by the commands:

\small\renewcommand{\arraystretch}{1.4}

Alignment of numbers (siunitx, S-column)

In this table all numbers are aligned, rounded and zeros added if necessary

Code:

\begin{center}
% Style changes
\small\renewcommand{\arraystretch}{1.4}
% si setup
\sisetup{\table-format = 2.3, \round-mode=places, \round-precision=3}
\end{center}
5.8 Tables

```
round-integer-to-decimal=true, % add trailing 0
%
% tabular
\begin{tabular}{|S % center = standard
|S[tablenumberalignment = left]
|S[tablenumberalignment = right]}%\hline
{Some Values} & {Some Values} & {Some Values} \\
\hline
2.34 & 2.34 & 2.34 \\
34.2345 & 34.2345 & 34.2345 \\
56.7834 & 56.7834 & 56.7834 \\
\hline
\end{tabular}
\end{center}
```

Result:

<table>
<thead>
<tr>
<th>Some Values</th>
<th>Some Values</th>
<th>Some Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.340</td>
<td>2.340</td>
<td>2.340</td>
</tr>
<tr>
<td>34.235</td>
<td>34.235</td>
<td>34.235</td>
</tr>
<tr>
<td>56.783</td>
<td>56.783</td>
<td>56.783</td>
</tr>
</tbody>
</table>

Note, that such a grid should not be applied to a table. It is here only to demonstrate the size and alignment of the columns.

5.8.3 Multicolumn and multirow cells

Multicolumn

Code:

```
\begin{center}
\renewcommand{\arraystretch}{1.4}
\begin{tabular}{|l|c|r|}
\hline
left & center & right \\
\hline
\multicolumn{3}{|c|}{3 columns} \\
\hline
1 & 2 & 3 \\
\hline
\end{tabular}
\end{center}
```

Result:

<table>
<thead>
<tr>
<th>left</th>
<th>center</th>
<th>right</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 columns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note, that such a grid should not be applied to a table. It is here only to demonstrate the usage of \multicolumn
Multirow

Code:
\begin{center}
\renewcommand{\arraystretch}{1.4}
\begin{tabular}{|l|c|r|} \hline
left & centered & right \ \hline
\hline
\multirow{2}{*}{two cells} & b & c \ \cline{2-3}
& 2 & 3 \ \hline
\end{tabular}
\end{center}

Result:

Note, that such a grid should not be applied to a table. It is here only to demonstrate the usage of \texttt{\multicolumn}

Multirow and multicolumn combined

Code:
\begin{center}
\renewcommand{\arraystretch}{1.4}
\begin{tabular}{|c|c|c|} \hline
1 & 2 & 3 \ \hline
\multicolumn{2}{|c|}{\multirow{2}{*}{2x2 cells}} & 6 \ \cline{3-3}
\multicolumn{2}{|c|}{} & 9 \ \hline
\end{tabular}
\end{center}

Result:

Note, that such a grid should not be applied to a table. It is here only to demonstrate the usage of \texttt{\multicolumn}
Multirow usage in a complex example

Code:

```
\begin{center}
\renewcommand{\arraystretch}{1.4}
\begin{tabular}{|c|c|}
\hline
\multirow{4}{2cm}{text} & Column a \\
& Column b \\
& Column c \\
& Column d \\
\hline
\multirow{3}*{text} & Column a \bigstrut \cline{2-2} \\
& Column b \bigstrut \cline{2-2} \\
& Column c \bigstrut \\
\hline
\multirow{4}*{\begin{tabular}{c}
row a \\
row b
\end{tabular}} & Column a \\
& Column b \\
& Column c \\
& Column d \\
\hline
\end{tabular}
\end{center}
```

Result:

```
<table>
<thead>
<tr>
<th>text</th>
<th>Column a</th>
<th>Column b</th>
<th>Column c</th>
<th>Column d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Column a</td>
<td>Column b</td>
<td>Column c</td>
<td>Column d</td>
</tr>
<tr>
<td></td>
<td>Column a</td>
<td>Column b</td>
<td>Column c</td>
<td>Column d</td>
</tr>
<tr>
<td></td>
<td>Column a</td>
<td>Column b</td>
<td>Column c</td>
<td>Column d</td>
</tr>
<tr>
<td>row a</td>
<td>Column a</td>
<td>Column b</td>
<td>Column c</td>
<td>Column d</td>
</tr>
<tr>
<td>row b</td>
<td>Column a</td>
<td>Column b</td>
<td>Column c</td>
<td>Column d</td>
</tr>
</tbody>
</table>
```

5.8.4 Item lists inside tabular cells

List require a special correction to be not, or rather to be intended correct in a tabular cell. The same commands work in tabu tables, see section 5.8.7.

Code:

```
\begin{center}
% Style changes
\small\centering\renewcommand{\arraystretch}{1.4}
% tabular
\begin{tabularx}{1\textwidth}{|X|X|X|}
\hline
\end{tabularx}
\end{center}
```
The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.

\begin{itemize}
\item The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program.
\item \TeX{} is a sophisticated program designed to produce high-quality typesetting,
\item especially for mathematical text.
\end{itemize}

\begin{enumerate}
\item The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program.
\item \TeX{} is a sophisticated program designed to produce high-quality typesetting,
\item especially for mathematical text.
\end{enumerate}

Note, that the grid lines should not be applied to a table. It is here only to demonstrate the size and alignment of the columns.
5.8 Tables

5.8.5 Footnotes in tables (tablefootnote)

Error: Command \tablefootnote not available

5.8.6 Colors in tables: rowcolor(s)
The alternating row colors (zebra table style) is created by the \rowcolors command. A single row is colored with \tableheadcolor.

Code:

```
\begin{center}
% Style changes
\small\sffamily\renewcommand{\arraystretch}{1.4}
% tabular
\rowcolors{1}{tablerowcolor}{tablebodycolor}
\begin{tabular}{ccc}
\hline
\rowcolor{tableheadcolor}
head & head & head \\
\hline
content & content & content \\
content & content & content \\
content & content & content \\
\hline
\end{tabular}
\end{center}
```

Result:

```
\begin{tabular}{ccc}
\hline
head & head & head \\
content & content & content \\
content & content & content \\
content & content & content \\
\hline
\end{tabular}
```

5.8.7 Tables with the tabu package

Simple table

The tabu environment from the tabu-package provides an alternative method for the creation of tables. This table is a very simple example where only the environment is exchanged.

Code:

```
\begin{center}
% Style changes
\small\sffamily\renewcommand{\arraystretch}{1.4}
% tabu
\begin{tabu}{|l|r|c|}
\hline
\end{center}
```
Note, that the grid lines should not be applied to a table. It is here only to demonstrate the size and alignment of the columns.

**X columns**

Tabu provides X-type columns which have an additional horizontal alignment as an argument.

**Code:**

\begin{center}
% Style changes
\textsmall
\sffamily
\renewcommand{\arraystretch}{1.4}
% tabu
\begin{tabu}{|l|X[r]|X[l]|}
\hline
left & X (right) & X (left) \ \hline
1 & 2 & 3 \ \hline
4 & 5 & 6 \ \hline
\end{tabu}
\end{center}

**Result:**

<table>
<thead>
<tr>
<th>left</th>
<th>X (right)</th>
<th>X (left)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

Note, that the grid lines should not be applied to a table. It is here only to demonstrate the size and alignment of the columns.

**X columns (multiples)**

The X-columns can also be stretched using a multiplier.

**Code:**

\begin{center}
% Style changes
\textsmall
\sffamily
\renewcommand{\arraystretch}{1.4}
% tabu
\begin{tabu}{|l|X[r]|X[l]|}
\hline
left & X (right) & X (left) \ \hline
1 & 2 & 3 \ \hline
4 & 5 & 6 \ \hline
\end{tabu}
\end{center}

**Result:**

<table>
<thead>
<tr>
<th>left</th>
<th>X (right)</th>
<th>X (left)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
\begin{center}
\% Style changes
\small\sffamily\renewcommand{\arraystretch}{1.4}
\% tabu
\begin{tabu} to 0.6\textwidth
{|X[1,l]|X[2,c]|X[3,c]|X[1,r]|}
\hline
1x & 2x & 3x & 1x \\ \hline
left & center & center & right \\ \hline
text & text & text & text \\ \hline
\end{tabu}
\end{center}

Result:

\begin{tabular}{|c|c|c|c|}
\hline
1x & 2x & 3x & 1x \\
\hline
left & center & center & right \\
\hline
text & text & text & text \\
\hline
\end{tabular}

Note, that the grid lines should not be applied to a table. It is here only to demonstrate the size and alignment of the columns.

Vertical and horizontal alignment
The X-columns further take the alignment as an option. Possible values are L,C,R and J (justified) and in the vertical direction p,m and b.

Code:

\begin{center}
\% Style changes
\small\sffamily\renewcommand{\arraystretch}{1.4}
\% tabu
\begin{tabu} to 0.9\textwidth{|X[2,Lp]|X[2,Cm]|X[2,Rb]|X[2,J]|}
\hline
left (p) & left (m) & left (b) & justified (p) \\
\hline
text which is considerably longer than the width of the column &
text which is considerably longer than the width of the column &
text which is considerably longer than the width of the column &
text which is considerably longer than the width of the column \\
\hline
\end{tabu}
\end{center}

Result:
Note, that the grid lines should not be applied to a table. It is here only to demonstrate the size and alignment of the columns.

**Colors in tabu tables**

The color commands from the xcolor package (\rowcolor) can not be used in tabu-tables. For this purpose the commands from the tabu package need to be applied, such as \taburowcolors.

Code:

```latex
\begin{center}
% Style changes
{\small\sffamily}\renewcommand{\arraystretch}{1.4}
% tabu
\begin{tabu} to 0.9\textwidth {X[l]X[c]X[c]X[c]}
\hline
\rowfont[c]{\bfseries}
\taburowcolors 1{tableheadcolor .. tableheadcolor}
head & head & head & head \\
\hline
\taburowcolors 2{tablebodycolor .. tablerowcolor}
content & content & content & content \\
content & content & content & content \\
content & content & content & content \\
\hline
\end{tabu}
\end{center}
```

Result:

<table>
<thead>
<tr>
<th>head</th>
<th>head</th>
<th>head</th>
<th>head</th>
</tr>
</thead>
<tbody>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
</tbody>
</table>
Item lists inside tabu tables

List require a special correction to intended correct in a tabu cell.

Code:

\begin{center}
% Style changes
\small\centering\renewcommand{\arraystretch}{1.4}
% tabular
\begin{tabu} to 1.0\textwidth {X[1,l]X[1,l]X[1,l]}
\hline
\centering header X & \centering header items (X) & \centering header enums (X) \tabularnewline
\hline
\% The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program. \TeX{} is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.
\&
\itemitemize
\begin{itemize}
\item The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program.
\item \TeX{} is a sophisticated program designed to produce high-quality typesetting,
\item especially for mathematical text.
\end{itemize}
\&
\itemitemize
\begin{enumerate}
\item The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program.
\item \TeX{} is a sophisticated program designed to produce high-quality typesetting,
\item especially for mathematical text.
\end{enumerate}
\end{itemize}
\% &
\begin{enumerate}
\itemitemize
\begin{itemize}
\item The \LaTeX{} document preparation system is a special version of Donald Knuth’s \TeX{} program.
\item \TeX{} is a sophisticated program designed to produce high-quality typesetting,
\item especially for mathematical text.
\end{itemize}
\\end{enumerate}
\end{itemize}
\% \tabl arsonewline
\hline
\end{tabu}
\end{center}

Result:
The \LaTeX document preparation system is a special version of Donald Knuth's \TeX program. \TeX is a sophisticated program designed to produce high-quality typesetting, especially for mathematical text.

\begin{filecontents}{content/longtable.tex}
\begin{longtable}{>{\itshape}l*{5}{Z}}
\captionabove{longtable tabular with tabularx columns} \\
\hline
\rowcolor{tableheadcolor} \upshape
\bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title \\
\hline
\endfirsthead
\hline
\upshape
\bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title \\
\hline
\endhead
\hline
\multicolumn{6}{r}{\emph{continued on next page \ldots}} \\
\endfoot
\hline
\endlastfoot
\end{longtable}
\end{filecontents}

5.8.8 Large tables
Longtable
This code demonstrates how to create columns which span over more than one page.

Code:
\begin{verbatim}
\% Creation of the table in a separate file
\begin{filecontents}{content/longtable.tex}
\begin{longtable}{>{\itshape}l*{5}{Z}}
\captionabove{longtable tabular with tabularx columns} \\
\hline
\rowcolor{tableheadcolor} \upshape
\bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title \\
\hline
\endfirsthead
\hline
\upshape
\bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title \\
\hline
\endhead
\hline
\multicolumn{6}{r}{\emph{continued on next page \ldots}} \\
\endfoot
\hline
\endlastfoot
\end{longtable}
\end{filecontents}
\end{verbatim}
<table>
<thead>
<tr>
<th>description</th>
<th>content</th>
<th>content</th>
<th>content</th>
<th>content</th>
<th>content</th>
</tr>
</thead>
<tbody>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
<td>content</td>
</tr>
<tr>
<td>description</td>
<td>content</td>
<td>content</td>
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</tbody>
</table>

\end{longtable}
\end{filecontents}
Result:

**Table 5.4:** longtable tabular with tabularx columns

<table>
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</table>

*continued on next page...*
longtabu (tabu package)

This code demonstrates how to create columns which span over more than one page using the `longtable` and the `tabu` package.

The advantage here is, that no extra file needs to be created and X columns can be used with the additional possibilities of the `tabu` package.

Code:

```latex
{ % start a group
\% style
\small\renewcommand{\arraystretch}{1.4}\sffamily
\% required if floatrow is loaded
\IfDefined{floatsetup}{\floatsetup[longtable]{font={sf,small}}}
\% the table
\begin{longtabu} to \textwidth{>{\itshape}l*5{X[c]}}
\captionabove{longtabu tabular with X columns} \\
\hline
\taburowcolors 1{tableheadcolor .. tableheadcolor}
\upshape
\bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title & \\
\hline
\endfirsthead
\hline
\upshape
\bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title & \\
\bfseries title \& \bfseries title \& \bfseries title \& \bfseries title \& \bfseries title \& \\
\endfoot
\hline
\upshape
\bfseries title & \bfseries title & \bfseries title & \bfseries title & \bfseries title & \\
\bfseries title \& \bfseries title \& \bfseries title \& \bfseries title \& \bfseries title \& \\
\endlastfoot
\end{longtabu}
```

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</tbody>
</table>
Result:

Table 5.5: longtabu tabular with X columns

<table>
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</tr>
</tbody>
</table>

*continued on next page...*
Wide tables (addmargin)
For wide tables one can use the addmargin environment to extend the textwidth into the margin. The usage is demonstrated in section 5.4.2 and 5.7.16.

landscape orientated tables (sideways)
The table orientated in landscape created by the environment sideways is floating with the caption placed above the table in the direction of the page.

Code:
\begin{table}[H]
\centering\small\renewcommand{\arraystretch}{1.4}\sffamily
\caption{very wide table (sideways)}
\rowcolors{1}{tablebodycolor}{tablerowcolor}
\begin{sideways}
\begin{tabularx}{0.90\textwidth}{*{6}{X}}
\hline
\rowcolor{tableheadcolor}
head & head & head & head & head & head \\
\hline
text which is considerably longer than the width of the column &
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text which is considerably longer than the width of the column &
text which is considerably longer than the width of the column &
text which is considerably longer than the width of the column &
\end{tabularx}
\end{sideways}
\end{table}
| text which is considerably longer than the width of the column & text which is considerably longer than the width of the column |
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\hline
\end{tabularx}
\end{sideways}
\end{table}

Result:: Shown on the following page.
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</tr>
</tbody>
</table>
landscape orientated tables (sidewaystable)

The table orientated in landscape created by the environment `\sidewaystable` is non-floating. The content is displayed on the following page. The caption is rotated as well and thus placed above the table in the orientation of the table.

Code:

```latex
\begin{sidewaystable}
\begin{center}
\centering\small\renewcommand{\arraystretch}{1.4}\sffamily\captionsetup{type=table}
\captionabove{very wide table (sidewaystable)}
\rowcolors{1}{tablebodycolor}{tablerowcolor}
\begin{tabularx}{1.0\textwidth}{*{6}{X}}
\hline
\rowcolor{tableheadcolor} head & head & head & head & head & head \\
\hline
text which is considerably longer than the width of the column k \\
text which is considerably longer than the width of the column k \\
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text which is considerably longer than the width of the column k \\
text which is considerably longer than the width of the column k \\
text which is considerably longer than the width of the column k \\
\hline
\end{tabularx}
\end{center}
\end{sidewaystable}
```

Result:: Shown on the following page.
<table>
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</tbody>
</table>

Table 5.7: very wide table (sidewaystable)
5.9 Math

For all math environments and commands the `mathmode.pdf` script by Herbert Voss is a very good reference.

5.9.1 Math formulas

Examples taken from [wikipedia.org](http://wikipedia.org)

Code:

Green’s theorem

\[
\iiint_{\mathcal{G}} \left[ u \nabla^2 v + (\nabla u, \nabla v) \right] \,d^3V = \oiint_{\mathcal{S}} u \frac{\partial v}{\partial n} \,d^2A
\]

Jacobian matrix

\[
J_f(a) := \frac{\partial f}{\partial x}(a) := \frac{\partial (f_1, \ldots, f_m)}{\partial (x_1, \ldots, x_n)}(a)
\]

Result:

Green’s theorem

\[
\iiint_{\mathcal{G}} \left[ u \nabla^2 v + (\nabla u, \nabla v) \right] \,d^3V = \oiint_{\mathcal{S}} u \frac{\partial v}{\partial n} \,d^2A
\] (5.4)

Jacobian matrix

\[
J_f(a) := \frac{\partial f}{\partial x}(a) := \frac{\partial f_1}{\partial x_1}(a) = \left( \frac{\partial f_i}{\partial x_j} \right)_{i=1, \ldots, m; j=1, \ldots, n}
\] (5.5)

5.9.2 Multiline equations (align)

Code:

\[
\begin{align}
\dot{q}_i &= \frac{\partial H}{\partial p_i} \\
\dot{p}_i &= -\frac{\partial H}{\partial q_i}
\end{align}
\]

Result:
\[ \dot{q}_i = \frac{\partial H}{\partial p_i} \quad (5.6) \]
\[ \dot{p}_i = -\frac{\partial H}{\partial q_i} \quad (5.7) \]

5.9.3 Multiline equations with only one number (aligned)

Code:
```
\begin{equation}
\begin{aligned}
\dot{q}_i & = \frac{\partial H}{\partial p_i} \\
\dot{p}_i & = -\frac{\partial H}{\partial q_i}
\end{aligned}
\end{equation}
```

Result:
\[ \dot{q}_i = \frac{\partial H}{\partial p_i} \quad (5.8) \]
\[ \dot{p}_i = -\frac{\partial H}{\partial q_i} \quad (5.9) \]

5.9.4 Multiline equations with multiple alignments (alignat)

Here the number of alignment specifiers must be declared.

Code:
```
\begin{alignat}{3}
a & = b + c & & = d - c \\
m & = n + k + w & & = l - f
\end{alignat}
```

Result:
\[ a = b + c = d - c \quad (5.9) \]
\[ m = n + k + w = l - f \quad (5.10) \]

5.9.5 special environments: cases

Code:
```
\begin{cases}
\text{rect}(t) = \begin{cases}
\end{cases}
```

\[
\begin{cases}
\text{rect}(t) =
\end{cases}
\]

\[ \text{rect}(t) = \begin{cases}
\end{cases} \]
\[ \text{rect}(t) = \begin{cases} 0 & \text{if } |t| > \frac{1}{2} \\ \frac{1}{2} & \text{if } |t| = \frac{1}{2} \\ 1 & \text{if } |t| < \frac{1}{2} \end{cases} \]

5.9.6 special environments: matrices

Code:

The determinant of the matrix

\[ A = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \]

is written as

\[ \det A = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc. \]

Result:

The determinant of the matrix

\[ A = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \]

is written as

\[ \det A = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc. \]

5.9.7 special commands: braket

Code:

\begin{equation}
\text{bra:} \Bra{a} \quad \text{ket:} \Ket{a} \quad \text{braket:} \Braket{a|b}
\end{equation}

Result:

\[ \text{bra:} \langle a | \quad \text{ket:} | a \rangle \quad \text{braket:} \langle a | b \rangle \quad \langle a | A | b \rangle \] (5.11)
5.9.8 special commands: cancel

Code:
\begin{equation}
f(x) = \frac{(a+1)x}{(x-1)(a+1)}
\end{equation}

Result:
\[f(x) = \frac{(a+1)x}{(x-1)(a+1)}\] (5.12)

5.9.9 special commands: empheq

Code:
\begin{empheq}[box=fbox]{align}
f(x) &= e^{-\frac{E}{kT}}
\end{empheq}

Result:
\[f(x) = e^{-\frac{E}{kT}}\] (5.13)

5.9.10 Double stroke math font (mathbb)

Code:
\[
\begin{array}{c}
\mathbb{N} \subset \mathbb{Z} \\
\mathbb{Z} \subset \mathbb{Q} \\
\mathbb{Q} \subset \mathbb{R} \\
\mathbb{R} \subset \mathbb{C}
\end{array}
\]

Result:
\[\mathbb{N} \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C}\]

5.9.11 Double stroke math font (mathds)

Code:
\[
\begin{array}{c}
\mathds{N} \subset \mathds{Z} \\
\mathds{Z} \subset \mathds{Q} \\
\mathds{Q} \subset \mathds{R} \\
\mathds{R} \subset \mathds{C}
\end{array}
\]

Result:
\[\mathds{N} \subset \mathds{Z} \subset \mathds{Q} \subset \mathds{R} \subset \mathds{C}\]
5.9.12 Euler script symbols in math mode (mathcal)

Code:
\[
\mathcal{A} \quad \mathcal{B} \\
\mathcal{C} \quad \mathcal{D} \\
\mathcal{E} \quad \mathcal{F}
\]

Result:
A B C D E F

5.9.13 split level fractions

Code:
You take \sfrac{1}{2} cup of sugar, \ldots

Result:
You take \(\frac{1}{2}\) cup of sugar, ...
New operators
\begin{equation}
\rot \vec{a} + \grad \vec{a} + \div \vec{a} + \rect f(x) + e^{-i x} = \text{const}
\end{equation}
%
New Symbols (laplace, dalembert)
\begin{gather}
\laplace f(x,y) = \frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} \\
\dalembert = \frac{\partial^2}{c^2\partial t^2} - \laplace
\end{gather}
%
Result:

New commands (absolute, norm, trace):

$$|−x| + |(x-3)^2| + \|\vec{a} - \vec{b}\|$$  \hspace{1cm} (5.14)

$$\Tr \{ M \} = \Tr \left\{ \begin{pmatrix} \alpha & \beta \\ \gamma & \delta \end{pmatrix} \right\} = \alpha + \delta$$  \hspace{1cm} (5.15)

Differentials (partial and total):

$$\int xy \partial x \, dy$$  \hspace{1cm} (5.16)

Abbreviations (real and imaginary)

$$\Re\{i-1\} + \Im\{i-1\}$$  \hspace{1cm} (5.17)

Characters for: complex, real, hamiltonian, probability, unity

$$\mathbb{C}, \mathbb{R}, \mathcal{H}, \mathcal{P}, \mathbb{1}$$  \hspace{1cm} (5.18)

New operators

$$\rot \vec{a} + \grad \vec{a} + \div \vec{a} + \rect f(x) + e^{-ix} = \text{const}$$  \hspace{1cm} (5.19)

New Symbols (laplace, dalembert)

$$\Delta f(x,y) = \frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2}$$  \hspace{1cm} (5.20)

$$\Box = \frac{\partial^2}{c^2\partial t^2} - \Delta$$  \hspace{1cm} (5.21)
5.10 Science

This section is mainly about packages that are useful for special professions, and the use of units in text is demonstrated.

5.10.1 units with siunitx

Code:

\begin{tabular}{ll}
Micrometer in text mode: & 33\,\textmu m \\
and in math mode with units: & $1,23\,\si{\micro m/s}$ \\
and with formatting of the number: & $\SI{0,25e-11}{m/s^2}$ \\
and finally with an uncertainty: & $\SI{1,7(5)e-11}{m/s^2}$ \\
\end{tabular}

Result:

<table>
<thead>
<tr>
<th>Micrometer in text mode:</th>
<th>33 µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>and in math mode with units:</td>
<td>1.23 µm/s</td>
</tr>
<tr>
<td>and with formatting of the number:</td>
<td>0.25 × 10^{-11} m/s²</td>
</tr>
<tr>
<td>and finally with an uncertainty:</td>
<td>(1.7 ± 0.5) × 10^{-11} m/s²</td>
</tr>
</tbody>
</table>

5.10.2 compatible commands for units

The old \texttt{units} package defines the commands \texttt{\unit} and \texttt{nicefrac}. The following commands are defined to provide some compatibility while the basic packages is switched to \texttt{siunitx}.

Note that the numbers must be provided in the \texttt{siunitx} format.

Code:

\begin{tabular}{ll}
units: & $1.23\,\unit{\micro m/s}$ \\
units: & $\SI{2.34}{\micro m/s}$ \\
unitfrac: & $1.23\,\unitfrac{\micro m}{s}$ \\
unitfrac: & $\SI{2.34}{\micro m/s}$ \\
\end{tabular}

Result:

<table>
<thead>
<tr>
<th>units:</th>
<th>1.23 µm/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>units:</td>
<td>2.34 µm/s</td>
</tr>
<tr>
<td>unitfrac:</td>
<td>1.23 µm/s</td>
</tr>
<tr>
<td>unitfrac:</td>
<td>2.34 µm/s</td>
</tr>
</tbody>
</table>
5.11 Symbols
5.11.1 Zapf Dingbats Symbols

Code:
\ding{52} \quad \ding{222} \\
\quad \ding{237}

Result:
☑   →   ☞
5.12 Bibliographies and Citations

5.12.1 biblatex

The text of this example is taken from the original biblatex examples.

Standard citation examples

<table>
<thead>
<tr>
<th>Code:</th>
<th>Result:</th>
</tr>
</thead>
<tbody>
<tr>
<td>\cite{companion}</td>
<td>[Goo94]</td>
</tr>
<tr>
<td>\cite[59]{companion}</td>
<td>[Goo94, p. 59]</td>
</tr>
<tr>
<td>\cite[see]{companion}</td>
<td>[see Goo94]</td>
</tr>
<tr>
<td>\cite[see][59--63]{companion}</td>
<td>[see Goo94, pp. 59–63]</td>
</tr>
</tbody>
</table>

Examples using \parencite

The \parencite command is similar to \cite at first glance, but the placement of the prenote argument is different.

<table>
<thead>
<tr>
<th>Code:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>This is just filler text \parencite{companion}.</td>
<td>This is just filler text [Goo94]. This is just filler text [Goo94, p. 59]. This is just filler text</td>
</tr>
<tr>
<td>This is just filler text \parencite[59]{companion}.</td>
<td>[see Goo94]. This is just filler text [Goo94, pp. 59–63].</td>
</tr>
<tr>
<td>This is just filler text \parencite[see]{companion}.</td>
<td></td>
</tr>
<tr>
<td>This is just filler text \parencite[see][59--63]{companion}.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Result:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>This is just filler text \parencite{companion}.</td>
<td>This is just filler text [Goo94]. This is just filler text [Goo94, p. 59]. This is just filler text</td>
</tr>
<tr>
<td>This is just filler text [Goo94]. This is just filler text [Goo94, p. 59]. This is just filler text [see Goo94]. This is just filler text [Goo94, pp. 59–63]. This is just filler text.</td>
<td></td>
</tr>
</tbody>
</table>

Examples using \textcite

<table>
<thead>
<tr>
<th>Code:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>\textcite{companion} show that this is just filler text.</td>
<td></td>
</tr>
<tr>
<td>\textcite[59]{companion} show that this is just filler text.</td>
<td></td>
</tr>
<tr>
<td>\textcite[see]{companion} show that this is just filler text.</td>
<td></td>
</tr>
<tr>
<td>\textcite[see][59--63]{companion} show that this is just filler text.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Result:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Goossens et al. [Goo94] show that this is just filler text.</td>
<td>Goossens et al. [Goo94, p. 59] show that this is just filler text. Goossens et al. [see Goo94] show that this is just filler text. Goossens et al. [see Goo94, pp. 59–63] show that this is just filler text.</td>
</tr>
</tbody>
</table>

Example using \autocite

By default, the \autocite command works like \parencite.

<table>
<thead>
<tr>
<th>Code:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>This is just filler text \autocite{companion}.</td>
<td></td>
</tr>
</tbody>
</table>
Result:

This is just filler text [Goo94].

Multiple citations
By default, a list of multiple citations is not sorted. You can enable sorting by setting the 'sortcites' package option.

Code:
\cite{companion,augustine,bertram,cotton,hammond,massa,murray}

Result:
[Aug95; Ber96; Cot99; Goo94; Ham97; Hos98; Mas04]

Citations details

Code:
\cite{companion}   \citeyear{companion}   \citeauthor{companion}
\citetitle{companion}   \citeyear{companion}   \citeauthor{companion}

Result:
[Goo94]  
LaTeX Companion  
1994  
GOOSSENS et al.
5.13 Index, glossaries, list of symbols, list of acronyms, ...

5.13.1 Index

The result of the index is not displayed here, but is shown in the appendix of the document on page 257.

Code:

```
Lorem\index{example!Lorem} ipsum\index{example!ipsum}
dolor\index{example!dolor} sit amet, consectetuer adipiscing elit Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi.
```

The resulting index is printed on page \pageref{sec:Index}.

Result:

```
Lorem ipsum dolor sit amet, consectetuer adipiscing elit Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi.
```

The resulting index is printed on page 257.

5.13.2 Package glossaries (acronyms, symbols, glossaries)

You need to configure the editor to execute the command `makeglossaries texdocument`, which is a script that executes the necessary makeindex commands.

You can also execute makeindex directly. See the documentation of the glossaries package for further details.

List of acronyms (glossaries)

Code:

```
% place these definitions before \begin{document}
\newacronym{NA}{NA}{numerical Apertur}
\newacronym{DOF}{DOF}{depth of field}
\newacronym{PSF}{PSF}{point spread function}
```

Code:

```
% use the acronyms in a document.
The \texttt{\glstexttt{NA}} of an microscope objective is defined by
\texttt{\mathbb{m}athrm{NA} = n \sin(\texttt{alpha})}, where and \texttt{\mathbb{a}lpha} is the
half-angle of the maximum cone of light that can exit the lens
The \texttt{\$z\$}-length under which the objective displays the probe with a sharp
picture is named \texttt{\glstexttt{DOF}} and the distribution of a single light point in the
focal area through the whole imaging system is termed \texttt{\glstexttt{PSF}}. Both, the
\texttt{\glstexttt{DOF}} and the \texttt{\glstexttt{PSF}} are dependent on the \texttt{\glstexttt{NA}}.

% print out acronym list (style can be modified)
\printglossary[type=\acronymtype]
```

Result:
The numerical Apertur (NA) of an microscope objective is defined by \( \text{NA} = n \sin(\alpha) \), where and \( \alpha \) is the half-angle of the maximum cone of light that can exit the lens. The \( z \)-length under which the objective displays the probe with a sharp picture is named depth of field (DOF) and the distribution of a single light point in the focal area through the whole imaging system is termed point spread function (PSF). Both, the DOF and the PSF are dependent on the NA.

### Acronyms

<table>
<thead>
<tr>
<th>Notation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOF</td>
<td>depth of field</td>
</tr>
<tr>
<td>NA</td>
<td>numerical Apertur</td>
</tr>
<tr>
<td>PSF</td>
<td>point spread function</td>
</tr>
</tbody>
</table>

### List of symbols (glossaries)

#### Code:

```
% place these definitions before \begin{document}
\newglossaryentry{symb:Pi}{%
    name=$\pi$,%
    description={mathematical constant},%
    sort=symbolpi, type=symbolslist%
}\newglossaryentry{symb:Phi}{%
    name=$\varphi$,%
    description={arbitrary angle},%
    sort=symbolphi, type=symbolslist%
}\newglossaryentry{symb:Lambda}{%
    name=$\lambda$,%
    description={wavelength},%
    sort=symbollambda, type=symbolslist%
}\end{glossary}
```

#### Code:

```
% use the symbols in a document.
Calculations with \texttt{\gls{symb:Pi}} always give an inaccurate result, because \texttt{\gls{symb:Pi}} is an irrational number.

% Add symbols not used in the text
\glsadd{symb:Phi}
\glsadd{symb:Lambda}

% print out symbol list (style can be modified)
```
Calculations with $\pi$ always give an inaccurate result, because $\pi$ is an irrational number.

### List of Symbols

<table>
<thead>
<tr>
<th>Notation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda$</td>
<td>wavelength</td>
</tr>
<tr>
<td>$\varphi$</td>
<td>arbitrary angle</td>
</tr>
<tr>
<td>$\pi$</td>
<td>mathematical constant</td>
</tr>
</tbody>
</table>

**Glossary (package glossaries)**

**Code:**

```latex
% place these definitions before \begin{document}
\newglossaryentry{glos:CD}{name=Compact disc (CD),
    description={The Compact Disc (also known as a CD) is an optical disc used
to store digital data. It was originally developed to store and playback sound
recordings exclusively, but later expanded to encompass storage of data (Source:
wikipedia)}}
\newglossaryentry{glos:DVD}{name=DVD,
    description={DVD is an optical disc storage media format, invented and
developed by Philips, Sony, Toshiba, and Panasonic in 1995. DVDs offer
higher storage capacity than Compact Discs while having the same dimensions.
The basis of the DVD name stems from the term \textit{digital versatile disc}. (Source: wikipedia)}}
```

**Code:**

```latex
% use the symbols in a document.
The \gls{glos:CD} was originally developed to play sound recordings, but later
extended to data storage. Later the \gls{glos:DVD} replaced the CD for the usage
of data storage.

% print out glossary
\printglossary[style=altlist]
```

**Result:**

The Compact disc (CD) was originally developed to play sound recordings, but later
extended to data storage. Later the DVD replaced the CD for the usage of data storage.
Glossary

Compact disc (CD)
The Compact Disc (also known as a CD) is an optical disc used to store digital data. It was originally developed to store and playback sound recordings exclusively, but later expanded to encompass storage of data. (Source: wikipedia)

DVD
DVD is an optical disc storage media format, invented and developed by Philips, Sony, Toshiba, and Panasonic in 1995. DVDs offer higher storage capacity than Compact Discs while having the same dimensions. The basis of the DVD name stems from the term digital versatile disc. (Source: wikipedia)

Styles of package glossaries
The glossaries package allows to print out its lists (symbols, acronyms, glossaries) using styles. The package itself defines more than 20 styles. Here only a selection is shown using the symbol list defined before.

Code:

\printglossary[type=symbolslist,style=list, title=list]

Result:

list
\lambda \text{ wavelength}
\phi \text{ arbitrary angle}
\pi \text{ mathematical constant}

Code:

\printglossary[type=symbolslist,style=altlist, title=altlist]

Result:

altlist
\lambda \text{ wavelength}
\phi \text{ arbitrary angle}
\pi \text{ mathematical constant}
This template defines the following styles

Code:
\[\text{\textbackslash printglossary[type=symbolslist,style=longFancyHeader,title=longFancyHeader]}\]

Result:
The `todonotes` package provides the commands \todo and \missingfigure to insert todo notes in a LaTeX document. These notes are automatically collected and can be printed.
out at the end of the document.

Code:

The most common usage this package is to insert clearly visible todo notes in a latex\texttt{todo}{Should be written as \LaTeX} document in the margin or inline in the text. An example of its usage is the command \texttt{todo}, which renders in the default setting with a orange box in the margin.

The line connecting the note with the place in the text can be disabled with the option \texttt{noline}, \texttt{todo}{A note with no line connecting the note to the placement in the text.}

Furthermore it is possible to place the notes in the main text instead of placing them in the margin. This is recommended if the text too large for printing it to the margin. However this also means that the placement of paragraphs, figures and tables in the the normal text is influenced. \texttt{todo}{A todo note placed in the text}

Result:

The most common usage this package is to insert clearly visible todo notes in a latex document in the margin or inline in the text. An example of its usage is the command \texttt{todo}, which renders in the default setting with a orange box in the margin.

The line connecting the note with the place in the text can be disabled.

Furthermore it is possible to place the notes in the main text instead of placing them in the margin. This is recommended if the text too large for printing it to the margin. However this also means that the placement of paragraphs, figures and tables in the the normal text is influenced.

\texttt{todo}{A todo note placed in the text}

\texttt{missingfigure} command is supposed to indicate missing figures. It can be handled as an \texttt{includegraphics} command in any figure environment.

Code:

\texttt{missingfigure}{Description or Caption of the missing figure}

Result:
Description or Caption of the missing figure
5.14 Verbatim, Listings

5.14.1 fancyvrb
Different styles of frames and line numbering:

   Error: Package fancyvrb not loaded.

5.14.2 listings
C++ code example

Code:

\begin{lstlisting}[style=lstStyleCpp]
// interface
class Person
{
 public:
   Person(); // constructor
 -Person(); // destructor
   void setName(string name);
      string name();
   void setAge(int age);
      int age();
 private:
   string m_name;
      int m_age;
};
\end{lstlisting}

Result:

\begin{lstlisting}
// interface
class Person
{
 public:
   Person(); // constructor
 -Person(); // destructor
   void setName(string name);
      string name();
   void setAge(int age);
      int age();
 private:
   string m_name;
      int m_age;
};
\end{lstlisting}

LaTeX code example
This example includes a caption that can be printed in a list at the end of the document with \lstlistoflistings.

Code:
Chapter 5 Template demonstration

Listing 5.1: Lines of code in a typical LaTeX document

```latex
\documentclass[paper=a4,fontsize=11pt]{scrartcl}
% preamble: (load packages, setup layout)
% 100 - 1000 lines of code (loc)
\usepackage[utf8]{inputenc}
\usepackage[ngerman]{babel}
...
% document: > 2000 loc
\begin{document}
\chapter{Introduction}
Some text ...
\chapter{Theory}
...
\end{document}
```

Result:

```
\documentclass[paper=a4,fontsize=11pt]{scrartcl}
% preamble: (load packages, setup layout)
% 100 - 1000 lines of code (loc)
\usepackage[utf8]{inputenc}
\usepackage[ngerman]{babel}
...
% document: > 2000 loc
\begin{document}
\chapter{Introduction}
Some text ...
\chapter{Theory}
...
\end{document}
```
5.15 Fancy Packages.

5.15.1 lettrine

Code:

\lettrine\{A\}\{} first example shows the default behavior of lettrine. It will produce an initial two lines, followed by the text between the curly brackets, which is set in small caps. The following text flows around the initial.

Result:

A first example shows the default behavior of lettrine. It will produce an initial two lines, followed by the text between the curly brackets, which is set in small caps. The following text flows around the initial.

Code:

\lettrine[lines=3]\{A\}\{} second example where the initial is printed across three lines. Note the indentation of the second and third line. This may be influenced by the parameter \texttt{nindent}. The indent of the first line is set with the parameter \texttt{findent}.

Result:

A second example where the initial is printed across three lines. Note the indentation of the second and third line. This may be influenced by the parameter \texttt{nindent}. The indent of the first line is set with the parameter \texttt{findent}.

Code:

\lettrine[lhang=1, nindent=0pt, lines=3]\{W\}\{e\} move now in the third example, the initial in the margin area. This behavior is controlled by the \texttt{lhang} parameter.

Result:

W move now in the third example, the initial in the margin area. This behavior is controlled by the \texttt{lhang} parameter.

Code:

\lettrine[lines=4, loversize=-.1, lraise=.1]\{Q\}\{uality\} has its price. And if it’s just the time to learn how such gimmicks can be achieved. But the results show that the effort is worthwhile. As you can see, the underscore of the Q does not protrude into the text.

Result:

QUALITY has its price. And if it’s just the time to learn how such gimmicks can be achieved. But the results show that the effort is worthwhile. As you can see, the underscore of the Q does not protrude into the text.
5.15.2 boxedminipage

Code:

\begin{boxedminipage}{0.5\textwidth}
\end{boxedminipage}

Result:


5.15.3 framed

Framed boxes with text width, which can span over more than one page.

Code:

\begin{framed}
\end{framed}

Result:


5.15.4 mdframed

Framed boxes, which can span over more than one page and where the style can be defined in every detail.

Code:
\% setup for all frames
\mdfsetup{skipabove=\topskip, skipbelow=\topskip}
\% style definition
\global\mdfdefinestyle{exampledefault}{%
  linecolor=red, linewidth=3pt, %
  leftmargin=1cm, rightmargin=1cm}
\%
\begin{mdframed}[ style=exampledefault ]
\end{mdframed}

Result:

5.16 Diagrams and plots with LaTeX

5.16.1 tikz/pgf

basic nodes

Code:

\begin{figure}[H]
\centering
\begin{tikzpicture}[scale=2.5]
\tikzstyle{every node}=[draw,shape=circle];
\path (0:0cm) node (v0) {$v_0$};
\path (0:1cm) node (v1) {$v_1$};
\path (72:1cm) node (v2) {$v_2$};
\path (2*72:1cm) node (v3) {$v_3$};
\path (3*72:1cm) node (v4) {$v_4$};
\path (4*72:1cm) node (v5) {$v_5$};
\draw (v0) -- (v1) (v0) -- (v2) (v0) -- (v3) (v0) -- (v4) (v0) -- (v5);
\end{tikzpicture}
\end{figure}

Result:

\begin{figure}
\centering
\begin{tikzpicture}[scale=2.5]
\tikzstyle{every node}=[draw,shape=circle];
\path (0:0cm) node (v0) {$v_0$};
\path (0:1cm) node (v1) {$v_1$};
\path (72:1cm) node (v2) {$v_2$};
\path (2*72:1cm) node (v3) {$v_3$};
\path (3*72:1cm) node (v4) {$v_4$};
\path (4*72:1cm) node (v5) {$v_5$};
\draw (v0) -- (v1) (v0) -- (v2) (v0) -- (v3) (v0) -- (v4) (v0) -- (v5);
\end{tikzpicture}
\end{figure}

for each example

Code:

\begin{figure}[H]
\centering
% code origin:
% http://www.texample.net/tikz/examples/rotated-polygons/
\newcounter{density}
\end{figure}
\begin{tikzpicture}[scale=0.75]
\def\couleur{OrangeRed}
\path[coordinate] (0,0) coordinate(A)
++( 90:12cm) coordinate(B)
++( 0:12cm) coordinate(C)
++(-90:12cm) coordinate(D);
\draw[fill=\couleur!\thedensity] (A) -- (B) -- (C) --(D) -- cycle;
\foreach \x in {1,...,40}{% 
\pgfmathsetcounter{density}{\thedensity+20}
\setcounter{density}{\thedensity}
\path[coordinate] coordinate(X) at (A){};
\path[coordinate] (A)
-- (B) coordinate[pos=.10](A)
-- (C) coordinate[pos=.10](B)
-- (D) coordinate[pos=.10](C)
-- (X) coordinate[pos=.10](D);
\draw[fill=\couleur!\thedensity] (A)--(B)--(C)-- (D) -- cycle;
}
\end{tikzpicture}
\end{figure}

Result:
Fancy plot with tikz

Code:

\begin{figure}[H]
\centering
\begin{tikzpicture}[scale=2]
\shade[top color=blue,bottom color=gray!50]
(0,0) parabola (1.5,2.25) \(\sim\) (0,0);
\draw (1.05cm,2pt) node[above]
{$\displaystyle\int_0^{3/2} \! x^2\mathrm{d}x$};
\draw[help lines] (0,0) grid (3.9,3.9)
[step=0.25cm] (1,2) grid +(1,1);
\draw[->] (-0.2,0) -- (4,0) node[right] {$x$};
\draw[->] (0,-0.2) -- (0,4) node[above] {$f(x)$};
\foreach \x/\xtext in {1/1, 1.5/1\(\frac{1}{2}\), 2/2, 3/3}
\draw[shift={\x,0}] (0pt,2pt) -- (0pt,-2pt) node[below] {$\xtext$};
\foreach \y/\ytext in {1/1, 2/2, 2.25/2\(\frac{1}{4}\), 3/3}
\draw[shift={(0,\y)}] (2pt,0pt) -- (-2pt,0pt) node[left] {$\ytext$};
\draw (-.5,.25) parabola bend (0,0) (2,4) node[below right] {$x^2$};
\end{tikzpicture}
\end{figure}

Result:
Circuit Libraries

Error: tikz library ‘circuits’ not loaded

Lindenmayer System Drawing Library

Error: tikz library ‘lindenmayer’ not loaded

Mindmap Drawing Library

Error: tikz library ‘mindmap’ not loaded

Shadings Library

Code:

\begin{figure}[H]
\centering
% code origin: pgf/tikz manual
\begin{tikzpicture}[scale=2]
\shade[upper left=red,upper right=green,
  lower left=blue,lower right=yellow]
(0,0) rectangle (3,2);
\end{tikzpicture}
\end{figure}

Result:

![Result of shaded rectangle]

Automata Drawing and To Path Library

Error: tikz library ‘automata’ not loaded
5.16.2 pgfplots

Simple plot with curve (calculated by TeX)

Code:

```
\begin{figure}[H]
\pgfplotsset{width=0.8\textwidth, height=0.6\textwidth}
\centering
\begin{tikzpicture}
\begin{axis}[
  xlabel=$x$,
  ylabel={$f(x) = x^2 - x +4$}
]
% use TeX as calculator:
\addplot {x^2 - x +4};
\end{axis}
\end{tikzpicture}
\end{figure}
```

Result:

![Plot of $f(x) = x^2 - x +4$](image)

Simple plot with curve (calculated by gnuplot)

Code:

```
\begin{figure}[H]
\pgfplotsset{width=0.8\textwidth, height=0.6\textwidth}
\pgfplotsset{samples=2000}
\centering
```

![Plot of $f(x) = x^2 - x +4$](image)
\begin{tikzpicture}
\begin{axis}[
    xlabel=$x$,
    ylabel={$\sin(x) (x+1) + 3x$},
    grid=major,
    /pgfplots/enlargelimits=false,
    ymax=500,
    /pgfplots/xtick={0,20,...,100},
    /pgfplots/ytick={0,100,...,600},
    ]
\addplot[domain=0:100, blue,style={line width=0.7pt}]
    gnuplot{\sin(x)*(x+1) + 3*x};
\legend{$\sin(x) (x+1) + 3x$}
\end{axis}
\end{tikzpicture}

Result:

Semilog axis with filled background

Code:
\begin{figure}[H]
\pgfplotsset{width=0.8\textwidth, height=0.6\textwidth}
\centering
\end{figure}
\begin{tikzpicture}
\begin{semilogyaxis}[%
axis background/.style={shade,top color=gray,bottom color=white},
legend style={fill=white},
/pgfplots/enlargelimits=false]\%
\addplot {exp(-x)};\%
\addplot {exp(-4*x)};\%
\legend\{$e^{-x}$,$e^{-4x}$}\end{semilogyaxis}\end{tikzpicture}

Result:

3D plot

Code:
\begin{figure}[H]
\pgfplotsset{width=0.8\textwidth, height=0.6\textwidth}
\centering
\begin{tikzpicture}
\begin{axis}[view={30}{30},grid=major,\%
/pgfplots/xtick={0,60,...,300},
/pgfplots/ztick={-1.0,-0.6,...,1.0},
colorbar,\%}
Plotting data from a file

Code:

\begin{figure}[H]
\pgfplotsset{width=0.8\textwidth, height=0.6\textwidth}
\centering
\begin{tikzpicture}
\begin{axis}[scale only axis,/pgfplots/enlargelimits=false]
\addplot[style=solid, color=blue, mark=none, style={line width=0.7pt}]
file{plotdata.txt};
\end{axis}
\end{tikzpicture}
\end{figure}

Result:
fitting with gnuplot

Code:

```latex
\begin{figure}[H]
\pgfplotsset{width=0.8\textwidth, height=0.6\textwidth}
\centering
\begin{tikzpicture}
\begin{axis}[scale only axis,
/pgfplots/enlargelimits=false,
ymax = 34,
legend cell align=left,
legend style={
cells={anchor=west},
legend pos=north west,
font=\small
}]
\addplot[style=solid, color=blue, mark=none, style={line width=0.7pt}]
file {plotdata.txt};
\addplot [raw gnuplot, style=solid, color=red, mark=none, style={line width=0.7pt}]
gnuplot [id=plotdata] {
```
```
% define function which should be fitted
f(x)=a*x;
% let gnuplot fit using column 1 and 2 of the data file
fit f(x) ’plotdata.txt’ using 1:2 via a;
% Plot the function with the specified plot range
plot [x=0:30] f(x);
%
\legend{{\raisebox{2.5ex}{$f(x) = 5\exp\left(-\left(\frac{x-5\pi}{2.5\pi}\right)^2\right)\sin(2x) + x$}},
\text{fit} = x}
\end{axis}
\end{tikzpicture}
\end{figure}

Result:

plotting multiple lines from single file

Code:
\begin{figure}[H]
\centering
\pgfplotsset{width=0.8\textwidth, height=0.6\textwidth}
\% read data to table
\pgfplotstableread{plotdata.txt}\datatable
\%
\begin{tikzpicture}
\begin{axis}[
scale only axis,
every axis plot/.append style={line width=1.5pt},
mark=none, style=solid,
enlargelimits=false, ymax = 3.5,
cycle list name=colorseries-office,
smooth
\]
% column with header "y1", "y2", ...
\addplot+ table[x=x1,y=y1] from \datatable;
\addplot+ table[x=x1,y=y2] from \datatable;
\addplot+ table[x=x1,y=y3] from \datatable;
\addplot+ table[x=x1,y=y4] from \datatable;
\end{axis}
\end{tikzpicture}
\end{figure}

Result:
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CHAPTER 6

Main file (LaTeXTemplate.tex)

6.1 Code before the documentclass
6.1.1 magic shortcodes

%!TeX encoding=utf8
%!TeX program = pdflatex
%!TeX spellcheck = en-US

6.1.2 bug fix packages

%! Bug fixes and other packages to be loaded before the class
\RequirePackage{fix-cm} \% permit Computer Modern fonts at arbitrary sizes.

6.2 Documentclass

In this template only classes from Koma-Script (Version 3) can be used. Other classes would result in a non compiling template and are not supported therefore.

In the document class options some of the most important settings for the document are configured, such as paper size, font size and language of the document.

%! Document Class (Koma Script) -------------------------------
%! Doc: scrguien.pdf
{%documentclass[%
  draft,  \% draft mode (no images, layout errors shown)
draft=false,  \% final mode
%%% --- Paper Settings ---
paper=a4,\% [Todo: add alternatives]
paper=portrait, \% landscape
pagesize=auto, \% driver
%%% --- Base Font Size ---
fontsize=11pt,\%
%%% --- Koma Script Version ---
version=last, \%
%%% --- Global Package Options ---
  english, \% language (passed to babel and other packages)
  \% (ngerman, english, french, ...)\}{scrbook} \% Classes: scrartcl, scrreprt, scrbook

133
6.3 Preamble (packages and settings)
The code after \documentclass and before the document starts is called preamble. All functionality and layout is loaded and configured there. The following sections show in which order things are loaded and configured.

6.3.1 Packages that come first
The following code loads all packages that must be loaded before anything else. This applies to all packages that modify \TeXinternals and in this template loaded in

- preamble/packages-SolutionsNoRoomForNewWrite.tex

and for all packages that provide control sequences that are used within the template.

\begin{verbatim}
%  \input{preamble/packages-SolutionsNoRoomForNewWrite.tex}
\end{verbatim}

6.3.2 Encoding
Selection of encoding of the LaTeX files and the encoding of the file system. The latter is primarily depended on the operating system.

\begin{verbatim}
% \usepackage{selinput}  \SelectInputMappings{adieresis={ä},germanum={ß},Euro={€}}
\end{verbatim}

6.3.3 Packages, layout, fonts and custom commands
Selection of fonts, packages (functionality), the style (layout) and custom commands that are required by the template. All defined in the following files:

- fonts/fonts.tex
6.3 Preamble (packages and settings)

- `preamble/packages.tex`
- `preamble/style.tex`
- `preamble/commands.tex`

```latex
\begin{verbatim}
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% preamble
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

%% select/load fonts
\input{fonts/fonts.tex}
%% load packages
\input{preamble/packages.tex}
%% apply style settings
\input{preamble/style.tex}
%% new commands / definitions (required by the template!)
\input{preamble/commands.tex}

%% Test the page layout
% display the layout
%\IfPackageLoaded{geometry}{\geometry{showframe}}
\end{verbatim}
```

6.3.4 Configuration

All the configuration code shown here is separated from the files `preamble/packages.tex` or `preamble/style.tex` because they are either system or target specific.

Selection of link colors: The links can either be displayed in colors for a pdf document or be displayed in black for a print document.

```latex
\begin{verbatim}
\begin{verbatim}
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% Configurations
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

%%% Switch between colored links (web) and black links (print)
\IfDefined{UseDefinition}{%
  %\UseDefinition{Target}{Print}
  \UseDefinition{Target}{Web}
}% end of UseDefinition

```

Here possible options are selectable, which configure the way the pdf document is opened.

```latex
\IfPackageLoaded{hyperref}{%
% set layout of PDF pages
\hypersetup{pdfpagelayout=OneColumn}
% options:
% SinglePage  Displays a single page; advancing flips the page
% OneColumn   Displays the document in one column; continuous scrolling.
% TwoColumnLeft Displays the document in two columns,
% odd-numbered pages to the left.
```
The backend and encodings for \texttt{biblatex} are configured in \texttt{preamble/packages.tex} together with the loading of the package, see section 7.3.12.

6.3.5 Custom definitions
With the following files custom macros (\texttt{macros/newcommands.tex}) and additional hyphenation patterns \texttt{content/hyphenation.tex} are loaded.

\begin{verbatim}
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\% custom definitions
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\input{macros/newcommands.tex}
\%
\%\%\% Hyphenation (Silbentrennung)
\input{content/hyphenation.tex}
\end{verbatim}

6.3.6 Execution of commands
Several packages only work if their make-commands are executed. Examples are index, glossaries and such. Here these are grouped in the file \texttt{preamble/makeCommands.tex}.

\begin{verbatim}
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\% execute necessary commands
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\% (... if the according package is loaded or not)
\input{preamble/makeCommands.tex}
\end{verbatim}

\begin{verbatim}
\listfiles \% list all loaded files at end of document
\end{verbatim}

6.3.7 Bibliography data
With \texttt{biblatex} the bibliography files are loaded before the document starts. They are loaded with the command \texttt{addbibresource} and the file is included without the .\texttt{bib} file extension. Multiple files bibliography files are added with multiple \texttt{addbibresource} commands.

\begin{verbatim}
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\% bibliography (now in preamble !)
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\%
\%\%\% bibtex file(s)
\end{verbatim}
6.3.8 Glossary entries

If you want to use acronyms, symbols lists or a glossary you can fill these definitions in the file `content/Z-GlossaryEntries.tex` loaded here:

```latex
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% Definition of glossaries Entries (before document!)
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% glossary, acronym, symoblist and such
\input{content/Z-GlossaryEntries.tex}
```

6.3.9 Document chapters: includeonly

The chapters which are included in the compilation can be chosen using the `\includeonly` command. If `\includeonly` is not specified in the preamble \LaTeX will assume that all `\include` commands should be evaluated. The advantage of `\includeonly` is that it creates aux files for each `\include` command, so that all references are kept. Note that all files loaded with `\input` are included in the compilation regardless of the `\includeonly` usage.

```latex
% \includeonly{
% content/0-title,
% content/0-Abstract,
% content/0-Introduction,
% content/1-Theory,
% content/2-Experiments,
% content/3-Results,
% content/4-Summary,
%} % end includeonly
```

6.4 The document (the content)

It start with `\begin{document}` and ends with `\end{document}`. The code in-between includes all the content for the document. Nevertheless the code is filled with necessary style and settings commands.

```latex
%\% document start %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\begin{document}
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```
6.4.1 Title page
The page style and the page numbering for the title page is set up with this code

```latex
% Configure page numbering - required for hyperref (not displayed)
pagenameumbering{alph}\setcounter{page}{1}%
pagestyle{empty}
```
followed by the title page in file `content/title.tex`.

```latex
% -- title page --
\include{content/0-title}
\cleardoublepage
```

6.4.2 Abstract
An abstract is common in phd thesis, but unusual in master and bachelor thesis. If you do not require an abstract just comment out the following lines.

```latex
% -- abstract --
%(only in phd thesis)
\include{content/0-Abstract}
\cleardoublepage
```

6.4.3 Declaration
These lines load the document `content/Z-Declaration.tex` in which you can state that the whole document is based on your ideas and written by only yourself. As far as I know this is required in bachelor and master thesis, but not part of phd-thesis. Comment out this line if you do not require it.

```latex
% -- declaration --
%(only in bachelor/master thesis)
\input{content/Z-Declaration.tex}
```

6.4.4 Frontmatter
The front pages of a thesis typically contain the table of contents followed by other lists. Here these are the symbol list, an acronym list and a glossary.

These lines only setup the page style and the line numbering for the front pages. The first line sets up as pages with headings defined by `srcheadings` and the line numbering is applied by the command `\frontmatter` in the second line.

```latex
\frontmatter
\IfPackageLoaded{scrlayer-scrpage}{\pagestyle{srcheadings}}
```

6.4.5 Table of contents
The table of contents is inserted with `\tableofcontents`. Additionally it is added to the pdf bookmarks.
6.4 The document (the content)

6.4.6 Lists: acronym, symbols, glossaries

These are loaded if the package for all these lists is loaded and the standard style, which requires the `longtable` package is loaded. If you do not require all these lists comment those out that you do not want. The make commands required for building these lists were already executed, see section 6.3.6 on page 136. The styles of these lists are defined in file `preamble/style-glossaries.tex`.

```latex
\IfPackagesLoaded{glossaries, longtable, tabu}{%
\clearpage % print out acronym list
\IfGlossariesStyleDefined{longtabuFancyHeader}%
{\printglossary[type=acronymtype, style=longtabuFancyHeader]}% % print out symbol list
\IfGlossariesStyleDefined{longtabuFancyHeader}%
{\printglossary[type=symbolslist, style=longtabuFancyHeader]}% % print out glossary
\printglossary[style=altlist]
} % end of glossaries
```

6.4.7 Main Document

This is the part which contains all the content. It start with `{\mainmatter}`, which sets up the line numbering and is followed by a list of files loaded with `{\include}`. The usage of `{\include}` is important to ensure that `{\includeonly}` works. See section 6.3.9 for the definition of `{\includeonly}`.

```latex
%%% --- Main Document --- --- --- --- --- --- ---
\mainmatter % (files loaded with include must not have the prefix .tex)
\include{content/0-Introduction}
\include{content/1-Theory}
\include{content/2-Experiments}
\include{content/3-Results}
\include{content/4-Summary}
%%% -- end of main content
```

6.4.8 Bibliography

The bibliography is placed directly after the main content. It however must not be placed in the appendix. The layout of the bibliography is defined in file `preamble/style-bibliotex`. 

```latex
% -- table of contents --
%
% add table of contents to pdf bookmarks
\IfPackageLoaded{hyperref}{\pdfbookmark[1]{\contentsname}{toc}}
\tableofcontents
```
text.

% -- bibliography --
% (must be placed _before_ appendix)
\IfPackageLoaded{biblatex}{
  \cleardoublepage
  \IfDefined{phantomsection}{\phantomsection}\label{sec:bibliography}
  \printbibliography[%
    heading=bibintoc, % (bibintoc, bibnumbered)
  ]
}% end of bibliography

6.4.9 Lists of figures, tables, listings

Several lists are automatically created by \LaTeX. The most common are the list of figures and list of tables. If one of these lists is not required the responsible line can be commented out.

%% -- list of figures and tables --
\cleardoublepage\IfDefined{phantomsection}{\phantomsection}\label{sec:lof}
\listoffigures
\cleardoublepage\IfDefined{phantomsection}{\phantomsection}\label{sec:lot}
\listoftables

6.4.10 Lists of listings

The list of listings is one of the additional lists that can be created. It should only be included if code listings with captions are created anyway. If you experience problems with the number of \write outputs used it could help to disable this list. For more information see section 3.2.1.

%% -- List of Listings --
% _Remove_ if no listing with caption is defined
\IfDefined{lstlistoflistings}{\cleardoublepage\lstlistoflistings}

6.4.11 Appendix

The appendix contains additional information that do not fit into the main text of the thesis and must contain only information which is not necessary for the understanding of the main text. Therefore the appendix is not treated as part of the thesis in the evaluation.

The appendix is started with \appendix and manually added to the table of contents. In the last line the file content/Z-Appendix.tex is loaded which contains all further chapters and sections of the appendix.

% --- Appendix --- --- --- --- --- --- ---
\cleardoublepage\IfDefined{phantomsection}{\phantomsection}\appendix
% Add 'Appendix' to TOC
\addcontentsline{toc}{part}{\appendixname}
% must be _input_., otherwise the TOC entry is at the wrong place
\input{content/Z-Appendix.tex}
6.4.12 Publications and Curriculum Vita
The list of publications is loaded with file `content/Z-Publications.tex` and the cv with `content/Z-CV.tex`. These files should only be loaded in case of a phd-thesis. For bachelor and master thesis these lines should be commented out.

```latex
% -- only in phd thesis --->
\input{content/Z-Publications.tex}
\input{content/Z-CV.tex}
% <------------------------
```

6.4.13 Index
An index is very useful for finding a topic in a large document. It is however also very time consuming to create a good index. If you are not sure that your index content is worth to include it in your thesis you should comment these lines out.

The setup for the index is done in file `preamble/style-index.tex`.

```latex
%%% -- Index --
% _Remove_ Index unless you really want to invest a large amount
% of time and effort to create a good index!
\IfDefined{printindex}{%
  \cleardoublepage\IfDefined{phantomsection}{\phantomsection}\label{sec:index}%
  \printindex%
}% end of index
```

6.4.14 Thanks
It is common to add a page at the end of the document where the author thanks all people who helped in the creation of the thesis.

```latex
\input{content/Z-Thanks.tex}
```

6.4.15 Todo
One can add a todo list using the features of the `todonotes`. By default it is disabled and must be removed for the final version of a document anyway. Its usage can be hindered by the `No room for new write` problem, see section 3.2.1.

```latex
% add todo list (remove for final document!)
% \input{content/Z-Todo.tex}
```

6.4.16 End
Finally the main file is closed with

```latex
%%% document END %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\end{document}
```

Any content after this line will not be executed.
CHAPTER 7

Preamble files

7.1 preamble/packages-SolutionsNoRoomForNewWrite.tex
This file loads either the packages \texttt{scrwfile} or \texttt{morewrites} and \texttt{etex}.

\begin{verbatim}
\% Description: see http://www.tex.ac.uk/cgi-bin/texfaq2html?label=noroom
\% short summary: The e-TeX extensions do not help with the
\% "no room for a new \texttt{\textbackslash write}" problem, but in other cases
\% of "no room for a new <thing>"
\% "It is essential that you load etex before any other packages,
\% and reserve any extra inserts immediately."
\usepackage{etex}
\reserveinserts{28}
\end{verbatim}

\begin{verbatim}
\% Description: Package \texttt{scrwfile} provides a general change of the LaTeX kernel,
\% that solve problems with the
\% error "no room for a new \texttt{\textbackslash write}"
\% Incompatible: \texttt{titletoc} (bot redefine the LaTeX kernel and are incompatible by
design)
\% Doc: \texttt{scrguien.pdf}
\%
\% \% If \texttt{titletoc} is not required, the usage of this package is recommended!
\% see: http://tex.stackexchange.com/questions/155101/scrwfile-removes-partial-toc
-\texttt{-created-with-titletoc}
\%
\% \usepackage{scrwfile}
\%
\% Description: This package is meant to be a solution for the
\% error "no room for a new \texttt{\textbackslash write}"
\% Note: it is less efficient than \texttt{scrwfile}, but the best alternative
\% Doc: \texttt{morewrites.pdf}
\usepackage{morewrites}
\end{verbatim}

7.2 fonts/fonts.tex
This file loads the packages \texttt{cmap}, \texttt{fontenc} and \texttt{textcomp}. The default font is \textit{Latin Modern}, loaded with package \texttt{lmodern}. Further font families and typical font combinations are presented but not loaded.

\begin{verbatim}
\% \% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\% Fonts Fonts Fonts
\% Fonts Fonts Fonts
\end{verbatim}
\% Make PDF files searchable and copyable
\usepackage{cmap}
\% T1 Schrift Encoding
\usepackage[T1]{fontenc}
\% Description: Additional Symbols (Text Companion font extension)
\usepackage{textcomp}
\% DO NOT LOAD ae Package as a font !

%%%% === Font Families / Font Combinations (Sans + Serif) ===============

%%%% - Latin Modern (LaTeX Standard)
\usepackage{lmodern}
%%%% sans math, use with '\mathversion{sans}'
\IfPackageLoaded{lmodern}{\input{fonts/fonts-lmodern-sansmath.tex}}

%%%% -------------------

%%%% - Times, Helvetica, Courier (Word Standard...)
\usepackage{mathptmx} \% --- Times (incl math)
\usepackage[scaled=.90]{helvet} \% --- Helvetica (Arial)
\usepackage{courier} \% --- Courier

%%%% -------------------

%%%% - Palantino , Helvetica, Courier
\usepackage{mathpazo} \% --- Palantino (incl math)
\usepackage[scaled=.95]{helvet} \% --- Helvetica (Arial)
\usepackage{courier} \% --- Courier

%%%% -------------------

%%%% - Charter, Bera Sans
\renewcommand\charter\linespread{1.05} \% --- Charter
\renewcommand\sfdefault{fvs} \% --- Bera Sans
\usepackage[charter]{mathdesign} \% --- Charter (Math)
\usepackage[scaled=0.85]{luximono} \% --- Luxi Mono (Typewriter)

%%%% Note: There is a better Charter font by Linotype
given by 'ITC Charter'

%%%% -------------------

%%%% - URW Garamond
\renewcommand\rmdefault{ugm} \% --- URW Garamond
\renewcommand\sfdefault{fvs} \% --- Bera Sans
\%\%\%\usepackage[small]{eulervm} \% --- EulerVM (MATH)
7.2 fonts/fonts.tex

```
\%\usepackage[garamond]{mathdesign} \ %% --- Garamond (Math)
\%\usepackage[scaled=0.85]{luximono} \ %% --- Luxi Mono (Typewriter)
\% Note: If you can afford it, combine with commercial
\% sans fonts like: Syntax, Frutiger or Thesis
\% (but then also use the commercial Garamond ...)
\% -------------------

%%%% =========== Typewriter =============
\%\usepackage{courier} \ %% --- Courier
\%\renewcommand\ttdefault{cmtl} \ %% --- CmBright Typewriter Font
\%\usepackage[scaled=0.9]{luximono} \ %% --- Luxi Mono (Typewriter)
\%\usepackage{ulgothic} \ %% --- Letter Gothic

%%%% =========== Math fonts ================
\% Recommanded to use with fonts: Aldus, Garamond, Melior, Sabon
\%\usepackage[ %% --- EulerVM (MATH)
\% small, \%for smaller Fonts
\% euler-digits \% digits in euler fonts style
\%\{eulervm\}
\% combine with utopia, garamond or charter font
\%\usepackage[
\% utopia,
\% garamond,
\% charter
\%\{mathdesign\}
```

7.2.1 fonts/fonts-lmodern-sansmath.tex

This file defines a sans math version for package \texttt{lmodern}. It is activated with \texttt{\mathversion{sans}}.

```
\DeclareMathVersion{sans}
% Math letters from Latin Modern Sans
\SetSymbolFont{letters}{sans}{OML}{cmbr}{m}{it}
% Math operators
\SetSymbolFont{operators}{sans}{OT1}{lmss}{m}{n}
% Math symbols
\SetSymbolFont{symbols}{sans}{OMS}{lmsy}{m}{n}
% Large symbols
\SetMathAlphabet\textit{\{mathrm\}}{sans}{OT1}{lmr}{m}{n}
\SetMathAlphabet\{mathsf\}{sans}{OT1}{lmss}{m}{n}
\SetMathAlphabet\{mathit\}{sans}{OT1}{lmr}{m}{it}
```

7.2.2 fonts/fonts-commercial.tex

If you own commercial fonts and have the required \LaTeX\ packages installed then this file might be of interest for you. It shows how to load some of the available fonts for pdflatex.
The file `fonts/fonts.tex` must still be loaded because it contains further packages that are required.

For MyriadPro and MinionPro the code is extracted into extra files because these package come with a lot of functionality and thus options.

\begin{verbatim}
\DeclareMathVersion{sans}  
% Math letters from Latin Modern Sans  
\SetSymbolFont{letters}{sans}{OML}{cmmr}{m}{it}  
% Math operators  
\SetSymbolFont{operators}{sans}{OT1}{lmsa}{m}{n}  
% Math symbols  
\SetSymbolFont{symbols}{sans}{OMS}{lmsy}{m}{n}  
% Large symbols  
\SetMathAlphabet{\mathrm}{sans}{OT1}{lmmr}{m}{n}  
\SetMathAlphabet{\mathsf}{sans}{OT1}{lmss}{m}{n}  
\SetMathAlphabet{\mathit}{sans}{OT1}{lmmr}{m}{it}  
\end{verbatim}

fonts/fonts-MinionPro.tex

File that loads MinionPro and takes care of the package loaded order.

\begin{verbatim}
% load after textcomp, amsmath and MnSymbol  
\IfFileExists{MinionPro.sty}{  
%  \ExecuteAfterPackage{amsmath}{  
%  \usepackage[  
%   %%% Font selection  
%   %smallfamily, % (std) use only regular and bold face  
%   medfamily, % use semibold face in addition to smallfamily  
%   %fullfamily, % use medium face in addition to medfamily  
%   noopticals, % (std) use only the optical size Text  
%   %opticals % use the optical sizes Caption, Text, Subhead, and Display  
%   %slides, % use only the optical size Caption (useful for slides  
%   %normalsize, % (std) adapt optical sizes to the normal font size  
%   %nonormalsize,% use static settings for the optical sizes  
%   %onlytext, % only change the text fonts  
%   %onlymath, % only change the math fonts  
%   %%% Figure selection  
%   %textosf, % use text figures in text mode  
%   %mathosf, % use text figures in math mode  
%   %osf, % (std) use text figures in text and math mode  
%   %textlf, % use lining figures in text mode  
%   %mathlf, % use lining figures in math mode  
%   %mathtabular, % use tabular figures in math mode  
%   %%% Miscellaneous options  
%   % scaled=1.0, % scale the font size by <factor>  
%   % minionint, % take the integral symbols from MyriadPro, not from MnSymbol  
}{MinionPro}  
\end{verbatim}
File that loads MyriadPro and takes care of the package loaded order. MyriadPro must be loaded after MinionPro if both shall be loaded.

\IfFileExists{MyriadPro.sty}{
% load after textcomp, amsmath and MnSymbol
\ExecuteAfterPackage{amsmath}{
\renewcommand{\bfdefault}{sb}
}% if you want to use MyriadPro as your mainfont:
% \renewcommand{\familydefault}{\sfdefault}
}{
% file not found:
}{\PackageWarning{template}{File 'MinionPro.sty' not found!\MessageBreak}{}}
7.3 preamble/packages.tex

7.3.1 Package sections

This is the file that loads all packages. The packages are grouped together according to their usage. However in many cases the loading order must be different. Therefore the loading order is corrected by commands such as \texttt{\textbackslash ExecuteAfterPackage}. If packages can only be loaded after other packages have been loaded or must not be loaded in a special combination this is recognized and the package either loaded or not in order to prevent the template from not compiling.

All package groups, named within this text sections, start with \texttt{\BeginTemplateSection} and end with \texttt{\EndCodeSection}. If these section are included in the compilation or excludes (not compiled) is defined at the beginning of the file:

\begin{verbatim}
%% -- package section selections -->
\DefineCodeSection[true]{PackagesBase}
\DefineCodeSection[true]{PackagesBugfixes}
\DefineCodeSection[true]{PackagesFonts}
\DefineCodeSection[true]{PackagesDiagrams}
\DefineCodeSection[true]{PackagesMath}
\DefineCodeSection[true]{PackagesScience}
\DefineCodeSection[true]{PackagesSymbols}
\DefineCodeSection[true]{PackagesTables}
\DefineCodeSection[true]{PackagesText}
\DefineCodeSection[true]{PackagesQuotes}
\DefineCodeSection[true]{PackagesCitation}
\DefineCodeSection[true]{PackagesFigures}
\DefineCodeSection[true]{PackagesCaptions}
\DefineCodeSection[true]{PackagesIndexes}
\DefineCodeSection[true]{PackagesMisc}
\DefineCodeSection[true]{PackagesVerbatim}
\DefineCodeSection[true]{PackagesFancy}
\DefineCodeSection[true]{PackagesLayout}
\DefineCodeSection[true]{PackagesHeadFoot}
\DefineCodeSection[true]{PackagesHeadings}
\DefineCodeSection[true]{PackagesTOC}
\DefineCodeSection[true]{PackagesPDF}
\DefineCodeSection[true]{PackagesAdditional}
\end{verbatim}

If you do not require all sections in your document you can thus change the setting from \texttt{true} to \texttt{false} in all section definitions you do not want to include in the compilation.

The whole template should compile with any section excluded except section \texttt{Packages-Base}. If this is not the case please submit a bug report.

7.3.2 Base packages

The following packages provide basic functionality such as language selections, graphics and colors. Since most other packages require these to be loaded they are loaded here at the beginning.
• calc
• babel, translater
• xcolor
• graphicx
• epstopdf
• ragged2e

The application of each package is given with a short description in the source code. The documentation file name and package loading order requirements are also included in the source code.

---

% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% These packages must be loaded before all others
% (primarily because they are required by other packages)
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

\BeginCodeSection{PackagesBase}

% Description: Calculation with LaTeX
% Doc: calc.pdf
\usepackage{calc}

% Description: Multi Language support for LaTeX
% Doc: babel.pdf
\usepackage{babel}

% Description: support automatic translations
% Doc: beameruserguide.pdf
\usepackage{translator}

% Description: Color support with color mixing modells
% Doc: xcolor.pdf
\usepackage[dvipsnames, table, fixpdfTeX, hyperref, fixinclude, \xcolor]{xcolor}

% Description: Support for graphics in LaTeX
% Doc: grfguide.pdf
\usepackage[final, \xcolor]{graphicx}

% Description: If an eps image is detected, epstopdf is automatically called to convert it to pdf format.

---
7.3.3 Bug fixing packages
TEX may be bug-free, but L\TeX{} and its packages are certainly not free of bugs. Most packages are updated in short term if bugs are encountered. L\TeX{} however has the philosophy to maintain a document setting stability. Therefore bugs in the base L\TeX{} system are not fixed, even if they are well known. However, some of them are fixed by extension packages. Others are fixed by special packages, which are loaded here.

- fixltx2e
- marginnote, (mparhack)
- scrhack
- marginfix
- xspace

\% \begin{CodeSection}{PackagesBugfixes}
\% Description: Fix known LaTeX2e bugs
\% Doc: fixltx2e.pdf
\% Removed: fixltx2e is not required with releases after 2015
\% All fixes are now in the LaTeX kernel.
\% Description: This package implements a workaround for the LaTeX bug that
\% marginpars sometimes appear on the wrong margin.
\% \usepackage{mparhack}
\% BUG: in some case this causes an error in the index together with package
\% pdfpages the reason is unknown. Therefore I recommend to use the
\% margins of marginnote
\% incompatible: marginfix
\% Description: marginnote allows a margin note, where \marginpar fails
7.3 preamble/packages.tex

% Doc: marginnote.pdf
\usepackage{marginnote}

% Description: Redefines implementations of packages float, hyperref and listings
% Doc: scrhack.pdf
\usepackage{scrhack}

%% Description: changes the \marginpar commands, such that long margin notes work.
%% Doc: marginfix.pdf (TODO: why not used)
\usepackage{marginfix}

% Description: Used to define commands that don't eat spaces.
% Doc: xspace.pdf
\RequirePackage{xspace}

\EndCodeSection{PackagesBugfixes}

7.3.4 Font packages
This section is rather empty since the fonts and most of the related packages are already loaded in the file \texttt{fonts/fonts.tex}.

- relsize

\BeginCodeSection{PackagesFonts}

% -----------------------------------------------
% Fonts
% -----------------------------------------------

\usepackage{relsize}

\EndCodeSection{PackagesFonts}

7.3.5 Math packages
The base package for all math in \LaTeX{} is the package \texttt{amsmath}. The other packages are not necessary, but some of them provide useful bug fixes and enhancement to the math commands and environments defined by \texttt{amsmath}.

- amsmath
- mathtools
- onlyamsmath
- braket
cancel
empheq
exscale
fixmath
icomma
xfrac

\BeginCodeSection{PackagesMath}

% Description: basic math package
% Doc: amsldoc.pdf
\usepackage[
 centertags,   % (default) center tags vertically
  tbtags,      % 'Top-or-bottom tags': For a split equation, place equation
    % numbers level with the last (resp. first) line, if numbers
    % are on the right (resp. left).
  sumlimits,   % (default) Place the subscripts and superscripts of summation
    % symbols above and below
  nosumlimits, % Always place the subscripts and superscripts of
    % summation-type symbols to the side, even in displayed
    % equations.
  intlimits,   % Like sumlimits, but for integral symbols.
  nointlimits, % (default) Opposite of intlimits.
  namelimits, % (default) Like sumlimits, but for certain 'operator names'
    % such as det, inf, lim, max, min, that traditionally have
    % subscripts placed underneath when they occur in a displayed
    % equation.
  nonamelimits, % Opposite of namelimits.
  leqno,      % Place equation numbers on the left.
  reqno,      % Place equation numbers on the right.
  fleqn,      % Position equations at a fixed indent from the left margin
    % rather than centered in the text column.
]{amsmath} %

\IfPackageLoaded{amsmath}{

% Description: The mathtools package is an extension package to amsmath.
% Furthermore it corrects various bugs
% Doc: mathtools.pdf
\usepackage[fixamsmath,disallowspaces]{mathtools}

% Description: Inhibits the usage of plain TeX and
% of standard LaTeX math environments
% Doc: onlyamsmath.pdf
\usepackage[}
all,
% warning
error
}[onlyamsmath]
% Note that many other packages have problems with the change of the 
% catcode of the $-char. Therefore workarounds/fixes for tikz and tabu 
% are provided (loaded in style.tex)
}
% end: IfPackageLoaded{amsmath}

% Description: Macros for Dirac bra-ket notation and sets.  
% Doc: braket.pdf
\usepackage{braket}

% Description: strike out arguments in math mode 
% Doc: cancel.sty
\usepackage{cancel}

% Description: Emphasize equations  
% Doc: empheq.pdf
\usepackage{empheq}

% Description: scales math mode output in all environments correct  
% Doc: Mathmode.pdf
\IfPackagesNotLoaded{MnSymbol,fourier}{
  \usepackage{exscale}
}

% Description: fixes for the default Computer Modern math fonts  
% Doc: fixmath.pdf
\IfPackageLoaded{lmodern}{%
  \usepackage{fixmath}
}%

% Description: Enables the correct use of the comma as  
% a decimal separator in math mode  
% Doc: icomma.pdf
\usepackage{icomma}

% Description: LaTeX 3 Package for nice inline fractions  
% Provides: \sfrac{1}{2}  
% Replaces: nicefrac  
% Doc: xfrac.pdf
\usepackage{xfrac}
\EndCodeSection{PackagesMath}
7.3.6 Diagram and vector graphics packages

Several approaches are possible to include vector graphics in a \LaTeX document with \LaTeX-code. In this template the packages `tikz/pgf` were chosen for this application.

Since `tikz` and `pgf` come with many options and extension package they are loaded in an extra file `preamble/packages-tikzpgf.tex`. The package `pgfplots` provides an extension for scientific plots.

- `tikz`
- `pgf`
- `pgfplots`
- `pgfplotstable`

```latex
\BeginCodeSection{PackagesDiagrams}

% diagrams
% \BeginCodeSection{packages-tikzpgf}
\input{preamble/packages-tikzpgf.tex}

% pgfplots
\usepackage{pgfplots}
\usepackage{pgfplotstable}
\usetikzlibrary{pgfplots.patchplots}
\usetikzlibrary{pgfplots.dateplot}
\usetikzlibrary{pgfplots.colormaps}
\usetikzlibrary{pgfplots.groupplots}
\usetikzlibrary{pgfplots.polar}
\usetikzlibrary{pgfplots.units}
\input{preamble/fix-pgfplots.tex} % fix bug in pgfplots with \directlua
\EndCodeSection{PackagesDiagrams}
```

`preamble/packages-tikzpgf.tex`

```latex
\usepackage{pgf}
\usepackage{tikz}
\IfPackageLoaded{pgf}{%
    % \usepgflibrary{arrows}
}{}

\IfPackageLoaded{tikz}{%
    %\% Chapter numbers according to
    %\% package version 2.10
    %
```
\usetikzlibrary{scopes} % Shorthand for Scope Environments
\usetikzlibrary{intersections} % Intersections of Arbitrary Paths
\usetikzlibrary{calc} % Coordinate Calculations
\usetikzlibrary{positioning} % Advanced Placement Options
\usetikzlibrary{arrows} % Automata Drawing Library
\usetikzlibrary{automata} % Background Library
\usetikzlibrary{backgrounds} % Calc Library -> see 13.
\usetikzlibrary{calendar} % Calendar Library
\usetikzlibrary{chains} % Circuit Libraries
\usetikzlibrary{circuits.logic.IEC} % circuits.logic.US
\usetikzlibrary{circuits} % circuits.ee.IEC
\usetikzlibrary{fixedpointarithmetic} % Fading Library
\usetikzlibrary{fit} % Entity-Relationship Diagram Drawing Library
\usetikzlibrary{external} % Fixed Point Arithmetic Library
\usetikzlibrary{fixedpointarithmetic} % Floating Point Unit Library
\usetikzlibrary{fit} % Lindenmayer System Drawing Library
\usetikzlibrary{lindenmayersystems} % Matrix Library
7.3.7 Science packages

Here packages are included which help to typeset numbers and units correctly. The recommended package is `siunitx`. The other packages are not activated by default because they are incompatible with `siunitx` or not necessary with the default fonts.
7.3 preamble/packages.tex

- **siunitx**
- not recommended: **gensymb, upgreek, units**

```latex
\begin{CodeSection}{PackagesScience}

\% science packages
\% \begin{CodeSection}{PackagesScience}
% Description: upright symbols from euler package
% \[Euler\] or Adobe Symbols \[Symbol\]
% Provides: \upmu
% Doc: upgreek.pdf
%\usepackage[Symbolsmallscale]{upgreek}
% \--> Use only if the original font does not provide
% the necessary upright symbols

% Description: Commands/symbols for both math and text mode
% Provides: \degree, \celsius, \perthousand, \ohm, \micro
% Incompatible: siunitx
% Requires: Command \upmu
% \IfDefined{upmu}\{\usepackage[upmu]{gensymb}}

% Description: package for setting units in a
% typographically correct way.
% Incompatible: siunitx
%\usepackage{units}

% Description: siunitx aims to provide a unified method to
% typeset numbers and units correctly and easily.
%\IfPackagesNotLoaded{gensymb, units}\{
%\usepackage{siunitx}
%
\end{CodeSection}{PackagesScience}
```

7.3.8 Symbol packages

There are many packages that provide additional symbols to \LaTeX. Since these are font depended they are also incompatible if special font packages are loaded. Here only a selection of symbol packages is documented and loaded.

- **dsfont**
- **esint**
- **mathcomp**
- **euscript**
- **pifont**
7.3.9 Table packages

Standard \LaTeX{} tables are just ugly. In order to create good looking or even fancy tables further packages are necessary.

- booktabs
- multirow, bigstrut
- ltxtable, tabularx, longtable
- tabu
- tablestyles

% Tables (Tabular)
7.3 preamble/packages.tex

% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{PackagesTables}

% Description: some additional commands to enhance
% the quality of tables
% Provides: \toprule, \midrule, \bottomrule, \cmidrule
% Doc: booktabs.pdf
\usepackage{booktabs}

% Description: extends the standard tabular environment with cells
% spanning over multiple rows.
% Doc: multirow.pdf
\usepackage{multirow, bigstrut}

% Description: Table spanning over many pages (from longtable package)
% and with streachable columns (from tabularx package)
% -> load after hyperref
\ExecuteAfterPackage{hyperref}{\usepackage{ltxtable}}

% Description: defines a single environment tabu to make all kinds of tabulars
% It is more flexible than tabular, tabular*, tabularx and array
% and extends the possibilities.
% Doc: tabu.pdf
\usepackage{tabu}

% tablestyles
\IfFileExists{tablestyles.sty}{
  \IfDefined{rowcolors}{\usepackage{tablestyles}}\
}{}

\EndCodeSection{PackagesTables}

7.3.10 Text related packages

This code is divided into bug fixing packages and packages for text-decoration, footnotes, references and lists.

- ellipsis
- ulem
- soulutf8
- url
- footmisc
- (chngcntr)
- (tablefootnote)
- varioref
- cleveref
• enumitem

```latex
\begin{CodeSection}{PackagesText}

%%% bug fixing ===========================================
% description: fixes bug in ellipsis (…)
% Doc: ellipsis.pdf
% -> load after babel
\usepackage[xspace]{ellipsis}

%%% Text-decoration ======================================  
% Description: commands for underlining for emphasis
% Provides: \ulin, \uuline, \sout, \xout, ...
% Doc: ulem.pdf
\usepackage[normalem]{ulem}

%%% footnotes============================================  
% Description: The footmisc package provides several different 
% customisations of the way footnotes are represented.
% Fixes a LaTeX bug with option 'bottom'
% Doc: footmisc.pdf
% Load after: setspace
% Load before: hyperref
\ExecuteAfterPackage{setspace}{%
% \usepackage[
% bottom,     % Footnotes appear always on bottom. This is necessary
% stable,     % especially when floats are used
% perpage,    % Make footnotes stable in section titles
% para,       % Place footnotes side by side of in one paragraph.
% side,       % Place footnotes in the margin
```
ragged, \% Use RaggedRight
\%norule, \% suppress rule above footnotes
multiple, \% rearrange multiple footnotes intelligent in the text.
\%symbol, \% use symbols instead of numbers
\{footmisc}\%

%% Description: footnotes are normally reset at each page.
%% With this package they can be reset only at
%% defined headings, such as chapters.
%% Doc: chngcntr.pdf
% \usepackage{chngcntr}
% \counterwithout{footnote}{chapter}

%% Description: provides the command \tablefootnote to be used in
%% a table or sidewaystable environment,
%% where \footnote will not work.
%% Doc: tablefootnote.pdf
%% Bug: does not work as expected, bug not found so far
%% tablefootnote must be loaded after rotating
%\ExecuteAfterPackage{rotating}{%
% \% and after hyperref
% \iffPackageNotLoaded{hyperref}{%
% \ExecuteAfterPackage{hyperref}{%
% \usepackage{tablefootnote}%
% }%
% }
% }
% \}
% \%
%}

%%% References ============================================
%
% Description: provides \vref, which is similar to \ref but
% adds an additional page reference, like
% 'on the facing page' or 'on page 27'
% Doc: varioref.pdf
\usepackage{varioref}

% Description: enhances the cross-referencing features,
% allowing the format of cross-references to be determined
% automatically according to the "type" of cross-reference
% Doc: cleveref.pdf
% loading: must be loaded after hyperref and after varioref
\ExecuteAfterPackage{hyperref}{%
% caption and cleveref incompatible in Versions before 2011/12/24
\usepackage{cleveref}[2011/12/24]
}%

% Description: Extension of the xr package for
% cross references, with hyperref support
% Doc: xr.pdf
7.3.11 Quotes

The package `csquotes` is a very powerful package that makes quotes language specific and in general easier.

- `csquotes`
7.3.12 Citation/bibliography packages

There are many packages for citations and creation or modification of the bibliography. However almost all of them are nowadays replaced by the package \texttt{biblatex} which provides the functionality of all previous package and beyond them. The enable the full functionality of \texttt{biblatex} it is necessary to also replace \texttt{bibtex} by the program \texttt{biber}.

- \texttt{biblatex}

\begin{verbatim}
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\% Citations
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\\begin{CodeSection}{PackagesCitation}
\\% Description: Modern Bibliographie package with full customizability
\\% Doc: biblatex.pdf
\\% Incompatible: ucs and every previous bibtex package
\\usepackage[
\style=alphabetic, % Loads the bibliography and the citation style
\bibstyle=alphabetic, % load a bibliography style
\citetitle=alphabetic, % load a citatio style
\natbib=true, % define natbib compatible cite commands
\%--- Backend --- --- ---
\backend=biber, % (bibtex, biber)
\bibwarn=true, %
\texencoding=auto, % auto-detect the input encoding
\bibencoding=auto, % (auto (equal to tex), \langle encoding\rangle)
\]{biblatex}
\% Other options:
\% style=numeric, %
\% style=numeric-comp, % [1-3, 7, 8]
\% style=numeric-verb, % [2]; [5]; [6]
\% style=alphabetic, % [Doe92; Doe95; Jon98]
\% style=alphabetic-verb, % [Doe92]; [Doe95]; [Jon98]
\% style=authoryear, % Doe 1995a; Doe 1995b; Jones 1998
\% style=authoryear-comp, % Doe 1992, 1995a,b; Jones 1998
\% style=authoryear-ibid,
\% style=authortitle,
\% style=authortitle-verb, %
\% style=authortitle-comp,
\% style=authortitle-ibid,
\% style=authortitle-icomp,
\% style=authortitle-terse,
\% style=authortitle-tcomp,
\% style=authortitle-ticomp,
\% APA Style
\% style=apa
\%
\end{CodeSection}
\end{verbatim}
7.3.13 Packages for figures, placement and floats

The basic package `graphicx` for figures is already loaded at the beginning as shown in section 7.3.2. Here further packages are loaded that extent the placement and floating possibilities.

- `(float` - replaced by `floatrow`)
- `wrapfig`
- `flafter`
- `placeins`
- `(floatflt, unused alternative to `wrapfig`)

% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% figures, placement, floats and captions
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{PackagesFigures}

\% Description: A package like "pst-pdf" for processing PostScript graphics
\% with psfrag labels within pdfLaTeX documents.
\% Doc: pstool.pdf
\% DOES Not work together with the template!
\% \usepackage[crop=pdfcrop]{pstool}

\% Description: provides new floats and enables H float modifier option
\% (in future incompatible with Koma Script)
\% Doc: float.pdf
\% --> replaced by `floatrow` package!
\% \usepackage{float}

\% Description: enables typesetting a narrow float at the edge of the text,
\% and making the text wrap around it.
\% load after: `float`
\% load before: `caption`
\% Provides: `wrapfigure` and `wrapfloat`
\% Doc: `wrapfig-doc.pdf`
\% \usepackage{wrapfig}

\% Description: place floats after the reference
\% Doc: no documentation
\% \usepackage{flafter}

\% Description: Defines a \FloatBarrier command, beyond which floats may not
7.3 preamble/packages.tex

% pass; useful, for example, to ensure all floats for a section appear before the next \section command.
% Doc: placeins-doc.pdf
\usepackage
section % "\section" command will be redefined with "\FloatBarrier"
}{placeins}
%

%% Description: Floating figures as in wrapfloat
%% (old LaTeX2e package from 1996)
%% Doc: floatflt.pdf
% \usepackage{floatflt}

\EndCodeSection{PackagesFigures}

7.3.14 Caption packages

The fundamental package for captions is the package \texttt{caption}. Its possibilities in terms of figure placement is enhanced by package \texttt{floatrow} and for subfigures package \texttt{subcaption}.

- \texttt{floatrow, fr-fancy}
- \texttt{caption}
- \texttt{subcaption} (replaces \texttt{subfig})
- \texttt{mcaption}
- \texttt{rotating}

\BeginCodeSection{PackagesCaptions}
% Description: extents the float mechanism of LaTeX and provides macros for precise placement of figures, tables and captions. works well together with the caption pack.
% load before: caption
% Doc: floatrow.pdf
\usepackage{floatrow, fr-fancy}

% Description: The caption package offers customization of captions in floating environments such figure and table and cooperates with many other packages.
% Doc: caption.pdf (Required v3.2 or newer)
\usepackage{caption}{2011/08/06}

% subfig ist NOT recommended, use subcaption instead
% Incompatible:
% - loads package capt-of. Loading of 'capt-of' afterwards will fail therefor
7.3.15 Misc packages

This section contains mainly packages that should be loaded before \texttt{hyperref} and do not fit into the other sections. Currently it contains only the package \texttt{lineno} for numbering lines in the document. It is not loaded by default, but can be activated by removing the comment chars.

- \texttt{lineno} (unused)

\begin{verbatim}
\%
\%  -----------------------------
\%  misc packages
\%  -----------------------------
\EndCodeSection{PackagesMisc}

\%
\%  Description: adds line numbers to the main text
\%  Doc: ulineno
\%\usepackage[
\%  ,left    \%  margin placement (left, right, switch, switch*)
\%  ,pagewise \%  Number the lines from 1 on each page (pagewise, running)
\%  ,modulo   \%  Print line numbers only if they are multiples of five.
\\end{verbatim}
7.3.16 Packages for index and other lists

For the index package \texttt{imakeidx} is loaded and for almost anything else \texttt{glossaries} provides a solution.

- \texttt{imakeidx}
- \texttt{showidx}
- \texttt{glossaries, glossary-longragged}

\begin{verbatim}
\% Index and other lists
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{PackagesIndexes}
%% Description: print text of \index{entry} to the margin
%% Doc: makeidx.pdf
%% --> load only in draft mode
%% load before: imakeidx
\IfDraft{
  \usepackage{showidx}
}

%% Description makeindex package with shell-escape makeindex call
%% Doc: imakeidx.pdf
%% consumes \write
\usepackage{imakeidx}

%% Description: Package for glossaries, nomenclatures and acronym lists
%% replaces: nomencl, acronym
%% load after: hyperref!, inputenc, babel and ngerman.
%% consumes \write (1 in general, 2 if entries are defined inside the document)
\ExecuteAfterPackage{hyperref}{%
  \usepackage[%
  % General Options
  % nomain, % This suppresses the creation of the main glossary and associated
  % .glo file, if unrequired. Note that if you use this option,
  % you must create another glossary in which to put all your
  % entries (either via the acronym (or acronyms) package option
  % sanitizesort, % This is a boolean option that determines whether or not
  % to sanitize the sort value when writing to the external
  glossary
  % file.
  savewrites, % This is a boolean option to minimise the number of
  % write registers used by the glossaries package.
}
\end{verbatim}
% (Default is savewrites=false.)
% savewrites
% Note!: This option can significantly slow document compilation.
% As an alternative, you can use the scrwfile package and not use this
% option.
% -> scrwfile disabled because of incompatibility with titletoc.
translate=true, % If babel has been loaded and the translator package
% is installed, translator will be loaded and the translations
% will be provided by the translator package interface.
hyperfirst=true, % options: (*true*, false)
% This is a boolean option that specifies whether each term
% has a hyperlink on first use.
%
% Sectioning, Headings and TOC Options
% toc, % Add the glossaries to the table of contents.
numberline, % When used with toc, this will add \numberline{} in
% the final argument of \addcontentsline. This will align the
% table of contents entry with the numbered section titles.
section=section, % Its value should be the name of a sectional unit (e.g.
chapter).
% This will make the glossaries appear in the named sectional
unit,
% otherwise each glossary will appear in a chapter,
% if chapters exist, otherwise in a section.
numberedsection = false, %
% The glossaries are placed in unnumbered sectional
% units by default, but this can be changed using numberedsection.
% options
% - false: no number, i.e. use starred form of sectioning command
% - nolabel: use a numbered section, but the section not labelled
% - autolabel: numbered with automatic labelling.
%
% Glossary Appearance Options
% entrycounter=false % (true, *false*)
% If set, each main (level 0) glossary entry will
% be numbered when using standard glossary styles.
% counterwithin=0 % if set will reset the glossaryentry counter every
% time the defined level is reset.
% nolong, % prevents loading of glossary-long and thus the longtable package
% nosuper, % prevents loading of glossary-super and thus the supertabular
% package
% nolist, % prevents loading of glossary-list
% notree, % prevents loading of glossary-tree
% nonumberlist, % This option will suppress the
% associated number lists in the glossaries
% counter=page, % The value should be the name of the default counter
% to use in the number lists ).
%
% Sorting Options
sort=standard, %
% options
% - standard : entries are sorted according to the value of the
% sort key used in \newglossaryentry (if present)
% or the name key (if sort key is missing);
% - def : entries are sorted in the order in which they were defined
% - use : entries are sorted according to the order in which they
% are used in the document
%
%%% Acronym Options
% acronym, % Creates a separate acronym list
% shortcuts, % define shortcuts (\ac for acronym)
%
\{glossaries\}
% further styles
\usepackage{glossary-longragged}
% Create a new list of symbols
\newglossary[slg]{symbolslist}{syi}{syg}{List of Symbols}
% Simplest and easiest sorting method, but it's
% inefficient and the sorting is done according to the English alphabet. To
% use this method, add \makenoidxglossaries to the preamble and put
% \printnoidxglossaries at the place where you want your glossary
% \makenoidxglossaries
%
\EndCodeSection{PackagesIndexes}

7.3.17 Verbatim packages

Verbatim environments are used to display text in monospaced fonts. The typical usage is
to display programming code. \verbbatim and \fancyverb are intended to be used for small
(and fancy) code sections, whereas \listings is optimal for large code section with syntax
highlighting.

The style of \listings is defined in file \texttt{preamble/style-listings.tex}.

- upquote
- \verbbatim
- \fancyverb
- \listings

% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% verbatim packages
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{PackagesVerbatim}
% \% Doc: upquote.sty
% \% Description: Reimplementation of the original verbatim environment
% \% Doc: \texttt{verbatim.pdf}
% \% Doc: \texttt{verbatim.pdf}
\EndCodeSection{PackagesVerbatim}
7.3.18 Fancy packages

Two different types of fancy packages are loaded. \texttt{lettrine} for dropping capitals and other packages for fancy framed texts: \texttt{boxedminipage}, \texttt{fancybox}, \texttt{framed} and \texttt{mdframed}. Not however that \texttt{mdframed} is a modern package that can replace the other three.

- \texttt{lettrine}
- \texttt{boxedminipage}
- \texttt{framed}
- \texttt{fancybox} (incompatible with fancyvrbb)
- \texttt{mdframed}
7.3 preamble/packages.tex

\begin{Verbatim}
\% Description: defines new environments where the user may choose
\% between several individual designs.
\usepackage{mdframed}
\end{Verbatim}

\EndCodeSection{PackagesFancy}

7.3.19 Layout packages

The indentation of the first paragraph can be modified using indentation. The text can be printed in multiple columns with package multicol. The line spacing can be modified using package setspace. And the page layout can be modified with the packages geometry or alternatively typearea. The latter is automatically loaded with the koma script class. changepage can be used to detect odd/even pages.

The configuration of most packages is in file preamble/style.tex and for package geometry in file preamble/style-geometry.tex.

- indentation (unused)
- multicol
- setspace
- geometry (unused)
- typearea (automatically loaded)
- changepage (unused)

\begin{Verbatim}
\% \begin{CodeSection}{PackagesLayout}
\%
\% indentation
\%
\% Description: Indent first paragraph after section header
\% Doc: indentfirst.pdf
\% \usepackage{indentfirst}
\%
\% columns
\%
\% Description: Environment for multicolumn text
\% Doc: multicol.pdf
\% \usepackage{multicol}
\%
\% line spacing
\%
\% Description: configure line spacing
\% Provides: \onehalfspacing, \doublespacing
\% Doc: setspace.sty
\% \usepackage{setspace}
\end{CodeSection}\end{Verbatim}
7.3.20 Packages for header and footer

The content in the header and footer of a page is defined with package `scrlayer-scrpage`, with the settings defined in file `preamble/style-scrlayer-scrpage.tex`.

The total number of page is provided by package `pageslts`.

- `scrlayer-scrpage`
- `pageslts`
markcase=ignoreuppercase,
% other options
% - lower % redefines \MakeMarkcase to convert the automatic running heads into lower-case
%    % letters using \MakeLowercase (lower case typesetting).
% - upper % redefines \MakeMarkcase to convert the automatic running heads into upper-case
%    % letters using \MakeUppercase (upper case typesetting).
% - used % redefines \MakeMarkcase to use automatic running heads without any case changes.
% - ignoreuppercase % redefines not only \MakeMarkcase but also \MakeUppercase and \uppercase locally
%    % to the running heads to leave the automatic running heads unchanged.
]{scrlayer-scrpage}

% Description: provides total number of pages (ie. page 7 of 19)
% Provides: \lastpageref{LastPage}
% load after: hyperref
% Doc: pageslts.pdf
\ExecuteAfterPackage{hyperref}{\usepackage{pageslts}}

\EndCodeSection{PackagesHeadFoot}

### 7.3.21 Layout of headings

All headings can be redefined using package `titlesec`.

\BeginCodeSection{PackagesHeadings}

% Description: The titlesec package is essentially a replacement - partial or total-for the LaTeX macros related with sections - namely titles, headers and contents.
% incompatible: with KOMA script, NOT Recommended!
\ifcsdef{chapter}
{\usepackage{titlesec}}
{\usepackage{titlesec} \csundef{chapter}}

\EndCodeSection{PackagesHeadings}

### 7.3.22 Layout of table of contents

The `titletoc` package is a companion to the `titlesec` package and it handles toc entries. It provides new commands with which one can format the toc entries in a generic way. It
is used to define the layout of the part-pages.

The format of the table of contents and other lists can defined by package `tocstyle`. It is currently unused because it lacks interaction with the \setkomafont command. If a manual setting in the table of contents is however not required the usage of this package is still encouraged.

The appendix title can be modified with package `appendix`. In this template it was so far not required, but other users might find its possibilities helpful.

- `titletoc`
- `tocstyle` (unused)
- `appendix` (unused)

```latex
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% settings and layout of TOC
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

\begin{CodeSection}{PackagesTOC}
% Description: The philosophy of this package is to use new commands which you 
% can format the toc entries with in a generic way.
% Doc: titlesec.pdf
% load before: hyperref
% consumes \write
% usage: % Define partial toc for part pages \PartialToc
% ifcsdef{chapter}
% \{\usepackage{titletoc}\}
%
% Description: apply different styles for the formating of the 
% table of contents and lists of floats.
% Doc: tocstyle.pdf (Koma Script)
% Alpha package, uses koma fonts (\setkomafont{}{}) only if KOMAlike is selected
% \usepackage[%
% \%
% %%% toc width calculation
% tocindentauto, % all widths at the TOCs are calculated by tocindentauto
% % tocindentmanual, % opposite of auto
% %%% indentation of toc
% tocgraduated, % standard
% % tocflat, % no intedation, text aligned
% % tocfullflat, % no intedation, no alignment
% %%% page breaking rules
% tocbreaksstrict, % sets a lot of penalties before and after TOC entries
% % tocbreakscareless,% allow more page breaks.
% %%% indentation of unnumbered TOC entries
% toctextentriesindented, % unnumbered TOC entrie are indented only as wide
% % as the number of numbered TOC entries of the same
```
7.3 preamble/packages.tex

\% toctextentriesleft, \% indented as if they have an empty number. \{}{tocstyle}

\% Description: The appendix package provides some facilities for modifying the typesetting of appendix titles. \% Doc: appendix.pdf \%\usepackage{\%
\%\,toc \% Put a header (e.g., 'Appendices') into the Table of Contents \%\,page \% Puts a title (e.g., 'Appendices') into the document at the \% Beginning of the appendices environment \%\,title \% Adds a name (e.g., 'Appendix') before each appendix title in \% the body of the document. \%\,titletoc \% Adds a name (e.g., 'Appendix') before each appendix listed \% in the ToC \%\,header \% Adds a name (e.g., 'Appendix') before each appendix in page headers. \%}appendix \%\renewcommand{\appendixtocname}{\appendixname}\%\end{document}

\EndCodeSection{PackagesTOC}

7.3.23 PDF packages (including hyperref)

pdfpages is a package for the inclusion of pages from external pdf documents, pdfpages for changing the page orientation, microtype for improving the text formatting, hyperref for almost everything else that is related to PDF especially its hyperlinks and bookmark for bookmarks in a PDF document.

Note that hyperref must be loaded after almost all packages!
The settings of hyperref are defined in file preamble/style-hyperref.tex.

- pdfpages
- pdfpages (unused)
- microtype
- hyperref
- bookmark

% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% pdf packages
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{PackagesPDF}

% Description: Include pages from external PDF documents in LaTeX documents % Doc: pdfpages.pdf \usepackage{pdfpages}

% Description: landscape orientation in PDF Format % Doc: pdflscape.pdf

\EndCodeSection{PackagesPDF}
7.3.24 Additional packages (explicitly after package hyperref)

These packages here have nothing in common except that they can be loaded after `hyperref`. Other additional package that must be loaded before must be put into the section `Misc`
Packages, see section section 7.3.15.

\BeginCodeSection{PackagesAdditional}

% Description: enable hyphenation of typewriter text word (\texttt)
% Doc:  hyphenat.pdf
% Note: According to documentation the font warnings can be ignored
\usepackage[htt]{hyphenat}
\usepackage[disable,]{todonotes}
\usepackage[NoDate]{currvita}
% \usepackage{nicefilelist}
\EndCodeSection{PackagesAdditional}

7.3.25 Last Package
This package indicates the point after which no other package is loaded. It is required by this template.

\BeginCodeSection{LastPackage}
% This package only indicates the last package loaded.
% It provides no functionality, it is just used by the command
% \ExecuteAfterPackage{lastpackage} to execute code before
% parameters of packages are set.
\usepackage{lastpackage}
\EndCodeSection{LastPackage}

7.4 preamble/style.tex

7.4.1 Package sections
This is the file that defines all settings for the package including the page layout. The settings are grouped together according to there usage. These section defined at the beginning of the file:

%% -- style section selections -->
\DefineCodeSection[true]{StyleColors}
\DefineCodeSection[true]{StyleMath}
\DefineCodeSection[true]{StyleDiagrams}
If you do not require all sections in your document you can change the setting from \textit{true} to \textit{false} in all section definitions you do not want to include in the compilation.

7.4.2 Colors

If package \texttt{xcolor} is loaded then colors for the sections, the tables and pdf links are defined with \texttt{\definecolor} and \texttt{\colorlet}. Note that \texttt{\SetTemplateDefinition} is used here to define switchable colors for different document targets (web/print).

\begin{verbatim}
\\% color of headings
\definecolor{sectioncolor}{RGB}{0, 51, 153} % blue
\definecolor{sectioncolor}{RGB}{0, 25, 152} % darker blue
\definecolor{sectioncolor}{RGB}{0, 0, 0} % black
\% Farbe fuer grau hinterlegte Boxen (fuer Paket framed.sty)
\definecolor{frameshadecolor}{gray}{0.90}
\definecolor{pdfanchorcolor}{named}{black}
\definecolor{pdfmenucolor}{named}{red}
\definecolor{pdfruncolor}{named}{cyan}
\end{verbatim}
7.4 preamble/style.tex

\SetTemplateDefinition{Target}{Web}{%
  \IfDefined{definecolor}{
    \definecolor{pdfurlcolor}{rgb}{0,0,0.6}
    \definecolor{pdffilecolor}{rgb}{0.7,0,0}
    \definecolor{pdflinkcolor}{rgb}{0,0,0.6}
    \definecolor{pdfcitecolor}{rgb}{0,0,0.6}
  }
}
\SetTemplateDefinition{Target}{Print}{%
  \IfDefined{definecolor}{
    \definecolor{pdfurlcolor}{rgb}{0,0,0}
    \definecolor{pdffilecolor}{rgb}{0,0,0}
    \definecolor{pdflinkcolor}{rgb}{0,0,0}
    \definecolor{pdfcitecolor}{rgb}{0,0,0}
  }
}
% Execute color definition defined by Target->Web
\UseDefinition{Target}{Web}

% table colors
\colorlet{tablebodycolor}{white!100}
\colorlet{tablerowcolor}{gray!10}
\colorlet{tablesubheadcolor}{gray!30}
\colorlet{tableheadcolor}{gray!25}

% End: \IfMultDefined{definecolor}
\EndCodeSection{StyleColors}

7.4.3 Math

This code shows how to exchange the vector symbol arrow with a bold font and how to exchange various greek symbols by there \textit{var} variant.

\begin{CodeBlock}{StyleMath}

%%% print vector in bold
\let\oldvec\vec
\def\vec#1{{\boldsymbol{#1}}} % bold vector

%%% exchange greek symbols
\let\ORGvarepsilon=\varepsilon
\let\varepsilon=\epsilon
\let\epsilon=\ORGvarepsilon

\end{CodeBlock}
7.4.4 Science

Loading of `preamble/style-siunitx.tex`.

\begin{CodeSection}{StyleScience}
\input{preamble/style-siunitx.tex}
\end{CodeSection}

`sieunitx` is setup for the detection of all font changes and in mode `math`. For german text several changes are applied to ensure the correct setting of math in that language.

Additionally the commands `\nicefrac`, `\unitfrac` and `\unit` are defined in order to emulate the commands from the package `units`.

\IfDefined{sisetup}\
\IfDefined{iflanguage}
7.4 Diagrams

Setup of default plot size for \texttt{tikz/pgfplots} and in case of german text the decimal separator is set up as a comma.

Further settings for \texttt{pgfplots} are in a separate file: \texttt{preamble/style-pgfplots.tex}.

\begin{verbatim}
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% diagrams
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{StyleDiagrams}
\input{preamble/style-pgfplots.tex}
\EndCodeSection{StyleDiagrams}
\end{verbatim}

\texttt{preamble/style-pgfplots.tex}

Color series for \texttt{pgfplots} are defined in this file.

\begin{verbatim}
\IfPackagesLoaded{tikz,pgfplots}{% 
% tikz/pgf
\pgfplotsset{width=0.8\textwidth,compat=1.5.1}
%% See \texttt{pgfplotstable documentation (4.12.1)} for further options
% set decimal point to comma for german text
\IfDefined{iflanguage}{% 
  \iflanguage{ngerman}{% 
  \pgfplotsset{every tick label/.append style={/pgf/number format/use comma}}
\end{verbatim}
% x tick label style=/pgf/number format/use comma,%
% y tick label style=/pgf/number format/use comma,%
% z tick label style=/pgf/number format/use comma%
\{}
{%} % end of \iflanguage
% for all languages
\pgfplotsset{%
  every tick label/.append style{/pgf/number format/set thousands separator ={\,),
  every node near coord/.append style{/pgf/number format/set thousands separator={\,}}
}%
{%} % end of \IfDefined

\definecolor{colorseriesRGB1}{RGB}{0, 0, 192}
\definecolor{colorseriesRGB2}{RGB}{192, 0, 0}
\definecolor{colorseriesRGB3}{RGB}{0, 128, 0}
\definecolor{colorseriesRGB4}{RGB}{192, 0, 192}
\pgfplotscreateplotcyclelist{colorseries-rgb}{
  {colorseriesRGB1},
  {colorseriesRGB2},
  {colorseriesRGB3},
  {colorseriesRGB4},
}

\definecolor{colorseriesOffice1}{RGB}{49, 93, 152}
\definecolor{colorseriesOffice2}{RGB}{154, 50, 47}
\definecolor{colorseriesOffice3}{RGB}{117, 150, 57}
\definecolor{colorseriesOffice4}{RGB}{92, 67, 125}
\definecolor{colorseriesOffice5}{RGB}{211, 112, 40}
\definecolor{colorseriesOffice6}{RGB}{45, 134, 161}
\pgfplotscreateplotcyclelist{colorseries-office}{
  {colorseriesOffice1},
  {colorseriesOffice2},
  {colorseriesOffice3},
  {colorseriesOffice4},
  {colorseriesOffice5},
  {colorseriesOffice6},
}
% color cycle list for bar plots
\pgfplotsset{
  /pgfplots/bar cycle list/.style={/pgfplots/cycle list={%
    {colorseriesOffice1!20!black,fill=colorseriesOffice1!80!white,mark=none},%
7.4.6 Text
Here the font for urls (package \texttt{url}) and the font in margins used by package \texttt{marginnote} is defined.

\begin{CodeSection}{StyleText}
\% style of URL
\IfDefined{urlstyle}{
  \urlstyle{tt} %sf
}
\% font used in margins by package \texttt{marginnote}
\IfDefined{marginfont}{
  \IfDefined{color}{
    \renewcommand*{\marginfont}{\color{red}\sffamily}
  }
}
\% Options of \texttt{enumitem}
\IfDefined{setlist}{%
  \setlist[itemsep=0pt]}
\%
\end{CodeSection}

7.4.7 Footnotes
Several definitions to solve common problems with footnotes and example code for the redefinition of the footnote layout.

\begin{CodeSection}{StyleFootnote}
7.4.8 Quotes

Settings for package csquotes.

% All facilities which take a 'cite' argument will not insert
% it directly. They pass it to an auxiliary command called \mkcitation
% which may be redefined to format the citation.
7.4 preamble/style.tex

\renewcommand\{\mkcitation}\{[1]{\{,\#1}\}
\renewcommand\{\mkccitation}\{ #1\}

\SetBlockThreshold{2} % Number of Lines at which a blockquote is separated
% from the text.

\newenvironment\{myquote\}
{\begin{quote}\small}
{\end{quote}}
\SetBlockEnvironment\{myquote\}
%\SetCiteCommand\{} % Changes citation command
%end: \IfPackageLoaded{csquotes}
\EndCodeSection{StyleQuotes}

7.4.9 Citations / Style of Bibliography

Loading of the settings file preamble/style-biblatex.tex for package\biblatex and mod-

ification of the layout of the bibliography items in file preamble/style-biblatex-alpha.
tex.

% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% Citations / Style of Bibliography
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{StyleCiteBib}

% \biblatex bibliography options
\input{preamble/style-biblatex.tex}
% modifications for an alpha style
\input{preamble/style-biblatex-alpha.tex}

% \KOMAoptions%
% \ bibliography=oldstyle%
% \ bibliography=openstyle%
%}\%
\EndCodeSection{StyleCiteBib}

preamble/style-biblatex.tex

Setting of bibliography options.

% !TeX encoding=utf8
% !TeX spellcheck = en-US

\IfPackageLoaded{biblatex}{%
\ExecuteBibliographyOptions{%
%--- Sorting --- --- ---
\ sorting=nty, % Sort by name, title, year.
% other options:
% nty % Sort by name, title, year.
}%}
% nyt Sort by name, year, title.
% nyvt Sort by name, year, volume, title.
% anyt Sort by alphabetic label, name, year, title.
% anyvt Sort by alphabetic label, name, year, volume, title.
% ynt Sort by year, name, title.
% ydnt Sort by year (descending), name, title.
% none Do not sort at all. All entries are processed in citation order.
% debug Sort by entry key. This is intended for debugging only.
%
sortcase=true,
sortcites=true, % do/do not sort citations according to bib
%--- Dates --- --- ---
% origdate= % (short, long, terse, comp, iso8601)
% eventdate=
% urldate=
% alldates=
% datezeros=true, %
% dateabbrev=true, %
%--- General Options --- --- ---
% maxnames=1,
% minnames=1,
% maxbibnames=15, %
% maxcitenames=1, %
% uniquename=true, % (biber only)
% maxalphanames=1, % (biber only)
% autocite= % (plain, inline, footnote, superscript)
% autopunct=true,
% language=auto,
% block=none, % (none, space, par, nbpar, ragged)
% notetype=foot+end, % (foot+end, footonly, endonly)
% hyperref=true, % (true, false, auto)
% backref=true,
% backrefstyle=three, % (none, three, two, two+, three+, all+)
% backrefsetstyle=setonly, %
% indexing=false, %
% options:
% true Enable indexing globally.
% false Disable indexing globally.
% cite Enable indexing in citations only.
% bib Enable indexing in the bibliography only.
% refsection=none, % (part, chapter, section, subsection)
% refsegment=none, % (none, part, chapter, section, subsection)
% abbreviate=true, % (true, false)
% defernumbers=true, %
% punctfont=false, %
% arxiv=abs, % (ps, pdf, format)
%--- Style Options --- --- ---
% The following options are provided by the standard styles
preamble/style-biblatex-alpha.tex

Redefinitions of bib-macros for an alpha style.

\makeatletter % for some reason required to make the bold author names possible ...
% no idea why it needs to be in front of \IfPackageLoaded
% is connected with the @ in the newbibmacro definition in line 92
\IfPackageLoaded{biblatex}{%
% the number is not used in the bibliography, nor
% the citations, but for the list of publications
% we want numbers to be available.
\ExecuteBibliographyOptions{labelnumber}
%
% change alpha label to be without +
\renewcommand*{\labelalphaothers}{}
%
% change 'In: <magazine>' to '<magazine>'
\renewcommand*{\intitlepunct}{[]}
\DefineBibliographyStrings{german}{in={}}
\DefineBibliographyStrings{english}{in={}}
%
% make names capitalized \textsc{}
\renewcommand{\mkbibnamegiven}{\textsc}
\renewcommand{\mkbibnamefamily}{\textsc}
%
% make volume and number look like
% 'Ed. 33(14):'
\renewbibmacro*{volume+number+eid}{%
  \setunit{\addcomma\space}%
  \bibstring{volume}%,
  \setunit{\addspace}%
  \printfield{volume}%
  \iffielddupe{number}{%}
    \printtext{parens}{%}
    \printfield{number}%
  }%
  \setunit{\addcomma\space}%
}
\printfield{eid}
%\setunit{\addcolon\space}
}

% <authors>: <title>
\renewcommand*{\labelnamepunct}{\addcolon\space}
% make ': ' before pages
\renewcommand*{\bibpagespunct}{\addcolon\space}
% names delimiter ' ' instead of ' ,'
%\renewcommand*{\multinamedelim}{\addsemicolon\space}
% move date before issue
\renewbibmacro*{journal+issuetitle}{
\usebibmacro{journal}%
\setunit*{\addspace}\
\iffieldundef{series}{}
\newunit\
\printfield{series}%
\setunit{\addspace}\
%
\usebibmacro{issue+date}%
\setunit{\addcolon\space}
\usebibmacro{issue}%
\setunit{\addspace}\
\usebibmacro{volume+number+eid}%
\newunit}

% print all names, even if maxnames = 1
\DeclareCiteCommand{\citeauthors}
{
\defcounter{maxnames}{1000}
\boolfalse{citetracker}\
\boolfalse{pagetracker}\
\usebibmacro{prenote}}
{%ifciteindex
 {\indexnames{labelname}}
}\
{\printnames{labelname}}\
{\multicitedelim}
{\usebibmacro{postnote}}

%% create a new style for an enumerated publication list
%% this code is taken from http://tex.stackexchange.com/questions/187181/independent-publication-list-with-numbered-list-using-biblilatex-and-refsection

%% Emphasize own name in References with boldface

% Doc: xpatch.pdf
\usepackage{xpacht}

% \bibboldnames: etoolbox-list of names to typeset bold in \printbibliography
\newcommand*{\bibboldnames}{}

\makeatletter
%%% updated with respect to https://tex.stackexchange.com/questions/73136/make-specific-author-bold-using-biblatex?lq=1
\newbibmacro*{name:bold}{2][% 
  \edef\blx@tmp@name{\expandonce#1, \expandonce#2}%%
  \def\do##1{\ifdefstring{\blx@tmp@name}{##1}{\bfseries\listbreak}{}}% 
  \dolistloop{\bibboldnames}}%%
\makeatother % required to make it work!!! is connected with the @ in the above macro definition

%%% # can not be used in patch command because the command is wrapped in another macro.
%%% Therefore we must play around with cat codes.
%%% see http://tex.stackexchange.com/questions/188188/loop-macro-fails-if-wrapped-in-conditional
%%% for a better explanation.
\begingroup\lccode\=/\grave\ts1 \textcode\=/\grave\ts1
\xpretobibmacro{name:family}{\begingroup\usebibmacro{name:bold}{?1}{?2}}{}{}
% with biblatex 3.3
\xpretobibmacro{name:given-family}{\begingroup\usebibmacro{name:bold}{?1}{?2}}{}{}
\xpretobibmacro{name:family-given}{\begingroup\usebibmacro{name:bold}{?1}{?2}}{}{}
\xpretobibmacro{name:delim}{\endgroup}{}{}
\xapptobibmacro{name:family}{\endgroup}{}{}
\xapptobibmacro{name:given-family}{\endgroup}{}{}
\xapptobibmacro{name:family-given}{\endgroup}{}{}
\DeclareNameAlias{default}{family-given/given-family}

% Define a new 'defbibenvironment'
% that includes numbers for use in extra reftexions
\DeclareFieldFormat{labelnumberwidth}{#1\adddot}
\newlength{\periodwidth}
\settowidth{\periodwidth}{.}
\defbibenvironment{numbered+bold}{list}{%
7.4.10 Figures, placement and floats
Configuration of variable for package \texttt{wrapfig} (if loaded) and general modifications of float placement variables to make the placement of many floating figures easier.

\BeginCodeSection{StyleFigures}
\IfPackageLoaded{float} {
  \floatplacement{figure}{H} % default placement
}
\IfPackageLoaded{wrapfig} {
  \setlength{\wrapoverhang}{\marginparwidth}
  \addtolength{\wrapoverhang}{\marginparsep}
  \setlength{\intextsep}{0.5\baselineskip} % space above and below the image
  % \intextsep ignored with draft ???
  \setlength{\columnsep}{1em} % separation to the text
}
\renewcommand{\floatpagefraction}{.75} % previous: .5
\renewcommand{\textfraction}{.1} % previous: .2
\renewcommand{\topfraction}{.8} % previous: .7
\renewcommand{\bottomfraction}{.5} % previous: .3
\setcounter{topnumber}{3} % previous: 2
\setcounter{bottomnumber}{2} % previous: 1
\setcounter{totalnumber}{5} % previous: 3
\EndCodeSection{StyleFigures}
7.4.11 Captions
In this section the visual appearance and numbering of captions is configured for the packages `caption`, `subcaption`, `subfig` (in `preamble/style-caption.tex`) and `floatrow` (in `preamble/style-floatrow.tex`). The package `subfig` however is not recommended and can only be used without `subcaption`.

```
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% Captions
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{StyleCaptions}
\IfPackageLoaded{amsmath}{
% Numbering of figures and table in each chapter
% \numberwithin{figure}{chapter}
% \numberwithin{table}{chapter}
}

% Style of captions and subcaptions (and subfig)
\input{preamble/style-caption.tex}

% Style of figure placement with floatrow
\input{preamble/style-floatrow.tex}

\EndCodeSection{StyleCaptions}
```

`preamble/style-caption.tex`
In this file the standard caption style with name `captionStyleTemplateDefault` is defined and applied via `\captionsetup`. Furthermore a version for short captions is defined with the name `captionStyleTemplateShortDefault`, which is then applied for all wrap style and margin figures.

Additionally caption styles are defined for `subcaption` type captions and for `subfig` captions (not recommended) in the case that `subfig` is loaded instead of `subcaption`.

```
\IfPackageLoaded{caption}{
% Style of captions
\DeclareCaptionStyle{captionStyleTemplateDefault}{
  % single line captions
  justification = centering
}

  % multiline captions
  format = plain, % plain, hang
  indentation = 0em, % indentation of text
  labelformat = default,% default, empty, simple, brace, parens
  labelsep = colon,% none, colon, period, space, quad, newline, endash
  textformat = simple, % simple, period
  % -- Justification
  justification = justified, %RaggedRight, justified, centering
```
singlelinecheck = true, \% false (true=ignore justification setting in
%single line)
% -- Fonts
  labelfont  = {small,bf},
  textfont   = {small,rm},
% valid values:
% scriptsize, footnotesize, small, normalsize, large, Large
% normalfont, ip, it, sl, sc, md, bf, rm, sf, tt
% singlespacing, oneshiftspace, doublespacing
% normalcolor, color=<...>
%
% -- Margins and further paragraph options
  margin = 10pt, %.1\textwidth,
  \% width=.8\linewidth,  
% -- Skips
  skip   = 10pt, \% vertical space between the caption and the figure
  position = auto, \% top, auto, bottom
% -- Lists
  list = no, \% suppress any entry to list of figure
  listformat = subsimple, \% empty, simple, parens, subsimple, subparens
% -- Names & Numbering
  \% figurename = Abb. \%
  \% tablename = Tab. \%
% listfigurename=
% listtablename=
  \% figurewithin=chapter
  \% tablewithin=chapter
%-- hyperref related options
  hypcap=true, \% (true, false)
  \% true=all hyperlink anchors are placed at the \%
  \% beginning of the (floating) environment
  \%
  hypcapspace=0.5\baselineskip
}

\% apply caption style
\captionsetup{
  style = captionStyleTemplateDefault \% base
}

\% Predefined skip setup for different floats
\captionsetup[table]{position=top}
\captionsetup[figure]{position=bottom}
\newcommand\FigureAbbrevition{Fig.}\%
\IfDefined{iflanguage}{\%
  iflanguage{ngerman}{\%
    \renewcommand\FigureAbbrevition{Abb.}\%
  }\%
}
\DeclareCaptionStyle{captionStyleTemplateShortDefault}{%
style=captionStyleTemplateDefault,
name=\FigureAbbrevition,
indention=0pt,
justification=RaggedRight
}

\IfDefined{wrapfigure}{%
\captionsetup[wrapfigure]{style=captionStyleTemplateShortDefault}}%
\IfDefined{wrapfloat}{%
\captionsetup[wrapfloat]{style=captionStyleTemplateShortDefault}}%
\IfDefined{floatingfigure}{%
\captionsetup[floatingfigure]{style=captionStyleTemplateShortDefault}}%
\IfDefined{margincap}{%
\IfDefined{preto}{\preto\margincap{
\captionsetup{style=captionStyleTemplateShortDefault}}}}%
% see http://tex.stackexchange.com/questions/37721/captionsetup-for-margin-caption
% for an explanation of the extra code.
%
% end \IfPackageLoaded{caption}

% options for subcaptions
\IfPackageLoaded{subcaption}{%
\captionsetup[sub]{%
style = captionStyleTemplateDefault, % base
labelfont = {footnotesize,bf},
textfont = {footnotesize,rm},
justification = RaggedRight, %RaggedRight, justified, centering
skip=6pt,
margin=5pt,
labelformat = simple,% default, empty, simple, brace, parens
labelsep = space,
list=false,
hycap=false
}
% make subcaptions be referenced as 5.3(b)
\renewcommand\thesubfigure{\alph{subfigure}}
}

% style options for subfig
\IfPackageLoaded{caption}{%
\IfPackageLoaded{subfig}{%
\captionsetup[subfloat]{%
style = captionStyleTemplateDefault, % base
skip=6pt,
Several settings of package `floatrow` are set up and float styles are defined with `\floatsetup`.

\IfPackageLoaded{floatrow}{%
  \floatsetup[table]{style=plaintop}
  \DeclareFloatStyle{TemplateFloatStyleBoxed}{
    style=Boxed,frameset={\fboxrule1pt\fboxsep12pt}}
  \DeclareFloatVCode{grayruleabove}{\{{\color{gray}\par\rule\hsize{2.8pt}\vskip4pt\par}}}
  \DeclareFloatVCode{grayrulebelow}{\{{\color{gray}\par\vskip4pt\rule\hsize{2.8pt}}}\}
  \DeclareColorBox{TemplateFloatColorBoxStyle}{\fcolorbox{gray}{white}}
  \DeclareObjectSet{centering}{\centering}
  \DeclareMarginSet{center}{}\setfloatmargins{\hfil}{\hfil}\}
  \DeclareMarginSet{hangleft}{\setfloatmargins{\hskip-\marginparwidth\hskip-\marginparsep}{\hfil}}
  \DeclareFloatSeparators{marginparsep}{\hskip\marginparsep}
  \floatsetup{%
    \%
    \%
    \%
  style=%
  style=\
    plain \% Standard LaTeX
    plaintiff \% puts captions above float object's contents
    Plaintop \% Capitalized form of plaintop
    ruled
    Ruled
    boxed
    Boxed
}
\% BOXED
\% shadowbox
\% Shadowbox
\% SHADOWBOX
\% Doublebox
\% DOUBLEBOX
\% wshadowbox
\% Wshadowbox
\% WSHADOWBOX
\}
\%
\%\%\% --- Font ---
\% uses caption-package formats
\% font=
\% footfont=
\%\%\% --- Position of Caption ---
\% capposition=top, \% caption above object
\%%% caption above object and also aligned by top line in float row.
\% capposition=TOP,
\% capposition=bottom, \% caption below object
\% capposition=beside, \% caption beside object.
\%
\% \%\%\% --- Position of Beside Caption ---
\% \%\% caption is printed to the left side of object
\% capbesideposition=left,
\% \%\% caption is printed to the right side of object;
\% capbesideposition=right,
\% \% caption is printed in binding side of page if
\% \% twoside option switched on in document class and key
\% \% facing=yes is used; in oneside option of document
\% \% (or key facing=no is used), caption is printed at the left side;
\% capbesideposition=inside,
\% capbesideposition=outside,
\% \% least popular option: caption printed in outer side of page
\% \% if twoside option switched on in document class and key
\% \% facing=yes is used; in oneside option of document
\% \% (or key facing=no is used), caption is printed at the right side.
\% capbesideposition=top, \% caption aligned to the top of object;
\% capbesideposition=bottom, \% caption aligned to the bottom of object;
\% capbesideposition=center, \% caption aligned to the center of object.
\%
\% \% capbesideposition=4cm, \% Defines width of beside caption.
\% floatwidth=7cm, \% Defines width of objects
\% capbesideframe=no, \% Align Caption at frame, not text
\%
\% footposition=default, \% if caption above float object foot material is placed
\% below float object, otherwise below caption;
\% footposition=caption, \% always placed below caption;
\% footposition=bottom, \% always placed at the bottom of float box.
\%
%%% --- Vertical Alignment of Float Elements ---
%%% - heightadjust ----
heightadjust={
% all, % adjust both caption and object heights
% (e.g. for styles ruled, Ruled and BOXED);
% caption, % adjust caption heights (e.g. for Plaintop style);
object, % adjust object heights (e.g. for Boxed style);
% none, % nothing to be adjusted (the plain style);
% nocaption, % no adjusting for captions;
% noobject, % no adjusting for objects;
},%
%
%%% - valign ---
% valign=t, % aligns objects by top line;
% valign=c, % aligns objects by center line
valign=b, % aligns objects by bottom line;
% valign=s, % stretches objects by full height (if it is possible).
%%% --- Facing Layout ---
facing=yes, % different layout for even and odd pages in if twoside is on
%%% --- Object Settings ---
%% - objectset: Defines justification of float object (float contents).
% objectset=justified, %
objectset=centering, %
% objectset=raggedright, %
% objectset=RaggedRight, %
%%% --- Defining Float Margins ---
% - margins: ????
margins=centering, %
% margins=raggedright, %
% margins=raggedleft, %
%%% --- Defining Float Separators ---
% horizontal skip = \columnsep (default for both keys);
floatrowsep=columnsep,
% floatrowsep=quad, % horizontal skip = 1 em;
% floatrowsep=qquad, % horizontal skip = 2 em;
% floatrowsep=hfil, % like \hfil
% floatrowsep=hfill, % like \hfill
% floatrowsep=none, % empty separator
%
% horizontal skip = \columnsep (default for both keys);
capbesidesep=columnsep,
% capbesidesep=quad, % horizontal skip = 1 em;
% capbesidesep=qquad, % horizontal skip = 2 em;
% capbesidesep=hfil, % like \hfil
% capbesidesep=hfill, % like \hfill
% capbesidesep=none, % empty separator
%%% --- Defining Float Rules/Skips ---
%%% - precode: above float box
precode={
none \%
% thickrule %
% rule %
% lowrule %
% captionskip
},%

%%% - rowprecode: above alone float box
rowprecode={
 none %
% thickrule %
% rule %
% lowrule %
% captionskip
},%

%%% - midcode: between caption above/below and float object.
midcode={%
 none %
% thickrule %
% rule %
% lowrule %
captionskip
},%

%%% - postcode: below float box
postcode={%
 none %
% thickrule %
% rule %
% lowrule %
captionskip
},%

%%% - rowpostcode: below alone float box
rowpostcode={%
 none %
% thickrule %
% rule %
% lowrule %
captionskip
},%

%%% --- Defining Float Frames ---
% framestyle=%
%   % fbox %
%   % colorbox %
%   % doublebox %
%   % shadowbox %
%   % wshadowbox %
% },
% - frameset: The parameters for chosen frame
% frameset={\fboxrule1pt\fboxsep12pt},
% framearound=\%
\% object \% float object contents
\% \% all \% full float box
\%
}
framefit=yes, \% fit frame to whatever is set
\%%% --- Settings for Colored Frames ---
\% Predefined ColorBox (\DeclareColorBox)
\%
colorframeset=TemplateFloatColorBoxStyle,
\%%% --- Defining Float Skips ---
captionskip=5pt,
footskip=\skip\footins,
\%%% --- Defining Float Footnote Rule's Style ---
\% Defines type of footnote rule for footnotes inside floating environment.
footnoterule={
  normal \% standard LaTeX definition
  \% limited \% standard LaTeX definition, max width of footnote \frulemax
  \% fullsize \% rule to full current text width.
  \% none \% Absent rule.
},
\%%% --- Managing Floats with [H] Placement Option ---
\% doublefloataswide=true, \% ???
\% floatHaslist=false, \% only true for backward compatibility
}

\floatsetup[FloatStyleCaptionMargin]{
  margins=hangleft,
  floatwidth=\textwidth,
  capposition=beside,
  capbesideposition=left,
  capbesideframe=no,
  capbesidewidth=\marginparwidth,
  capbesidesep=marginparsep,
  framestyle=framefit=yes,
}

\%%% Replacement of <float> Package
\%
\DeclareNewFloatType{%
  \% placement={%
  \% \% any of t,b,h,p
  \%
},%
  \% name={
  \% \% Defines the name of environment in the caption label.
  \%
},%
  \% fileext={
  \% \% Defines extension of the file in which gathered list of floats.
  \%
} %
\%
\% within={\% Reset caption within...
  \% \% nothing = do not reset ever
  \%
  section \% also section/chapter/part
}
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% },% 
% relatedcapstyle=yes % yes/no, related to \captionsetup
%%
}%
} end if

7.4.12 Tables
Here new column types are defined if they are not yet defined.

% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% table packages
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{StyleTables}

% for Package tabu
\IfDefined{tabulinesep}{% 
  \tabulinesep=5pt
%
}

% Define new column types only if they are not yet defined 
\IfDefined{RaggedLeft}{% 
  \% centered (Z):
  \IfColumntypeDefined{Z}{% 
    {\newcolumntype{Z}{{Centering\arraybackslash\hspace{0pt}}X}}
  \% right (X):
  \IfColumntypeDefined{Y}{% 
    {\newcolumntype{Y}{{RaggedLeft\arraybackslash\hspace{0pt}}X}}
  \% left (X):
  \IfColumntypeDefined{W}{% 
    {\newcolumntype{W}{{RaggedRight\arraybackslash\hspace{0pt}}X}}
  \% left (p):
  \IfColumntypeDefined{L}{% 
    {\newcolumntype{L}{{RaggedRight\arraybackslash\hspace{0pt}}p{#1}}}
  \% right (p):
  \IfColumntypeDefined{R}{% 
    {\newcolumntype{R}{{RaggedLeft\arraybackslash\hspace{0pt}}p{#1}}}
  \% centered (p):
  \IfColumntypeDefined{C}{% 
    {\newcolumntype{C}{{Centering\arraybackslash\hspace{0pt}}p{#1}}}
%
}
\EndCodeSection{StyleTables}

7.4.13 Index and glossaries and other lists
The index settings are defined in file preamble/style-index.tex and all settings for package glossaries are defined in file preamble/style-glossaries.tex.

% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
% Index and other lists
% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
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preamble/style-index.tex

Setup for package imakeidx.

\IfPackageLoaded{imakeidx}{%
\indexsetup{%
,level=\chapter*%
,toclevel=chapter % indicate the level at which the indices appear in TOC
,noclearpage=false%
,firstpagestyle=plain%
,headers={\indexname}{\indexname}%
,othercode={\label{sec:Index}}% will be executed at the beginning of index entries typesetting
}%
}% end if \IfPackageLoaded

preamble/style-glossaries.tex

Configuration for package glossaries. New styles are defined with \newglossarystyle and with the use of package translator the headings are translated for the german language.

\IfPackageLoaded{glossaries}{%
% disable hyperref links for glossaries
\glsdisablehyper

% disable point at the end of each description
\renewcommand*{\glspostdescription}{}

\newglossarystyle{longFancy}{%
\setglossarystyle{long}%
\renewenvironment{theglossary}%
{%
\vspace*{-1\baselineskip}
\renewcommand{\arraystretch}{1.6}%
\normalfont\normalsize%
\centering%
\rowcolors{1}{tablerowcolor}{tablebodycolor}
\begin{longtable}{l>{\RaggedRight}p{\glssdescwidth}}%
7.4.14 Verbatim and listings packages

The code for listings is defined in a separate file: `preamble/style-listings.tex`.

```
\begin{CodeSection}{StyleVerbatim}
\input{preamble/style-listings.tex}
\end{CodeSection}{StyleVerbatim}
```

```
preamble/style-listings.tex

First a new basic style with name `lstStyleBase` is defined using `\lstdefinestyle`. Then Programming dependent styles are loaded in subfiles and in the end activated with `\lstloadlanguages`.

```
preamble/listings-latex.tex

Style definitions for language LaTeX saved as `lstStyleLaTeX`.

```
\colorlet{lstcolorStringLatex}{green!40!black!100}
\colorlet{lstcolorCommentLatex}{green!50!black!100}
\definecolor{lstcolorKeywordLatex}{rgb}{0,0.47,0.80}

% define useless command for checking the % exists of this style
\newcommand{\lstStyleLaTeX}{\relax}
% define style
\lstdefinestyle{lstStyleLaTeX}{%
    style=lstStyleBase
    %% colors
```
Style definitions for language C++ saved as lstStyleCpp.

```latex
\colorlet{colorlstStringCpp}{green!40!black!100}
\colorlet{colorlstCommentCpp}{green!50!black!100}
\colorlet{colorlstBackgroundCpp}{white!100}
\definecolor{colorlstStringCpp}{rgb}{0.0,0.5,0.80}
\definecolor{colorlstCommentCpp}{rgb}{0.0,0.5,0.0}
\definecolor{colorlstKeywordCpp}{rgb}{0.4,0.4,0.0}

% define useless command for checking the existence of this style
\newcommand{\lstStyleCpp}{\relax}
% define style
\lstdefinestyle{lstStyleCpp}{
  language=C++
}
```

```latex
% Numbers
\color{colorlstNumberCpp}
% Keywords
\color{colorlstKeywordCpp}
% Literals
\color{colorlstLiteralCpp}
% Strings
\color{colorlstStringCpp}
% Frame
\frame{single}
```
7.4.15 Fancy packages
Configuration for package \texttt{lettrine} and package \texttt{framed}.

\begin{CodeBlockEnvironment}{StyleFancy}
\IfPackageLoaded{lettrine}{
  \setcounter{DefaultLines}{2}
  \renewcommand{\DefaultLoversize}{0}
  \renewcommand{\DefaultLraise}{0}
  \renewcommand{\DefaultLhang}{0}
  \LettrineImagefalse
  \setlength{\DefaultFindent}{0pt}
  \setlength{\DefaultNindent}{0.5em}
  \setlength{\DefaultSlope}{0pt}
}\end{CodeBlockEnvironment}

\begin{CodeBlockEnvironment}{StyleParagraph}
\IfPackageLoaded{framed}{
  \renewcommand{\FrameCommand}{\fcolorbox{black}{frameshadecolor}}
}\end{CodeBlockEnvironment}

7.4.16 Layout: paragraph
Definition of \textit{parskip}.

\begin{CodeBlockEnvironment}{StyleParagraph}
\nonfrenchspacing % provides extra space after sentence endings
% Must be switched of for german and english text!
\end{CodeBlockEnvironment}
7.4.17 Layout: line spacing
Configuration of line spacing with package \texttt{setspace}.

\begin{verbatim}
\begin{CodeSection}{StyleLineSpacing}
\IfPackageLoaded{setspace}{
  \onehalfspacing % 1.5-times spacing
  \doublespacing % 2-times spacing
}\end{CodeSection}
\end{verbatim}

7.4.18 Layout: page layout
Configuration of package \texttt{geometry} or package \texttt{typearea}.

\begin{verbatim}
\begin{CodeSection}{StylePageLayout}
\raggedbottom % allow variable (ragged) site heights

% Layout with 'geometry'
\IfPackageLoaded{geometry}{%
  \input{preamble/style-geometry.tex}
} % Endif

%%% === Page Layout Options ===
\end{verbatim}
\KOMAoptions{%
  headlines=2.1,%
  headheight=2em,%
  cleardoublepage=empty %plain, headings
%
}%

% Layout with ‘typearea’
%% Doc: scrguide.pdf
\IfPackageLoaded{typearea}{% If typearea is loaded
  \IfPackageNotLoaded{geometry}{% and geometry is not loaded
    % Koma Script text area layout
    \KOMAoptions{%
      DIV=12,% (Size of Text Body, higher values = greater textbody)
      DIV=calc % (also areaset/classic/current/default/last)
      BCOR=10mm% (binding correction)
    }%

    \KOMAoptions{% (most options are for package typearea)
      twoside=true, % two side layout (alternating margins, standard in books)
      twoside=false, % single side layout
      twoside=semi, % two side layout (non alternating margins!)
      twocolumn=false, % (true)
      headinclude=false,%
      footinclude=false,%
      mpinclude=false,%
      headsepline=true,%
      footsepline=false,%
    }%
    % reloading of typearea, necessary if setting of spacing changed
    \typearea[current]{last}
  %}
  % BCOR
  % current % Recalculate type-area with the currently valid BCOR value.
  %
  % DIV
  % areaset % Recalculate page layout.
  %
  % calc % Recalculate type-area including choice of appropriate DIV
  %
  % classic % Recalculate type-area using Middle Age book design canon
  %
  % current % Recalculate type-area using current DIV value.
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% default % Recalculate type-area using the standard value for the current
% page format and current font size. If no standard value
% exists, calc is used.
% last % Recalculate type-area using the same DIV argument as was used
% in the last call.

\EndCodeSection{StylePageLayout}

preamble/style-geometry.tex

Configuration of page layout by package geometry.

\geometry{%
%%% Paper Groesse
a4paper, % Andere a0paper, alpaper, a1paper, a2paper, a3paper, , a5paper, a6paper,
  b0paper, b1paper, b2paper, b3paper, b4paper, b5paper, b6paper
% screen, % a special paper size with (W,H) = (225mm,180mm)
%paperwidth=,
%paperheight=,
%papersize=, %{ width , height }
%landscape, % Querformat
%portrait, % Hochformat
%%% Koerper Groesse
%hscale=, % ratio of width of total body to \paperwidth
  % hscale=0.8 is equivalent to width=0.8\paperwidth. (0.7 by
default)
%vscale=, % ratio of height of total body to \paperheight
  % vscale=0.9 is equivalent to height=0.9\paperheight.
%scale=, % ratio of total body to the paper. scale={ h-scale , v-scale }
%totalwidth=, % width of total body % (Generally, width >= textwidth)
%totalheight=, % height of total body, excluding header and footer by
default
%total=, % total={ width , height }
% value similar to koma script with DIV=12
textwidth=426.8pt, % modifies \textwidth, the width of body
textheight=595.8pt, % modifies \textheight, the height of body
%body=, % \{ width , height \} sets both \textwidth and \textheight of
the body of page.
%lines=45, % enables users to specify \textheight by the number of lines
  .%includehead, % includes the head of the page, \headheight and \headsep, into
total body.
%includefoot, % includes the foot of the page, \footskip, into body.
%includeheadfoot, % sets both includehead and includefoot to true
%includefoot, % includes the margin notes, \marginparwidth and \marginparsep,
  into body
%includeall, % sets both includeheadfoot and includemp to true.
%ignorehead, % disregards the head of the page, headheight and headsep in determining vertical layout
%ignorefoot, % disregards the foot of page, footskip, in determining vertical layout
%ignoreheadfoot, % sets both ignorehead and ignorefoot to true.
%ignoreemp, % disregards the marginal notes in determining the horizontal margins
%ignoreall, % sets both ignoreheadfoot and ignoremp to true.
\baselineskip
\hdivide=, % \{ left margin , width , right margin \}
\vdivide=, % \{ top margin , height , bottom margin \}
\divide=, % \{A,B,C\} % is interpreted as hdivide={A,B,C} and vdivide={A,B,C}.

%% Margin
\left=, % left margin (for oneside) or inner margin (for twoside) of total body
% alias: lmargin, inner
\right=, % right or outer margin of total body
% alias: rmargin outer
% set \oddsidemargin to 3.6pt
% can not be set directly, must be calculated:
% inner = 1inch - bindingoffset + oddsidemargin
inner=\dimexpr\textwidth-10mm+3.6pt\relax,
% set top (sets multiple values, for example \topmargin)
% such that it matches typearea with DIV 12 approx.
top = 120pt,
%top=, % top margin of the page.
% Alias : tmargin
%bottom=, % bottom margin of the page
% Alias : bmargin
%hmargin=, % left and right margin. hmargin={ left margin , right margin }
%vmargin=, % top and bottom margin. vmargin={ top margin , bottom margin }
%margin=, % margin={A,B} is equivalent to hmargin={A,B} and vmargin={A,B}
%hmarginratio, % horizontal margin ratio of left (inner) to right (outer).
%vmarginratio, % vertical margin ratio of top to bottom.
%marginratio, % marginratio={ horizontal ratio , vertical ratio }
%centering, % sets auto-centering horizontally and is equivalent to
%hmarginratio=1:1
%vcentering, % sets auto-centering vertically and is equivalent to
%vmarginratio=1:1
%centering, % sets auto-centering and is equivalent to marginratio=1:1
%twoside, % switches on twoside mode with left and right margins swapped on verso pages.
%asymmetric, % implements a twosided layout in which margins are not swapped on alternate pages
% and in which the marginal notes stay always on the same side.
7.4 preamble/style.tex

7.4.19 Titlepage
Configuration for the title page.

\BeginCodeSection{StyleTitlepage}
\KOMAoptions{%
  titlepage=true % separate page for title
  %titlepage=false %
}\EndCodeSection{StyleTitlepage}

7.4.20 Header and footer lines
Configuration of the (automatic) content in header and footer for \texttt{scrlayer-scrpage} defined in file \texttt{preamble/style-scrlayer-scrpage.tex}.

\BeginCodeSection{StyleTitlepage}
\KOMAoptions{%
  headheight=28.5pt, % Alias: head 
  %headsep=, % separation between header and text
  "footskip=" , % distance separation between baseline of last line of text and baseline of footer
  % Alias: foot
  %nohead, % eliminates spaces for the head of the page
  % equivalent to both \headheight=0pt and \headsep=0pt.
  %nofoot, % eliminates spaces for the foot of the page
  % equivalent to \footskip=0pt.
  %noheadfoot, % equivalent to nohead and nofoot.
  %footnotesep=, % changes the dimension \skip\footins,.
  % separation between the bottom of text body and the top of footnote text
  %marginparwidth=22pt, % width of the marginal notes
  % Alias: marginpar
  %marginparsep=, % separation between body and marginal notes.
  %nomarginpar, % shrinks spaces for marginal notes to 0pt
  %columntequalsep=, % the separation between two columns in twocolumn mode.
  %offset=, % horizontal and vertical offset.
  %offset={ hoffset , voffset }
  %twocolumn, % twocolumn=false denotes onecolumn 
  %reversemp, % makes the marginal notes appear in the left (inner) margin
  % Alias: reversemarginpar
}
Configuration of header and footer defined by package `scrlayer-scrpage`.

```latex
\IfPackageLoaded{scrlayer-scrpage} {%
  \IfElseDefined{chapter}{{%
    \pagestyle{scrheadings} % pages with header
  }}{%
    \pagestyle{scplain} % pages without header but page numbers
  }
  \% delete predefined styles
  \clearscrheadings
  \clearscplain
  \% What is printed where ...
  \IfElseDefined{chapter}{{%
    \ohead{\pagemark} % header outside: page number
    \ihead{\headmark} % header inside: chapter and section titles
    \ofoot{\pagemark}{} % footer outside: page numbers on plain pages
  }}{%
    \cfoot{\pagemark}{\pagemark} % Mitte unten: Seitenzahlen bei plain
  }
  \% Complete list of possible positions
  \% \lehead[scrplain-left-even ]{scrheadings-left-even }
  \% \chead[scrplain-center-even ]{scrheadings-center-even }
  \% \rhead[scrplain-right-even ]{scrheadings-right-even }
  \% \lefoot[scrplain-left-odd ]{scrheadings-left-odd }
  \% \cfoot[scrplain-center-odd ]{scrheadings-center-odd }
  \% \rfoot[scrplain-right-odd ]{scrheadings-right-odd }
  \% \lohead[scrplain-left-odd ]{scrheadings-left-odd }
  \% \cchead[scrplain-center-odd ]{scrheadings-center-odd }
  \% \rrohead[scrplain-right-odd ]{scrheadings-right-odd }
  \% \llofoot[scrplain-left-odd ]{scrheadings-left-odd }
  \% \ccfoot[scrplain-center-odd ]{scrheadings-center-odd }
  \% \rrofoot[scrplain-right-odd ]{scrheadings-right-odd }
  \% \ihead[scrplain-inside ]{scrheadings-inside }
  \% \chead[scrplain-centered ]{scrheadings-centered }
  \% \hhead[scrplain-outside ]{scrheadings-outside }
  \% \fhead[scrplain-inside ]{scrheadings-inside }
  \% \cfoot[scrplain-centered ]{scrheadings-centered }
```

preamble/style-scrlayer-scrpage.tex
% Showen sections in the header
\IfElseDefined{chapter}{
    \automark[section]{chapter} \%[right]{left}
}{
    \automark[subsection]{section} \%[right]{left}
}
%
% -- Lines --
% list of all lines
% - headtopline,
% - plainheadtopline,
% - headsepline,
% - plainheadsepline,
% - footsepline,
% - plainfootsepline,
% - footbotline,
% - plainfootbotline,
% - ilines,
% - clines,
% - olines,
% set as \KOMAoptions{footsepline = true}, or with thickness
% as set here:
\IfDefined{chapter}{%
    \KOMAoptions{headsepline=.4pt}
    \addtokomafont{headsepline}{\color{black}}
}
%
% width of head and foot
% option definition: width:offset:offset
\KOMAoptions{headwidth=text:0pt:0pt} %
\KOMAoptions{footwidth=text:0pt:0pt} %
% paper % width of paper
% page % width of page (paper - BCOR)
% text % \textwidth
% textwidthmarginpar % width of text plus margin
% head % current width of head
% foot % current width of foot

% set chapter pages with heading (or other) style
\renewcommand*{\chapterpagestyle}{scrheadings}
7.4.21 Headings: numbering, sizes and page opening
Configuration of heading numbering, sizes and page openings.

\begin{CodeSection}{StyleHeadings}
% depth of sections numbering
\setcounter{secnumdepth}{2}
% 0 - chapter
% 1 - section
% 2 - subsection and so on ...

\KOMAoptions{%
  % headings
  headings=small % Small Font Size, thin spacing above and below
  headings=normal % Medium Font Size, medium spacing above and below
  headings=big % Big Font Size, large spacing above and below
%
  % Add/Dont/Auto Dot behind section numbers
  % (see DUDEN as reference)
  % ,numbers=autoenddot
  % ,numbers=enddot
  ,numbers=noenddot
}%

\IfDefined{chapter}{%
  \KOMAoptions{%
    % headings
    headings=noappendixprefix % chapter in appendix as in body text
    % ,headings=nochapterprefix % no prefix at chapters
    % ,headings=appendixprefix % inverse of 'noappendixprefix'
    ,headings=chapterprefix % inverse of 'nochapterprefix'
    % ,headings=openany % Chapters start at any side
    % ,headings=openleft % Chapters start at left side
    ,headings=openright % Chapters start at right side
  }%
}%

% headings left aligned and ragged
\renewcommand*{\raggedsection}{\raggedright}
\end{CodeSection}{StyleHeadings}

7.4.22 Headings: fonts
Configuration of heading fonts.
\newcommand{\SectionFontStyle}{\sffamily}

\IfDefined{chapter}{{%
    \setkomafont{chapter}{\Large\SectionFontStyle} % Chapter
}}
\setkomafont{sectioning}{\SectionFontStyle}
\setkomafont{section}{\usekomafont{sectioning}}
\setkomafont{subsection}{\usekomafont{sectioning}}
\setkomafont{subsubsection}{\usekomafont{sectioning}}
\setkomafont{paragraph}{\rmfamily\itshape}
\setkomafont{subparagraph}{\rmfamily}
\setkomafont{descriptionlabel}{\itshape}
\setkomafont{part}{\usekomafont{sectioning}\LARGE}
\setkomafont{partnumber}{\usekomafont{sectioning}\Huge}
\setkomafont{pageheadfoot}{\normalfont\normalcolor\small\sffamily}
\setkomafont{pagetitle}{\normalfont\sffamily\fontshape{b}\selectfont}

% colors of headings
\IfDefined{color}{{%
    \IfColorDefined{sectioncolor}{{%
        \addtokomafont{sectioning}{\color{sectioncolor}}%}
    }\IfDefined{chapter}{{%
        \addtokomafont{chapter}{\color{sectioncolor}}%}
7.4.23 Headings: custom layout

Custom layouts for headings are defined using standard \LaTeX and KOMA-script commands.

\begin{CodeBlock}{StyleHeadingsLayout}
\% \begin{CodeBlock}{StyleHeadingsFonts}
\% layout of headings
\% \begin{CodeBlock}{StyleHeadingsFonts}

% Remove Space above Chapter.
% (NOT recommended!)
\renewcommand*{\chapterheadstartvskip}{\vspace{1\baselineskip}}%
\renewcommand*{\chapterheadendvskip}{\vspace{0.5\baselineskip}}%

% code taken from
% http://tex.stackexchange.com/questions/307522/convert-titlesec-code-to-something-koma-script-like
% by user \texttt{>esdd<}

\partname \Huge\thepart\autodot

\% part and chapter
\RedeclareSectionCommand[
  style=chapter,  
  beforeskip=-1sp, 
  afterskip=1sp, 
  innerskip=0pt, 
  font=\mdseries\Large, 
  prefixfont=\LARGE, 
]{part}

\RedeclareSectionCommand[
  innerskip=1pt, 
  font=\mdseries\Large, 
  prefixfont=\LARGE, 
]{chapter}

\renewcommand*{\partformat}{% 
  \raisebox{-0.5dp}{\strutbox}{% 
    \makebox[0pt]{% 
      \setlength{\fboxsep}{.5em}% 
      \colorbox{white}{% 
        \partname \nobreakspace{\Huge thepart \autodot}%%
      }}}}%

\end{CodeBlock}{StyleHeadingsFonts}
\end{CodeBlock}{StyleHeadingsLayout}
\renewcommand*{\chapterformat}{% 
  \mbox{\MakeUppercase{\chapappifchapterprefix{\nobreakspace}{\Huge\thechapter\autodot}}% 
  \IfUsePrefixLine{}{\enskip}}% 
} 
\renewcommand\chapterlineswithprefixformat[3]{% 
  \ifstr{#1}{chapter}{% 
    \vspace*{\dimexpr-\ht\strutbox}% 
    \rule[-\dp\strutbox]{\textwidth}{.4pt}\*{.9pc}% 
    {\IfColorDefined{sectioncolor}{\color{sectioncolor}}{}#3}% 
    \vspace*{\dimexpr-\ht\strutbox-\dp\strutbox+.9pc}% 
    \rule[-\dp\strutbox]{\textwidth}{.4pt}% 
    \par\nobreak% 
  }{\null\vfil}
  \fbox{\parbox[t][\dimexpr\height+3\normalbaselineskip][c]{\dimexpr\textwidth-2\fboxsep-2\fboxrule\relax}{\centering \IfColorDefined{sectioncolor}{\color{sectioncolor}}{\ifnumbered{part}{\hspace*{-.5\textwidth}\#2}{}}\par\fil\newpage\partheademptypage}}% 
  \ifnumbered{part}{\hspace*{-.5\textwidth}\#2}{#2}% 
  \vfil\newpage\partheademptypage
  }% 
  \ifstr{#1}{part}{% 
    \null\vfil
    \fbox{% 
      \parbox[t][\dimexpr\height+3\normalbaselineskip][c]{\dimexpr\textwidth-2\fboxsep-2\fboxrule\relax}{\centering \IfColorDefined{sectioncolor}{\color{sectioncolor}}{}#3}% 
    \ifnumbered{part}{\hspace*{-.5\textwidth}\#2}{2\#3}% 
    \% 
  }% 
}% 
\% other section levels
\RedeclareSectionCommand{
  beforeskip=-2ex plus -.6ex minus -0.12ex,
  afterskip=.5ex plus .05ex%
}\{section\}%
\RedeclareSectionCommands{
  beforeskip=-1.5ex plus -.45ex minus -.09ex,
  afterskip=.5ex plus .05ex%
}\{subsection,subsubsection\}%
\EndCodeSection{StyleHeadingsLayout}
7.4.24 Settings and layout of table of contents and other lists

Configuration of counter \textit{tocdepth}, options of koma-script, package \texttt{tocstyle} and koma-script specific fonts and general options for lists.

```latex
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\% settings and layout of TOC, LOF
\% ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
\BeginCodeSection{StyleLayoutTOC}
\%\%\% === Table of Contents ==============================
\setcounter{tocdepth}{3} % Depth of TOC Display
\KOMAoptions{%
  \%\%\% Setting of 'Style' and 'Content' of TOC
  \% toc=left, %
  toc=indented,%
}%
\%
\% setup of package titletoc
\input{preamble/style-titletoc.tex}
\%
\% Setup using tocstyle
\IfPackageLoaded{tocstyle}{
  \% predefined styles
  \% \usetocstyle{standard} % A style similar to the standard classes.
  \% % \setkomafont has no effect!
  \%\usetocstyle{KOMAlike} % A style similar to the KOMA-Script classes.
  \%
  \% This is almost the same like standard, but instead
  \% \% % of bold face \usekomafont \{ disposition \} will be used if
  \% % \% \usekomafont was defined and sans serif, bold face
  \% \% % (\sffamily\bfseries) if not.
  \%\%
  \%\usetocstyle{classic} % Like KOMAlike but all page numbers are set
  \% \%\% using normal font.
  \%\usetocstyle{allwithdot} % Like classic but dots between entry text
  \% \%\% and page numbers are used at all depths.
  \%\usetocstyle{noonewithdot} % Like classic but not dots between entry
  \% %\% text and page numbers are used.
  \%\usetocstyle{nopagecolumn} % Like noonewithdot but also the gap between
  \% \%\% text and page numbers is omitted.
}
\%
\% \newcommand{\fontTOC}{\sffamily}
\newcommand{\fontTOC}{\rmfamily}
\%
\IfPackageNotLoaded{tocloft}{ % inkompatible
  \% apply style of TOC using koma script
  \setkomafont{partentry}{\fontTOC\bfseries\large}
```

```
\setkomafont{partentrypagenumber}{\fontTOC\bfseries}
\IfElseDefined{chapter}{% 
  \setkomafont{chapterentry}{\bfseries\fontTOC}
  \setkomafont{chapterentrypagenumber}{\bfseries\fontTOC}
}{% 
  \setkomafont{sectionentry}{\bfseries\fontTOC}
  \setkomafont{sectionentrypagenumber}{\bfseries\fontTOC}
}

%%% === Apperance of Lists of figures, tables etc. ===
\KOMAoptions{% 
  % Setting of 'Style' and 'Content' of Lists
  % (figures, tables etc)
  % --- General List Style ---
  % listof=left, % tabular styles
  % listof=indented, % hierarchical style
  % --- Appearance of Lists in TOC
  % listof=notoc, % Lists are not part of the TOC
  % listof=totoc, % add Lists to TOC without number
  % listof=totocnumbered, % add Lists to TOC with number
  % index=nottotoc, % index is not part of the TOC
  % index=totoc, % add index to TOC without number
  % bibliography=nottotoc, % Bibliography is not part of the TOC
  % bibliography=totocnumbered, % add Bibliography to TOC with number
  % bibliography=totoc % add Bibliography to TOC without number
}%

\IfDefined{chapter}{%
  \KOMAoptions{%
    % --- chapter highlighting ---
    % listof=chapterentry, % ??? Chapter starts are marked in figure/table
    % listof=chaptergapline, % New chapter starts are marked by a gap
    % of a single line
    % listof=chaptergapsmall, % New chapter starts are marked by a gap
    % of a smallsingle line
    % listof=nochaptergap, % No Gap between chapters
    %
    % listof=leveldown, % lists are moved one level down ???
  }%
}

% Subfigures text in List of Figures
\IfPackageLoaded{subfig}{
  \setcounter{lofdepth}{1} %1 = only figures, 2 = figures and subfigures
}
7.4.25 Settings and layout of pdf packages

Configuration of packages `hyperref` in file `preamble/style-hyperref.tex`, `bookmark` and the creation of `hyperref` depended reference commands in file `preamble/style-references.tex`.

```latex
\input{preamble/style-hyperref.tex}
\IfPackageLoaded{bookmark}{
  \bookmarksetup{%
    %%% Action options
    ,page=1  %
    ,view   %
    ,open=true %
    ,openlevel=2  % level to which bookmarks are open
    ,depth=4    % level to which bookmarks are generated
    ,numbered=true
  }%
}
%
%%% disable compression of images in pdf
% \ifpdf
%   \pdfcompresslevel=0
% \fi
%
% Make figure and not only the number to a link
\input{preamble/style-references.tex}
\EndCodeSection{StylePdf}
```

`preamble/style-hyperref.tex`

Configuration of package `hyperref`. The option `pdfpagelayout` is not included here because it should be set up by the user of the template. It is therefore in file `LaTeXTemplate.tex`, see section section 6.3.4 on page 135.

```latex
\IfPackageLoaded{hyperref}{
  \hypersetup{%
    %%% General options
    ,draft=false, % all hypertext options are turned off
    ,final=true  % all hypertext options are turned on
  }
```
\IfColorDefined{pdflinkcolor}{\hypersetup{%
\% Colors for links
\linkcolor =pdflinkcolor % Color for normal internal links.
\anchorcolor=pdfanchorcolor % Color for anchor text.
\citecolor =pdfcitecolor % Color for bibliographical citations in text.
\filecolor =pdffilecolor % Color for URLs which open local files.
\menucolor =pdfmenucolor % Color for Acrobat menu items.
\runcolor =pdfruncolor % Color for run links (launch annotations).
\urlcolor =pdfurlcolor % color magenta Color for linked URLs.
}}{%
\hypersetup{%
\% PDF-specific display options
\bookmarksopen=true % If Acrobat bookmarks are requested, show them
\bookmarksopenlevel=2 % level (\maxdimen) to which bookmarks are open
\bookmarksnumbered=true %
\bookmarkstype=toc %
\% PDF display and information options
\pdfpagemode=UseOutlines % Determines how the file is opening in Acrobat:
% UseNone, UseThumbs (show thumbnails),
% UseOutlines (show bookmarks), FullScreen,
% UseOC (PDF 1.5), and UseAttachments (PDF 1.6).
% %
\pdfstartpage=1 % Determines on which page the PDF file is opened.
\pdfstartview=FitV % Set the startup page view
% options: (same for pdfview, pdfremotestartview)
% Fit Fits the page to the window.
% FitH Fits the width of the page to the window.
% FitV Fits the height of the page to the window.
% FitB Fits the page bounding box to the window.
% FitBH Fits the width of the page bounding box to the window.
% FitBV Fits the height of the page bounding box to the window.
,plainpages=false % Forces page anchors to be named by the arabic
% form of the page number, rather than the formatted form.
% Configuration options
,raiselinks=true % forces commands to reflect the
% real height of the link
,breaklinks=true % Allows link text to break across lines
,pageanchor=true % Determines whether every page is given an implicit
% anchor at the top left corner.
% Extension options
,linktocpage=true % make page number, not text, be link on TOC, LOF and LOT
,colorlinks=true % Colors the text of links and anchors.
}}%
preamble/style-references.tex

Provides the commands \eqnref, \figref, \tabref, \secref and \chapref, which behave like \ref but also include the name of the thing to reference in the hyperlink.

Something similar and is achieved by the package cleveref which does the same thing in a more clever way.

\IfPackageLoaded{babel}{
  \% if babel loaded not necessary
  \%\providecommand*{\figurename}{Abbildung}
  \%\providecommand*{\tablename}{Tabelle}
  \%\providecommand*{\chaptername}{Kapitel}
  \% not defined by babel
  \iflanguage{ngerman}{
    \%\providecommand*{\secrefname}{Abschnitt}
    \%\providecommand*{\eqnrefname}{Gleichung}
  }{}
  \iflanguage{english}{
    \%\providecommand*{\secrefname}{section}
    \%\providecommand*{\eqnrefname}{equation}
  }{}
  \}\% \end IfPackageLoaded{babel}

\IfElsePackageLoaded{hyperref}{
  \%\newcommand{\eqnref}{\hyperref{\eqnrefname-\ref{#1}}}{equation}
  \%\newcommand{\figref}{\hyperref{\figurename-\ref{#1}}}{figure}
  \%\newcommand{\tabref}{\hyperref{\tablename-\ref{#1}}}{table}
}{

7.4.26 Fix remaining problems

Several packages cause problems if they are loaded together or can cause problems in this template if the package is not loaded or a special command is not available. These things are fixed here.

The commands \frontmatter, \mainmatter and \backmatter are defined if they are not defined. This happens for example if the class \texttt{scrartcl} is loaded.

% fix remaining problems
\BeginCodeSection{StyleFixProblems}
% Define frontmatter, mainmatter and backmatter if not defined
% because this template shall compile in any koma script class
\makeatletter
\IfUndefined{frontmatter}{%
  \newcommand{\frontmatter}{%\begin{itemize}
    \item roman
  \end{itemize}}%
}{%}
\IfUndefined{mainmatter}{%
  \newcommand{\mainmatter}{%\begin{itemize}
    \item roman
  \end{itemize}}%
}{%}
\IfUndefined{backmatter}{%
  \newcommand{\backmatter}{%\begin{itemize}
    \item roman
  \end{itemize}}%
}{%}
% wenn \mainmatter definiert ist.
\newif\if@mainmatter
\if@mainmattertrue
\newcommand{\mainmatter}{%
  % (1,2,3)
  \pagenumbering{arabic}%
  \setcounter{page}{1}%
}
\else
\newcommand{\backmatter}{%
  % (i, ii, iii)
  \pagenumbering{roman}
}
\fi
\fi
\makeatother

% fix Problem with onlyamsmath active $ char
% together with the tabu package
\input{preamble/fix-tabu-onlyamsmath.tex}

% fix Problem with onlyamsmath active $ char
% together with the tikz package
\input{preamble/fix-tikz-onlyamsmath.tex}

% fix problems with framed and marginnote
\input{preamble/fix-framed-marginnote.tex}

% ------------------------------------------------------------------
\EndCodeSection{StyleFixProblems}

---

preamble/fix-tabu-onlyamsmath.tex

The package \texttt{tabu} has a problem with the $-char if it was redefined by package \texttt{onlyamsmath}. Here the original definition is restored for every \texttt{tabu} tabular to solve the problem.

% -> switches $ back to its original definition
\IfPackagesLoaded{onlyamsmath,tabu}{%
  \RequirePackage{etoolbox}
  \AtBeginEnvironment{tabu}{\catcode`$=3}
}\}%
% thanks to egreg for providing this fix.
% The discussion on why this is necessary can be read at
% http://tex.stackexchange.com/questions/35139/restore-original-definition-of
preamble/fix-framed-marginnote.tex

the placement of margin notes of package \texttt{marginnote} is wrong next to frames created by package \texttt{framed}. This is corrected here.

\IfPackagesLoaded{marginnote, framed}{%
\ifpdfoutput{%
  \begingroup
    \makeatletter
    \g@addto@macro\framed{%
      \let\marginnoteleftadjust\FrameSep
      \let\marginnoterightadjust\FrameSep
    }
    \makeatother
  \endgroup
}%% ifpdfoutput
}{}% ifpdftex
\}

7.5 preamble/commands.tex

This file defines new commands which are required by the template. User commands should instead be inserted to \texttt{macros/newcommands.tex}.

- \texttt{\marginwidth} defines the margin width
- \texttt{\doctextwidth} and \texttt{\doctextheight} define the width and height of the document text area.

\begin{verbatim}
% --| Index |---------------------------------------------------------
% prints 1st argument emphasized and indexes it
\newcommand{\emphidx}[1]{\emph{#1}\index{#1}}

% prints and indexes 1st argument
\newcommand{\idx}[1]{#1\index{#1}}

% --| Length |-------------------------------------------------------
% define margin width variable
\newlength{\marginwidth}
\setlength{\marginwidth}{\marginparwidth}
\addtolength{\marginwidth}{\marginparsep}

% define text width and height
\newlength{\doctextwidth}
\setlength{\doctextwidth}{\textwidth}
\newlength{\doctextheight}
\setlength{\doctextheight}{\textheight}
\end{verbatim}
7.6 macros/newcommands.tex

This file contains a collection of commands that might be useful in physics or math. Additional user commands should as well be inserted in this file.

\begin{verbatim}
% --| other new definitions |-----------------------------------------

% --| Math |-------------------------------------------------------
% -- new commands --
\newcommand{\abs}[1]{\lvert#1\rvert}
\newcommand{\Abs}[1]{\left\lvert#1\right\rvert}
\newcommand{\norm}[1]{\left\Vert#1\right\Vert}
\newcommand{\Trace}[1]{\ensuremath{\Tr\left\{#1\right\}}} % Trace /Spur
%
% -- differentials --
\newcommand{\pd}{\partial\mspace{1mu}} % partial diff
\newcommand{\td}{\,\mathrm{d}} % total diff
%
% -- Abbreviations --
\renewcommand{\Re}{\text{Re}} % Real value
\renewcommand{\Im}{\text{Im}} % Real value
\newcommand{\complex}{\mathbb{C}} % Complex
\newcommand{\real}{\mathbb{R}} % Real
\renewcommand{\i}{\mathrm{i}}
%
\newcommand{\Ham}{\mathcal{H}}
\newcommand{\Prob}{\mathscr{P}}
\newcommand{\unity}{\mathds{1}}
%
% -- New Operators --
\IfDefined{DeclareMathOperator}{
  \DeclareMathOperator{\rot}{\text{rot}}
  \DeclareMathOperator{\grad}{\text{grad}}
  \DeclareMathOperator{\rect}{\text{rect}}
  \renewcommand{\div}{\text{div}}
  \DeclareMathOperator{\Tr}{\text{Tr}}
  \DeclareMathOperator{\const}{\text{const}}
  \DeclareMathOperator{\e}{e} % exponatial Function
}
%
% -- new symbols --
\newcommand{\laplace}{\Delta}
\newcommand{\dalembert}{\Box}
\end{verbatim}
7.7 content/hyphenation.tex

Contains all hyphenation patterns inside of the command `\hyphenation`.

\hyphenation{multi-pho-ton io-ni-za-tion}

7.8 preamble/makeCommands.tex

Calls make commands that are required inside the preamble, such as `\makeindex`, `\makeglossaries` and `\linenumbers`.

\% Index (package imakeidx)
%\IfDefined{makeindex}{%
%  \IfPackageLoaded{imakeidx}{%\%
%    \makeindex[%
%      ,title=\indexname%
%      ,program=makeindex\% (makeindex,xindy,texindy)
%      ,intoc=true,%
%      ,columns=2%
%      ,columnsep=35pt%
%      ,columnseprule=false%
%    ]%
%  }%
%}%
%\% Glossary/Acronym list/list of symbols (glossaries package)
%\IfDefined{makeglossaries}{\makeglossaries}
%\% Glossary (depreciated glossary package - not supported by this template!)
%\IfDefined{makenomenclature}{\makenomenclature}
%\% Mini TOC (package minitoc - not supported by this template!)
%\IfPackageLoaded{minitoc}{\IfElseUndefined{chapter}{\dosecttoc}{\dominitoc}}
%\% Line numbers (package lineno)
%\IfDefined{linenumbers}{\linenumbers}
%\% prints all new columntype definitions into the log file.
%\IfDefined{showcols}{\showcols}
CHAPTER 8

Document content files

The structure of this part inside LaTeXTemplate.tex is described in section 6.4.7 on page 139.

8.1 content/Z-GlossaryEntries.tex

Definition of acronyms, symbol list and glossary entries using commands \newacronym and \newglossaryentry from package glossaries.

Note that this file must be loaded before \begin{document}.

```latex
%!TeX encoding=utf8
%!TeX spellcheck = en-US

%%% --- Acronym definitions
\IfDefined{newacronym}{%
% place these definitions before \begin{document}
\newacronym{NA}{NA}{numerical Apertur}
\newacronym{DOF}{DOF}{depth of field}
\newacronym{PSF}{PSF}{point spread function}
}%

%%% --- Symbol list entries
\IfDefined{newglossaryentry}{%
% place these definitions before \begin{document}
\newglossaryentry{symb:Pi}{%
  name=$\pi$,%
  description={mathematical constant},%
  sort=symbolpi, type=symbolslist%
}
\newglossaryentry{symb:Phi}{%
  name=$\varphi$,%
  description={arbitrary angle},%
  sort=symbolphi, type=symbolslist%
}
\newglossaryentry{symb:Lambda}{%
  name=$\lambda$,%
  description={wavelength},%
  sort=symbollambda, type=symbolslist%
}
}%

}\%```
8.2 content/title.tex

Here different approaches to generate a title are shown. The first uses \maketitle which however is difficult to modify and therefore not used. The title used makes use of several \vspace commands for manual alignment. The same layout is shown as a template for bachelor and master thesis. For phd-thesis however it usually must be created according to the rules of the university.

8.3 content/0-Abstract.tex

The abstract should only be included in a phd thesis. In master and bachelor thesis this is typically not desired. Here it is on two pages. The first for the language of the thesis and the second for an English translation. If the thesis itself is in english the first page should be removed.

8.4 content/Z-Declaration.tex

This file prints a declaration stating the work was done by the author himself. It may belong to a phd thesis, but often this is on a separated document. In all bachelor and master thesis I know of, this was part of the thesis itself.
I hereby declare that this thesis is my own work and effort and that it has not been submitted anywhere for any award. Where other sources of information have been used, they have been acknowledged.

\hspace{4\baselineskip}\copyright{\vfill\hfill\copyright{\vfill\hfill

---

Hiermit versichere ich, die vorliegende Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt sowie die Zitate deutlich kenntlich gemacht zu haben.

\hspace{4\baselineskip}\copyright{\vfill\hfill\copyright{\vfill\hfill

These document contain your content. Fill them with the content of the thesis. The commands available for creating your document are shown in the example code demonstration in documentation in part II.

Contains all chapters or sections for the appendix.

% !TeX encoding=utf8
% !TeX spellcheck = en-US
%
% \input{content/Z-Appendix-01.tex}
Add all your publications to this file. Unfortunately I did not find a satisfactory way of creating this bibliographic data other than manually.

\section*{Publications}
\markboth{Publications}{Publications}
\begin{refsection}
\nocite{Siegel2007, Palmer2010, Pospiech2009, Pospiech2010, Pospiech2011}
\forcsvlist{\listadd\bibboldnames}
\begin{refcontext}[sorting=nyt]
\printbibliography[env=numbered+bold, heading=none, resetnumbers=true]
\end{refcontext}
\end{refsection}

\section*{Submissions to international conferences}
\begin{refsection}
\nocite{Morgner2008, Palmer2008a, Siegel2008, Pospiech2009a, Pospiech2010b, Pospiech2010a}
\forcsvlist{\listadd\bibboldnames}
\begin{refcontext}[sorting=nyt]
\printbibliography[env=numbered+bold, heading=none, sorting=ynt, resetnumbers=true]
\end{refcontext}
\end{refsection}

\section*{Submissions to national conferences}
This CV is based on the CV in my own PhD thesis (with little changes) and created with package currvita. A CV should only be part of a PhD thesis, not a bachelor or master thesis. This CV should not be misunderstood with the CV in job application. The CV in a job application is something completely different and typically considerably longer and more detailed.
\begin{cv}{}
\begin{cvlist}{Personalien}
  \item[Name]
  Max Musterman \\
  geboren am 01.02.1979 in Berlin \\
  ledig, deutsch
\end{cvlist}
\%
\begin{cvlist}{Schulbildung}
  \item[1998] Abitur, Gymnasium Musterschule in Berlin
\end{cvlist}
\%
\begin{cvlist}{Zivildienst}
  \item[07/98 - 08/99]
  \textless{}Einfügen\textgreater{}
\end{cvlist}
\%
\begin{cvlist}{Studium}
  \item[SS/99 - SS/06] Universität Hannover, Studium der Physik
  \\[0.5\text{baselineskip]\]
  Thema der Diplomarbeit: \texttt{Charakterisierung des Rauschverhaltens eines weit abstimmbaren Ytterbium dotierten kerngepumpten Faserlasers}, durchgeführt am Laserzentrum Hannover e.\textbackslash{}V.
  \item[09/2006] Abschluss: Diplom-Physiker
\end{cvlist}
\%
\begin{cvlist}{Promotion}
  \item[09/2006 - heute] Wissenschaftlicher Mitarbeiter am Institut für Quantenoptik, Leibniz Universität Hannover
\end{cvlist}
\end{cv}{}

8.9 content/Z-Thanks.tex
The thesis ends with some acknowledgment statements. Here a fixed paragraph skip is introduced and the paragraph indentation removed.

%!TeX encoding=utf8
%!TeX spellcheck = en-US

% change parskip
\setlength{\parindent}{0pt}
\setlength{\parskip}{\medskipamount}

% chapter without heading and without number
\addchap*{Danksagung}
\addchap*{Acknowledgments}
%
% Add your text here! You may take the following text as a guide:

I thank ?? and ?? for giving me the opportunity to write this bachelor/master/phd thesis at ??, and for their professional advise.

I thank in particular the ?? team who readily/willingly provided information at any time and ??.

I would also like to than all people who supported me in writing this thesis.

\cleardoublepage

8.10 content/Z-Todo.tex
This code prints out a todo list created by commands of package todonotes.

\IfPackageLoaded{todonotes}{{
  \clearpage
  \IfPackageLoaded{hyperref}{\phantomsection}
  \todototoc \% add to toc
  \listoftodos \% print to document
}}
Bibliography


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A List of packages loaded

A.1 Sorted list for speed measurement

The packages listed in table A.1 were recorded by adding step by step more code and comparing the log files for changes in the list of packages. The execution times for each part were monitored as well. These numbers are presented in fig. 1.1. Here only .sty files are listed, all further files that are loaded by packages, such as .cfg or .fd files are not included in the list. For a complete list.

This evaluation was done during the development of this template and not updated since then. The number of packages is thus not consistent with the current template. A recent list of all packages is presented in appendix A.2

<table>
<thead>
<tr>
<th>Table A.1: Packages loaded by the template (Version of January 2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section</strong></td>
</tr>
<tr>
<td>LaTeXTemplate.tex</td>
</tr>
<tr>
<td>LaTeX Kernel</td>
</tr>
<tr>
<td>template packages</td>
</tr>
<tr>
<td>encoding (documents)</td>
</tr>
<tr>
<td>encoding (files)</td>
</tr>
<tr>
<td>fonts/fonts.tex</td>
</tr>
<tr>
<td>Fonts</td>
</tr>
<tr>
<td>Packages: Base</td>
</tr>
<tr>
<td>preamble/packages.tex</td>
</tr>
</tbody>
</table>

continued on next page...
<table>
<thead>
<tr>
<th>Section</th>
<th>List of Packages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math</td>
<td>amsmath.sty, amstext.sty, amsgen.sty, amsbsy.sty, amssopn.sty, mathtools.sty, mhssetup.sty, onlyamsmath.sty, braket.sty, cancel.sty, empeq.sty, exscale.sty, fixmath.sty, icomma.sty</td>
</tr>
<tr>
<td>Math (using LaTeX 3)</td>
<td>xfrac.sty, l3keys2e.sty, expl3.sty, l3names.sty, l3bootstrap.sty, l3basics.sty, l3expan.sty, l3tl.sty, l3seq.sty, l3int.sty, l3quark.sty, l3prg.sty, l3clist.sty, l3token.sty, l3prop.sty, l3file.sty, l3kip.sty, l3keys.sty, l3fp.sty, l3box.sty, l3coffins.sty, l3color.sty, l3luatex.sty, l3candidates.sty, xparse.sty, xtemplate.sty</td>
</tr>
<tr>
<td>pgf/tikz</td>
<td>pgf.sty, pgfrcs.sty, everyshi.sty, pgfcore.sty, pgfsys.sty, tikz.sty, pgforn.sty, pgfkeys.sty, pgfplots.sty, pgfplotstable.sty, pgfcalendar.sty</td>
</tr>
<tr>
<td>siunitx</td>
<td>siunitx.sty</td>
</tr>
<tr>
<td>Symbols</td>
<td>dsfont.sty, esint.sty, mathcomp.sty, euscript.sty, eurosym.sty, pifont.sty</td>
</tr>
<tr>
<td>Tables</td>
<td>booktabs.sty, multirow.sty, bigstrut.sty, tabu.sty, varwidth.sty, tablestyles.sty, ltxtable.sty, tabularx.sty</td>
</tr>
<tr>
<td>Text</td>
<td>ellipsis.sty, ulem.sty, soulutf8.sty, soul.sty, url.sty, varioref.sty, xr-hyper.sty, enumitem.sty, footmisc.sty, cleveref.sty</td>
</tr>
<tr>
<td>Quotes (csquotes)</td>
<td>csquotes.sty</td>
</tr>
<tr>
<td>Bibliography (biblatex)</td>
<td>biblatex.sty, biblatex2.sty, logreq.sty, ifthen.sty</td>
</tr>
<tr>
<td>Figures</td>
<td>wrapfig.sty, flafter.sty, placeins.sty</td>
</tr>
<tr>
<td>Captions</td>
<td>floatrow.sty, caption3.sty, fr-fancy.sty, fancybox.sty, caption.sty, subcaption.sty, mcaption.sty, changepage.sty, rotating.sty, ltcaption.sty, fr-longtable.sty</td>
</tr>
<tr>
<td>Index</td>
<td>imakeidx.sty, xkeyval.sty, xpatch.sty, multicol.sty</td>
</tr>
<tr>
<td>Verbatim, Listings</td>
<td>upquote.sty, verbatim.sty, fancyverb.sty, listings.sty, lstmisc.sty</td>
</tr>
<tr>
<td>Fancy</td>
<td>letrine.sty, boxedminipage.sty, framed.sty, mdframed.sty, zref-abspage.sty, zref-base.sty, auxhook.sty, atbegshi.sty</td>
</tr>
<tr>
<td>Layout</td>
<td>setspace.sty (multicol.sty)</td>
</tr>
</tbody>
</table>

*continued on next page*
<table>
<thead>
<tr>
<th>Section</th>
<th>List of Packages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head and Foot</td>
<td>scrpage2.sty, pageslts.sty, atveryend.sty, undolabl.sty, rerunfilecheck.sty,</td>
</tr>
<tr>
<td></td>
<td>uniquecounter.sty, bigintcalc.sty, alphas.sty, intcalc.sty</td>
</tr>
<tr>
<td>Headings</td>
<td>titlesec.sty</td>
</tr>
<tr>
<td>PDF</td>
<td>pdfpages.sty, eso-pic.sty, microtype.sty, hyperref.sty,</td>
</tr>
<tr>
<td></td>
<td>hobsub-hyperref.sty, hobsub-generic.sty, hobsub.sty, ifvtex.sty,</td>
</tr>
<tr>
<td></td>
<td>intcalc.sty, bigintcalc.sty, bitset.sty, uniquecounter.sty,</td>
</tr>
<tr>
<td></td>
<td>letltxmacro.sty, hopatch.sty, xcolor-patch.sty, atveryend.sty, refcount.sty,</td>
</tr>
<tr>
<td></td>
<td>hycolor.sty, bookmark.sty, nameref.sty, gettitlestring.sty</td>
</tr>
<tr>
<td>Additional</td>
<td>hyphenat.sty, todonotes.sty, currvita.sty</td>
</tr>
</tbody>
</table>

**preamble/style.tex**

**Style.tex**

**LaTeXTemplate.tex** after `{begin}{document}`

**Document**
A.2 Complete File list

The following list is extracted from the log file of TemplateDocumentation.tex from the compilation of this document. It thus shows the most recent list of files used.

<table>
<thead>
<tr>
<th>Package</th>
<th>Date</th>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fix-cm.sty</td>
<td>2015/01/14</td>
<td>v1.1t</td>
<td>fixes to LaTeX</td>
</tr>
<tr>
<td>ts1enc.def</td>
<td>2001/06/05</td>
<td>v3.0e</td>
<td>(jk/car/fm) Standard LaTeX file</td>
</tr>
<tr>
<td>ts1enc.dfu</td>
<td>2018/04/05</td>
<td>v1.2c</td>
<td>UTF-8 support for inputenc</td>
</tr>
<tr>
<td>scrbook.cls</td>
<td>2018/03/30</td>
<td>v3.25</td>
<td>KOMA-Script document class (book)</td>
</tr>
<tr>
<td>scrkbase.sty</td>
<td>2018/03/30</td>
<td>v3.25</td>
<td>KOMA-Script package (KOMA-Script-dependent basics and keyval usage)</td>
</tr>
<tr>
<td>scrbase.sty</td>
<td>2018/03/30</td>
<td>v3.25</td>
<td>KOMA-Script package (KOMA-Script-independent basics and keyval usage)</td>
</tr>
<tr>
<td>keyval.sty</td>
<td>2014/10/28</td>
<td>v1.15</td>
<td>key=value parser (DPC)</td>
</tr>
<tr>
<td>scrfile.sty</td>
<td>2018/03/30</td>
<td>v3.25</td>
<td>KOMA-Script package (loading files)</td>
</tr>
<tr>
<td>tocbasic.sty</td>
<td>2018/03/30</td>
<td>v3.25</td>
<td>KOMA-Script package (handling toc-files)</td>
</tr>
<tr>
<td>scrsize11pt.clo</td>
<td>2018/03/30</td>
<td>v3.25</td>
<td>KOMA-Script font size class option (11pt)</td>
</tr>
<tr>
<td>typearea.sty</td>
<td>2018/03/30</td>
<td>v3.25</td>
<td>KOMA-Script package (type area)</td>
</tr>
<tr>
<td>preamble/packages-SolutionsNoRoomForNewWrite.tex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>etex.sty</td>
<td>2016/08/01</td>
<td>v2.7</td>
<td>eTeX basic definition package (PEB,DPC)</td>
</tr>
<tr>
<td>morewrites.sty</td>
<td>2018/04/04</td>
<td></td>
<td>Always room for a new write</td>
</tr>
<tr>
<td>expl3.sty</td>
<td>2018-08-23</td>
<td>L3</td>
<td>L3 programming layer (loader)</td>
</tr>
<tr>
<td>expl3-code.tex</td>
<td>2018-08-23</td>
<td>L3</td>
<td>L3 programming layer</td>
</tr>
<tr>
<td>l3pdfmode.def</td>
<td>2018-08-23</td>
<td>v L3</td>
<td>Experimental driver: PDF mode</td>
</tr>
<tr>
<td>primargs.sty</td>
<td>2018/04/04</td>
<td></td>
<td>Parsing arguments of primitives</td>
</tr>
<tr>
<td>atveryend.sty</td>
<td>2016/05/16</td>
<td>v1.9</td>
<td>Hooks at the very end of document (HO)</td>
</tr>
<tr>
<td>codesection.sty</td>
<td>2014/06/27</td>
<td>v0.1</td>
<td>disableable code sections</td>
</tr>
<tr>
<td>etoolbox.sty</td>
<td>2018/08/19</td>
<td>v2.5f</td>
<td>e-TeX tools for LaTeX (JAW)</td>
</tr>
<tr>
<td>templatetools.sty</td>
<td>2014/06/27</td>
<td>v0.1</td>
<td>Collection of conditional commands useful inside templates</td>
</tr>
<tr>
<td>ifpdf.sty</td>
<td>2018/09/07</td>
<td>v3.3</td>
<td>Provides the ifpdf switch</td>
</tr>
<tr>
<td>ltxcmds.sty</td>
<td>2016/05/16</td>
<td>v1.23</td>
<td>LaTeX kernel commands for general use (HO)</td>
</tr>
<tr>
<td>array.sty</td>
<td>2018/04/30</td>
<td>v2.4h</td>
<td>Tabular extension package (FMi)</td>
</tr>
<tr>
<td>ifdraft.sty</td>
<td>2016/05/16</td>
<td>v1.4</td>
<td>Detect class options draft and final (HO)</td>
</tr>
<tr>
<td>latexdemo.sty</td>
<td>2012/12/01</td>
<td>v0.1</td>
<td>typeset code and resulting output</td>
</tr>
<tr>
<td>listings.sty</td>
<td>2018/09/02</td>
<td>1.7</td>
<td>(Carsten Heinz)</td>
</tr>
<tr>
<td>lstmisc.sty</td>
<td>2018/09/02</td>
<td>1.7</td>
<td>(Carsten Heinz)</td>
</tr>
<tr>
<td>listings.cfg</td>
<td>2018/09/02</td>
<td>1.7</td>
<td>listings configuration</td>
</tr>
<tr>
<td>xspace.sty</td>
<td>2014/10/28</td>
<td>v1.13</td>
<td>Space after command names (DPC,MH)</td>
</tr>
<tr>
<td>filecontents.sty</td>
<td>2018/05/30</td>
<td>v1.4</td>
<td>Create an external file from within a LaTeX document</td>
</tr>
<tr>
<td>mdframed.sty</td>
<td>2012/01/09</td>
<td>v1.2a</td>
<td>mdframed</td>
</tr>
<tr>
<td>kvoptions.sty</td>
<td>2016/05/16</td>
<td>v3.12</td>
<td>Key value format for package options (HO)</td>
</tr>
<tr>
<td>kvsetkeys.sty</td>
<td>2016/05/16</td>
<td>v1.17</td>
<td>Key value parser (HO)</td>
</tr>
<tr>
<td>infwarerr.sty</td>
<td>2016/05/16</td>
<td>v1.4</td>
<td>Providing info/warning/error messages (HO)</td>
</tr>
<tr>
<td>etexcmds.sty</td>
<td>2016/05/16</td>
<td>v1.4</td>
<td>Providing info/warning/error messages (HO)</td>
</tr>
<tr>
<td>etexcmds.sty</td>
<td>2016/05/16</td>
<td>v1.4</td>
<td>Providing info/warning/error messages (HO)</td>
</tr>
<tr>
<td>flutex.sty</td>
<td>2016/05/16</td>
<td>v1.4</td>
<td>Provides the flutex switch (HO)</td>
</tr>
<tr>
<td>xparse.sty</td>
<td>2018-08-23</td>
<td>L3</td>
<td>Experimental document command parser</td>
</tr>
<tr>
<td>zref-apsbase.sty</td>
<td>2016/05/21</td>
<td>v2.26</td>
<td>Module apsbase for zref (HO)</td>
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<tr>
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<td>v3.25 KOMA-Script package (defining layers and page styles)</td>
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Changes and history

Version numbers
The version number is defined by the KOMA-Script version followed by the template version. Version 3.2.0 is thus a huge change from 3.1.0 with both compatible for version 3 of KOMA-script.

2018/09 v3.2.5
Minor bug fixes and other changes
- The template failed to compile the \biblatex code in the publication list correct. This was due to a change in the code base of \biblatex.
- Examples for \glossaries were added to the template.
- replaced \texttt{scrpage2} by \texttt{scrlayer-scrpage}

2015/08 v3.2.4
Minor bug fixes and other changes
- The template failed to compile with latest package \texttt{titlesec} in combination with KOMA-script. Since both are not compatible and can be used only with workarounds within KOMA-Script the package \texttt{titlesec} was removed and the style changes applied using different commands.

2015/08 v3.2.3
Minor bug fixes and other changes
- The template failed to compile with TeX Live 2015. Package \texttt{pageslts} requires \texttt{atveryend} to be loaded before \texttt{etoolbox}.
- Removed package \texttt{fixltx2e}

2014/07 v3.2.2
Bug fixes, Improvements and other changes
- The template failed to compile with TeX Live 2014. The error was in the definition of \texttt{\addmoretexcs}.
- The options of \texttt{geometry} were not well thought out. If a spacing factor was introduced this could lead to an ugly page layout. All options of \texttt{geometry} are now such that the page layout is similar to the one of \texttt{typearea} with DIV12.
- The publications lists are now bibliography lists create with \texttt{\printbibliography}. Previously these needed to be created completely manual.
- New magic comment for the bibliography tool added.
- Removed packages. These are now available from CTAN or better the distribution package manager.
2014/01 v3.2.1
Mainly enhancements and bug fixing. The following list is a selection:

- Selection of packages for the “no room for a new \write’’ problem added.
- Update of glossary lists handling. New file for definitions and update of glossaries options.
- Added tocstyle to the list of used packages.
- Added file list with date of release
- Enabled typearea instead of geometry. This was basically a mistake in the code.

2013/06 v3.2.0
Initial Release of the complete reworked template with several outstanding features and changes:

- Complete new compilation of packages (up to date at 2013) with framework for selecting package sections.
- Focus on a target group of user who want to write thesis like documents.
- Introduction of a template documentation.
- Significant enhancements in the latex examples. It transformed from a simple rudimentary test and sample document to a test and example framework with examples for every package.
- Translation of all texts and comments into English. It targets therefor a much broader audience.

2008/12 v3.1.0 (LaTeX-Vorlage 3)
New release due to a rework for KOMA-Script 3.x. The basic design was adopted from the previous version. Further changes mainly in terms of package updates and bug fixes.

2006/06 v2.0.0 (LaTeX-Vorlage)
Initial online release of the template. It is based on KOMA-Script 2.x, supports most modern packages (at year 2006), provides most package options in the code and a documentation of the preamble code. The basic language is German. Additionally it provides a demo file for testing and showing the document layout.
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